With the authors respects.

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WEATHER, HEALTH, AND FORESTS:

A REPORT

ON THE INEQUALITIES OF THE

MORTALITY FROM MALARIAL FEVER

AND OTHER DISEASES,

IN MAURITIUS,

CONSIDERED IN RELATION TO THE INEQUALITIES OF

TEMPERATURE, HUMIDITY, AND RAINFALL;

ON A POSSIBLE PERIODICITY OF MORTALITY RELATED TO THE

ELEVEN-YEAR PERIODICITY OF SOLAR ACTIVITY;

AND ON THE CLIMATIC AND OTHER EFFECTS OF FORESTS.

Prepared for the Sanitary Commission of Mauritius appointed by Proclamation No. 50 of 1879.

BY CHARLES MELDRUM, L.L.D., F.R.S.

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1881.

Royal Alfred Observatory,
Mauritius, October 19, 1881.

To

The Honorable R. STEIN,

Chairman of the Sanitary Commission.

Sir,

Referring to my letter, No. 274, of the 20th May, 1880, in reply to Mr. Garrioch's letter of the 20th April, 1880, I have now the honor to forward, for submission to the Sanitary Commission, the accompanying Report on the relations of Weather to Mortality and on the Climatic Effects of Forests.

I have the honor to be,

Sir,

Your most obedient servant,

C. MELDRUM,

Director.

PREFACE.

When, on the 20th April, 1880, I was requested by the Sanitary Commission to compare the death-rates of Mauritius with its Meteorology, for the period 1867-79, I resolved to confine the comparison to the period 1871-79, because for those years Tables giving the number of deaths from malarial fever and other diseases in each month, for each of the nine Districts of the Colony, had been already prepared by the General Board of Health.

Finding, however, that, during the years 1871-79, the mortality from fever had a remarkable yearly inequality or periodicity, which seemed to depend upon the yearly inequalities or periodicities of temperature, humidity, and rainfall, and that this periodicity was so strongly marked as to impart a similar periodicity to the total mortality, it became desirable to ascertain whether the total mortality had been subject to the same periodicity before the fever epidemic of 1867.

Accordingly, having satisfied myself that the periodicity in question had existed since 1867, I examined the vital statistics of the Colony for the years 1861-66, and found that for that period the total mortality had no such periodicity as that which it has exhibited since 1866.

This interesting fact led to a detailed examination of the circumstances connected with the rise and spread of malarial fever in the Colony, as related in the Report (and its appendices) of the Fever Inquiry Commission of 1868; and it was found, among other things, that, in the almost unanimous opinion of the medical men of Mauritius at that time, the "exciting or determining causes" of the epidemic were the great flood of the 12th February, 1865, and the droughts, high temperature, and prevalence of westerly and north-westerly winds, by which it was followed.

The destruction of the forests, which had been carried to a great extent, was also considered to have been an exciting cause.

In presence of these opinions of the best judges in the matter, it next became desirable to ascertain all that could be ascertained concerning the weather of 1865-67, and the climatic effects of forests.

The abnormal weather which prevailed in Mauritius in 1865-67 was found to have prevailed in many other places, in which it was also attended or immediately followed by excessive death-rates.

Extending the inquiry as far back as possible, it was further ascertained that, since 1831, certain periods and years, namely, the periods 1832-35, 1841-45, 1854-56, 1866-69, and in a less degree 1877-79, and the years 1834, 1844, 1854, 1862, and 1867, which had been the most remarkable for high death-rates in Mauritius, had very nearly been the periods and years of highest death-rates in many other places, and that during those periods the weather had been more or less abnormal over a great part of the earth's surface.

With the view of forming an idea of how far the cutting down of the primeval forests had conduced to the outbreak and continuance of malarial fever, it was next deemed expedient to consider the climatic effects of forests generally, and to give an outline of the history of the forests of Mauritius, showing their nature, their original extent, their gradual destruction, their present condition, and the probable consequences of the extensive clearings that had been made.

The inquiry thus assumed proportions far beyond those which at the outset were contemplated, and, the original design having once been exceeded, it was thought best to submit, as far as possible, and unreservedly, all the facts, statistics, observations, views, and opinions, that might perchance be of use in discussing, now or hereafter, questions which are admitted to be of great importance to the Colony.

The main object, throughout, has been to give the greatest amount of reliable information that could be obtained, and I trust that the results will be found to be tolerably correct.

Summaries of the principal results and conclusions will be found towards the end of the Report.

My best thanks are due to those who have favored me with statistics. In this respect, I am especially indebted to Mr. J. B. Kyshe, the Registrar General, and to Mr. D. P. Garrioch, of the Colonial Secretary's Office. I am also much indebted to Mr. Garrioch for having assisted in correcting the proof sheets.

C. M.

Mauritius,

October 19, 1881.

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ON THE INEQUALITIES

OF THE

MORTALITY FROM MALARIAL FEVER

CONSIDERED

In relation to the Inequalities of Temperature, Humidity, and Rainfall.

Materials.

1. The materials which form the basis of this inquiry, in so far as the mortality from fever is concerned, have been mainly derived from tabular statements, prepared and printed by the General Board of Health.

Monthly Statements of Mortality commenced by Dr. F. Reid.

2. At a meeting of the Board held on the 19th January, 1875, the late Dr. F. Reid, after stating that he "had for a long time been in the habit of sending to the Local Board of Health of Port Louis a Return, compiled from the Records in the office, showing, month by month, the mortality in the Urban and Rural Districts", said that he "had caused a similar Return to be drawn up for last month (December, 1874), but fuller in details, and giving the mortality for the months of December during the last five years (1870-74) with the approximate ratio of deaths per thousand of the population of each District."

Data furnished by the Officers of the Civil Status.

3. Since that time similar Returns have been presented to the Board monthly (and printed), showing the number of deaths from malarial fever, dysentery, diarrhœa, consumption, &c., and all other diseases, in each of the nine Districts of the Colony, during each month both of the current year and of the previous four years, the data having been furnished by the Officers of the Civil Status.

4. Having been favored with a copy of the valuable statistics thus collected, embracing nine complete years, namely, 1871-79, and having carefully analysed them, I will proceed to state the results that have been obtained, premising that for the five years 1871-75 the figures given in the Minutes of the Board for the year 1875 have alone been used, and those in the Minutes of each succeeding year for that particular year and not for any previous year. This precaution was found to be necessary in consequence of serious errors having evidently been committed, after 1875, in transcribing the figures for the same months of former years.

Annual Mortality from Fever and all Causes in each District.

5. The first step was to determine the number of deaths from malarial fever, the number of deaths from all causes, and the total death-rate per thousand of the estimated population, in each District, for each of the nine years 1871-79.

Great Annual and Local Inequalities of Mortality.

6. The results are given in Table I. (see Appendices). and they show great inequalities in the numbers of deaths from fever and all causes from year to year, in the several Districts. Thus, in Port Louis the deaths from fever ranged between 1001, in 1871, and 1717 and 1700 in 1873 and 1877, and the total millesimal death-rates between 32.14 in 1871 and 52.46 and 46.83 in 1873 and 1877. In Pamplemousses, the greatest number of deaths from fever occurred, as in Port Louis, in 1873 and 1877 ; but in Rivière du Rempart the mortality from fever was greatest in 1876 and 1877 ; in Flacq and Black River, in 1876-77-79, especially 1877 ; in Grand Port in 1872-78-79 ; in Savanne in 1876-77-79, especially 1876 ; in Plaines Wilhems in 1873-77-79 ; and in Moka in 1876-77-78-79, especially 1877. Again, while the year of fewest deaths from fever in Port Louis, Flacq, Plaines Wilhems and Moka, was 1871, it was 1872 in Pamplemousses, Rivière du Rempart, and Black River, 1874 in Savanne, and 1877 in Grand Port. The comparatively small mortality inGrand Port in 1877 is particularly remarkable, inasmuch as nearly all the other Districts suffered greatly from fever in that year.

Mean Annual Mortality in each District and the whole Colony.

7. For the several Districts theaverage annual results for the whole period (1871-79) are as follows : T. denoting the mean annual number of deaths from all causes, F. the mean annual number of deaths from fever, R. the mean total death-rate per thousand of population, *r.* the mean death-rate from fever alone, and P.C. the percentage of deaths from fever.

Table A.

Districts.	T.	F.	R.	*r.*	P.C.
Port Louis	2595.8	1342.8	40.11	20.75	5~~6~~.~~0~~ 1.7
Pamplemousses	1116.0	628.0	25.20	14.18	56.5
Rivière du Rempart ...	482.3	226.4	21.06	9.89	46.9
Flacq	1353.1	701.2	24.72	12.81	51.8
Grand Port...	1293.8	587.5	27.05	12.28	45.4
Savanne	790.8	350.0	25.99	11.50	44.3
Black River	403.0	238.9	31.57	18.71	59.3
Plaines Wilhems ...	1087.7	448.8	29.13	12.02	41.3
Moka	620.5	234.3	26.94	10.17	37.8
Means	9743.0	4757.9	27.98	13.65	48.8

Port Louis, Black River, and Pamplemousses, suffered most from fever; and Rivière du Rempart and Moka least.

It will be seen that the mean annual number of deaths from all causes for the whole Island was 9743, of which 4758, or 48.8 per cent., were attributed to malarial fever; and that while the mean death-rate from all causes was 27.98, the death-rate from fever alone was 13.65. The total death-rates were greatest in Port Louis, Black River, and Plaines Wilhems, and least in Rivière du Rempart, Flacq, and Pamplemousses. The death-rates from fever were greatest in Port Louis, Black River, and Pamplemousses, and least in Rivière du Rempart, Moka, and Savanne. The percentages of deaths from fever were greatest in Black River, Pamplemousses, and Port Louis, in which Districts more than one half of the deaths was ascribed to fever; and least in Moka, Plaines Wilhems, and Savanne, especially in Moka.

Flacq

Remarkable Contrast.

The contrast between Pamplemousses, on the one hand, and Plaines Wilhems and Moka, on the other, is worthy of note; in the former District the total mortality was less than in either of the latter Districts, but the percentage of deaths from fever was much greater in the former than in the latter.

Mortality in each year.

8. The yearly number of deaths from all causes, as well as from fever, for the whole Island, together with the death-rates, were as follows:

TABLE B.

Years.	T.	F.	R.	r.	P. C.
1871...	8173	3592	25.26	11.10	43.9
1872...	8746	4300	25.59	12.58	49.1
1873...	11222	5172	31.59	14.56	46.1
1874...	9989	4178	29.52	12.35	41.8
1875...	8586	4170	24.88	12.08	48.6
1876...	9541	4975	27.45	14.31	52.1
1877...	10360	5886	29.04	16.50	56.8
1878...	9608	5138	27.16	14.52	53.5
1879...	11458	5411	31.39	14.82	47.2
Means... ...	9742.6	4757.9	27.98	13.65	48.8

From the third column of the above Table it appears that the mortality from fever increased from 1871 to 1873, decreased in 1874 and 1875, during which years it was stationary, increased till 1877, whi~~ch~~ it was greatest, and remained high in 1878 and 1879. en

The years in which fever was most fatal were 1873—77—78—79, especially 1877, and those in which it was least fatal

1871—72—74—75, especially 1871. The high total death-rates in 1873 and 1879 were due to measles and dengue in the former year and to *béri-béri* in the latter.

Total deaths and total death-rates, for each year, according to Registrar-General.

9. With the view, before proceeding further, of testing the accuracy of the statistics of the Board of Health, the total number of deaths and the total death-rates for each year were compared with those given by the Registrar General. According to the Returns of that Officer the total population of the Colony, the total deaths, and the total death-rates, for each year, were as follows :—

TABLE C.

Years.	Total Population.	Totals Deaths.	Total Death-rates.
1871...	321494	8171	25.41
1872...	326454	8745	26.78
1873...	331782	11210	33.78
1874...	339371	10019	29.52
1875...	344602	8584	24.88
1876...	345955	9525	27.53
1877...	348628	10335	29.64
1878...	354623	9649	27.20
1879...	357339	11485	32.14
Means	341138.7	9747.0	28.54

Discrepancies.

10. Comparing the total deaths in the above Table with those derived from the records of the Board of Health, we find certain discrepancies. The results for 1871, 1872, and 1875, are nearly the same, differing to the extent of only 1 and 2 deaths ; but the differences in the other years range from 12 in 1873 to 41 in 1878. In several instances the death-rates also differ ; those for the years 1874 and 1875 are the same ; and those for the years 1871, 1876, and 1878, are very nearly the same ; but those for the years 1872, 1873, 1877, and 1879, differ to amounts varying from 0.60 in 1877 to 2.19 in 1873. These discrepancies do not altogether arise from the differences in the total number of deaths ; for while there is a difference of only 1 in the total deaths for 1872, there is a difference of 1.19 in the death-rates for that year. It may be, therefore, that the Board of Health adopted a different estimate of the total population for 1872. It is possible, also, that errors were committed in calculating the monthly death rates for each District. Moreover, as the death-rates for each month and for each District were given separately by the Board

of Health, the annual death-rates for the whole island, obtained by taking a mean of those for the Districts, would necessarily differ somewhat from the rates derived directly from the total population and total deaths.

Not such as to materially affect the results.

11. But in whatever way these discrepancies may have arisen, they are not of such a nature as to materially affect the general results. The main object is to compare the inequalities of the mortality from fever with those of temperature, humidity, and rainfall. A few deaths more or less in a certain month or a certain year are not likely to mask any general characteristics that the mortality may possess through meteorological influences. At the same time, it is important that the data should be correct, and if the Returns of the Registrar General contaiñd Tables showing the monthly mortality from fever in each District for an equally long period, they would have been used in preference, as, doubtless, they would have been more reliable, seeing that the object of the Board of Health was merely to obtain approximate values. That these values are sufficient for the present object is further confirmed by the fact that the mortality from fever in the several Districts, for 1878, as given by the Registrar General in his Report for that year, differ little from those given by the Board of Health, and that the discrepancies may be accounted for by the circumstance that deaths in the Poor Law Hospitals were credited by the Board to the Districts from which the patients came.

Mortality from Fever subject to a yearly Periodicity in each District.

12. Having come to the conclusion that the materials at disposal contained much valuable information, and that they might be advantageously used for the objects in view, the next step was to enter as much into details as the data permitted. For this purpose a Table was prepared showing, (1) the number of deaths from fever, (2) the total number of deaths from all causes, and (3) the total death-rates, for each month of each of the nine years (1871-79), for each of the nine Districts, namely, Port Louis, Pamplemousses, Rivière du Rempart, Flacq, Grand Port, Savanne, Black River, Plaines Wilhems, and Moka. The nine Tables thus formed are numbered II to X, and they show, conclusively, that in each District malarial fever is subject to a yearly periodicity, which comes out prominently in the monthly means for the nine years.

Periodicity in Port Louis.

13. Turning, for example, to Table II, for Port Louis, we find from the columns of " means " that the deaths from fever increased from a minimum in November to a maximum in May, and then decreased to November, the progression being well-marked, and upon the whole very regular. On examining the results for each separate year, however, it will be seen that there were considerable deviations from the means, the epoch of maximum occurring occasionally in March, April, June, or July, and the epoch of minimum in September or October.

In other Districts.

14. The Tables for the other Districts give similar evidence, namely, a regular mean annual progression, from which the results for the individual years deviate to a certain extent; and it is to be remarked that the deviations themselves are more or less different in the different Districts.

15. It is unnecessary to dwell just now on the results of these nine Tables. An examination of them will convey more information than can be given by any description.

Periodicity confined to Mortality from Fever.

16. In order to facilitate comparison,the mean annual results for each District, as given in Tables II to X., are placed side by side in Table XI., which also gives the mean monthly differences (Dif.) between the total deaths and the deaths from fever. Turning to the last four columns of this Table, it will be seen (1) that the mean monthly mortality from fever (F.), per (mean) District, rises from 30.7 in November to 60.8 in May, and then gradually decreases till November, with a slight increase in October; (2) that the mean total mortality (T.) has a similar annual progression; but (3) that the mortality from all causes except fever (Dif.) does not show such progression, the number of deaths from January to May not increasing, as in the case of fever, but being irregular, and this irregularity continuing throughout the year, the mortality being, however, greatest in July and least in September and October. It would thus appear that the characteristic of a yearly periodicity shown by the total mortality is imparted to it by the mortality from fever alone, and that the mortality from all other causes is not subject to the same periodicity.

This is the case in each District.

17. On referring to the results for the individual Districts in the same Table (XI.), it will be seen that in none of them does the mortality from all causes except fever (Dif.) present a yearly progression like that of the mortality from fever, and that the uniformity, or equality, is greatest in those Districts in which, as in Moka, the percentages of deaths from fever are least.

Mean Annual Variation of Mortality from Fever for each District and for the whole Island.

Epochs of maximum and minimum not the same in the several Districts.

18. The mean annual variation of the mortality from fever in each District is given in Table XII. in such a form that the periodicity may be seen at a glance, and the epochs of maximum and minimum mortality be readily compared. In Port Louis, Pamplemousses, Rivière du Rempart, Flacq, and Grand Port, the mean maximum for the nine years occurs in May; in Black River in April and May; in Savanne in April; and in Plaines Wilhems and Moka in March. On the other hand, the minimum occurs in November in all the Districts, except Flacq, where it occurs in October, and in Plaines Wilhems, where it occurs in September. The mean variation for the whole Island (taking the mean for the nine Districts,) is given in the last column, from which it appears that, on an average, the fever-mortality is above its monthly mean during five months, namely, March, April, May, June, and July, and below it during the other seven months, attaining its maximum, as already stated, in May, and its minimum in November, with, however, a slight increase in October.

The epochs of maximum Mortality from Fever vary much from year to year.

Range of minimum poch less.

19. This mean yearly periodicity appeared so remarkable that it was considered desirable to ascertain how far the monthly fever-mortality, for the whole Island, differed in each year from the average monthly mortality for the entire period of nine years. Accordingly, nine other Tables were prepared, showing the monthly fever-mortality, the monthly total mortality, and the monthly total death-rates, for each District, for the same year. These yearly Tables are not given, since the data are all contained in Tables II to X for the several Districts; but the yearly results for the Colony, as

whole, month by month, will be found in Table XIII. From this Table it will be seen that in almost every year the progession differed from the mean progression for the whole period, and in some years, as in 1878 and 1879, to a great extent. In 1871 and 1873, the maximum occurred in April, in 1874 in June, in 1876 in March, in 1878 in July, in 1879 in February, and in 1872, 1875, and 1877, in May; thus having in the course of nine years, a range extending over six months; a remarkable fact. The minimum, on the other hand, occurred in November, in each year, except in 1876 and 1878, when it took place in September.

Variations of Mortality from Fever in each year for the whole Island.

20. The variations of the fever-mortality from month to month, in each year, for the whole Island, are given in Table XIV, in the form in which the variations for each District for the whole period (1871-79) are given in Table XII, and we see at once in what respects the monthly mortality in each year differed from the mean monthly mortality for the nine years. In the last column we have the mean monthly deviations from the mean monthly fever-mortality for the whole Island, and (bearing in mind that all the nine Districts, and not a mean District, are taken) the results are the same as in Table XII. In other words, during five months the mortality is above the monthly mean, and during seven months below it; the maximum occurring in May, and the minimum in November, with a slight increase in October. But in the individual years, we find considerable deviations from the mean results. In 1879, for example, the fever-mortality was above the monthly mean in January and February, which is unusual. Again, in 1878 the fluctuations were especially remarkable, the mortality in January having been above the monthly mean, in February below it, in March above it, in April and May (which are generally the most deadly months) below it, above it again in June, and, most of all, above it in July. It will also be seen that there were some extraordinary fluctuations in 1871, the mortality, after falling below the mean in June, rising considerably above it in July. And another note-worthy circumstance is that in 1875 the mortality was above the monthly average in August.

Remarkable Deviations from the means.

Were these Deviations due to Meteorological Causes?

21. Finding, then, that there was, on an average, a regular yearly periodicity of the mortality from fever, but that there were considerable deviations from the means not only with regard to individual Districts, but especially with regard to individual years, the question arose whether such periodicity might not be connected with meteorological periodicities, and the deviations from the mean annual progression of mortality with deviations from the mean annual progression of one or other of the meteorological elements. The temperature, humidity, and rainfall were the elements most likely to influence the march of malarial fever, and observations of these three elements had been taken daily at Beau Séjour, Plaines Wilhems, by the Honorable Mr. Stein, and at the Government Observatory, Pamplemousses. Tables were prepared, therefore, showing the mean temperature of the air, the mean relative humidity, and the rainfall, for each month of the years 1871-1879, at each of those stations*. From these Tables, which are numbered XV, XVI and XVII, we see that at each station the three elements had on an average well-marked yearly periodicities, the progression of tempe-

Meteorological Observations at Beau Séjour and the Government Observatory.

* The hygrometric observations at Beau Séjour are for the seven years 1873—79.

rature however, being more regular than those of humidity and rainfall. Both at Beau Séjour and at the Observatory the temperature increases from a minimum in July to a maximum in January and February, decreasing again till July; and the progressions in the individual years differ little from each other or from the mean for the whole period. On the other hand, while the mean humidity and rainfall have also yearly periodicities, with their maxima in March and minima in September to November, there were in the individual years great deviations from the mean progressions, as was the case with the mortality from fever; and, moreover, the annual values of humidity and rainfall varied much from year to year, as was also the case with the number of deaths from fever.

Annual Progressions of the three Elements at these Stations.

Mean Annual Variations.

22. In the following Table, the mean annual variations of the three elements, for both stations, are compared with the mean annual variations of the mortality from fever, for the whole Island, commencing with October:—

Table D.

Months.	Var. of Temperature	Var. of Rainfall	Var. of Relative Humidity	Var. of Mortality
	°	Inches	Percentage	
October.	— 1.6	— 3.4	— 3.7	— 90.5
November	+ 0.9	— 3.0	— 3.6	— 120.3
December	+ 3.8	+ 1.2	+ 0.7	— 76.5
January.	+ 4.9	+ 5.1	+ 1.8	— 45.4
February	+ 4.8	+ 5.2	+ 2.3	— 8.3
March	+ 3.9	+ 6.8	+ 2.7	+ 86.3
April	+ 2.5	+ 1.1	+ 2.1	+ 135.8
May	— 0.9	— 1.4	+ 1.0	+ 150.7
June	— 3.9	— 2.6	— 0.2	+ 77.8
July	— 5.3	— 2.8	— 0.6	+ 39.5
August...	— 4.9	— 2.7	— 0.3	— 53.3
September	— 3.9	— 3.9	— 2.6	— 96.6
Means	73.1	5.22	73.5	396.5

Similarity of the Variations.

The mean monthly temperature for Beau Séjour and the Observatory is 73°.1, the mean monthly rainfall 5.22 inches, and the mean monthly relative humidity 73.5; while the mean monthly number of deaths from fever for the whole Colony is 396.5. Now, we see from the above Table that the temperature is above (+) the monthly mean during six months of the year, and below it (—) during the other six months, attaining its maximum in January or February, and its minimum in July; that the rainfall is above its monthly mean in five months; that the relative humidity is above its monthly mean in six months; and that the mortality from fever is above its monthly mean during five months. What is specially worthy of note is that the rainfall is above its monthly mean for the same length of time that the fever-mortality is above its mean, but that while the rainfall attains its maximum and minimum in March and September, respectively, the mortality attains its maximum and minimum about two months later, namely, in May and November. Similarly, the rainfall and humidity lag somewhat behind the temperature.

Are they connected?

23. It is well known that the first three of the above variations are intimately connected. But the question is whether the fourth variation, that of mortality from fever, is connected with the three other variations, and if so, whether the inequalities of temperature, humidity, and rainfall, are sufficient to account for the inequalities of mortality?

Further Comparisons of Rainfall and Mortality.

24. As the inequalities of temperature are small, and as the inequalities of humidity are generally similar to those of the rainfall, we may dispense with the two former, and confine our attention to the rainfall alone, the inequalities of which are very great. We have observations of the rainfall in seven Districts for the nine years 1871-79, and Tables XVIII to XXIII give the monthly and annual falls, the means, and variations.

Mean Variations of Rainfall and Mortality.

25. The mean variations of the rainfall and fever-mortality for the whole period are as follows:—

TABLE E.

Months.	Var. of Rainfall.	Var. of Mortality.
	inches.	
January	+5.08	— 45.4
February...	+3.75	— 8.3
March	+5.99	+ 86.3
April	+2.51	+135.8
May...	—1.00	+150.7
June	—1.84	+ 77.8
July...	—2.60	+ 39.5
August	—2.20	— 53.3
September	—3.74	— 96.6
October	—3.70	— 90.5
November	—3.49	—120.3
December	+ 1.25	— 76.5
Means	6.64	396.5

We see that the rainfall and mortality are both above their respective means during five months of the year, and below them during the remaining seven months, but that the epochs of maximum and minimum of the mortality lag behind those of the rainfall to the extent of about two months. It is to be remarked, also, that a slight increase of rainfall in August is followed by a slight increase of mortality in October. These results are similar to those which were obtained by using the rainfalls of the Observatory and Beau Séjour alone.

Have these Variations a Causal Connexion?

26. Bearing in mind the above average variations for the whole Island, and for the whole period, let us now compare with them the variations in each year, and see whether, when the rainfall deviates from its average variation, the fever-mortality deviates from its average variation.

Variations in 1871.

27. The variations of the rainfall and fever-mortality in 1871 (see Tables XIV and XXIII) were as follows :—

TABLE F.

Months.	Variation of Rainfall.	Variation of Mortality.
	inches.	
January	+ 14.75	— 29.3
February	— 0.84	+ 11.7
March	— 1.25	+ 98.7
April	+ 4.17	+ 104.7
May	— 2.59	+ 86.7
June	— 2.44	— 14.3
July	— 2.89	+ 57.7
August	— 2.53	— 20.3
September	— 4.59	— 74.3
October	— 3.10	— 61.3
November	— 0.01	— 99.3
December	+ 1.33	— 60.3
Means	5.92	299.3

We see that in 1871 the mean monthly rainfall of seven Districts, as derived from observations taken at 14 stations, * was 5.92 inches, and that the mean monthly mortality from fever for the whole Island was 299.3. The rainfall was at its maximum in January, when it was 14.75 inches above (+) the monthly mean, that is, 20.67 inches in all ; and the mortatlity was at its maximum in April, when it was 104.7 above the mean, that is 404 deaths in all. Now, on an average, the maximum rainfall occurs in March, and the maximum mortality in May ; but in this year (1871) *both* the maximum rainfall and mortality occurred *earlier*. Another peculiarity is, that while, on an average, the mortality is below the monthly mean in

* These stations are: The Observatory and Botanical Gardens (Pamplemousses) ; Labourdonnais (Rivière du Rempart) ; Riche Mare (Flacq) ; Gros Bois, Joli Bois, and Beau Vallon (Grand Port) ; St. Aubin and L'Union (Savanne) ; Beau Séjour, Trianon and Westra (Plaines Wilhems) ; and Espérance and Bonne Veine (Moka).

February, it was in February, 1871, above it; that is, the mortality was, as it were, drawn forward towards the month of maximum rain. A still more striking circumstance is that a remarkable increase of rain in April was followed by a remarkable increase of fever in July. The rainfall in March and the mortality in June were below the average, but they respectively rose much above the average in April and July.

Hence it would appear that, as in the case of the average variation, heavy rains, in 1871, were followed, at certain intervals, by increased mortality, but that as the epochs of those rains differed from the mean, so did the epochs of the increased mortality.

It is necessary also to take into account the character of the rainfall with respect to frequency; that is, to know whether it fell on a few days, or was more or less equally distributed; and likewise to examine the rainfalls of November and December of the previous year, there being apparently a considerable interval between the occurrence of increased rains and increased mortality.

With regard to these points, the principal features were, that the rainfall of November, 1870, was above the average; that the rainfall of December, 1870, was much above the average, and that the greater part of it fell between the 1st and 6th; that most of the rains of January fell during the passage of a hurricane between the 3rd and 5th; that there were no heavy rains in February and March; and that the excessive rains in April fell in the early part of the month.

Variations in 1872.

28. In 1872 the variations were as follows:—

TABLE G.

MONTHS.	Var. of Rainfall.	Var. of Mortality.
	inches.	
January	+ 6.56	— 60.3
February	+ 5.68	— 59.3
March	+ 1.91	+ 52.7
April	— 1.59	+128.7
May	— 1.89	+182.7
June	+ 2.78	+101.7
July	— 1.94	— 24.3
August	— 0.35	— 45.3
September	— 3.57	— 74.3
October	— 3.10	— 81.3
November	— 4.41	—107.3
December	— 0.63	— 13.3
Means	5.90	358.3

In 1872 the mean monthly rainfall was almost identical with that of 1871, but the mean monthly mortality was much greater. This increase of mortality, then, was not due to an increase of the rainfall for the year. We find, however, that the monthly distribution of the rainfall in 1872 was different from that of 1871, the falls in February and March, 1871, having been very considerably less than in the same months of 1872. It will be observed, also, that the rainfalls of January and February, 1872, both of which were above the average, were nearly equal, and that the rainfall of March was above the monthly average for the year.

There was nothing remarkable in the rainfalls of November and December, 1871. On the 22nd. and 31st. January, 1872, 5.25 and 2.07 inches fell at the Observatory, * and 5.14 inches on the 16th. and 17th. February ; and in most parts of the Island the falls on those occasions were much greater. The rainfall of March was well distributed. In April and May the rain was a good deal below the average, and in June a good deal above it.

Turning now to the monthly mortality from fever, we find that, in comparison with the average mortality for the nine years, the most salient points were, that in July the number of deaths was below instead of above the mean ; that in January and February the mortality was, as in the case of the general averages, below the mean, but abnormally so in February ; and that, though the mortality was greatest in May, it was also high in April and June. On the whole, however, the variation did not deviate much from the average variation, the principal anomaly being the comparatively smaller number of deaths in July.

With respect to the deaths in January and February being below the average, it is to be remarked that there was nothing abnormal in the rainfalls of November and December, 1871, excepting that the former was above and the latter below the average. It is also to be remarked that the high mortality in April, May, and June, was preceded in January, February, and March, by rainfalls above the monthly average, the maximum occurring in January and February, and that the considerable decrease of mortality in July was preceded by small rainfalls in April and May. On the other hand, there is no indication of the increase of rain in June having been followed by an increase of fever in August or September. Whether this was owing to the lateness of the season and a lower temperature, or to some other cause, is a point which will be considered further on.

Variations in 1873.

29. Let us now briefly consider the rainfall and mortality variations in 1873, as presented in the following Table :

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* The rainfall at the Observatory is taken as an illustration of what occurred in most other parts of the Island.

TABLE H.

MONTHS.	Variations of Rainfall.	Variations of Mortality.
	inches.	inches.
January	+ 5.08	— 26.0
February	+ 13.85	+ 44.0
March	+ 3.02	+ 185.0
April...	+ 7.56	+ 304.0
May	— 4.10	+ 199.0
June	— 5.64	+ 31.0
July	— 3.90	— 28.0
August	— 3.75	— 102.0
September...	— 3.91	— 134.0
October	— 2.23	— 157.0
November...	— 5.40	— 163.0
December	— 0.57	— 153.0
Means..	7.18	431.0

Both the rainfall and the mortality were greater in this year than in 1871 or 1872.

The rainfall was above its monthly average during the first four months. It increased from January to February, decreased in March, and then increased considerably in April. The maximum, which was an exceptionally large one, took place in February. In May and June, the falls were much below the average. The principal deviation from the average was that the maximum took place in February instead of in March.

November, 1872, was remarkable for a frequency of rain all over the island, the number of days on which rain fell at the Observatory having been 20, which is far above the average for that month , and in some places the falls were considerable. The rainfall of December, 1872, was somewhat below the average for the nine years (1871-79), but there were heavy falls from the 5th. to the 12th.

From the 5th. to the 8th. January, 1873, 5.34 inches fell at the Observatory, and 22.74 inches from the 12th. to the 20th.

February, 15.94 inches of that large amount falling in 48 hours In March, again, 3.07 inches fell on the 6th. and 7th, and in April 7.14 inches on the 21st. and 22nd.

It will be seen that the mortality from fever was above the average in February, that it increased rapidly to a maximum in April, then decreased, and was below the average in July.

We thus find that the frequent rains in November, 1872, the considerable falls from the 5th, to the 12th. December, 1872, and the heavy rains from the 5th. to the 8th. January, 1873, were followed by an unusual increase of mortality in February, 1873, the average mortality for that month for the whole period being below in place of above the mean; that the earlier maximum rainfall in February was followed by an earlier maximum mortality in April; and that the small rainfall in May and June was followed in July by a mortality below the monthly average for the year, whereas the mean mortality in July for the whole period of nine years is above the monthly average.

The circumstance that the very considerable increase of rain towards the end of April had, apparently, no effect, will be considered presently.

Variations in 1874.

30. The variations in 1874 were as follows :—

TABLE I.

Months.	Var. of Rainfall.	Var. of Mortality.
	inches.	
January	+ 0.14	— 51.2
February...	— 2.95	— 30.2
March	+33.14	+ 17.8
April	— 4.16	+ 36.8
May	— 3.36	+125.8
June...	+ 1.74	+198.8
July	— 4.17	+ 91.8
August	— 5.03	— 25.2
September	— 5.28	— 90.2
October	— 7.08	— 65.2
November	— 5.02	—113.2
December	+ 2.07	— 96.2
Means	7.67	348.2

The mean monthly rainfall (7.67 inches) was above the monthly mean (6.64 inches) for the whole period, but the mean monthly mortality (348.2) was below the mean monthly mortality (396.5) for the whole period. Moreover, while the mean monthly rainfall was greater than in 1873, the mean monthly mortality was considerably less. This, again, shows that an increase of mortality does not altogether depend upon a mere increase of the total fall for the year.

With regard to the distribution of the rainfall in 1874, we find (see Table XXII) that the falls in January and February were considerably below the average (especially in February), enormously above it in March, below it in April and May, and much above it in June.

In November and December, 1873, the rainfall was below the average ; in the former month rain fell at the Observatory on only 9 days, and the greatest fall in 24 hours was only 0.36 inch ; in the latter month rain fell on 19 days, but the total fall was only 3.68 inches. There were frequent rains in January, 1874, but no heavy rains till the 27th, when 2.50 inches fell. February was rather dry ; there were only 17 days of rain, and the greatest fall in 24 hours was 1.36 inch on the 25th. March, on the other hand, was excessively wet, rain falling on 25 days, often heavily ; on the 8th and 9th together we had (at the Observatory) 7.15 inches, and from the 23rd to the 30th 26.04 inches, of which 11.45 inches fell from 9 A.M. of the 26th to 9 A.M. of the 27th, when the centre of a cyclone was passing near the Island. There was no peculiarity in the rainfalls of April and May, with the exception that, as already stated, they were below the average. The excess of rain in June was confined to the first half of the month, and chiefly to the Districts of Moka, Plaines Wilhems, Savanne, and Grand Port.

Comparing now the variation of mortality with that of the rainfall, we find that the dry November of 1873 was followed in January and February 1874, by a mortality which was below the average ; that the rainfalls of January and February continuing below the average (with, however, occasional aeavy falls), the mortality in March and April did not rise much above the average ; that the excessive rains in March, especially at the end of the month, when the maximum for the year occurred, were followed by a rapid increase of mortality in May, and a strongly marked maximum in June, about a month later than the usual epoch ; and that there was a comparatively high mortality in July and August (though a little below the monthly average in August), after an increase of rain in June.

It would thus appear that the enormous rainfall in the last days of March (January and February having been comparatively dry) not only threw the maximum of mortality back, but, with more rains in June, prevented a decrease of mortality in July, after a somewhat dry April and May.

31. We come now to the variations in 1875, which were as follows :

TABLE J.

Variations in 1875.

Months.	Variation of Rainfall.	Variation of Mortality.
	inches.	
January	— 1.22	— 49.5
February	— 2.87	— 30.5
March	— 2.59	+ 41.5
April	+ 1.12	+ 22.5
May	+ 7.80	+ 106.5
June	— 2.81	+ 92.5
July	— 4.45	+ 79.5
August	+ 0.96	+ 15.5
September	— 1.95	— 59.5
October...	— 1.62	— 64.5
November	— 0.22	—104.5
December	+ 7.79	— 48.5
Means...	6.45	347.5

The mean monthly rainfall in 1875 was very nearly the same as the mean monthly fall for the whole period, but the mean monthly mortality was 49 below the average. This is another proof that, as a rule, the mortality is not proportional to the yearly rainfall.

In January, February, and March, the rainfall was below (—) the mean monthly fall for the year, and much below the mean falls of those months for the whole period (Table XXII). In April and May, the rainfall was above the monthly mean for the year, and greatly so in May, when it was at its maximum for the year. Compared with the monthly means for the whole period, the rainfall in April was somewhat below the mean, but much above it in May. In June and July the rainfall was below the monthly means both for 1875 and for the whole period, but in August it was above them, and in September and October above the monthly means for the whole period, but below the monthly means for 1875.

In November, 1874, the rainfall was below the average, and in December above it; the former was a dry month and the rains in the latter, though frequent, were never heavy.* January,

* An exception to this occurred in the lower part of Flacq on the 9th Dec.

February, and March, 1875, were dry; most of the rain at the Observatory in January fell from the 26th. to the 30th, and amounted to 2.08 inches, of which 0.90 inch fell on the 29th; in February rain fell on 21 days, but the total was only 2.78 inches, and the greatest amount in one day 0.53 inch on the 21st; in March the number of days of rain was 20, the total fall 2.18 inches, and the greatest fall in 24 hours 0.47 inch on the 24th. In April 5.27 inches fell on 17 days, the heaviest falls being 1.76 inch on the 11th and 1.92 inch on the 24th. and 25th. May was unusually wet, 13.78 inches falling on 23 days; on the 1st. and 2nd. 2.73 inches fell, on the 10th. 1.72 inch, on the 12th. 3.36 inches, and 2.77 inches on the 19th. and 20th. In June 2.07 inches fell on 21 days, in July 1.04 inch on 16 days, in August 2.54 inches on 26 days, and in September 2.23 inches on 16 days.

Let us now turn to the monthly mortality from fever. We see that it was below the average in January and February; that it increased in March, though not greatly, and that, contrary to what usually happens, it decreased in April; that it attained its maximum in May, but that this maximum did not much exceed the mortality in June; that the mortality continued high in July; and, which is quite exceptional, that the mortality was above the average in August.

What we have to note is, that the dry November of 1874 was followed in January and February, 1875, by a mortality below the average; that the dry weather in January and February was followed in April by a decrease of mortality; and, especially, that the unusually late rainfall maximum was followed by a remarkable prolongation of a comparatively high mortality.

With regard to the circumstance that in this year the rainfall and mortality were greatest in the same month, we shall see presently that although, on the whole, the mortality was at its height in May, yet in some Districts the maximum occurred in June, July, or August.

Comparing 1871 and 1875 with 1873, we see that, as January, February, and March, in the two former years, were comparatively dry, and in the latter wet, so the maximum mortality was only 404 and 454 in the former, while in the latter it was 735. We shall see also that in 1877, which was wetter than 1873, the maximum mortality rose to 962 in May. Still, the rainfall and mortality are not proportional.

Variations in 1876.

32. The variations in 1876 were as follows :—

TABLE K.

Months.	Var. of Rainfall.	Var. of Mortality.
	Inches.	
January	+ 10.62	— 94.6
February	+ 6.02	+ 36.4
March	+ 1.80	+ 182.4
April	+ 0.07	+ 161.4
May	— 0.98	+ 120.4
June	— 1.62	+ 85.4
July	— 2.10	+ 52.4
August	— 2.70	— 84.6
September	— 3.72	— 170.6
October	— 2.24	— 136.6
November	— 4.25	— 111.6
December	— 0.96	— 40.6
Means	5.69	414.6

In this year the mean monthly rainfall was below, and the mean monthly mortality above, the general means.

The rainfall in November 1875, was below the monthly mean for that year, but, considerably above the mean for the nine years. December was a wet month. In January 1876, the rainfall was greatly above the average; at the Observatory 10.81 inches fell on 19 days, 7.69 inches falling from the 8th. to the 14th. The fall in February, also, was above the average, but after that month the rains diminished much.

Now we see that the rains of November and December were followed in February by a mortality above the average; that the strongly marked maximum rainfall in January (two months earlier than the mean maximum) was followed by a strongly-marked maximum mortality in March (two months earlier than the mean maximum mortality); and that the rainfall in each month from May to September having been not only below the monthly mean for the year, but also below the monthly means for the whole period, the epoch of minimum mortality advanced from November to September.

Variations in 1877.

33. In 1877 the rainfall and mortality varied as follows:

TABLE L.

Months	Var. of Rainfall.	Var. of Mortality.
	inches	
anuary......	+ 9.16	— 189.5
February	+ 11.16	— 114.5
March	+ 3.39	+ 99.5
April	+ 7.58	+ 427.5
May	— 5.05	+ 471.5
June	— 2.69	+ 91.5
July	— 3.56	— 13.5
August	— 2.54	— 127.5
September	— 6.43	— 130.5
October......	— 4.81	— 138.5
November...	— 2.84	— 221.5
December	— 3.43	— 154.5
Means	8.39	490.5

Both the mean monthly rainfall and mortality were greater in this than in any other year of the period.

The rainfalls in November and December, 1876, which were greatly below the average, were followed in January and February, 1877, by a mortality which was likewise greatly below the average. But excessive rains falling during the first four months of 1877, and the maximum occurring in February, the mortality increased rapidly, and was very great in April and May, the maximum, on the whole, occurring in May. The rainfall and mortality then decreased, and it will be seen that in July the mortality was somewhat below the monthly mean for the year.

Variations in 1878.

34. The variations in 1878 were remarkable :

TABLE M.

Months.	Var. of Rainfall.	Var. of Mortality.
	inches.	
January	+ 2.37	+ 34.8
February	+ 0.09	− 28.2
March	+ 2.48	+ 30.8
April	+10.98	− 11.2
May	− 0.43	− 22.2
June	− 3.66	+ 31.8
July	+ 3.01	+104.8
August	− 3.97	− 29.2
September	− 3.15	− 64.2
October	− 5.31	− 24.2
November	− 3.80	+ 0.8
December	+ 1.41	− 24.2
Means	6.18	428.2

The mean monthly rainfall was somewhat below, but the mean monthly mortality a good deal above, their means for the nine years.

November, 1877, was comparatively wet, and December comparatively dry. In January, February and March, 1878, the rainfall was below the average of the nine years, though not to a great extent, and the driest of those months was February. The maximum rainfall occurred in April, and it was a high one. May was an average month, June dry, and July wet.

The wet November was followed in January by an increase of mortality ; the comparatively dry December by a decrease of mortality in February ; an increase of rain in January (though the total was below average) by a small increase of mortality in March ; a decrease of rain in February by a small decrease of mortality in April and May ; and the large maximum rainfall in April by an increase of mortality, which attained as marked a maximum in July as the rainfall had done in April. It is worthy of note, also, that while the mortality in November of each of the other nine years was greatly below the monthly mean, it was in this year a little above it.

In some parts of the Island the rainfall in November, 1877, was greatly above the average, especially in and about Port Louis, where, towards the end of the month, the streams and water-courses were swollen. Much rain fell also in Pamplemousses. The total fall at the Observatory was 9.22 inches on 13 days, 5.91 inches falling from the 24th. to the 25th. alone. In December 4.27 inches fell on 20 days, and the heaviest fall in 24 hours was 1.38 inch on the 4th. The fall in January, 1878, was 5.15 inches on 21 days, and 1.94 inch fell on the 15th. and 16th. The greatest fall on one day in March was 1.13 inch on the 18th, and the total fall 3.94 inches on 15 days. In April 8.47 inches fell on 14 days; on the 2nd. and 3rd. 2.68 inches fell; and 4.17 inches from the 22nd. to the 25th. The greatest fall in May was 1.85 inch on the 6th, and the total fall 2.97 inches on 18 days. June was very dry all over the Island, and July wet. In the latter month 5.71 inches fell at the Observatory on 15 days, and 4.85 inches of the whole on the 10th. to the 12th. These details show how irregular and fitful the rainfall was at Pamplemousses in this year, and similar anomalies occurred in the other Districts.

The most prominent feature, with regard to the rainfall, was the occurrence of extraordinary floods on the 22nd. April, especially in Grand Port, Savanne, and parts of Flacq; and, with regard to fever, an extraordinary increase of mortality in July, two or three months after those floods. At Gros Bois (Grand Port) 27.22 inches of rain fell from 11 p.m. on the 21st. to 8 p.m. on the 22nd, and at St. Aubin (Savanne) 19.55 inches; and most of those quantities fell in a few hours. But although the floods were confined to certain Districts, there were heavy rains all over the Colony. Now, the point to which special attention should be directed is that a retardation of the maximum rainfall to the last week in April, was followed by a retardation of the maximum mortality to July.

Let it be noted, also, that July of this year was much rainier than any other July of the period, and that in the following months of August to December the mortality was higher than in the same months of any other year.

35. Lastly, we come to the variations in 1879.

Variations in 1879.

TABLE N.

Months.	Var. of Rainfall.	Var. of Mortality.
	inches.	
January	— 1.73	+ 57.1
February...	+ 3.59	+ 97.1
March	+ 11.97	+ 68.1
April	— 3.21	+ 48.1
May...	+ 1.70	+ 86.1
June...	— 2.29	+ 82.1
July...	— 3.40	+ 35.1
August	+ 0.06	— 60.9
September	— 1.02	— 71.9
October	— 3.86	— 85.9
November	— 5.47	—162.9
December	+ 3.63	— 97.9
Means...	6.41	450.9

The mean monthly rainfall was 0.23 inch below the average, and the mean monthly mortality 54.4 above the average.

In November and December, 1878, the rainfall was below the average, to the extent of 24.5 per cent in November, and of 3.8 per cent in December. Towards the end of the latter month there were some heavy rains in different parts of the Island ; on the 23rd. 4.39 inches fell at the Observatory, 2.20 at Beau Séjour and Lynnwood, 2.87 at Gentilly, 3.33 at Espérance, and 6.16 at Cluny. The rainfalls of January and February, 1879, were respectively 60 and 4 per cent below the average, that of March 45.5 per cent above the average, that of April 65 per cent below the average, and that of May 44 per cent above the average. In June and July the falls were somewhat below the average, and in August and September above it, especially in September, which was the wettest during the nine years. No heavy rains occurred in January. In February from 1 to 3 inches fell on the 2nd. and 5th, and from 1 to 4 inches on the 26th. during the passage of a cyclone. Nearly all the rains in March fell during a hurricane on the 20th. to the 22nd, when from 7 to 22 inches were registered at the several stations. Another downpour took place on the 3rd. to the 4th. May, from 4 to 8 inches falling in the course of twenty-four hours. On the 6th. to the 7th. September from 1 to 5 inches fell at some stations.

What at first strikes one most on looking at the mortality variation is that the number of deaths was above the monthly average for the year during the seven months of January to July. But, on comparing the several excesses, we find that the number of deaths was greatest in February, that it decreased in March and April, especially in April, and that it then increased considerably in May and June.

The floods of the 22nd. April and the excessive rains of the 10th. to the 12th. July, 1878, were, as we have seen, followed by a high mortality, which, we now find, continued throughout the greater part of 1879, a year which was remarkable for alternations of droughts and heavy rains. The rainfall of November, 1878, was not greatly below the average, and the heavy falls in the end of December seem to have increased the fever intensity which had previously existed, and to have raised the mortality in January and February, 1879. The dry month of January (the rainfall of February was also much below the average till the 25th) was followed by a marked decrease of mortality in March and April, and the torrential rains of the 20th to the 22nd March by an equally marked increase of mortality in May and June. It would thus appear that the fluctuations in the rainfall were to a certain extent, and at certain intervals, followed by fluctuations in the mortality. The circumstance that the considerable rainfall on the 6th. to the 7th. September was not, apparently, followed by an increase of mortality will be considered presently.

36. The general results of the analysis of the variations for the individual years are as follows :

Resumé.

1o. In six of the nine years, viz., 1871-73-74-76-77-78, the fever mortality in January and February was above or below the monthly mean for the year, according as the rainfall in November and December was above or below its monthly mean, or heavy rains fell on a few days. Thus, heavy rains in December, 1870, were followed in February, 1871, by a mortality above the mean ; a small rainfall in November, 1872, by a mortality below the mean in January, 1873 ; and heavy rains from the 5th. to the 12th. December, 1872, by a mortality above the monthly mean in February, 1873 ; rainfalls below the average in November and December, 1873, by mortalities below the monthly means in January and February, 1874 ; rainfalls above the average in November and December, 1875, by a mortality above the monthly mean in February, 1876 ; an exceptionally dry November and December, in 1876, by mortalities greatly below the monthly means in January and February, 1877 ; a wet November, 1877, by a mortality above the mean in January, 1878, and a dry December, 1877, by a mortality below the mean in February, 1878.

2o. Marked alterations in the epochs of maximum rainfall were, as a rule, followed by marked alterations either in the epochs of maximum mortality, or in the mean annual progression of the mortality. Thus, in 1871-73-76, the maximum rainfall occurring in January or February, in place of in March, the mortality attained its maximum in March or April, instead of in May. Again, a great maximum rainfall occurring in the last week of March, 1874, the maximum mortality took place in June; and another great maximum rainfall occurring towards the end of April, 1878, the mortality attained its maximum in July. In 1875, both the maximum rainfall and the maximum mortality occurred in May, but the maximum mortality was not much above the mortality in June and July, and, which was quite abnormal, the mortality was above the monthly mean in August.

3o. A small rainfall in February and March, 1871, was followed by a decrease of mortality in May and June (especially June), and a great increase of rain in April by a very considerable increase of mortality in July; a decrease of rain in April and May, 1872, was followed by a decrease of mortality in July; a small rainfall in May and June, 1873, was followed by a decrease of mortality in July and August; and the very dry January of 1879 (the driest January during the nine years) was followed by a decrease of mortality in March and April, while an increase of rain in March and April was followed by an increase of mortality in May and June.

4o. The range of the epochs of maximum rainfall was six months, namely, December to May, and the range of the epochs of maximum mortality was also six months, namely February to July. On the other hand, the ranges of the epochs of minimum rainfall and mortality were both (with a slight exception in the case of the rainfall) confined to the three months of September to November.

5o. The average epochs of maximum and minimum rainfall occurred in March and September, and those of mortality two months later, namely, in May and November; and a slight increase of the monthly average rainfall in August was followed by a slight increase of the monthly average mortality in October.

6o. Hence it would appear that, on the whole, an increase or decrease of rain was followed two months later on by an increase or decrease of mortality from malarial fever.

7o. The mortality, however, was not proportional to the amount of rain; it depended to a certain extent upon the distribution of the rain; that is, upon alternations of rains and droughts.

These results have been obtained exclusively from Tables XIII., XIV., XXII., and XXIII., showing the monthly rainfall and mortality for the whole Island. But both the rainfall and the mortality were occasionally different in different parts of the Colony, and if we examine the rainfall and mortality Tables for the several Districts, we shall find similar results, and that apparent anomalies in the general results for the whole Island are to a great extent accounted for. Thus, in December, 1871, the rainfall was nearly 300 per cent above the average in Moka, and 40 per cent below it in the other Districts, except Pamplemousses, where it was 25 per cent above it; but as Moka does not contribute much to the mortality from fever, and as the rainfall generally was below the average in December, 1871, the mortality was generally below the monthly mean in February, 1872. Again, although after the wet June of 1872 the mortality was, on the whole, somewhat below the monthly mean, yet in Pamplemousses, Rivière du Rempart, Savanne, Black River, and

Moka, there was a distinct increase of mortality in one or more of the months of July, August, and September. Similarly, the increase of rain in April, 1873, was followed in May and June by a comparatively high mortality in Port Louis, Pamplemousses, and Flacq. The copious rains in June, 1874, and the frequent rains in July of the same year, were followed by a general increase of mortality in October. The heavy rains in May, 1875, were followed in Port Louis and Savanne by a maximum mortality in July, in Pamplemousses by a maximum mortality in August, and in Grand Port by a maximum mortality in June and July, though for the whole Island the maximum mortality occurred in May. After the rains of the 6th. to the 7th. September, 1879, the mortality increased considerably in Port Louis, Pamplemousses, Plaines Wilhems, and Moka. And these local fluctuations in the mortality appear to have corresponded with local fluctuations in the rainfall. On comparing the monthly rainfalls and mortalities for the several Districts many similar instances will be found, one of the most remarkable being that after the floods of the 22nd. April, 1878, the mortality increased greatly in Grand Port, where the rainfall was greatest, and attained a high maximum (102) in July.

Conclusion.

37.—From all these facts it is concluded that the amount of mortality from malarial fever in Mauritius, and the epochs of maximum and minimum, depend to a very considerable extent upon the monthly distribution and amount of the rainfall. There are some anomalies, but they are so few, in comparison with the numerous striking coincidences, that they could probably be explained, if we knew all the details.

Greatest Anomalies in Grand Port.

38.—The most remarkable, and almost the only, anomalies have occurred in Grand Port. While in 1877 the mortality was very high in all the other Districts, and upon the whole greater than in any other year, it was at its minimum in Grand Port. Again, in 1872 the mortality was considerably above the average in Grand Port, whereas in all the other Districts it was considerably below it, and in May of the same year the mortality in that District was higher than in any other month of the whole period, which was not the case in any other District.

A possible Explanation.

39.—When we turn to the rainfalls of Grand Port in 1872 and 1877, we find that the fall during the first four months of 1877, at three stations, was 232.61 inches, and in 1872 only 125.28 inches. In January to April 1877, heavy rains fell almost daily. But in 1872 there were intervals of dry weather between falls of 2 to 5 inches in twenty-four hours, and heavy rains in January and February, especially in January, were followed by comparatively dry weather in March and April, which was not the case in 1877. It may be, then, that the smaller mortality in Grand Port, in 1877 was due to almost *continuous* excessive rains during the first four months, and the greater mortality in 1872 to alternations of heavy rains and dry weather. The rainfall of Grand Port is greater than that of the other Districts at the same altitudes, and it will be seen that the mortality was greatest when the conditions, as far as rain is concerned, approached those of other parts of the Island in the years in which they suffered most from fever. When the rains were frequent and heavy in Grand Port, as during the first four months of 1873 and 1877, the mortality was below the average, but when they were smaller and more irregular, with intervals of dry weather, as in 1872, 1876, 1878, and 1879, the mortality was above the average. It would thus appear that, in reality, the apparent anomalies in Grand Port confirm the rule that the mortality from fever is greatly influenced by the rainfall and its distribution.

Variations of Total Mortality, Mortality from Fever, and Mortality from all other causes except Fever.

40. We have seen that both the total mortality from all causes and the mortality from fever alone are subject to an annual periodicity, but that the mortality from all causes, except fever, is not subject to the same periodicity. This will appear more clearly from the following Table of the annual variations of these three classes of mortality :

TABLE O.

MONTHS.	Var : of Total Mortality.	Var : of Mortality from Fever.	Var : of Mortality from all causes except Fever.
January	+ 28.8	— 45.4	+ 16.6
February	+ 20.1	— 08.3	— 11.8
March	+ 100.0	+ 86.3	+ 13.7
April..................	+ 134.3	+ 135.8	+ 1.5
May	+ 163.3	+ 150.7	+ 12.6
June	+ 96.8	+ 78.5	+ 18.3
July	+ 76.1	+ 39.5	+ 36.6
August..............	— 32.5	— 53.3	+ 20.8
September	— 133.7	— 96.6	— 37.1
October	— 129.3	— 90.5	— 38.8
November	— 144.8	— 120.3	— 24.5
December............	— 80.4	— 76.5	— 3.9
Means................	811.8	396.5	415.3

The mortality from all causes, excepting fever, was a little more than one half of the total mortality. Now, we see that its variation is materially different from the variations of the total mortality and the mortality from fever, the deaths in January being above the monthly mean, falling below it in February, rising in March, falling in April, then rising to a maximum in July, and falling to a minimum in October. As already remarked, this indicates that the annual variation of the total mortality is, in a great measure, due to the strongly-marked annual variation of the fever-mortality.

41. With the view of ascertaining whether the mortality from other diseases had yearly periodicities, Tables XXIV., XXV., XXVI., and XXVII., were constructed, showing, according to the statistics of the Board of Health, the number of deaths (for the whole Colony) from Dysentery, Diarrhœa, Consumption, and other Pulmonary Diseases, in each month of the nine years 1871—79. The annual variations of the mortality from these diseases were as follows :

TABLE P.

MONTHS.	Var : of Mortality from Dysentery.	Var : of Mortality from Diarrhœa.	Var : of Mortality from Consumption.	Var : of Mortality from other Pulmonary Diseases.
January	— 0.36	+ 1.79	— 2.84	+ 5.27
February.........	+ 7.86	+ 4.02	— 5.62	— 8.96
March	+ 20.64	+ 2.02	— 7.96	— 4.29
April	+ 20.19	+ 1.02	— 5.95	— 7.62
May	+ 25.86	+ 0.79	— 1.40	— 5.85
June...............	+ 20.42	— 1.32	— 3.18	— 4.07
July	+ 6.86	+ 1.24	+ 2.82	+ 11.38
August	— 9.81	— 2.10	+ 14.16	+ 10.82
September	— 20.25	— 2.87	— 0.06	+ 5.71
October	— 32.47	— 4.54	+ 5.05	+ 2.93
November	— 25.92	— 1.32	+ 2.82	— 3.62
December	— 19.03	+ 0.24	+ 2.16	— 1.73
Monthly Means	72.25	12.54	45.62	41.29

Variations of Mortality from Dysentery, Diarrhœa, &c.

The annual variation of the mortality from dysentery is well-marked, and very nearly the same as that of the mortality from fever ; but the variations of the mortalities from diarrhœa, consumption, and other pulmonary diseases, are totally different. The epoch of maximum mortality from diarrhœa coincides nearly with the maximum temperature, and that of maximum mortality from consumption and other pulmonary diseases coincides nearly with the minimum temperature. And it will be seen that there are several other important differences.

42. As the mortality from dysentery has almost the same annual progression as that from fever, it must, to a certain extent, contribute to the similar progression exhibited by the total mortality from all causes. Let us, then, take from the total monthly mortality both the monthly fever-mortality and the monthly dysentery-mortality, and see whether the remainders have a yearly progression. The figures are as follows :

TABLE Q.

MONTHS.	Mean Total Mortality.	Mean Fever Mortality.	Mean Dysentery Mortality.	Mean Mortality from all causes except Fever and Dysentery.	Var.
January	783.0	351.1	71.9	360.0	+ 16.9
February	791.7	388.3	80.1	323.3	— 19.8
March	911.8	482.8	92.9	336.1	— 7.0
April	946.1	532.2	98.4	315.5	— 27.6
May	975.1	547.2	98.1	329.8	— 13.3
June	908.6	475.0	92.7	340.9	— 2.2
July	887.9	436.0	79.1	372.8	+ 29.7
August	779.3	343.2	62.4	373.7	+ 30.6
September	678.1	299.9	52.0	326.2	— 16.9
October	682.5	306.0	39.8	336.7	— 6.4
November	667.0	276.2	46.3	344.5	+ 1.4
December	731.4	320.0	53.2	358.2	+ 15.1
Means	811.8	396.5	72.2	343.1	

Annual Variation of the Mortality, from all Causes, excepting Fever and Dysentery.

Comparing the variation of the mortality from all causes, except fever and dysentery, in the last column of the above Table, with the variation of the mortality from all causes, except fever alone, in the last column of Table O, we find a still greater departure from the variation of the total mortality. In fact, the march of the mortality from all causes, except fever and dysentery, has no resemblance whatever to the annual progressions of the total mortality and the mortality from fever.

43. Hence it is evident that the yearly periodicity of the total mortality, during the nine years 1871-79, was due mainly to fever, and partly to dysentery.

Mean monthly Mortality in the years 1871-7-75-76-77-78.

44. In 1873 and 1874 there was an epidemic of measles and *dengue*, and in 1879 *béri-béri*, or acute dropsy,* was prevalent. As the mortality from these diseases was no doubt partly the cause of the results obtained by subtracting the fever and dysentery mortalities from the total mortality for the period 1871-79, the three years 1873, 1874, and 1879 are now omitted, in order to ascertain the mean march of the total mortality *minus* the fever and dysentery mortalities for the other six years. The results are as follows :

TABLE R.

MONTHS.	Mean Total Mortality.	Mean Fever Mortality.	Mean Dysentery Mortality.	Mean Mortality from all causes except Fever and Dysentery.	Var :
January	676.5	325.0	59.7	291.8	— 18.7
February	695.7	359.0	67.2	269.5	— 41.0
March	833.8	474.0	77.5	282.3	— 28.2
April	895.3	528.5	85.3	281.5	— 29.0
May	946.5	547.3	86.8	312.4	+ 1.9
June	869.8	454.5	80.5	334.8	+ 24.3
July	876.8	432.5	71.0	373.3	+ 62.8
August	771.7	341.2	60.3	370.2	+ 59.7
September	655.2	294.2	48.3	312.9	+ 2.4
October	654.8	305.3	36.2	313.3	+ 2.8
November	612.5	282.5	44.3	285.7	— 24.8
December	680.3	332.8	48.7	298.8	— 11.7
Means	764.1	389.7	63.8	310.5	

* The exact nature of the disease seems to be unknown.

Same Conclusion.

We see that the total mortality, the fever mortality, and the dysentery mortality, have still the same yearly progressions, but that the variation of the total mortality *minus* the fever and dysentery mortalities, in the last column, is somewhat different from that in Table Q, the mortality in January being now below, instead of above, the monthly mean, and the minimum occurring in February, instead of in April. This difference is due to measles, *dengue*, and *béri-béri* in 1873-74-79. But still, the variation is essentially different from the variation of the total mortality, the minimum occurring in February, and the maximum in July and August. We come, therefore, to the same general conclusion, as before, namely, that the mean yearly periodicity of the total mortality for the period 1871-79 was due to fever and dysentery.

Annual March of Mortality previous to 1867.

45. These results, and the circumstance that the fever mortality had in 1867 and in subsequent years a strongly-marked periodicity of the same character as that which it still possesses, suggested the desirability of ascertaining, as far as possible, the annual march of the total mortality previous to the great epidemic of that year. Accordingly, an application was made to the Registrar General, Mr. J. B. Kyshe, for tabular statements of the number of deaths in each District, and in each month, during the five years 1861-63-64-65-66; the year 1862 being omitted, because there was an outbreak of cholera. Mr. Kyshe has kindly furnished these statements, and, as they are very important, they are given *in extenso* in Tables XXVIII to XXXII. From these Tables I have compiled Table XXXIII, showing the monthly mortalities in each year for the whole Colony, the monthly means, and the mean annual variation.

Entirely different from its March since 1866.

46. From the following Table showing the monthly means and the variation for those five years it will be seen that the annual march of the total mortality, before 1867, was totally different from what it has been since the outbreak of fever in that year.

TABLE S.

Months.	Monthly Means	Var.
January	1003.4	+ 49.2
February	935.8	— 18.4
March	986.8	+ 32.6
April	919.8	— 34.4
May	972.6	+ 18.4
June	898.4	— 55.8
July	970.4	+ 16.2
August	971.4	+ 17.2
September	947.2	— 7.0
October	969.8	+ 15.6
November	910.4	— 43.8
December	965.0	+ 10.8
Means	952.4	

From 1861 to 1866 the Total Mortality had no periodic Progression.

Comparing the above variation with that of the total mortality for 1871-79 (Table O.), we see at once that there is no resemblance between them. Before the epidemic of 1867, the mortality varied little from month to month, and such variation as it had was without character. But the fever brought a complete change in this respect; the total mortality assumed a remarkable yearly periodicity, which, notwithstanding occasional deviations from the means, it has since preserved. The mean monthly mortality for any three consecutive years from 1867 to 1879 clearly reveals this periodicity, but the mean monthly mortality of any three or more years of the period 1861-66 shows no periodicity. On the other hand, the inequalities of the total mortality, before 1867, have a considerable resemblance to those of the total mortality *minus* the fever and dysentery mortalities for the period 1871-79, as may be seen by comparing Tables Q and S.

47. The principal results which have been obtained with regard to the annual inequalities of the temperature, relative humidity, rainfall, and mortality, are represented by 12 curves.

Mean annual Curves.

No. 1 is the Temperature Curve for the period 1871-79. The mean temperature of the Observatory (Pamplemousses) and Beau Séjour (Plaines Wilhems) is 73°. 1 Fah., which is an approximation to the mean temperature of the Island, the two stations being respectively 960 and 179 feet above the sea-level; and the curve shows in what months and to what extent the temperature rises above or falls below the mean.

No. 2 is the Relative Humidity Curve for the same two stations.

No. 3 is the Rainfall Curve. The mean monthly fall for 14 stations is 6.64 inches, and the curve shows how much and in what months the amount of rain is above or below the mean.

Nos. 4 to 11 are Mortality Curves for the period 1871-79, and they are constructed so as to be comparable, the departures from the respective monthly means being represented in percentages of those means. No. 4 (Total Mortality Curve) has to a certain extent been decomposed, and Nos. 5 to 11 show the principal components. It will be seen that Nos. 4, 5 and 6 have a striking resemblance; the epochs of maximum and minimum are almost identical; and the progressions have on the whole the same character as those of the temperature, humidity, and rainfall. No. 7 has its maximum about the time of maximum temperature, but Nos. 8 and 9 have their maxima in the coldest months. Nos. 10 and 11 are specially interesting; compared with No. 4, they show that the total mortality owes its periodicity to fever and dysentery, but almost entirely to fever; for although dysentery has a most marked periodicity, the mean monthly mortality is small in comparison with that from fever.

No. 12 is the Total Mortality Curve for the period 1861-66 (omitting the cholera year 1862); and, compared with No. 4, it shows how greatly the character of the total mortality, as regards yearly progression, has been altered by malarial fever. Compared with No. 11, it shows that previously to 1867 the variations of the total mortality had a pretty close resemblance to those of the total mortality *minus* the fever and dysentery mortalities for the period 1871-79.

Yearly Comparisons.

48. Having compared the mean yearly inequalities or periodicities of the temperature, humidity, and rainfall, for the period 1871-79, with the mean yearly inequalities of the total mortality, the mortality from malarial fever, &c., for the same period, it may be well to compare now the annual values of the principal meteorological elements for a number of years with the annual values of the total and the fever death-rates for the same years.

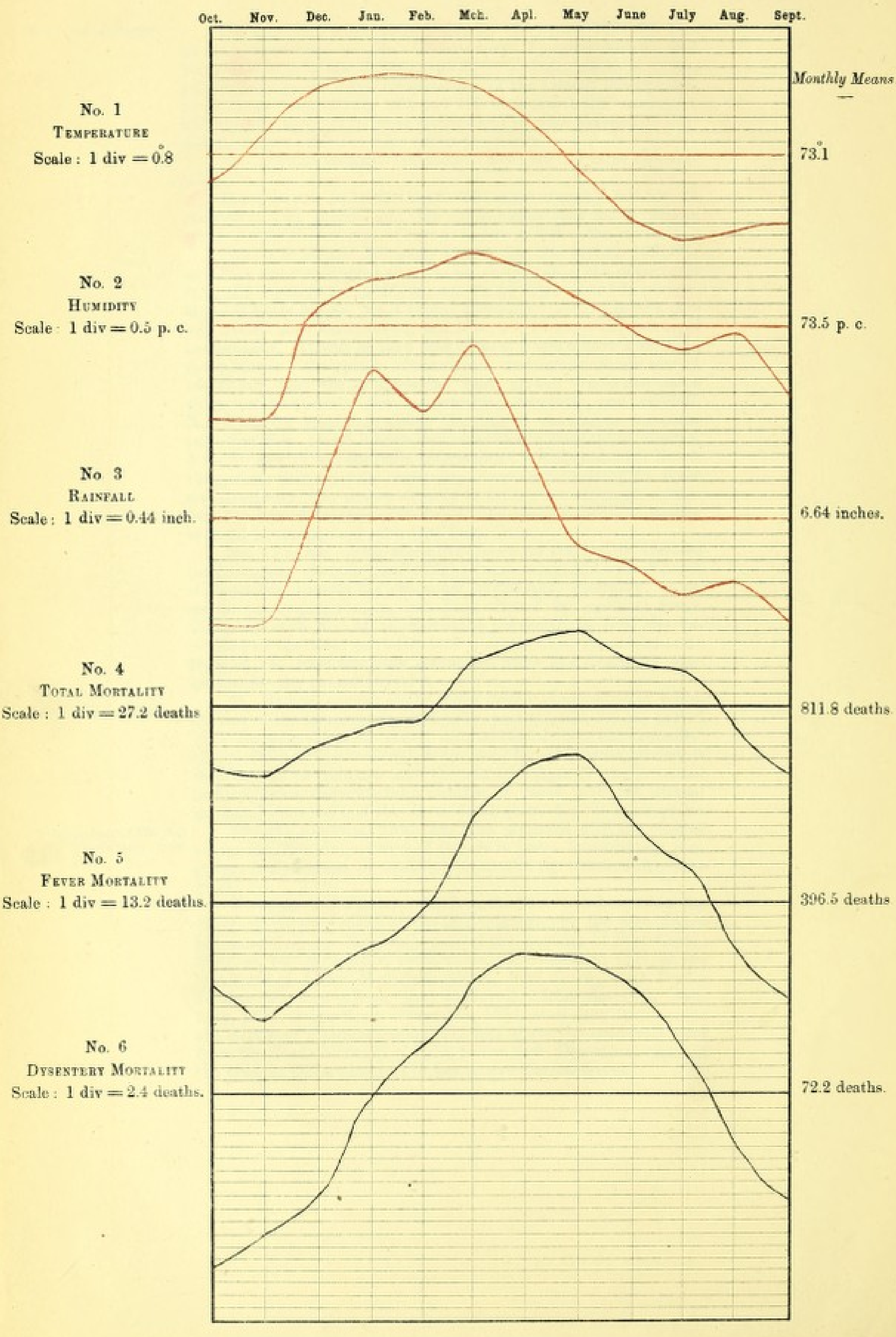
Temperature of the Air at the Observatory from 1861 to 1880.

49. The following Table has been prepared with the view of comparing the temperature of the air in years immediately preceding the outbreak of malarial fever with the temperature since 1866.

From the 1st. January, 1861, to the 31st. October, 1866, the observations were taken at the Old Observatory (30 feet above the sea-level) on the south side of the harbour of Port Louis; from the 1st. November, 1866, to the 16th. January, 1871, at the lower end of Little Mountain Street, Port Louis, near *Parc à Boulets* (25 feet above the sea-level); from the 17th. January, 1871, to the 22nd. November, 1874, at *Maison Boulle*, near the village of Pamplemousses (215 feet above the sea-level); and from the 23rd. November, 1874, to the 31st. December, 1880, at the present Observatory (179 feet above the sea-level).

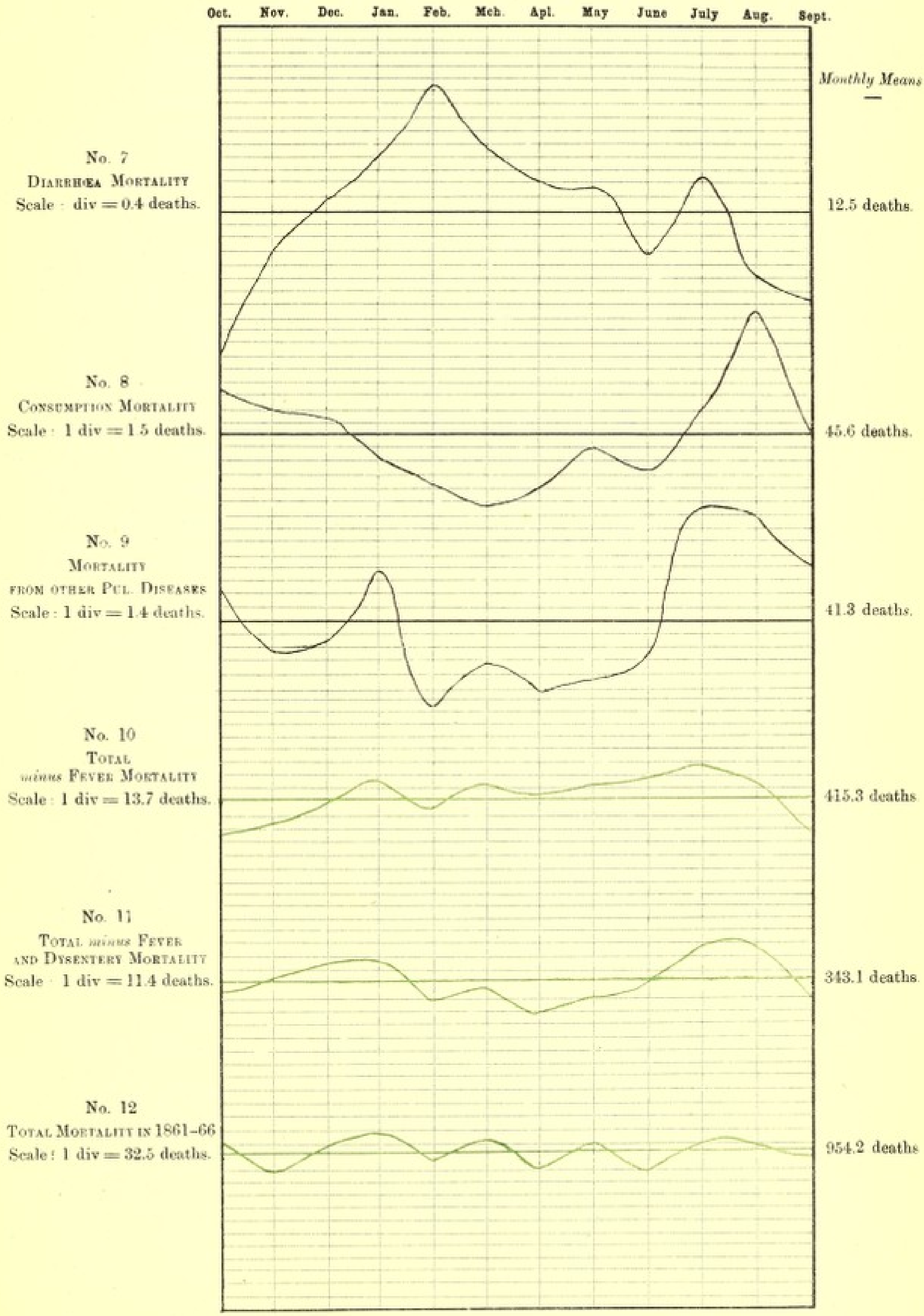
MEAN ANNUAL CURVES

For The Period 1871 – 79.



MEAN ANNUAL CURVES

For The Period 1871 — 79.



The observed mean temperatures for the years 1867-80 have been corrected by adding or substracting the mean differences between them and the mean temperature at the Old Observatory from 1861 to 1866, so as to make the annual means nearly comparable.

The extreme maxima and minima have not been altered.

TABLE T.

Years.	Mean Temperature	Extreme Max.	Extreme Min.	Annual Range.
	°	°	°	°
1861	76.9	89.5	67.0	22.5
1862	77.5	89.4	68.0	21.4
1863	77.0	88.0	65.9	22.1
1864	76.7	89.0	66.0	23.0
1865	77.1	90.0	67.6	22.4
1866	76.8	89.6	62.8	26.8
1867	77.7	93.5	68.9	24.6
1868	77.2	92.7	68.0	24.7
1869	76.5	93.2	67.6	25.6
1870	76.3	91.5	68.5	23.0
1871	76.6	86.3	60.9	25.4
1872	77.1	88.1	61.0	27.1
1873	76.9	89.1	59.1	30.0
1874	77.0	88.0	61.5	26.5
1875	77.7	87.0	61.2	25.8
1876	76.8	86.7	57.1	29.6
1877	77.2	88.5	59.3	29.2
1878	77.6	88.8	54.6	34.2
1879	76.2	86.4	55.2	31.2
1880	75.8	85.6	58.0	27.6
Means	76.9	89.0	62.9	26.1

We see that the mean annual temperature was 76°·9 ; that the warmest years were 1862, 1867, 1868, 1875, 1877 and 1878, and the coldest 1870, 1879 and 1880 ; that the mean annual range was 26°·1 ; and that the greatest ranges occurred in 1873, 1878, and 1879.

The mean annual range for Port Louis (1861-70) was 23°·6 and for Pamplemousses (1871-80) 28°·7, the difference being no doubt mainly due to the greater elevation of Pamplemousses.

The mean annual temparature at the Old Observatory was 77°·0, in Little Mountain street 79°·6, at *Maison Boulle* 74°.2, and at the present Observatory 74°·4. *

Although the mean temperature at the Old Observatory in the six years 1861—66 was 2°·6 less than the mean temperature in Little Mountain street in the four years 1867—70, yet it must not be inferred that the former were colder than the latter. The difference was due much more to a different exposure of the thermometers than to an actual difference in the annual temperatures. It is important to bear this in mind, because the apparently higher temperature in the latter part of 1866 and during 1867, as published in the local newspapers and in the Blue Books, has frequently been adduced as a cause of the outbreak of fever in those years.

After reducing the observations, however, to what they would probably have been, had they been taken at the Old Observatory, we still find that in the years 1867-68-75-77 and 78, especially in 1867, 1875, and 1878, the temperature was above the average.

Temperature of the Air at Beau Séjour from 1864 to 1880.

50. That this was the case for the whole Island is inferred from the observations taken daily with verified maximum and minimum thermometers at Beau Séjour from 1864 to 1880, the results being as follows :

* The mean annual temperature at Port Louis for the six years 1787-93 and the two years 1803-04, according to Lislet Geoffroy's observations, was 76°. 74. Thus :

Years.	1787	76.50
,,	1788	77.04
,,	1789	76.67
,,	1790	76.32
,,	1791	77.28
,,	1792	77.50
,,	1803	76.21
,,	1804	76.33
	Mean	76.74

The observations are supposed to have been taken either at the Caudan or at the Old Observatory. Now as the mean annual temperature at the Caudan for the six years 1853-58 was 76°5, and 76°9 at the Old Observatory, for the eight years 1859-66, it would appear that the mean temperature has not changed.

TABLE U.

Years.	Mean Temperature	Extreme Max :	Extreme Min :	Range.
	°	°	°	°
1864	70·7	83·5	54·5	29·0
1865	71·6	85·0	55·5	29·5
1866	71·6	84·5	54·0	30·5
1867	72·1	85·0	52·5	32·5
1868	72·3	85·0	55·0	30·0
1869	71·5	85·5	53·0	32·5
1870	71·6	83·5	52·5	31·0
1871	71·0	84·0	55·0	29·0
1872	71·9	84·5	56·0	28·5
1873	71·6	86·0	55·0	31·0
1874	71·5	83·0	55·0	28·0
1875	72·1	83·0	57·0	26·0
1876	71·2	84·0	56·0	28·0
1877	72·1	83·0	58·0	25·0
1878	72·8	85·0	56·0	29·0
1879	71·9	84·0	56·0	28·0
1880	71.2	84·0	56·0	28·0
Means.	71·7	84·3	55·1	29·2

It will be seen that the warmest years, as at the Observatory, were 1867—68—75—77 and 78, and that, the elevation (960 feet) being greater, the range was greater.

Temperature of the Air at Curepipe.

According to observations taken by the late Hon. Mr. Fred. Dick at Curepipe (1820 feet above the sea-level) in 1870—71—72, with verified thermometers, the highest recorded temperature in the shade was 82° on the 7th. and 8th. January, 1870, and the lowest 51° on the 30th. July, 1870, which gives a range of 31°. The mean temperature for the same year, derived from observations of maximum and minimum thermometers taken daily (except on some days in September and October) was 66°·3, or 10° lower than the temperature of Port Louis for the same year, and 5°·3 lower than that of Beau Séjour. The observations for 1871 and 1872 are not complete, but as the mean annual temperature does not vary much the results for 1870 may be considered a fair approximation.

Rainfall.

51. The annual rainfalls at the Observatory from 1861 to 1880, at Beau Séjour and Cluny from 1862 to 1880, and at St. Aubin from 1865 to 1880, were as follows :

TABLE V.

Years.	Observatory. 45 and 212 feet.		Beau Séjour 960 feet.*		Cluny 1000 feet.		St. Aubin 150 feet.	
	Rain-fall.	No. of days.	Rainfall.	No. of days.	Rainfall	No. of days.	Rainfall	No. of days.
	in.		in.		in.		in.	
1861	68·73	116	......	...	......	...	......	...
1862	28·41	124	69·17	147	122·54	261	......	...
1863	33·42	147	99·76	193	147·09	273	......	...
1864	24·15	138	54·60	189	122·48	288	......	...
1865	44·74	154	87·11	209	192·45	292	115·60	251
1866	20·74	117	44·55	181	121·97	285	70·51	245
1867	35·97	117	64·58	187	141·05	269	71·66	229
1868	64·18	138	95·65	216	183·74	292	112·12	260
1869	54·57	120	67·58	179	129·37	290	76·66	234
1870	45·57	143	54·49	192	160·43	273	82·39	226
1871	42·62	182	45·97	179	133·71	279	82·02	225
1872	47·76	202	62·68	184	146.83	288	76·10	230
1873	75.54	219	82·89	199	171·32	264	89·08	205
1874	64.82	216	110·36	201	177.59	273	88·68	215
1875	49·98	212	60·92	191	......	...	84·94	220
1876	41·87	198	58·29	207	......	...	67·92	196
1877	71·36	225	92·91	235	203·50	243	117·97	227
1878	43·25	174	63·65	171	133·10	181	92·58	195
1879	49·16	205	62·89	190	132·36	213	75·26	226
1880	34·03	198	43·43	204	107·44	185	64·53	226
Means.	47·04	167	69.55	192	148·65	262	85·50	226

* The altitudes are only approximations.

The annual falls at the Observatory are not comparable, * the observations having been taken at Port Louis from 1861 to 1870, and at Pamplemousses from 1871 to 1880 ; but it is evident that the years ofgreatest rainfall were 1861, 1873, and 1877, and those of least rainfall 1864 and 1866. At the other three stations 1866, 1876, and 1880 were the years of least rain, and 1865, 1868, 1874 and 1877 those of most rain.

The passage of a cyclone near the Island affects the total fall for the year so much that a comparatively dry year may appear to have been very wet. In 1874 torrents of rain fell during a cyclone in the last week of March ; in 1868 much rain fell during the passage of two cyclones in January and March ; on the 12th. February 1865, heavy floods occurred during a thunderstorm.

At Beau Séjour the mean annual fall for the ten years 1862-71 was 68.34 inches, and the mean number of days of rain 187.2 : during the ten years 1871-80 the means were respectively 68.40 inches and 196.1 days. During the four years 1862-65 the mean fall at Cluny was 146.14 inches, and the mean number of days of rain was 278.5 ; while during the four years 1877-80 the means were 144.10 inches, and 205.5 days. At St. Aubin the mean falls for each of the eight years 1865-72 and 1873-80 were 85.88 and 85.12 inches, and the days of rain 237.5 and 213.7.

No proof that the Rainfall has decreased.

It cannot be inferred that either the rainfall, or the number of days of rain, has decreased. It is true that at three of the stations the rainfall in 1880 was less than in any other year of the series, and that at Cluny and St. Aubin the number of days of rain in the later years was apparently a good deal less than in the earlier years ; but the period is too short for coming to a conclusion as to whether or not there has been a permanent change. At Port Louis, where observations were taken for a much longer period, the mean annual rainfall for the ten years 1861-70 was 42.05 inches, and the mean number of days of rain 131.4 ; while, according to Lislet Geffroy, who was considered a very careful and accurate observer, the mean rainfall in the same locality in the three years 1789-91 was only 30.02 inches, and the mean number of days of rain 86.7. The same observer makes the mean fall at Port-Louis in the three years 1821-27-31 higher, viz : 37.69 inches , and the mean number of days of rain 113.3 ; but these figures are still considerably less than the corresponding ones for 1861-70.

Range of Rainfall.

As far as has yet been ascertained, the mean annual falls in different parts of the Island range from 33 to 156 inches, the greatest being 156.16 inches at Midlands (Plaines Wilhems), according to Dr. Icery's observations from 1873 to 1879, and the least 33.11 inches at Gros Cailloux (Black River), according to Mr.Commins's observations from 1862 to 1870. On the east coast the rainfall is nearly double of what it is on the west coast, at the same elevation, and from both sides it increases inwards and upwards to the highest parts of the Island.

Direction and Velocity of the Wind in 1861-80.

52. The direction and the velocity of the wind have an annual and a diurnal oscillation. In the five years 1876-80 the mean direction for January, as obtained from a self-recording anemometer, was S. 89° 35′ E., from which it gradually backed to-

* From inattention to this point it has been inferred on more than one occasion that the rainfall has increased.

wards the South, until, in May, it was S. 62° 10' E.; it then began to return towards the East, at first very slowly, and after July more rapidly, until, in December, it was N. 89° 50' E., which was its northern limit. The mean velocity increased from 10.9 miles per hour in March to 13.6 in August, and then upon the whole decreased. The mean diurnal oscillation had a range of 14°, and was such that the direction was farthest South during the coldest hours, and the velocity greatest during the warmest hours.

There are, however, many deviations from the normal direction and velocity, and in this respect one year may differ considerably from another. Table XXXVI (Appendices) shows the number of times the wind came from the principal points of the compass, at the Observatory, in each of the years 1861-80. From 1861 to 1870 the observations were made in Port Louis at 3½ A. M., 9½ A. M., 3½ P. M. and 9½ P. M.,—and at the same hours at Pamplemousses from 1871 to 1880. During the years 1867-74, that is, from the time the Old Observatory in Port Louis was vacated until the present Observatory was built, the directions were estimated with the aid of a wind-vane. *

Taking the number of times the wind came from each quarter, we get the following results.

TABLE W.

Years.	N. E. Quadrant.	S. E. Quadrant.	S. W. Quadrant.	N. W. Quadrant.	Totals.
1861	235	832	32	97	1196
1862	116	913	36	111	1176
1863	136	959	28	132	1255
1864	95	1035	30	115	1275
1865	97	1044	32	104	1277
1866	61	1104	38	91	1294
1867	84	1100	15	153	1352
1868	97	1072	61	133	1363
1869	106	1096	63	98	1363
1870	128	1108	29	107	1372
1871	85	1044	35	39	1203
1872	118	962	34	35	1149
1873	155	810	35	38	1038
1874	123	956	28	59	1166
1875	288	1048	27	26	1389
1876	232	1012	48	19	1311
1877	328	1001	56	73	1458
1878	194	1149	50	64	1457
1879	269	1031	56	28	1384
1880	269	1161	22	12	1464
Yearly Means.	168.8	1021.8	37.7	76.7	1297.6

* As there was no self-registering anemometer from 1867 to 1874 it is necessary to confine the comparison to the six hourly observations.

The most remarkable feature is the comparatively great frequency of N. Wly. winds in 1863-67 and 68, especially in 1867, and the comparative absence of wind from that quarter in 1871 to 1880. This latter feature may have been partly due to the place of observation in 1871-80 having been more inland. The differences in the totals arise from the circumstance that the "calms" and "variables" are not given.

Atmospheric Pressure and Humidity.

53. The atmospheric pressure has a well-known annual and diurnal oscillation, but as the inequalities of this element are believed to have no appreciable influence on the death-rates, the yearly results are not given. The inequalities of the relative humidity are similar to those of the rainfall.

Death-Rates from 1861 to 1880.

54. In order to determine with sufficient accuracy the annual death-rates per 1000 of population it is essential to know the number of persons alive at certain times, and the fluctuations to which that number is subject from arrivals, departures, births, and deaths.

Births, Arrivals, Departures, and Deaths from 1861 to 1880.

The following Table shows, as far as I can ascertain, the number of births, arrivals, departures, and deaths, from the 8th. April, 1861, to the 31st. December, 1880. In preparing it, I have had recourse to every available source of information.

TABLE X.

Years	Total Births.	Total Arrivals.	Total Departures.	Total Deaths.
1861*	7865	16555	3328	6854
1862	10837	13523	4354	13719
1863	11169	9776	4544	11666
1864	11499	12166	5934	11649
1865	12118	24735	5866	12042
1866	12134	10770	6488	11702
1867	10568	3910	6447	40114
1868	9436	5801	5432	18403
1869	9979	4963	5125	11295
1870	11157	7291	5313	7423

* From 8th. April.

TABLE X.—(*Continued.*)

Years.	Total Births.	Total Arrivals.	Total Departures.	Total Deaths.
1871	11803	6843	5195	8171
1872	11363	9755	5883	8745
1873	11534	11227	5035	11210
1874	11984	11781	6416	10019
1875	12931	7566	6682	8584
1876	12831	4512	6465	9525
1877	12486	6776	6257	10335
1878	12422	9461	6236	9649
1879	13107	7116	6022	11485
1880	13373	5370	6046	10143

All the above figures, with the exception of the arrivals and departures in 1871-72-73-74 & 80, have been taken from the printed Reports and Tables of the Registrar General, to whom I am indebted for much valuable assistance. For the arrivals and departures during the years 1871-74 and 1880, it was necessary to have recourse to the Honorable the Collector of Customs, the Harbour Master, and the Officer in Charge of the Immigration Department, who were good enough to furnish tabular statements, and to allow me to examine the original records, in some cases for each day throughout the whole period.

Estimated Population on the 31st. December, from 1861 to 1880, according to Registrar General.

55. According to the Registrar General's Reports for 1872 and succeeding years the living population on the 31st. December of each year, from 1861 to 1880, was represented by the numbers given in the second column of the following Table. Assuming the correctness of those numbers and of the number of deaths (in Table X), the death-rates per 1000 of population would be those given in the third column. The fourth column gives the number of deaths from fever alone, from 1864 to 1880, the fifth column the fever death-rates, and the last column the percentages of deaths from fever. The number of deaths from fever in 1864-1865-66-67 is taken from the Report of the Fever Inquiry Commission of 1868, and the numbers in the other years from the Reports of the Registrar General.

TABLE Y.

Years.	Estimated Population on 31st. Dec.	Total Death-rates.	Deaths from Fever.	Fever Death-Rates.	Percentages of Deaths from Fever.
1861	322046	31.35	......	......	......
1862	326228	42.05	......	......	......
1863	328028	35.56	......	......	......
1864	332188	35.07	5789	17.4	49.7
1865	348500	34.55	5181	14.87	43.0
1866	350567	33.38	4913	14.01	41.1
1867	320606	125.12	31920	99.56	79.6
1868	312144	58.95	10923	34.99	59.4
1869	306144	36.89	6330	20.67	56.0
1870	313179	23.71	3329	10.63	44.8
1871	321494	25.41	3578	11.13	43.8
1872	326454	26.78	4235	12.97	48.4
1873	331782	33.78	5031	15.17	44.9
1874	339371	29.52	4024	11.86	40.1
1875	344602	24.88	4061	11.78	47.3
1876	345955	27.53	4845	14.00	50.9
1877	348628	29.64	5787	16.60	56.0
1878	354623	27.20	5144	14.50	53.3
1879	357339	32.14	5303	14.84	46.1
1880	359988	28.18	5173	14.37	51.0
Means	334493.3	37.08	6798.1	20.55	50.3

It would thus appear that the mean annual death-rate for the whole Island in the two decades 1861-80 was 37.08. In the first decade it was 45.66 and in the second 28.51. Omitting 1862, which was a cholera year, and the years of epidemic fever 1867-68, the mean annual death-rate was 30.32. It is worthy of remark that the death-rate from *fevers* in 1864 was higher than in any year since 1869. I will return to this point.

Estimated Population based upon the Census Returns, Births, Deaths, &c.

56. According to the Census of the 8th. April, 1861, the living population on that day, exclusive of the Military and the Shipping, was 310,050. From the 8th. April to the 31st. December, 1861, there were, according to the Registrar General, 7,865 births, 6,854 deaths, 16,555 arrivals, and 3,328 departures. Hence the estimated population on the 31st. December, 1861, should be 324,288.

Continuing this method, and using the figures given by the Registrar General, we get the numbers given in the second column of the following Table, until we come to the 31st. December, 1870, when the estimated population was 328,604.

On the 11th. April, 1871 another Census was taken, and according to it the population on that day was 316,042. But as the estimated population on the 31st. December 1870, was 328,604, and as the births from the 1st. January to 10th. April, 1871, were 4,187, the arrivals 867, the deaths 2,300, and the departures 1,459, the population on the 11th. April, 1871, should have been 329,899.

An Error.

There is thus, on the 11th. April, 1871, an error, from some cause or another, of 13,857, for if the enumerations made on the 8th. April, 1861, and on the 11th. April, 1871, had been correct, and the births, deaths, arrivals and departures also correct, the enumerated and estimated populations on the 11th. April, 1871, should have been the same.

Starting now with the enumerated population on the 11th. April, 1871, and taking into account the births, arrivals, deaths, and departures, we obtain another series of values of the estimated population from 1871 to 1880. The enumerated population on the 11th. April, 1871, having been 316,042, the births from the 11th. April to the 31st. December of that year 7,616, the arrivals 5,976, the deaths 5,871 and the departures 4,293, the estimated population on the 31st. December, 1871, was 319,470. In the same way, using the number of births, &c., given in Tables X and Y, we get the estimated population on the 31st. December of each succeeding year.

The estimated populations for the whole period 1861-80 are given in the second column of the following Table, the total death-rates calculated upon them in the second column, and the differences between them and those of the Registrar General (Table Y) in the third column.

TABLE Z.

Years.	Estimated Population on 31st Dec.	Total Death-rates.	Differences in Estimated Population.
1861	324287	31·13	+ 2241
1862	330575	41·50	+ 4347
1863	335310	34·79	+ 7282
1864	341392	34·12	+ 9204
1865	360337	33·42	+ 11837
1866	365051	32·06	+ 14484
1867	332968	120·47	+ 12362
1868	324370	56·73	+ 12226
1869	322892	34·98	+ 16748
1870	328604	22·59	+ 15425
1871	319470	25·58	— 2024
1872	325960	26·83	— 494
1873	332476	33·75	+ 694
1874	339806	29·49	+ 435
1875	345037	24·88	+ 435
1876	346390	27·50	+ 435
1877	349060	29·61	+ 432
1878	355058	27·18	+ 435
1879	357774	32·10	+ 435
1880	360328	28·15	+ 340
Means.	....	36·34	....

Discrepancies.

57. It will be seen that the differences between the estimated population in the above Table and the estimated population in Table Y are considerable for the decade 1861-70, and that they went on increasing, until, on the 31st. December, 1869, the difference amounted to 16,748, the estimated population on that

day (based upon the Census of the 8th. April, 1861, and the official returns of births, deaths, arrivals, and departures) having to that extent exceeded the number given by the Registrar General. (See Table Y.)

After 1871 the differences are much less, and during the last seven years they do not exceed 435, which does not materially affect the death-rates. In fact, since that year, the results are, practically, identical.

As there is only one way of estimating the living population (without taking a Census), it became interesting to know how such differences arose for the first decade. On the 31st. December, 1865, for example, the estimated population, according to the Registrar General, was 348,500, while in 1866 the total births were 12,134, the total arrivals 10,770, the total deaths 11,702, and the total departures 6,488.

Hence we get :

Estimated Population on 31st. December 1865	348500
Add Births and Arrivals in 1866	22904
	371404
Subtract Deaths and Departures in 1866	18190
Estimated Population on 31st. December 1866	353214
But according to the Registrar General (Table Y), the estimated population on that day was	350567
Difference	2647

How was this estimated population of 350,567 obtained ?

Explanations. 58. On examining the Reports of the Registrar General, and the vital statistics given in the "Mauritius Almanach and Colonial Register", which is also an official publication, I found that for the years 1861-70, there were two sets of " estimated population". One of these has been given in Table Y.

In the other set, the estimated population, I was glad to find, was almost identical with what I had made it (Table Z.) In his Report for 1871, for example, the Registrar General (Dr. Edwards) made the estimated population on the 31st. December, 1870, to have been 328,633, and I have made it 328,604. To show how close the results are to one another, I will give those for the years 1866-70.

Years.	Table Z.	Reg. Gen.	Differences.
1866	365051	365083	32
1867	332968	333000	32
1868	324370	324402	32
1869	322892	322924	32
1870	328604	328633	29

There is thus no doubt that from the taking of the Census on the 8th. April, 1861, to the 31st. December, 1870, the Registrar General estimated the living population in the only way in which it could be estimated. The differences in the results are so small that they may be accounted for by the commission of a slight error, on one side or the other, in the number of births, deaths, &c., which took place on the day of the Census.

What, then, was the origin of the first set of estimates for the decade 1861-70 (Table Y), which differ so widely from the second set (Table Z) ?

Original Estimates of Population altered.

It has been stated that the enumerated population on the 11th. April, 1871, was 316,042, whereas the estimated population on that day was 329,899. Finding so great a difference, the Acting Registrar General altered the figures representing the estimated population in the Reports for 1861 to 1870, and in his Annual Report for 1872 he gave, for the years 1861 to 1872, the figures given in Table Y. By thus trying to make the estimated populations agree with the results of the Census, he changed the figures to such an extent that the estimated population for the 31st. December, 1870, for example, was reduced from 328,633 to 313,179, that is, to the extent of 15,454.

This accounts for the circumstance that although the births, deaths, arrivals, and departures are given for each year from 1861 to 1870, all in the same tabular statements, yet the altered populations do not correspond to the estimated populations deducible in the ordinary way from the data given in those statements. Thus, as shown above, according to the data in Table Y, the estimated population on the 31st. December, 1866, should have been 353,214, whereas it is made to have been 350,567, its actual value (Table Z.) being 365,051.

The first set of estimated populations (Table Y) has been repeated in subsequent Annual Reports ; it is given, for instance, in the Report for 1877. But in the " Mauritius Almanach and Colonial Register " for 1876, the second set is given from 1866 to 1870. Moreover, for the 31st. December, 1871, the estimated population is put down in the Almanach at 318,584, whereas in the Annual Report it is put down at 321,494. As these two results were given for an epoch which was less than nine months after the Census of the 11th. April, 1871, and as there is only one set of data, it is difficult to account for so great a divergence in so short a time. The actual estimated population on the 31st. December, 1871, was 319,470 (Table Z).

Importance of accurate Death-Rates.

59. In order to compare with one another the sanitary conditions of the Colony in different years, and with the sanitary conditions of other countries, it is important that the death-rates should be tolerably accurate. The death-rates given by the Registrar General for the period 1861-70 are calculated on his altered estimated populations, which, with the annual number of deaths, are given in Table Y. On the other hand, I have given in Table Z. the estimated populations based upon the Censuses of 1861 and 1871 and upon the annual number of births, deaths, arrivals, and departures, and given the death-rates as calculated

upon the living population, thus obtained, for the 31st. December of each year.

Different Results.

60. According to Table Y. the mean death-rate per 1000 of population for the whole period (1861-80) is 37·08, and according to Table Z. 36.34. For the decade 1861-70 the mean death-rate, according to Table Y., is 45·66, and according to Table Z. 44·18, which is considerably less. In the epidemic years 1867-68 the difference was nearly from 2 to 5 per 1000.

Which of these results, for the period 1861-70, are the more correct?

Which of them are the more correct?

61. In remodelling the estimated populations, by calculating backwards from the Census of 1871, the Registrar General assumed that the enumerated population on the 11th. April, 1871, was correct, or approximately so, and that, from some cause or another, a large error had been committed either in the Census of 1861, or in the registers of births, arrivals, deaths, and departures from 1861 to 1871, or been shared by these and the Census together. But there is no proof that the Census of 1871 was correct, and that one or more of the previous calculations were incorrect. There is an error somewhere, but whether it is in the Census of 1861, or in the Census of 1871, or in the registers of births, &c., or spread over all of them, is not known.

It is not probable that the whole of the error was committed in taking the Census of 1861, for, in that case, the enumerated population must have been 13,857 *greater* than the actual population, which is not likely. With regard to the births and deaths, which were registered, it is not probable that more were registered than actually took place. If all the births were not registered the tendency would be to make the enumerated population on the 11th. April, 1871, greater, instead of less, than the estimated population; but if, on the other hand, all the deaths were not registered, the result would be the reverse. It is very possible that during the epidemic of 1867-68 some deaths were not registered, but it is improbable that thousands were not registered.

Probably the Censuses of 1861 and 1871 were incomplete.

62. The estimated populations and death-rates are, at best, only approximations; but having examined the original records of the arrivals and departures for a number of years, and the methods of registering the births and deaths, I have come to the conclusion that Table Z. is more correct than Table Y., and that the difference (13,857) between the enumerated and estimated populations on the 11th. April, 1871, was mainly due to incomplete Censuses. The names of all Indian Immigrants, men, women, and children, that arrived, and of all Indian Emigrants that left, have been carefully registered in the Immigration Office, and the names of all other persons, who arrived or left, have been similarly registered in the Harbour and Customs Departments, while the births and deaths, with all the usual details, have been registered in the Offices of the Civil Status. That so great an error should have arisen from making up the annual results from those sources is improbable, inasmuch as the numbers which have been independently obtained for several years are practically the same as those given by the Registrar Ge-

neral. The number of departures in 1880, for example, obtained from the original records for each day, differs from that given by the Registrar General to the extent of only 18, and the difference in the departures does not exceed 111. Again, although the arrivals and departures from 1871 to 1874 were obtained from the records of the Harbour and Customs Departments, yet the estimated populations for the last seven years of the decade 1871-80 are nearly the same as those given by the Registrar General. It is presumed, therefore, that if the original records from 1861 to 1870 had been examined the results would practically have been the same as those given in the Annual Reports of the Registrar General down to 1871. Moreover, it is difficult to understand how a cumulative error of 13,857 could have arisen in registering the births, deaths, arrivals, and departures, from 1861 to 1871.

On the other hand, considering the habits of a large majority of the population, the difficulty of securing the services of efficient enumerators, &c., it may well be supposed that errors and oversights were committed in taking the Censuses. Under the most favorable circumstances, the chances are that the enumerated population of Mauritius, obtained by taking a Census, will always be less than the actual population, and it is easy to conceive how the difference might amount to thousands.

The Results in Table Z. more accurate than those in Table Y.

63. For these reasons, I adopt the estimated populations for 1861 to 1870 given in Table Z., that is, those which were originally given by the Registrar General. It is not improbable that even these are too low, but there is little doubt that they are more accurate than those in Table Y.

If the enumerated population on the 11th. April, 1871, was also too low, as it probably was, then, admitting the accuracy of the births, deaths, &c., the estimated populations for 1871-80 are also too low, and the death-rates for those years too high; but there is no alternative but to use the official figures at disposal, namely, the enumerated populations and the returns of births, deaths, arrivals, and departures; and it is upon these data alone that Table Z. is based. Table Y. is rejected because the first half of it is based upon hypotheses.

Death-Rates in Table Z. from 1861 to 1880.

64. Turning now to the column of death-rates in Table Z., we observe a great increase of mortality in 1862, a decrease from that year until 1866, an enormous increase in 1867, a rapid decrease until 1870, and from that year to the end of 1880 comparatively small death-rates, especially in 1870, 1871, and 1875. The salient features are the low death-rates in those years, and the high death-rates in 1862, 1867, and 1868. Were, then, these great fluctuations in the mortality in any degree due to abnormal meteorological conditions?

Principal Departures of Temperature, Rainfall and Direction of Wind from the Annual Means.

65. We have seen (Tables T. and U.) that the warmest years from 1861 to 1880 were 1867, 1875, 1878, 1862, 1868, and 1877, and the coldest 1880, 1879, 1870, 1871, 1869, and 1864. Now, as the death-rate in 1875 was only 24.88, and in 1867, with the same mean temperature, 120.47, it is evident that the difference in the death-rates of these years could not have been due to a relatively high mean temperature. Again, with a lower mean

temperature in 1880 than in 1870 the death-rate in the former year was higher than in the latter. The extreme range of temperature in 1866, when the death rate was 32.06, was 2 ° 2 greater than in 1867, when the death-rate was much higher. Mere changes of temperature, therefore, do not account for the changes in the death-rates.

Temperature.

Rainfall.

66. With regard to the rainfall, it has been shown (Table V.) that, for the Island in general, the years of greatest rainfall were 1861, 1865, 1868, 1874, and 1877, and those of least rainfall 1864, 1866, 1867, and 1880. Now, there is, apparently, no relation between the mere annual amounts of rainfall and the annual death-rates, for while the rainfall in 1861 was more than three times the rainfall in 1866, the difference in the death-rates of those years was only 0.93. If, then, the mortality is influenced by the rainfall it must be through much rain falling in a short time, and then little or no rain falling for weeks.

Floods in February, 1861.

67. The years most remarkable for such occurrences were 1861 and 1865. Of the 68.72 inches that fell at the Observatory, in 1861, no less than 44.22 fell from the 12th. to the 17th. February, during the passage of a cyclone, and on those six days 98 inches fell at Vacoa (1400 feet above the sea level). Of course the rivers and water-courses were flooded, and much *débris* was carried down to the low lands and into the sea. Throughout the rest of the year, however, except in May, August, and November, when there was a slight excess, the rainfall was below the average, and in September no rain at all fell at the Observatory.

Floods on 12th. February, 1865.

68. In 1865 the total fall was only 2 inches above the average, but on the 12th. February in that year floods occurred, which, in suddenness and in intensity, were apparently unprecedented in Mauritius. On the 10th. and 11th, the weather having been showery all over the Island, the soil was saturated, so that the rain which fell afterwards nearly all found its way into the rivers. Heavy passing showers occurred during the morning of the 12th, but there was no unusual fall, for the season, till the afternoon. At 1 p.m. the wind, which was then from N.E., began to increase and to veer to North; at 3.30 p.m. it was from North, with a pressure of 7.5 lbs. per square foot; it then began to decrease, still veering; at 6 p.m. it was from N.W., with a pressure of 1.0 lb. per square foot, and it remained at N. Wrd. during the rest of the night. From 7 to 10 p.m. there was a thunderstorm, with much vivid lightning. The total rainfall at the Observatory, from 9 a.m. on the 12th to 9 a.m. on the 13th, was 7.46 inches, of which by far the greater part fell between 6 and 9 p.m. on the 12th. As might have been expected from the direction of the wind, the rain was heaviest on the western and northern parts of the Island. At Vacoas, Beau Séjour, and Trianon 12 inches fell on the 12th (chiefly in the evening), 15 inches in the lower parts of Moka, 10 inches at Gros Cailloux (Black River), 10.5 inches at Labourdonnais (Rivière du Rempart), 13 inches at Lucia (Pamplemousses), and 18 inches at La Gaieté (Flacq). In Savanne and Grand Port the fall was much less, having been only 5 inches at St. Aubin and Beau Vallon, and 4 inches at Gros Bois. The line or belt of greatest precipitation extended from the Black River and Vacoas mountains in the S. W., on to the Corps de Garde mountain, the Moka and

Port Louis mountains, the Calebasses mountains, and the Piton and Fayence mountains in the N. E. and east, and must have been much more intense on those heights than at lower levels, for the rivers rose immensely in a few hours. The river Baptiste at Moka rose 22½ feet above its ordinary level ; * the river Papaye at Vacoas fully 10 feet ; the river Sèche at Plaines Wilhems 18 to 20 feet ; and a tributary of the river Calebasses about 14 feet. In Port Louis, the Pucelles, Tonnier, Pouce and Creole streams overflowed their banks, flooding the Company's Gardens, Chaussée Street, Shops, Storerooms, &c., to the depth of 4 or 5 feet. Along the rivers which fall into the sea on the west coast, from Tamarind Bay to the Arsenal, bridges, causeways, &c., were swept away. Large quantities of organic matter were deposited on the banks of the rivers and water-courses on the low lands, or carried into the sea, portions of it being afterwards cast upon the beach to the south and north of Grand River N. W., or left in hollows inside the coral reefs. At Port Louis, "the torrents of rain brought down an enormous amount of debris of all kinds, which covered the waters of the Harbour for many yards outside the edge of the Quay†." The flood was at its height about 8 p.m. After 8.30 p.m. the rivers began to subside, and by 11 p.m. they had fallen considerably; their sudden rise and fall were generally attributed to the bursting of water-spouts over the mountains. The nearest known approach to such floods in Mauritius was in February, 1861, and on the 20th. January, 1854, but on neither of those occasions did the rivers rise so high as they did on the 12th. February, 1865.

Rainfall in 1865, after the flood of 12th. February.

69. The flood was followed by a deficiency of rain in March, and by a severe drought in April, May, and June. In July and August the rainfall was above the average ; in September, October, and November, nearly the average ; and in December greatly above the average, 12.09 inches falling at the Observatory against an average of 5.05 inches in 18 years. In the last week of December 8.22 inches fell. But the greatest falls on those days were in Grand Port and Savanne, namely, 21.42 inches at Cluny, 16.32 inches at Beau Vallon, 22.67 inches at Gros Bois, and 20.89 inches at St. Aubin.

Rainfall in 1862-63-64.

70. In 1862 the rainfall was below the average, but well distributed, and no floods or droughts occurred. January and February, 1863, were unusually wet, and the other months, except June, September and October, comparatively dry, especially August, November and December. The fall for the year was generally above the average, but no unusual floods took place. In 1864 the rainfall at all the stations was below the average. From the 1st. January to the 10th. February there was a drought, which was followed by some heavy rains in February, but which set in again and continued more or less from the 3rd. March until July. December was also dry. There were no floods.

Rainfall in 1866.—Drought.

71. After the heavy rains of December, 1865, a drought set in, and, upon the whole, 1866 was one of the driest years on record. The rainfall at the Observatory was below the average in every month, except in April, when it was 0.44 inch above it, and

* Report on the Inundation of the 12th. February, 1865.

† Evidence of Captain Wales. Page 49.

such was the case generally over the Island. The drought was relatively greatest in February, October, November, and December, and especially in November and December on and near the west coast, only 1.50 inch falling during those two months at Gros Cailloux, 0.79 inch at Port Louis, 1.80 inch at Les Rochers (now St. André), and 1.77 inch at Mont Choisy. In Grand Port and Savanne, on the other hand, the falls for the same two months were much greater, having been 14.60 at Cluny, 8.01 at Beau Vallon, 12.31 at Gros Bois, and 8.23 at St. Aubin.

Rainfall in 1867. — Droughts.

72. In 1867 the rainfall was also below the average, but not so much as in 1866. The relatively driest months were January, March, May, June, and October, and the wettest February, April, November, and December. In January some heavy rains fell from the 3rd. to the 6th, on the 15th, and from the 25th. to the 31st, especially in Savanne ; but, generally, the total fall was 50 per cent below the average. The deficit was greatest at Port Louis, where it amounted to 78 per cent. In February the rainfall was 25 per cent below the average, and the greater part of the whole fell from the 14th. to the 18th. At Port Louis the deficit was 66 per cent, and at Mont Choisy 50 per cent. In March the mean rainfall of the Island was 64 per cent below the average ; but at Port Louis where 2 inches fell on the 4th. and 2.42 inches on the 11th. (during thunderstorms), and 1.57 inch on the 21st, the total fall was 21 per cent above the average, although the weather was generally dry. At Gros Cailloux, also, the rainfall was above the average. The deficits were greatest in Pamplemousses, Moka, Grand Port, and Savanne, where they ranged from 68 to 81 per cent. In April the rainfall was somewhat above the average in each District, but it almost all fell on five days, namely, on the 10th. to the 13th. and on the 27th. The falls in May and June were below the average ; in July, August, and September, above it ; in October below it ; and in November and December above it, to the extent of 54 and 52 per cent, respectively. The first ten days in November were dry, but heavy rains fell in the northern Districts from the 11th. to the 14th, and in Savanne and Grand Port on those days and from the 25th. to the 29th. In December rain fell at almost all the stations on every day, except from the 17th. to the 23rd, the heaviest falls occurring from the 14th. to the 16th, and amounting to 8.93 inches at Labourdonnais, 4.97 at Les Rochers (St. André), 4.69 at Port Louis, 4.04 at Gros Cailloux, 9.41 at Espérance (Moka), 8.34 at Trianon (Plaines Wilhems), 8.12 at Gros Bois, 6.83 at St. Aubin, and 7.05 at La Gaité (Flacq).

Rainfall in 1868.

73. The rainfall of the Island in 1868 was above the average in January ; much above it in March, April and May ; above it in December ; and, upon the whole, below it during the other months. Two cyclones passed near the Colony in January ; one from the 2nd. to the 5th, and one from the 16th. to the 19th. A severe cyclone passed still nearer from the 9th. to the 14th. March. There were also cyclonic disturbances at some distance to the northward in April and May. The consequence was that the rainfall was 28 per cent above the average in January, 88 in March, 85 in April, and 108 in May. On the other hand, it was 38 per cent below the average in February, and up to the 14th. the weather was very dry, especially on and near the west coast, no rain at all falling at Gros Cailloux till the 18th, and only 0.08

inch at Port Louis till the 15th, when 0.33 inch fell. In December the fall was 21 per cent above the average, and most of it took place between the 9th. and 16th. The falls in the other months presented nothing unusual.

Rainfall in 1869.

74. In 1869 the rainfall was from 25 to 31 per cent above the average in January, February, and March ; very nearly the average in April ; above the average in May and June ; and below the average during the other six months. In December the fall was 65 per cent below the average, and at many of the stations rain occurred on only five days.

Rainfall in 1870.

Floods in April, 1870.

75. Comparatively dry weather prevailed throughout January, February, and March, 1870, the falls in those months having been respectively 54, 45 and 30 per cent below the average. In April the fall was 165 per cent above the average, heavy rains occurring on the 6th. and 7th. at all the stations, and particularly in Grand Port and Savanne. At Port Louis 7.63 inches fell on those days, 6.61 at Mont Choisy, 7.45 at the Botanical Gardens (Pamplemousses), 6.68 at Labourdonnais, 5.13 at Gros Cailloux, 12.50 at Espérance (Moka), 9.01 at Croft-an-Righ (Moka), 10.58 at Gentilly, 8.59 at Beau Séjour, 15.88 at Forestside (Curepipe), 23.87 in 24 hours at Good End (Mare aux Vacoas), upwards of 27.40 at Cluny (Grand Port) in 24 hours,* 16.00 at Gros Bois, 12.10 at St. Aubin, 17.54 at L'Union (Savanne), and 9.21 at La Gaiété (Flacq). Heavy rains, though not so heavy as on the 6th. and 7th, fell also on the 5th. and 8th. In Grand Port and Savanne some of the rivers rose greatly, and bridges which had withstood former floods were swept away. There were frequent showers during the rest of the month. May was very dry, the mean fall over the Island having been only 1.39 inch against an average of 5.64 inches. The drought continued till the end of September. In October, November, and December, the falls were respectively 70, 78, and 12 per cent above the average ; but there was nothing unusual in the distribution of the rains, except that fully the half of those in November occurred on the 24th.

Rainfall in 1871-80.

76. The rainfalls of the years 1871-79 have been already discussed. With regard to that of 1880, it need only be remarked here that it was 23 per cent below the average, and that no floods occurred. In February, June, and July, the falls were 17 to 37 per cent above the average, and in the other months from 10 to 57 per cent below it. The wettest month was February, and the relatively driest months were March and April.

Direction of Wind from 1861 to 1880.

Relative frequency of Wind from N.W. Quadrant.

77. As already stated (par. 52), the most remarkable feature with respect to the directions of the wind, from 1861 to 1880, was the unusual prevalence of winds from the N. W. quadrant in 1863, 1867, and 1868. The following Table shows the monthly distribution of these winds from 1861 to 1870.

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* 27.40 inches were measured, but during a part of the night of the 6th. to the 7th. the gauge was overflowing.

TABLE *a*.

Months.	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	Mean
January ...	15	5	13	12	15	13	32	21	24	18	16.8
February...	15	5	13	15	28	11	4	15	14	20	14.0
March ...	12	7	15	6	3	8	15	19	3	7	9.5
April ...	5	13	12	2	11	13	1	7	7	2	7.3
May... ...	7	8	0	20	13	8	14	12	7	7	9.6
June. ...	5	7	1	10	0	3	18	3	3	5	5.5
July... ...	0	4	7	5	1	2	4	3	2	1	2.9
August ...	0	5	4	2	1	5	6	1	0	1	2.5
September.	7	4	8	3	10	7	9	7	8	13	7.6
October ...	10	7	6	8	9	7	13	32	4	16	11.2
November .	11	20	26	22	6	5	20	5	10	7	13.2
December .	10	26	27	10	7	9	17	8	16	10	14.0
Totals...	97	111	132	115	104	91	153	133	98	107	9.5

From the last column of the above Table it appears that the frequency of winds from the N.W. quadrant was at a minimum in August, from which it increased to a maximum in January. The most note-worthy features were an excessive frequency of those winds in November and December 1862-63-64, May 1864, February 1865, January 1867, and October 1868.

The observations, as already stated, were made four times daily at equal intervals, and hence there were in all 160 for each year, including " Calms " and " Variables. " Of the 1352 directions of the wind recorded in 1867 there were 153 between North and West ; of the 32 in January of that year 14 were from North to N.W., and 18 from N.W. to West ; in May 2 from North to N.W., and 12 from N.W. to West ; in June 6 from North to N.W., and 12 from N.W. to West ; in November 8 from North to N.W., and 12 from N.W. to West ; and in December 5 from North to N.W., and 12 from N.W. to West.

Prominent Features.

78. The foregoing details have been given with the view of conveying some idea of the meteorological occurrences which were most likely to influence the death-rates from 1861 to 1870.

Now, the most prominent features, and such as above all others might reasonably be expected to affect the public health, were :

1o. The floods of the 12th. to the 17th. February, 1861, followed by comparatively dry weather in March and April, by moderate rains in May and August, and by a severe drought in September and October.

2o. The floods of the 12th. February, 1865, followed by a drought in April, May and June, and by torrential rains in December.

3o. The severe drought of 1866.

4o. Continuation of dry weather in 1867, with heavy rains occasionally.

5o. The floods of the 6th. and 7th. April, 1870, a month which was unusually wet, and preceded and followed by dry weather.

6o. An unusual frequency of winds from the N.Wrd in November and December 1862-63-64, May 1864, February 1865, and especially in January 1867, and October 1868.

7o. A temperature above the average in 1862 and 1867, and below it in 1870.

The Floods of 1861 did not increase the death rate in that year.

Considering the annual death-rates, with which we are at present concerned, it does not appear that the floods of February, 1861, increased the mortality of that year, for it was less (31.13) than the mortality of any of the years 1861-69.

The mortality in 1862, however, was much greater (41.50 Was this in any way due to the weather in 1861 ?

Cholera in 1862.

79. In August and October, 1861, two cases of " sporadic " cholera, one of which proved fatal, occurred at La Gaiete (Flacq), and a third, also fatal, at Bon Espoir (Flacq) in October of the same year. A fatal case of " Asiatic " Cholera occurred in the Civil Hospital, Port Louis, on the 1st. December, another at Pointe aux Sables, near Grand River mouth, on the following day, and from the 2nd. to the 9th. December 22 cases were declared, 10 of which terminated fatally. The disease spread over the Island, and in February, 1862, the number of deaths from it in Port Louis amounted to 848, Pamplemousses 240, Rivière du Rempart 30, Flacq 103, Grand Port 94, Savanne 58, Plaines Wilhems 92, Moka 93, and Black River 24. At the end of April, upwards of 3,370 deaths from cholera had been registered. The last cases took place in August. This was the longest visitation of cholera experienced in Mauritius, but it was much less fatal than that of 1854. *

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* I am indebted for these details to Dr. F. V. Pouguet's *Etudes sur les Epidémies de Choléra à Maurice.*

80. It is almost the universal belief in Mauritius that Asiatic Cholera has never been spontaneously generated in the Colony, but been imported from India. On the 26th. and 31st. August, 1861, the *Arethusa* and *Edmundsbury* arrived from Madras with coolies, and, as cholera had appeared on board, the Immigrants were sent to Flat Island, where they remained until 27 to 29 days after the last case of the disease on board.

Believed to have been imported.

Dr. Pougnet considers that in the case of those two vessels the quarantine laws were strictly observed, "since we were spared." But a third vessel, the *Mountstuart Elphinstone*, which arrived from Madras on the 22nd. November with coolies, among whom there had been cases of cholera on board, was, through a mistake as to the date of the last case, put in quarantine for only one day, and merely in order to provide the Immigrants with new clothes. The mistake, as related by Dr. Pougnet, was that the Chief Medical Officer gave the vessel pratique on the 23rd. November, because he had been led to believe that 33 days had elapsed since the date of the last case of cholera on board, whereas only 7 days had elapsed. The coolies were distributed on the 27th. to the 30th. November. Two of them were allotted to employers in Port Louis, and, as mentioned above, fatal cases of cholera occurred on the 1st. and 2nd. December. But, notwithstanding an offer of a reward of £ 200, no evidence of a breach of the quarantine laws was adduced. The cases of sporadic cholera in August and October were, Dr. Pougnet remarks, "proved to be neither communicable, nor transmissible from one locality to another."

If, then, as most, if not all, of the medical men of Mauritius believe, cholera has never broken out spontaneously in this Island, we must conclude that the only probable influence of the floods of February, 1861, in swelling the mortality of 1862, consisted in supplying conditions, such as accumulations of decaying vegetable matter, favorable to the propagation of the imported cholera-germ or poison.

Floods in 1865 not followed by an increase of mortality in that year or in 1866.

81. With regard to the floods of the 12th. February, 1865, the floods in December of that year, and the drought of 1866, the first remark to be made is that the death-rates in 1865 and1866 were less than in any year since 1861, and that the great Epidemic of 1867 did not occur until two years after the first of the above occurrences. It should be remarked, also, that although the inundations of the 12th. February, 1865, were more intense than those of February, 1861, yet they lasted only for a few hours, whereas the latter lasted several days. There is little doubt that from the 12th. to the 19th. February, 1861, more vegetable *débris* was brought down to the low lands and into the sea than in February, 1865 ; for not only was the rainfall very much greater, but most of the trees which had withstood the force of the wind (varying from a pressure of 15 to 46 lbs. per square foot during five days) were completely stripped of their foliage. Yet the death-rate in 1867, supposing it to have been partly due to an accumulation of organic matter caused by the floods of the 12th. February, 1865, was nearly three times greater than that of 1862, the year after the floods of February, 1861, when, it may well be supposed, there was more organic matter. On the other

hand, it is possible that the unexampled death-rate of 1867 was to a greater or less extent due, not merely to the floods of February, 1865, but also to the drought during April, May and June, and to the floods of December of that year, followed by a prolonged drought in 1866, although the mortality of the whole Island in 1866 was comparatively small. There was, in the opinion of many, a series of meteorological conditions the cumulative effect of which at least helped to make the year 1867 so deadly. Let us, then, see what were the main facts connected with the rise and progress of Malarial Fever in the Island.

Rise and Spread of Malarial Fever.

82. It appears to be universally acknowledged that, previously to 1857, genuine Malarial Fever was unknown in Mauritius, except in the case of persons who had contracted the disease in other countries. " The Principal Medical Officers, from Dr. Mc. Mullin in 1828 to Dr. Clerihew in 1858, have each successively, in their Annual Reports on the health of the troops, recorded the absence of Malarial Fevers in Mauritius " (Report of Sub-Committee of Fever Inquiry Commission of 1868, page 15).

In his reply to the first question* of the Fever Commission, in August 1867, Dr. Guérin Menneville stated that he had been practising in the District of Flacq since 1857, and that " pendant ces dix années il m'a été fréquemment donné l'occasion d'observer de véritables cas sporadiques de " fièvres intermittentes," et cela dans toutes les classes de la population indistinctement." Dr. Verdalle deponed as follows : " Dans toutes les classes de la population blanche ou de couleur, Européenne, Indienne, ou Africaine, j'ai observé, depuis mon arrivée dans l'Ile, en 1859, que la fièvre intermittente paludéenne était endémique dans le quartier de la Rivière du Rempart et des Pamplemousses, où je traite." Dr. Le Guen, who arrived in the Colony in 1861, gave somewhat similar evidence.

Other medical men, however, who had had long experience in the Colony, affirmed that they had not observed, among persons who had never left the Island, any case of true Malarial Fever before 1865, or 1866.

Malarial Fever in 1865.

83. Dr. O. Beaugeard stated that a few rare cases of intermittent fever, among persons who had not left the Island for a long time, had been admitted into the Civil Hospital before 1865, and that in that year such cases increased, 1 Creole having been admitted on the 16th January, 1 Indian in March, 2 Europeans in May, 1 Indian and 2 Europeans in July, 2 Indians and 1 European in September, 1 European in November, and 2 Indians and 1 European in December. " In all, 7 Europeans, 6 Indians and 1 Creole entered the Civil Hospital with Intermittent Fever contracted in the Island during 1865." This increase of intermittent fever among old residents, in so short a time, was considered to be quite abnormal.

" Sporadic cases of fever, evidently of malarious origin,

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* " What fevers have you been accustomed to meet with in your practice prior to 1865, among the various sections of the population ? "

began to appear among the men of the Royal Artillery, stationed in the Towers at the mouth of Grand River (N. W.), in the begining of 1865, and a few weeks after the great inundation of February in that year." (Report of Fever Commission, page 20.)

During the last three months of 1865, there was an epidemic of Remittent Fever (simple) on the Wolmar estate on the sea-shore in the District of Black River. But only 3 deaths out of 80 patients occurred (Dr. Le Guen).

At the mouth of the Petite Rivière, in the District of Black River, there is a shallow but extensive inlet, or *barachois*, which, at low water, becomes partly dry. In November, 1865, after a prolonged drought, a portion of the bed of the *barachois* was exposed to the suns' rays. The proprietor of the Albion estate, considering that the black fœtid mud which had accumulated in the *barachois* would make excellent manure, got it at first placed upon the banks, and, after it had been partly dried by exposure, carted into the cane fields. "This was continued till January or February, 1866, when some members of the family and several of the men fell sick with fever, and the work was discontinued." (Dr. Barraut and Mr. Commins.)

From the 15th. to the 25th. November (1865), Dr. Penaud met with several cases of intermittent fever at Petite Rivière, and Mr. Henri Chauvin stated that after November there were many cases in the vicinity of Albion estate.

I can find no information as to the number of deaths from *malarial* fever in 1865; but Dr. A. R. Barraut gives a Table of the mortality from *fever* (of some kind) during that year. The following are the monthly results for the whole Island :

TABLE *b*.

Months	Deaths	Months	Deaths
January	506	July	419
February	406	August	387
March	439	September	401
April	516	October	416
May	478	November	363
June	418	December	432
Totals	2763	Total	2418

84. Early in, 1866, fever appeared among the Indian labourers

on Albion and Gros Cailloux estates in Black River, the former situated on the sea-shore, and the latter 1½ mile inland, at an elevation of about 200 feet above the sea-level. According to Dr. C. F. Edwards (General Sanitary Inspector) the following were the numbers of cases and deaths on those two properties during the year.

Malarial Fever in 1866.

Months	Albion		Gros Cailloux	
	Cases	Deaths	Cases	Deaths
January	2	0	1	1
February...	12	4	14	1
March	35	2	176	1
April	24	2	83	1
May...	41	1	81	8
June...	18	13	33	8
July...	14	4	32	12
August	8	2	24	5
September	1	0	15	0
October	9	0	31	0
November	6	2	15	2
December	37	1	12	2
Totals	207	31	517	41

Dr. Edwards states that the " first case of intermittent fever occurred on the 9th. March " ; that the *barachois* was cleaned out early in January ; and that the mud was removed from the banks in July.

From Albion the fever passed to the northward and southward, " following all the sinuosities of the coast," and in some places extending two or three miles inland. In its northerly course, which extended over a distance of 10 miles, it attacked the neighbourhood of Grand River N.W. and the parts of Port Louis nearest the coast in April, Rochebois, Tombeau and Arsenal Bays, and Pointe aux Piments in May, and the village of Pamplemousses in July. In its southerly course it did not go farther than the village of Bambous, which is only 3 miles from Albion.

From July to November it was stationary, but in December it started afresh, attacked the northern point of the District of Rivière du Rempart, and, passing round the Island, reached Rivière Sèche in the District of Flacq on the east coast. On the west coast, travelling in a southerly direction, it reached the foot of the high mountains separating the District of Black River from that of Savanne.

The disease was most severe on and near the seashore, in May to September, but, generally, it was not of a severe type, and, except at Petite Rivière, the mortality did not exceed the average. It does not appear to be known how many persons died of malarial fever in the course of the year. The monthly number of deaths from fever of some kind, for the whole Island, was as follows :—

TABLE *d.*

Months.	Deaths.	Months.	Deaths.
January	490	July	399
February	460	August	369
March	393	September	306
April	418	October	375
May	456	November	332
June	445	December	470
Totals ...	2662		2251

Malarial Fever in 1867

85. After November, 1866, the disease began to increase rapidly in the localities in which it had appeared in that and in the preceding year, and to invade new localities. On the east coast, it passed Rivière du Rempart in March, 1867, the northern part of Flacq in April, the Post of Flacq in May, and Rivière Sèche in June, travelling in a southerly direction. On the west coast, it advanced from Bambous southwards to Tamarind Bay, Black River, and Case Noyale, where it was most intense in June and July. It also extended inland from Petite Rivière as far as Beau Bassin, Rose Hill, Vacoas, and Eau Coulée.

We further learn from the Report of the Fever Commission that throughout March and April the ravages of the disease were not relaxed for a moment, not only over the low-lying plains, but generally at all elevations under 450 feet, from Bambous in Petite Rivière (on the west coast) northwards to Arsenal Bay, and thence round the northern coasts to the village of Poudre d'Or on the east side of the Island. At Bambous and the higher parts of Petite Rivière (450 feet), Pailles (300 feet), Coromandel (400 feet), Roche Bois, Terre Rouge, Pamplemousses (208 feet), and Rivière des Calebasses (192 feet), no less than on the low littoral plains of Yémen, Wolmar, Albion, Gros Cailloux, Grand River, Cassis, Port-Louis, the Valleys of the Ponce, Plaine Verte, and Ste. Croix, the Arsenal, Pointe aux Piments, and Poudre d'Or, neither age, nor sex, nor race was spared. "Wherever bad hygienic conditions, such as overcrowding, small, low, hot and badly ventilated dwellings existed, and constitutions weakened by improper food and want of medical care were found, the disease made a clean sweep. Entire families disappeared, and the odour of putrefaction exhaled from their dwellings indicated to the passers by, or to the Inspectors, that there were bodies to be interred." The places which suffered most were comprised within a belt of about 40 miles in length and from 1 to 4 miles in width along the coasts. Further inland the mortality was much less.

The highest level attained by the fever was about 1500 feet (at Vacoas and Eau Coulée in Plaines Wilhems), and in proportion as the altitude increased above 450 feet, in the neighbourhood of Petite Rivière, and at less elevation at greater distances in the north of the Island, the disease "lost its severity, becoming lighter and lighter, badly characterized, and somewhat difficult to recognise."

After May the mortality began to abate considerably, and, upon the whole, it continued to do so until December, when it began to increase once more.

According both to Dr. Barraut (then Acting General Sanitary Inspector), and to the Fever Commission, the monthly mortality from *fever* in this year (1867) was as follows :—

TABLE C.

Months.	Deaths.	Months.	Deaths.
January	717	July	2996
February...	2028	August	738
March	5403	September	1027
April	7831	October	320
May	6077	November	351
June	3768	December	664
Totals ...	25824		6096

The whole of Grand Port and Savanne, and the parts of Moka upwards of 450 feet above the sea-level, had as yet escaped, the cases of fever that had appeared in these localities having been contracted on the low lands.

Malarial Fever in 1868.

86. Starting for the third time from its several foci, in December, 1867, the disease attacked new localities, and in January, 1868, it made its appearance for the first time among the inhabitants of the fishing village of Petit Cap, the hamlet of St. Martin, and Bel Ombre estate, all in Petite Savanne. The last mentioned of these localities is the most distant from the South-West extremity of Black River, and is 5 miles from it along the shore. Following an analagous course on the east side of the Island, intermittent fever crossed the estuary of Grand River S.E., advanced to the Southt-Eastern littoral at Grand and Petit Sable, Pointe Bambous, Anse Jonchée, and Old Grand Port, whence it crept along the creek of the Champagne River at Ferney. Somewhat later on it extended to Mahebourg, and at last to Plaine Magnien, where it caused considerable mortality in and after March and April. (Reports of the Commission and of Dr. Francis Reid.)

Dr. Reid states, also, that in this year (1868), about the same time as at Petite Savanne, a sharp outburst of intermittent fever took place among the inhabitants of Ste. Anne and the cultivators of the high grounds between Chamarel and the Baie du Cap on the borders of Savanne and Black River; that about the same time, too, a similar outbreak occurred on the elevated tract of land called the Nouvelle Découverte in the northern part of the Island; and that in January the fever advanced from the coast of Flacq into the interior, reaching Camp de Masque and Trois Ilots, into which it had never before penetrated.

Although, however, the mortality in January, 1868, was much higher than in January, 1867, yet it soon became apparent that the epidemic was abating.

The following is a statement of the monthly mortality from fever throughout the Colony during the year:

Table *f*.

Months.	Deaths.	Months.	Deaths.
January	1135	July	764
February	1575	August	520
March	1905	September	367
April	1218	October	276
May	1389	November	307
June	1121	December...	346
Totals	8343	....	2580

Malarial Fever in 1869 and 1870.

87. Throughout 1869 and 1870 the fever was still decreasing, and in the latter year the mortality from it was less than in any year before or since. The following Table gives the number of deaths ascribed to fever in each month of those two years.

TABLE *g*.

MONTHS.	Deaths in 1869.	Deaths in 1870.
January	502	372
February	547	266
March	888	305
April	952	298
May	944	357
June	589	374
July	417	308
August	341	277
September	288	204
October	306	185
November	239	197
December	317	186
Totals ...	6330	3329

88. The descriptions of the fever in 1865-68, given above, have been derived from accounts printed at the time, or soon after, and they convey a good general idea of what took place.

Conflicting Evidence.

But before proceeding to compare the salient features in the rise and progress of the Epidemic with the more marked Meteorological phenomena of 1865-67, it is important to determine, as nearly as possible, the exact dates of the first cases of true malarial fever among persons who could not have contracted the disease anywhere except in Mauritius. With regard to this point, the evidence is somewhat conflicting. That malarial fever should, for years before 1865, have existed among Indian Immigrants, Chinese, or natives of Madagascar, who had come from countries, or localities, in which it had been endemic, was what might be expected, and not more surprising than the appearance of the same disease among soldiers who had brought it with them, or among Mauritians who have settled in London or in Paris since 1867. Similarly, it would not be surprising to learn that the disease had frequently shown itself among Creoles of Mauritius who had visited Madagascar, or any other country in which malarial fever prevailed, for it is well known that the poison may be absorbed in a short time and remain in the system for years.

When, therefore, Drs. Menneville, Verdalle, and one or two other practitioners, stated in reply to the first question of the Commission, that they had met with malarial fever among all classes of the population, previously to 1865, it would be well if they had given the attendant and antecedent circumstances of one or more cases, in order to show that the disease had been contracted in Mauritius. Not only, however, did they not do so, but in their replies to three subsequent questions bearing directly upon the subject, they did not adduce a single instance, with dates and circumstances, of intermittent fever having occurred among the general population before 1865, the earliest dates given by them having been April and May, 1867.

The questions alluded to (Nos. VI., VII., and VIII.) were as follows :—

Question VI. "Have you seen Intermittent Fever among the Indian population, and a large number ill with it at the same time ? When, where, and with what termination ?"

Question VII. "Have you met with Intermittent Fever among individuals of other sections of the population who could not possibly have contracted it out of Mauritius ? What number of such cases were observed, where, and with what termination ?"

Question VIII. "At what date did that Fever appear and become extensively prevalent in your district or range of practice ? In what locality was it first observed ? What sections of the population did it attack, and what was its manner of invasion and extension ?"

With regard to the first of these questions (No. VI) it is to be borne in mind that no evidence of intermittent fever among Indians, before 1865, can be admitted as proof of a local origin of the disease, unless it be shown that they did not bring it with them from India. Now, what were the answers to the question ? Of 29 medical men who responded, 14 said that they had met with intermittent fever among the Indian population in 1866-67, but they did not say that they had observed it before 1866. Among those 14 deponents were Drs. Finnimore, H. L. Beaugeard, Riccard, Icery, Harel, Bestel, and Luciany. Of the remaining 15 witnesses, all, with a single exception, declared that the cases which they saw among Indians before the Epidemic of 1866-67 were very rare, and no one said that any of those cases had been contracted by persons who had never left the Island. Some of the oldest and most experienced of the deponents affirmed that the disease was not one of local origin before 1865 or 1866. Dr. Reilly, for example, said : "Intermittent Fever, as a disease of the Island, was completely unknown to me till the early part of the year 1866 ; and I have it from the late Dr. Montgomery that he had never had occasion to treat a case of the disease of native origin, and to the best of my recollection the late Dr. Rogers expressed the same opinion." Another old practitioner, the late Dr. J. R. Johnston said: "I do not remember to have seen Intermittent Fever during the last 20 years in Mauritius, except in very rare cases among Indians or strangers, prior to 1866." Dr. Fressanges, another experienced Medical man, said: "Oui, sur les Immigrants à bord de leur transports en rade, alors que je faisais le Service Médical du Port, années 1863 et 1864 : voir les cadres." The late Dr. J. Mailloux said: "Pas avant l'Epidémie de 1866-67. J'ai observé, mais très rarement, parmi des Indiens ou autres étrangers au pays, des cas isolés de la Fièvre Intermittente avant cette époque." Dr. Penaud said that from 1852 to 1856, when he practised at Rivière du Rempart, he only met with "un nombre très restreint de fièvre intermittente parmi les Indiens." Dr. Fropier's evidence was as follows: "Depuis que j'exerce dans le pays, c'est-à-dire depuis le mois de Novembre 1863, il m'est arrivé quelquefois de diagnostiquer la Fièvre Intermittente, mais chez les Indiens seulement." It is needless to produce more of the evidence. The only person who said that he had seen many cases of *Intermittent* Fever among the Indians, before 1866, was Mr. Falloon: according to this witness "large numbers of the Indians had been ill with Intermittent Fever during the years 1863 and 1864 in the District of Pamplemousses."

In reply to question VII, which, in a measure, was a test question, and which would have been still more so if a statement of the *dates* and circumstances had been requested, 16 out of 24 medical witnesses confined their answers to the Epidemic of 1866-68, without any reference to previous years, and amongst those 16 were Drs. Menneville, Verdalie, and Le Guen. As to the remaining 8, Dr. Penaud said that among the Creole and European population he had met with a limited number of cases of intermittent fever, and he added: "Je suis convaincu que depuis douze ans, je n'en ai point vu cinquante cas". As the "twelve years" included 1865-67 it would not be surprising if even more than 50 cases had been met with; but nothing is said as to how many of those cases occurred before 1865, or where or when they occurred. Dr. Sauzier replied, "à peu près une dizaine de cas par an en ville et à lacampagne": Dr. Grivot de Grandcourt, "pas un seul cas : Dr. H. Rogers, "I don't recollect any such cases:" Dr. Bolton, "I have seen Creoles (woodmen) occasionally attacked; so far as I remember without fatal result:" Dr. Pougnet, "not a single case, originating in Mauritius, before 1865": Dr. J. R. Johnston, "I have met with intermittent fever amongst all classes of the population only since the outbreak of the reigning epidemic." Dr. O. Beaugeard's reply has been already given; he stated that on the 16th. January, 1865, a Creole with intermittent fever was admitted into the Civil Hospital, and that, in all, 7 Europeans, 6 Indians and 1 Creole entered with that disease contracted in the island during that year. With regard to what took place before 1865, Dr. Beaugeard said: "A few rare instances, indeed, now and then occurred in the aborigenes, or dwellers of this Colony, *who had not left it for a long time.*" It would thus appear that the few cases which had been met with at the Hospital, before 1865, were limited to persons who had been out of the Colony. Even in 1865, only one Creole with intermittent fever was admitted, the other 13 patients having been Europeans or Indians, and it is not said whether, or not, that Creole had ever been out of the Colony.

Question VIII asks "at what date did the fever appear ?" The rest of it, however, is framed in such a way that some may have thought that the query referred to the Epidemic alone. Be that as it may, it is certain that the 38 replies which were sent in allude to the first appearance and march of the Epidemic in 1865-66-67, solely with reference to the localities in which the deponents lived or practised.

Dates, Localities, &c., of first cases of Malarial Fever in 1865-68.

89. In the voluminous appendices to the Report of the Fever Commission, there are answers given by Magistrates, Committees, Inspectors, Planters, &c., to the question : "At what date did Intermittent or Remittent Fever first appear among persons (who could not have contracted it out of Mauritius) residing in the District, Town, Village, Estate, or other place in or near which you reside, or have frequently visited and become familiar with ?" From the answers to that question and to question VIII., and the Evidence generally, the dates and localities of the first appearance of the disease in different parts of the Island, in the years 1865-68, may be approximately ascertained, and consequently a pretty correct idea formed as to the progress of the disease, with regard to time and place. And as it is of importance, in forming an opinion respecting the probable effects of local conditions, to know, with the greatest possible accuracy, the dates and the most prominent of the attendant circumstances, the following brief statements, with the names of the different Authorities, have been prepared. *

1865. January 16.—Civil Hospital, Port Louis : Intermittent Fever ; a Creole. (Dr. O. Beaugeard.)

1865. In the beginning of the year, and a few weeks after the inundation of the 12th. February, cases of fever of malarious origin began to appear among the men of the Royal Artillery, stationed at the mouth of Grand River, near Port Louis. (Report of Fever Commission, page 20.)

1865. October—December.—An epidemic of Remittent Fever on Wolmar Estate, Black River, among Indian labourers ; 80 attacked ; 3 deaths. (Dr. Le Guen.)

1865. November 15-25.—Intermittent Fever at Petite Rivière, in the neighbourhood of the Church. (Dr. Penaud.)

1865. November—December.—The Fever appeared in the neighbourhood of Albion estate in November and December 1865. (H. Chauvin).

1866. January.—In the neighbourhood of the Chapel of Petite Rivière, the estate Gros Cailloux, and the estate Albion. (H. Chauvin).

1866. January 6.—One case of Remittent Fever at Gros Cailloux, Petite Rivière, Black River. (A. B. Commins.)

* The evidence was tendered in the latter part of 1867.

1866. January 29.—One case (fatal) of Intermittent Fever, on Gros Cailloux estate. (A. B. Commins.)

1866. January.—The first case of true Intermittent Fever I saw on a European (outside the Civil Hospital, Port Louis) was on Gros Cailloux estate in January, 1866. (Dr. H. Rogers.)

1866. January.—The first cases I saw were at Petite Rivière, Black River, in January, 1866. Chiefly of the Remittent Form. (Dr. J. R. Johnston.)

1866. January.—In the first part of January, 1866, among the ex-apprentice population at Cassis and Rochebois, near Port Louis. The cases distinctly showed the Intermittent type. Invasion and extension sudden. (Dr. Barraut).

1866. January and February.—At Petit Sable (Grand River), the Salines and Cassis (Port Louis), and Rochebois. Very few cases in centre of Port Louis. (Dr. Penaud.)

1866. February.—The disease was common, but not very severe, at Grand River. (Dr. J. R. Johnston.)

1866. February.—Two cases of Intermittent Fever in Gaiety and Farquhar streets, Port Louis. (Dr. O. Beaugeard.)

1866. March.—A case of pernicious Intermittent Fever at Rochebois. Death in 48 hours. (Dr. Grivot de Grandcourt.)

1866. March.—Still common at Grand River. (Dr. J. R. Johnston.)

1866. March.—Early cases of paroxysmal fever possessing peculiar and marked characters appeared among the men, women, and children of the Royal Artillery, Port Louis. (Dr. Hannan.)

1866. April.—The first cases I saw in Port Louis were at the Salines, the Caudan, and Cassis. All classes were attacked, masters and servants, the poor and those in easy circumstances, and very many cases occurred simultaneously. (Dr. J. R. Johnston.)

1866. April.—One of the members of a family residing at a short distance from the Arsenal (District of Pamplemousses) was attacked with Intermittent Fever in the middle of the month of April, 1866; he had never suffered from the disease previously, neither here nor in Europe, of which he was a native. (Dr. Reilly.)

1866. May.—The Manager of Solitude estate, at Pointe aux Piments, in Pamplemousses, was taken ill daily with fever and cramps. (C. Dombreu.)

1866. May.—Still at the Salines. Caudan, and Cassis, Port Louis. (Dr. J. R. Johnston.)

1866. May.—In my own family at Champ Delort, Port Louis. (Dr. Bestel.)

1866. June 19.—The Inspector of Balaclava Distillery, at the Arsenal (Pamplemousses) contracted Intermittent Fever. From that date till October, several Indians on the estates Arsenal, Solitude, and Unité, all in Pamplemousses, had Intermittent Fever. In October several cases proved fatal. (C. Dombreu)

1866. June.—At Cassis and the Salines (Port Louis) among all classes. Became Epidemic about the end of December, 1866, or the beginning of January, 1867. The fever gradually gained Souillac, Brabant and D'Entrecasteaux streets. Canal and St. James's streets presented numerous cases. At the Salines the fever was so deadly that almost all the cases there were either fatal or extremely serious. This may be accounted for by the nature of the soil and its vicinity to the sea. (Dr. Pougnet.)

1866. June or July.—Two cases at Terre Rouge, in Pamplemousses. (Dr. De Rosnay.)

1866. June.—At village of Pemplemousses since June (Chairman of Committee).

1866. August.—Several persons who lived at Tombeau, in the District of Pamplemousses, were attacked with Intermittent Fever. (J. H. Shellam, Inspector of Police.)

1866. August.—About this time cases occurred on Rivière Noire estate, in Black River. (J. Monneron.)

1866. Middle of year.—Several isolated cases occurred at Pailles among the resident Indian population. (Committee of Moka.)

1866. September.—At Grand River, Cassis, and afterwards Pailles. Extended rapidly in commencement of November and became general, indiscriminately. (Dr. Jacques.)

1866. October.—Intermittent Fever at Cassis, Reserve street and the Salines, amongst Creoles who had never left the Island. The persons affected, generally lived near marshy ponds, stagnant water, &c. (Dr. H. L. Beaugeard.)

1866. October.—From October 1866, a large proportion of the fever patients in the 13th Regiment (Line Barracks, Port Louis) were affected with what appeared to be continued fever. No cases of Intermission till February, 1867. (Dr. Power.)

1866. October—December.—Malarious fever rife between Black River Bay and the Morne. (Dr. Reid).

1866. November.—Beau Séjour estate, Plaines Wilhems. (M. C. Gosse.)

1866. November.—The first case of Intermittent Fever of which I have knowledge in Plaines Wilhems occurred amongst my servants at Myrtle Hill towards the end of November, in the person of a girl, four years of age, who had not, for at least three or four previous months, left the yard. (J. Rouillard, Magistrate.)

1866. December.—In December, the father of the girl was seized with true Intermittent Fever. On my visits to the Hospital at Rose Hill, the Attendant informed me that there were cases of slight fever, of a periodical nature. Towards the middle of December, the peon of my office, and two of his children, who had never left the locality, were taken ill with purely intermittent fever. (J. Rouillard).

1866. December.—In the District of Plaines Wilhems, properly so called, the fever made its appearance in December. I say "properly so called", because the disease existed for a long time at the extremities of the District bordering on the village of Petite Rivière. (Dr. Gouly).

1866. December.—At Vacoas (Plaines Wilhems) in the early part of December. (J. Macpherson, Inspector of Police.)

1866. December.—Tamarind Bay (Black River) in the latter end of the month. (Joseph Greer, Serjeant Major.)

1866. December.—Malarious Intermittent Fever first appeared amongst the detachments of the Royal Artillery stationed at Black River and Cannonier's Point in the first week of December. Its outbreak was very sudden. (Staff Assist. Surgeon Ferguson.)

1866. December.—Intermittent or Remittent Fever declared itself amongst persons residing on Mont Mascall estate (Mapou) in December, 1866. M. Couturout.)

1866. December.—The first symptoms of fever appeared at Poudre d'Or in the beginning of December, 1866. (H. Lipsic, Serjeant Major.)

1866. December.—Fever appeared at Rivière Sèche, about the 12th. December, 1866. (W. Clark, Serjeant of Police.)

1867. January.—Intermittent Fever assumed an Epidemic form in the District of Rivière du Rempart, in the first week of January, among all classes, particularly around the village of Poudre d'Or. (Dr. Verdale.)

1867. January.—It was not till January, 1867, that I saw the first non-imported case of the disease at Champ Delort, Port Louis, where I reside. (Dr. Fressanges.)

1867. January 8.—The first case of Intermittent Fever on Mapou estate (Rivière du Rempart) took place on the 8th January. (M. G. Belin.)

1867. January 10.—Appeared generally amongst the inhabitants of the village of Pamplemousses. (G. Fannell, Serjeant-Major.)

1867. January 16.—Among persons at Long Mountain, Pamplemousses. (J. Webb, Serjeant).

1867. January.—At Trou d'Eau Douce in Flacq. (S. Sullivan, Serjeant).

1867. January 15.—On Belle Vue and St. François estates, Mapou, Rivière du Rempart. (F. Arékion).

1867. February 20.—Intermittent Fever declared itself on The Vale estate (Rivière du Rempart) towards the 20th. February, and both Intermittent and Remittent Fevers were severe from March to July. (Mr. Levin).

1867. February.—On Lucia estate, Pamplemousses. (Mr. Maroussem).

1867. February.—Appeared in February, and extended greatly in March, April, and May. I first observed it on the Poudre D'Or, Belmont, and Grand Baie estates, in the village of Grande Baie, and in other localities. All classes were attacked nearly at the same time. The Poudre d'Or estate is surrounded by canals, and the Belmont and Grande Baie estates, as well as the village of Grande Baie, are surrounded by several brackish marshes. (Dr. Harel).

1867. February.—On Constance estate, (Truquez and Co.) in Flacq, towards the middle of February. (Manager of Constance).

1867. February.—On Queen Victoria and Bonne Mère estates, in Flacq, towards the middle of February. (From the Manager.)

1867. March.—Only towards March. The greatest development took place in May and June, at the Post of Flacq, on the estates Choisy, Constance D'Arifat, Trou d'Eau Douce, and Beau Champ (Grand River S. E.) I first observed the fever among the Indians on the estate Constance D'Arifat, where the camp is to leeward of a large marsh. I next met with it on the estate Beauchamp. All the seaboard to windward of that establishment is formed of salt-water marshes called the *Salines*. The establishment Choisy, at the Post of Flacq, suffered greatly. It is situated on the borders of an immense salt-water marsh communicating with the sea. (Dr. G. Menneville).

1867. March 1.—On Helvetia estate in Moka. (M. Lecoultre).

1867. March. 4.—On Stanley estate (Plaines Wilhems) on 4th. March,and on Ebene estate on 24th. March (From Manager.)

1867. March 23.—On Sebastopol estate, Flacq, since the 23rd March. From 25 to 30 cases in all, of which only 9 serious. Several marshes. (E. Fontenay).

1867. March 24.—At Mon Désert (Moka), the first case was that of a man whose only occupation was to bring provisions from Port Louis. A few days after, three men arrived with fever from town. Towards the 15th. April, a young man arrived from Port Louis with fever. Some other persons also arrived with fever. The young man was the only person that succumbed (M. Noel).

1867. April 26.—On Riche Mare estate, Flacq, the first case of Intermitent Fever (declared by Dr. Menneville) occurred on the 26th. April. (A. Régnard).

1867. April 17.—Deep River estate, Flacq, on 17th. April (G. Paddle).

1867. May.— Intermittent Fever declared itself among the Indians on La Gaieté estate, Flacq, at a time when the disease was decreasing in Port Louis, that is, towards the end of May. The Epidemic first manifested itself by isolated cases of a purely intermittent form. Soon after, it assumed a graver character, and from the end of June it departed from its original type, and became complicated. In proportion to the population, the number of cases was not very great, but during the last weeks they were almost all rapid and insidious. (Dr. Icery).

1867. June and July.—Greatest intensity at Tamarind, Black River (proper), and Case Noyale, all in the District of Black River, in June and July. (Report of Commission).

1867. June. — Very intense and extremely fatal along and near the seaboard from Black River Bay to the Morne Brabant during the warm months of 1867 and until June, abating in the cooler months, and recommencing its attacks, with the increasing temperature, in the last quarter of the year. (Dr. F. Reid).

1868. January, February, &c.—Petit Cap and St. Martin, (Petite Savanne); the high grounds between Chamarel and the Baie du Cap (on the borders of Savanne and Black River); the elevated land of Nouvelle Decouverte (near the northern extremity of Moka); Camp de Masque and Trois Ilots (7 or 8 miles inland from the coast of Flacq); and the south-eastern littoralof the District of Grand Port from Grand River S. E. on to Anse Jonchée, Old Grand Port, and the creek of the Champagne River at Ferney. (Dr. Reid).

Hitherto the southern littoral, from the Champagne River round to Mahébourg, and thence to Petite Savanne, had escaped; but, although the details are unknown, those parts were invaded before the end of the year (1868).

Main Facts connected with the Rise and Progress of the Epidemic.

90. From the foregoing and other details we gather that the following were the main facts connected with the rise and spread of the Epidemic :

1o. There is no proof that, previously to 1865, malarial fever existed among persons who had never been out of Mauritius.

2o. The first cases of malarial fever, respecting which there is no doubt of their having been contracted in the Colony, occurred on Albion and Gros Cailloux estates in January, 1866 ; but as a good many cases of remittent and intermittent fever had appeared two or three months earlier, among some classes or other of the population in adjoining parts of Petite Rivière, the Epidemic, which afterwards spread in different directions, may be said to have commenced in that locality in November, 1865.

3o. Cases of malarial fever occurred in Mauritius, long before 1865, among soldiers, Indians, natives of Madagascar, Creoles, and others who had contracted the disease in places where it was endemic ; and there is no doubt that it was in the Colony in 1863 and 1864.

4o. The mortality from fevers, in 1864, was, as already stated, greater than it has been in any year since 1869, but there is ample evidence that malarial fever was not one of them, except in cases (and these were rare) of persons who had come from other countries.

5o. The disease (omitting the case in the Civil Hospital) appeared, for the first time, among natives of Mauritius who had never left the Island, on or near the seashore on the west coast, and it first of all spread along the seaboard, north and south of the embouchure of Petite Rivière.

6o. Starting from that locality, about the middle of November, 1865, and travelling northwards, it reached Pointe aux Sables, Cassis, the Salines (Port Louis), and Roche Bois (north of the harbour of Port Louis, in January, 1866, the Arsenal in April, Pointe aux Piments in May, Solitude and Unité estates on the 19th. June, and Canonnier's Point in the first week of December, 1866. In other words, it took about 13 months to pass over 21 miles of the seaboard in a northerly direction, the places first attacked still suffering. How it got round the northern extremity of the Island, is not known ; but it was at Mapou and the village of Poudre d'Or, on the east coast (8 to 13 miles from Canonnier's Point on the west coast), early in December, 1866, and at Rivière Sèche about the middle of December.

7o. The dates of its first appearance at successive points along the line of coast from Petite Rivière southwards to the Morne Brabant, are not so well known ; but as it was at Black River in August, and along the coast, between Black River Bay and the Morne, in the last quarter of 1866, it must have advanced from Petite Rivière to the Morne, a distance of 18 miles, in about 11 months.

8o. The only progress it made round the Island, in 1867, was from Rivière Sèche southwards to Grand River S. E., a distance of 3 miles, which it traversed in about 3 months, having been at Beau Champ estate in March of that year.

9o. In the course of 1868 it passed over the remaining portion of the seaboard, lying between the Morne and Grand River S. E. ; that is, the southern and south-eastern coasts, by the south, but we have no dates.

10o. Its progress from the seashore towards the interior of the Island, was much slower than along the coasts. It would appear, for example, that it reached Gros Cailloux, about 1½ mile inland from the coast of Petite Rivière, in January, 1866. It slowly advanced inland along Grand River N. W., reaching Pailles (2 or 3 miles from the sea) only in June or July, 1866. Though it attacked Cassis, and the Salines in Port Louis, in January, 1866, it did not reach the Champ Delort till May, 1866,* or January 1867, its progress inland from street to street having been noted by Dr. Pougnet. Terre Rouge, in the District of Pamplemousses, and about 3 miles from the coast, was not visited till June or July, 1866, nor the village of Pamplemousses till about the same time, while Long Mountain, still farther from the coast, was not reached till January, 1867. From Petite Rivière the fever did not reach Myrtle Hill, 3 miles inland, until November, nor Rose Hill and Vacoas until December, 1866.

11o. Owing to the progress of the fever in 1865-68 having at first been regarded as separate "invasions," there is in the earlier accounts some confusion as to the dates of the first appearance of the disease in different localities. Moreover, it is possible that at some places, as at Rivière Sèche, the first cases were imported. There is no doubt, however, that before the end of December, 1866, malarial fever had implanted itself all along the western seaboard from the Morne Brabant, in the south-western extremity of the Island, on to Cannonier's Point, in the north, and thence round the north coast to at least the village of Poudre d'Or on the east coast.

12o. So little was then known of one of the chief characteristics of the fever, namely, its annual periodicity, that the marked abatement which took place in August to November, 1866, especially in October and November, led "to the supposition that the disease was about to become extinct." It would appear that the first person that was struck with seasonal variations of the fever was Dr. O. Beaugeard. Referring to the number of persons treated at the Civil Hospital from January, 1866, to June, 1867, he alluded to "the gradual rise and comparative fall of that form of Fever (intermittent), which fall, singular to say, takes place from August to October, inclusively," and he remarked that the "climax (maximum) was reached in April." He also said that remittent fever presented "nearly the same variations." We now know that these variations are annual, although they are still sometimes called "waves"—three of which are said to have passed over certain parts of the Colony in the three years from November, 1865, to November, 1868; whereas, once malarial fever had got a footing on the low lands, it remained there, increasing or decreasing according to changes of weather and season, and, sometimes, at the epochs of minimum, appearing to be extinct.

13o. Excepting on the seaboard from Petite Rivière on to Grand River N. W., Cassis, the Salines, and Roche Bois, the fever, in 1866, was mild, and the mortality small; but from December, 1866, to April, 1867, it increased enormously, and was very fatal all round the Island from the Morne Brabant to Connonier's Point, on the west coast, and thence round the northen shores to Mapou, Poudre d'Or, the Post of Flacq, Trou d'Eau Douce, and Grand River S. E., on the east coast, the mortality in January having been nearly double of what it was in December, 1866, more than quadruple in February, tenfold in March, seventeen fold in April, and nearly thirteen fold in May. The mortality then decreased rapidly, and, in October, 1867, it was less than in October, 1866. In December, 1867, it began to increase again,

* The case mentioned by Dr. Bestel may have been imported. Dr. Fressanges did not meet with non-imported cases till January, 1867.

and attained a maximum in March, 1868, but it was very much less than in 1867, and its monthly variations from January to June were much more uniform (See Tables *e* and *f*).

14o. Although the fever reached the southern extremity of Black River (near the Morne) in the last quarter of 1866, and Grand River S.E. in March, 1867, yet it did not pass either the boundary between Black River and Savanne or the boundary between Flacq and Grand Port, until January, 1868. While it raged more or less during 15 months in the south-western extremity of Black River, Petite Savanne, in the neighbourhood, was all that time quite exempt. Dr. Reid has called particular attention to this circumstance.

15o. In January, 1868, some elevated localities, as Chamarel and Nouvelle Découverte, the residents of which had hitherto escaped, were attacked, and the littoral of Grand Port and Savanne in the course of the year.

16o. The fever was most prevalent, intense, and fatal, on and near the coasts, and at elevations below 250 feet above the sea-level. According to most Medical men, it was also, *ceteris paribus*, much more intense near marshes than elsewhere, except on the high lands, where marshes were apparently innocuous.

The most prominent Circumstances.

91. Of all these circumstances † the most prominent (exclusive of yearly periodicity, which has already been discussed) were : (1) the comparatively rapid propagation of the disease along the coasts, and its slow progress towards the interior; (2) its great intensity on the low lands, and especially near marshes ; and (3) its arrest on the confines of Savanne and Grand Port for 15 and 10 months, respectively, and the immunity of those Districts, in 1866-7, while the low lands in all the other Districts were suffering.

State of the Seaboard and low-lying Lands before the Epidemic.

92. In connection with the first of these points, it should be remarked that all along the west coast, from Morne Brabant in the south to Cap Malheureux in the north, and thence to Grand River S. E. on the east coast, there were before the fever appeared marshes, lagoons, and shallow inlets, to some of which allusion has already been made. From the Morne to Black River Bay, between the coral reefs and the beach, there was a shallow tidal lagoon, the shores of which had long been "more or less muddy, swampy, and noisome." "The land between the shore and the mountains received the neglected drainage of the western watershed, and was in many places low, damp, and miry, the brooks overgrown with rank vegetation, and their estuaries blocked with foul mud, fish refuse, and often decaying drift weeds, which at times collected in immense quantities." * At Black River Bay, Tamarind Bay, Petite Rivière Bay, Grand River Bay, Tombeau Bay, Arsenal Bay, and Grand Bay, there were low muddy foreshores, and swamps and marshy ground at the mouths of the rivulets. Inside the sandy downs, which at

† The stirring up of the mud in the barachois, at Albion, is passed over, because it is uncertain whether that event took place in November or December, 1866, or in January, 1867, and because it is probable that the fever would have spread without it. There is no doubt, however, that the sudden outbreak on the Albion and Gros Cailloux estates took place after the mud had been turned up.

* Dr. Reid's Report, page 13.

intervals extended along the shore, there were here and there from Tamarind Bay to Grand River saline marshes. All the lower parts of Port Louis, towards the west and south-west, comprising Cassis, the Salines, Fort William, and the Caudan, were more or less swampy and, in some places, the receptacles of Town sweepings and of refuse brought down by the Pouce and other streams. At a short distance north from the mouth of the harbour of Port Louis was the Mer Rouge, a shallow expanse of salt water, receiving the Terre Rouge and Lataniers rivulets, with the refuse of the eastern parts of Port Louis, and often more or less dry at low tide. A similar state of matters existed at many other parts of the coast, as Tombeau, the Arsenal, Grand Bay, Mapou, the village of Poudre d'Or, Post of Flacq, Trou d'Eau Douce, and Grand River S.E.

There were also ponds, marshes, and lagoons on the lowlands, near the rivers, streams, water-courses, and springs. Petite Rivière was noted for its marshes and ponds. There were marshlands at Anse Courtois, Pailles, and along the rivulet St. Louis; in the valleys of the Pouce, Plaine Verte, des Prêtres, and Mountain Long; on the banks of the Pamplemousses river, as at the Powder Mills and Beau Plan; and, in short, generally, in the vicinity of springs and water-courses on the low-lying plains, all around the Island.

Now, it was along the coasts that the fever appeared first, slowly radiating inland, along the streams and rivers.

Effects of Elevation above the Sea.

93. With regard to the circumstance that the fever was most intense at elevations below 250 feet, and worst of all on the seashore, it is to be remarked that although the disease was not confined to those limits, yet it generally became milder as the altitude increased, and finally disappeared at heights varying from 700 to 1200 feet. Most, if not all, of the cases that appeared on the sugar estates in Moka and on the high lands of Plaines Wilhems, were imported. It is doubtful whether any cases of true malarial fever have occurred at a higher elevation than 1000 feet, among persons who had never left the locality. Such cases, if any, have been very rare.

Arrest of the Fever.

Black River and

94. As to the singular fact that, in its progress round the Island, the fever was arrested for months on the borders of Savanne and Grand Port, it is to be remarked that those Districts are separated from Flacq ~~and Savanne~~ by lofty mountain chains, some spurs of which terminate close to the sea.

Between Black River and Savanne, these barriers slope down towards the shore, and from the last of the comparatively low and narrow ridges "starts up the high terminal rocky bluff of the Morne." The road from Black River to Petite Savanne crosses these ridges on the landward side of the Morne, between it and the mountains, and then descends to the seashore, south of the Morne.

On the Flacq side of Grand River S. E., a spur (near Pointe aux Bœufs) terminates close to the sea, and, on the Grand Port side, another spur (near Pointe aux Feuilles) does the same. South of this last spur several others, branching off from the Bambou mountains, come down close to the beach.

No such barriers existed from Petite Rivière to the Morne and to Cap Malheureux on the west coast, or from Cap Malheureux to Grand River S. E. on the east coast; and along the whole of that line the fever steadily advanced, till it reached the borders of Savanne and Grand Port.

Dr. Reid considered that the seeds of the disease were wafted from Black River to Petite Savanne, and from Flacq to Grand Port, by the N. W., North, and N. E. winds of a Cyclone which passed north, west, and south of Mauritius, from the 2nd to the 5th January, 1868.

On the other hand, it should be mentioned, in connection with the immunity of Savanne and Grand Port, till 1868, that no floods occurred in those Districts on the 12th February, 1865, and that the localities that suffered most in 1866 and 1867 were precisely those in which the inundations had been greatest, as Black River, Port Louis, and Pamplemousses. It is to be observed, also, that the drought of 1866-67 was not so severe in Gand Port and Savanne as in the leeward and nothern Districts.

The Fever essentially malarious, or paludal, and non-contagious.

95. In reply to questions as to the nature of the disease, 37 out of 39 Medical men declared that it was essentially malarious, or paludal, and all, excepting 2, that it was non-contagious. The facts adduced by Drs. Stone, Icery, Beaugeard, Fressanges, and many others, are, so far as a layman can judge, absolutely conclusive. Independently of the symptoms, stages, and treatment of the disease, which were the same here as in other countries, it derives its name from the circumstance that it is most prevalent and fatal in the vicinity of water and marshes on hot and low lands, and we have seen with what predilection it laid hold of such localities in Mauritius. Then, with respect to its non-contagiouness, there are two facts which seem to put the matter beyond all doubt, viz: (1) that it did not spread along the main lines of communication between different parts of the Colony, where the population was densest and intercourse most frequent, but along the coasts and water-courses; and (2) that although many persons, suffering from the fever, left infected localities for others which were not infected, they did not communicate it to those around them, the residents remaining exempt until the disease reached their abodes in the course of its onward but devious march.

Fevers in Mauritius previous to 1865.

96. It would appear that the fevers which were most common in Mauritius before 1865 were: 1o. Common Continued Fever; 2o. Typhoid Fever; 3o. Bilious Remittent, or Bilious Typhoid, commonly called "Bombay" Fever. The first two were met among all classes, and the third almost exclusively among Indians.

Bombay Fever.

97. The Bombay Fever made its first appearance in Mauritius in or about 1838, and since that time it has occasionally been very prevalent and deadly among the Indian population, especially in 1843-46 and 1855. With reference to this disease the Fever Commission of 1868 remarked: "For a long period, apparently, and under the name of Bombay Fever, at least two kinds of fever have been classed—very opposite as to their origin, form, nature, and treatment. To us, Bombay Fever, as generally met with among Indians, and occasionally, though much less frequently, among the general population, appears to be a continued fever, an *enteric Typhus* of more correct nomenclature, with hepatic or bilious complication, and

is highly contagious. The other form, which we may call the *spurious* Bombay Fever, is less frequently met with, not at all contagious, and attacks, almost exclusively, Indians. This form appears to be a Malarial Remittent, showing itself in those persons chielfy who had already imbibed the malarial poison in their own country, and in whom the small amount of malaria possibly existing here, which apparently had no sensible effect upon others not so prepared, was yet sufficient to set up an attack of the disease in them" (Report, page 15.)

These Fevers prevalent in 1862-64.

98. There is ample evidence that these fevers were unusually prevalent in 1862-64. Dr. Finnimore states that in the winter of 1862 he met, among the Indians in Grand Port, with a form of fever which he felt at a loss how to designate. "It was clearly not the same fever as that which had existed up to that date. In some cases the febrile symptoms were continuous, with exacerbations; in others there were remissions, and biliary complications were usually superadded. This form of disease became gradually epidemic, and the mortality considerable. It was confined exclusively to the Indian population." Dr. O. Beaugeard remarks that in 1862-64 "a fever, akin to the Bombay fever," was prevalent, not only in the Civil Hospital, but elsewhere. "In the years 1863 and 1864 especially, it raged with more or less intensity throughout some parts of the Island, preserving everywhere its principal features, viz: its almost invariable limitation to persons of Indian origin; its prevalence in localities which were badly situated, kept unclean, insufficiently ventilated, and where overcrowding of the inmates was the rule; and its cessation, whenever these were removed to another habitation" "I am of opinion that this fever is, and was at those different times, a Remittent Fever of essentially malarious origin, eminently dangerous when severe, and in which the complications of Icterus, with organic changes in the liver and spleen, are always the predominant characteristics." "It increased from 1862 to 1864, when its cases were very numerous, descended below 1863 in 1865, apparently lower again in 1866, and stood highest in 1867, when, during the first six months alone, it reached the high number of 1302 admissions." * "Let it suffice for the present, not to lose sight of the fact that, for years back in this Island, at various intervals, and in certain local conditions, one class of the population, belonging to a particular race coming from a country where malaria is rife, and where they had probably suffered from some of the diseases which it generates, did present symptoms of a Fever of malarious origin" "Remittent Fevers themselves, as they had been distinguished, scarcely make any show in the table mentioned;† and can only be said to have appeared in 1866 and 1867." According to Drs. Pougnet, Harel, Fropier, Menneville, and others, Bombay Fever was very fatal in Savanne, Grand Port, Plaines Wilhems, Pamplemousses, Rivière du Rempart, and Flacq, in 1863 and 1864. When Mr. Falloon said that "large numbers of the Indians had been ill with Intermittent Fever during the years 1863 and 1864 in the District of Pamplemousses," it is possible that it was Bombay Fever (in one or other of its forms), for he afterwards stated that he had had little experience of that fever.

* The admissions in 1862-63-64-65-66 where respectively 153, 199, 247, 163, 121.

† Tabular statement of admissions into Hospital.

Bombay Fever totally different from Malarial Fever.

99. Medical testimony is unanimous as to there being no resemblance between true Bombay Fever and Malarial Fever. The former is highly contagious and incurable by quinine; the latter the reverse *. But it would appear that the spurious form of Bombay Fever, which was almost exclusively confined to Indians, was allied to Malarial Fever, inasmuch as it was, like it, non-contagious and of similar origin.

Variations in the Types of Malarial Fever.

100. Nearly all the Medical men who responded to the Fever Commission allude to variations and irregularities in the forms exhibited by the Malarial fever. Generally, the disease first showed itself in the Remittent form, from which it passed into the Intermittent; but in other cases the Intermittent appeared first, and then often merged into the Remittent and Continued forms. It frequently happened, also, that one or two of the usual stages of the true Intermittent form were absent or badly defined. Moreover, the variations themselves were different at different times of the year. These irregularities led one experienced Medical man, who arrived in the Colony in 1865, to the belief that the fever was not of *paludal* origin, but a "Recurrent Fever" of the same nature as that which ravaged Russia in 1865. He was, however, the only practitioner that did not consider the fever to be malarious. His colleagues, with scarcely an exception, maintained, not only that it was essentially malarious, but that throughout all its variations and complications the Intermittent form was predominant.

Inequalities in the Death-Rates from 1861 to 1870 connected with Meteorological Inequalities.

101. The details without which it was impossible to form an opinion having now been presented, we return to the question, Were the extraordinary inequalities in the death-rates from 1861 to 1870 (Table Z) due in whole or in part to abnormal meteorological inequalities?

Meteorological Evidence.

102. Now, looking at the matter from a meteorological point of view, we are, first of all, struck with the fact that an Epidemic of Cholera commenced 9 months after the great inundations of February, 1861, and an Epidemic of Malarial Fever 9 months after the intense inundations of February, 1865; and, further, that those two epidemics began in the same locality, namely, in the vicinity of Grand River mouth, on the west coast, at a distance of 1 to 4 miles from the anchorage near the Bell Buoy, where vessels from India with fevers and cholera on board sometimes remained for days, during which in certain states of the weather the germs of disease may have found their way to the neighbouring shores, which were in a fit state to receive them and to favor their propagation. It is worthy of remark, also, that, according to the official reports, the cholera epidemic of 1862 commenced, not only in the same locality as that in which the cholera epidemic of 1854 commenced, but in the same house, and that the first case in the cholera epidemic of 1856, on the main land, took place at Fort George, on the north side of the entrance to the harbour.

These facts point to the importance of the adoption of special hygienic measures for the portion of seaboard extending from Petite Rivière to Grand River mouth, Cassis, the Salines, Fort William, the harbour of Port Louis, Fort George, Rochebois, and thence to Tombeau Bay, and the Arsenal.

* Another difference is that Bombay Fever has frequently proved very fatal in Indian camps on the high table-lands, whereas malarial fever has not done so.

In the next place, it is to be remarked that the unusual frequency of westerly and north-westerly winds in 1862, 1863, and 1864, with a temperature above the average in 1862, excessive rains in January and February, 1863, and droughts in 1864, were accompained or followed by a very considerable increase of mortality, partly from cholera in 1862, and from fevers in 1862-63-64.

The depressing influence of those westerly winds, popularly called "Madagascar" winds, is proverbial, and many instances of their noxious effects were observed during the fever epidemic of 1867. "New cases of fever became very numerous, deaths more frequent, and returns of the disease more rife, after westerly winds, which carried the miasmata emanating from the mouths of rivers, or from the swampy districts along the sea coast, landward." Mr Commins observed at Petite Rivière that "when the wind blew steadily from S. E. there was hardly any fever, but that with one or two days' wind from the westward nearly every one was attacked more or less." This was so common on the west coast that many persons believed that the fever was brought by the wind from Madagascar.

The floods of February, 1861, and the westerly winds in 1862-64, having apparently produced their full effects, and many of the aged and infirm having been carried off in those years, the mortality decreased in 1865 and 1866. But soon after the floods of February, 1865, unmistakable signs of a fresh increase of disease began to appear, at first in the form of "a catarrhal influenza, which became prevalent in several parts of the Island, and especially in Port Louis." * Then, a few weeks after the floods of February, 1865, "cases of sporadic fever, evidently of malarious origin, were observed among the men of the Royal Artillery stationed at the mouth of Grand River." † Towards the end of the year several cases appeared at Petite Rivière. Nevertheless, as the disease was only beginning to manifest itself, the death-rate for the whole Island was less than in 1864.

After heavy rains in December, 1865, a severe drought set in, and in January, February and March, 1866, numerous cases of malarial fever appeared among the Indians on Albion and Gros Cailloux estates, particularly in March (par. 84, page 57), after stirring up mud in a *barachois*, and, the drought continuing, with occasional heavy showers, the disease spread rapidly, but generally in a mild form. The drought in November and December, 1866, was intense, and in the latter month the disease began to increase. Still, the death-rate of the Island for the year was less than in 1865.

The drought continuing throughout January, 1867, with a remarkable prevalence of westerly winds (Table *a*, page 52), and a mean monthly temperature of 1°·5 above the average, the disease increased greatly in magnitude and intensity. The rainfall in February, though greater than in January, was 25 per cent below the average, and most of it fell on 5 days. At Port Louis and Petite Rivière the rainfall in March was 21 per cent above the average, but nearly the whole of it fell on 3 days,

* Drs. Beaugeard and Barraut.

† It is not stated whether those men contracted the fever in Mauritius or abroad.

and north-westerly winds were unusually prevalent. The fever went on increasing, and the mortality attained its maximum in April, after which it decreased to a minimum in October (Table *e*, page 59), the death-rates, however, though diminishing, having been high till August.

At length, after apparently an unprecedented drought, heavy rains fell in November and December, 1867, and in the latter month the fever began to increase; but January, February and March, 1868, being both wet and stormy (two or three Cyclones passing in the neighbourhood of the Island), the disease seems to have received a check, the mortality, though high, having been much less than at the same period in 1867, and reaching in October a smaller figure than it did in any month during 1865 and 1866 (Table *f*.)

Throughout 1866 and 1867 the fever was confined to the parts of the coast (radiating inland) which had suffered from the inundations of February 12, 1865. At last, in 1868, it passed into Grand Port and Savanne, but the mortality in those Districts was comparatively small until 1871 and 1872.

From the 5th. to the 8th. April, 1870, heavy floods took place in Grand Port and Savanne, (par. 75, page 51), and, two years after, the mortality from fever attained a maximum (Table VI., Appendices) in Grand Port, just as, two years after the floods of February, 1865, it attained a maximum in the Districts which had suffered from the latter floods. In May, 1872, the mortality from malarial fever, in Grand Port, was greater than in any month during the nine years 1871-79. There was, also, a high fever mortality in Savanne in April and May, 1871, and in 1876 and 1877, all after floods.

In 1869 and 1870 there were no floods or droughts in the other Districts, and there the fever went on decreasing, but probably this was partly owing to great numbers of predisposed persons having been carried off in the previous years.

Evidence of Medical Men.

103. In so far as malarial fever is concerned the evidence which has now been adduced, (1) with regard to its monthly variations (pars. 27 to 36), and, (2) with regard to its variations in the years 1865-70, leaves little doubt of an intimate connection between it and meteorological conditions. But as the consideration of the subject belongs especially to Medical men, who, knowing the nature of the disease, are the most qualified to give an opinion as to its causes, let us see what were the views entertained by the practitioners who witnessed the rise and progress of the epidemic, and who were more or less cognizant of the antecedent and attendant circumstances. *

Dr. F. Reid (Chief Medical Officer). The views of the late Dr. Reid may be gathered from two Reports which he submitted to the Fever Commission. On many parts of the seacoast, he remarks, considerable quantities of organic matter have been accumulating and undergoing oxidation and generally slow decomposition. These processes have been hastened at times when the waters have become low, or have quite disappeared during protracted drought and great solar heat. From these accumulations, which received enormous accessions from

* The evidence was given in the latter part of 1867.

the uplands during the inundation flood of 1865, unwholesome emanations have proceeded, which, when the wind came from the sea, have been carried in the moist air, often far inland, until stopped by rising ground, trees, or hills. During the epidemic it was constantly remarked by Medical men, as well as by many other observing persons, that while the wind blowing over such localities came landward, those within its reach who had hitherto escaped, experienced a sense of depression, lassitude, and general malaise ; that new cases of fever became far more frequent than during other states of weather ; that returns of febrile paroxysms were much more common, and that the mortality was remarkably increased ; and, on the other hand, that on a change to the landwind taking place a great amelioration in all these respects was noticed. These results, following the changes specified, were watched and noted by so many persons, in divers degrees of intensity, indeed, yet so invariably consequent upon them, in greater or less measure, that there can be no doubt of their standing in the relation of cause and effect. Among the many sources of the malarious poison on the western, northern, and parts of the eastern sides of the Island, where the epidemic prevailed, by far the most extensive and potent, beyond question the very hot-beds of the disease,existed in the low lands, along the rivers and water-courses,and on and near certain portions of the seaboard. At the inlet of the sea at Petite Rivière, where, first in Mauritius, intermittent fever extensively appeared and attacked more or less all ranks and classes,—and in the expanded tidal mouth of the river, immense quantities of fetid mud had accumulated, as also in the extensive marshes adjoining ; in all of which situations the waters had become very low during the prolonged drought, and under the excessive solar heat, of 1866-67. Large portions, indeed, were nearly dry.

Dr. A. R. Barraut (Acting General Sanitary Inspector). In his Report dated August 31, 1868, Dr. Barraut calls particular attention to the floods of February, 1865. The rivers became enormously swollen, and carried with them, not only the vegetable detritus of the mountain slopes, but a considerable portion of the animal and mineral ingredients scattered all over the cultivated lands for manure. Stopped to a great extent by the long line of coral reefs, they spread over the wide estuaries, which constitute the openings of most of our rivers, accumulated in their hollows, and contributed to raise the level of the already existing alluvial deposits. In the summer of 1866, which was unusually long and dry, fermentation began to give most unmistakable signs of its presence by the stench occasioned in localities round the seacoast. At the same time, the persistance of westerly and northwesterly winds, the scarcity of rain and thunder-storms, and the frequent stillness of the air, seemed to point out that some peculiar disturbance was taking place on the leeward coast of the Island. The conditions for the spontaneous generation of disease, therefore, were not wanting, and, with heat, moisture, and decomposition of vegetable matter, we can understand how the soil in a country where the influence of paludal malaria had passed unnoticed for so many years could in 1866 have given rise to the subtile poison which is known under the name of marsh poison, and produce the specific disease called Intermittent Fever, with its sub-divisions of Remittent and Continued.

In the replies to one or other of the questions, what have been the predisposing causes of the Epidemic Fever? and what have been the exciting or determining causes thereof? we have the opinions of nearly all the Medical men of Mauritius at that time. The following is a brief *résumé* of the principal replies:

Dr. O. Beaugeard (Civil Hospital). Let me premise that "malaria" is the admitted generating cause of fevers belonging to the intermittent group, and that it has several equally prolific sources: the decomposition of vegetable matter, with the assistance of moisture, under a continued high temperature; the rapid desiccation, under this last influence, of certain soils formerly and habitually saturated with moisture; the continued overheating, by a fiery sun's rays, of the dry surface of such soils, or of some others which are principally loose, porous, or clayey, become easily fissured, and allow the evaporation of the moisture from their substrata through their crevices.

The meteorological phenomena which have taken place since 1865 show that all those conditions have existed, and that all those causes have come into action since that time in the parts of the Island in which the epidemic prevailed, and to which it was almost altogether confined. In 1865 the mean rainfall of Flacq, Rivière du Rempart, Pamplemousses, Port Louis, and part of Black River was 73.06 inches, of which 13.03 fell on the 12th February, when a frightful flood devastated the greater portion of the lower parts of those districts. The inundation filled up all the low lands, hollows, &c., with weeds, leaves, vegetable detritus of all sorts, mud, and water; and soaked the ground on all sides, as completely as possible.

The incipient processes of evaporation and desiccation were kept in abeyance by the cool winter season and a small rainfall. In December the rainfall rose suddenly. In 1866 the rainfall was much below the average. For the first six months of 1867 the rainfall was somewhat heavier, but unequally distributed. In such conditions, and with a high temperature, evaporation and desiccation must have proceeded steadily. A high temperature, assisted by hot sea-breezes from the N.W. and West, and an inordinate and prolonged drought, acted upon land which was naturally swampy, as at Albion, Gros Cailloux, Petite Rivière, part of Pamplemousses and of Rivière du Rempart, or made artificially so by the collections of water and vegetable detritus which had been gathered in the low lands and in the hollows after the floods; and on soil eminently loose and porous, such as that at Pailles, Rochebois, and Pamplemousses. The evaporation of the moisture and desiccation of the soil were at first moderated by the winter of 1865 and by the copious rains in December of the same year. But afterwards these processes went on uninterruptedly; gradual in their advance, as might be expected; again moderated during the winter of 1866, but yet progressive; increased in rapidity during the commencement of the hot season, and continued unchecked till December, 1866.

After the long drought of 1866, when the surface ground had been parched up and fissured, when the stagnant pools, the swamps, and the water-courses had almost dried up, leaving their exposed banks and a large surface of their beds covered by a layer of vegetable detritus, to feel directly the influence of the sun's rays, the generation of the fever-breeding exhalations, proceeding from these latter and from the subsoil of the former, was at its height. The sea breezes then fanned them inland from the seashore and its vicinity; and the random showers of rain, in 1867, increased the evil by furnishing an evanescent quantity of moisture, which was evaporated as soon as produced. The cold season of 1867 had not in an equal degree the beneficial effect of the preceding one, and this I attribute to the more advanced conditions of dryness and overheating of the soil...

Such I consider the broad outline of the primary causes of the epidemic...

The first great outbreak of the fever took place at Albion. The disease spread rapidly, and so violent were the first cases that the labourers were regularly thunder-stricken by it, and even cattle fell victims to its invasion in the first instance. Such malignancy in its nature was the occasion of its being called an intense Bilious Remittent Fever, that is to say, one of the most deadly forms of malarious fever. The following were the circumstances which brought about such direful and sudden results: in a locality in which the rainfall is less than in any other part of the Island, and in the vicinity of a tract of land in which the soil is oozy and swampy from a number of springs which gush up to form marshes, mud was removed from the bottom of an extensive *barachois*, i.e., a shallow inlet of the sea in which fresh and salt water become mixed up. The mud, which is described by eye-witnesses as black and of sickening fetidity, was first heaped up on the banks, remaining exposed to the sun's rays, and then part of it carted away to the neighbouring canefields to serve as manure. This took place in January (1866), * but a large quantity of the mud remained festering in the sun till July, and perhaps later. What more evident cause of the explosion of the epidemic, first in that quarter, need be enquired after, than the exhalations from this accumulatian of fetid mud, taken out of brackish water, on the banks of the *barachois*, or in the cane-fields, being wafted all over the adjoining country? Had no such circumstances occurred, I am of opinion that the Epidemic Fever would have been gradual in its evolution and progress in that district, as well as in the others.

Dr. A. G. Ferguson (Staff Assistant Surgeon).—Black River runs in a shallow stony bed, through the centre of the valley, and near the outlet into the sea spreads out and forms a large marsh or lagoon. During the inundation of February, 1865, the river became a fearful torrent, carrying down enormous quantities of vegetable debris, which, on the subsidence of the waters, were left spread out over the lagoon and banks of the river. Unfortunately, at the same time the wind was blowing on shore, so that any portion which found its way into the sea was blown back and thrown up on the shores of the bay on which the Military Post stands. The disagreeable effects of this mass of decaying vegetable matter were soon felt, and many complaints were made of the stench caused by it. How-

* Dr. Barraut mentions November, 1866, and Mr. Commins towards the end of 1866.

ever, there was no unusual degree of sickness till next year, when, the summer being very hot and dry, the river became so low that water was only to be found in scattered pools. The lagoon and other patches of marshy land became completely dried up and fissured in all directions by the excessive heat; and as during the time the wind blew almost constantly from the sea, it carried inland the miasma generated by this soil, which possessed so largely all the requisites for the generation of malaria.

Dr. Riccard.—The excessive drought and heat of the last two summers. Decomposing vegetable and animal matter on the seacoast, banks of tidal rivers, and marshy lands.

Dr Hannan (Royal Artillery).—The unusual heat and continued dryness of the weather acting upon a vast extent of swampy soil. If heat and moisture acting on vegetable deposits be capable of producing malaria, or if malaria can be produced from moist mud having vegetable and animal matter combined with it, this poison ought to exist in all its virulence at the Caudan (Port Louis), and I have but too much reason to know, from my own experience, that it does exist, and that to a great extent.

Dr. H. Rogers.—(Civil Hospital).—The inundation of 1865. An intensely dry and hot season. The absence of a hurricane for several years. Noxious effluvia arising from low foreshores.

Dr. J. R. Johnston.—Continued drought and excessive heat. Such causes have given rise to epidemics of a similar nature in other countries.

Dr. O'Dwyer (22nd Regiment).—A small rainfall favoring the drying up of marshes, rivers, fields of sugar-canes, &c.

Dr. R. S. Stone.—The absence of the trade-wind. The great heat. The various conditions in Mauritius favorable to the production of malaria.

Dr. Fressanges.—An extraordinary drought preceded by a still more extraordinary inundation. The exposure to the free air, during six months, of mud extracted from the *barachois* at Albion. The stirring up, by the inundation, of the muddy bottom of the saline basin of Cooper's island, which receives the residue of distilleries, &c.

Dr. Harel.—Possibly the prolonged drought, which disengaged pestilential miasmata.

Dr. Reilly.—The disease has been most virulent wherever the collections of water remained longest on the ground after the inundation. I feel more inclined to attribute this outbreak of fever to the drying up of marshes, especially those that are subterranean.

Dr. Gouly.—The inundation of 1865 and the drought of 1866.

Dr. Icery (Honorable).—The fever is of a paludal nature. Its symptoms, march, complications, mode of termination, and cures, sufficiently prove the fact. The perfect similitude which it bears to diseases of paludal intoxication cannot, indeed, be doubted.

The circmstances in the midst of which it was produced also support this opinion; for it was after a long and exceptional drought which dried up many of the streams, and exposed for whole months, to the rays of an ardent sun, vast extents of land ordinarily humid and covered with verdure, that the disease became general, in acquiring greater and greater gravity. A similar epidemic neverexisted in Mauritius before 1866-67. It must be said, also, that in former times the effects of a drought so persistent as that which we have experienced would have been profoundly and happily attenuated by the presence of the forests (three fourths of them are now destroyed) which extended over different parts of the country and protected the soil and the sources of the rivers from too rapid evaporation.

The primary and specific cause of the disease being recognised, all the circumstances peculiar to persons and to localities, generally considered as capable to facilitate the development of the paludal intoxication, must necessarily have had an influence. But to appreciate which among the secondary causes are those which have more peculiarly contributed to give the epidemic the degreeof intensity which it has acquired in certain places, it would be necessary to embrace a considerable body of facts, and to enter into very extensive considerations.

The manifestation, march, and virulence of the epidemic have always appeared to me independent of those purely local conditions and restricted and accidental nuisances to which too great importance is generally attached here. I consider that the disease was engendered and propagated principally under the influence of general causes in their relations to the actual topography of the country. If it is true, as I think, that the epidemic developped itself as a consequence of a prolonged drought which transformed into veritable miasmatic sources very moist lands, only some years age covered with dense woods and to-day almost entirely denuded, it is quite evident that the reckless *déboisement* which is practised on a large scale in the country must be considered as one of the principal causes of this epidemic.

Dr. Percy Fitz Patrick.—It has long been an established fact that, in almost every country, there are certain places—marshes, fens, and tracts where the soil is alternately wet and dry, and where vegetable matter is decaying, which produce emanations, which, mixed with the atmosphere, affect with fever human beings who breathe them. This is a constant fact, and it is equally constant, that these places are the habitations of myriads of infusoria, of which, according to Cuvier and Ehrenberg, there are several orders. These creatures, when deprived of moisture, seem to die, and become a sort of dust, which, being dry and light, is carried about by the wind. Last summer, almost without rain, in the leeward districts, was most favorable to the atmospheric diffusion of these animalculi, and thus to their being inhaled by man. Do they penetrate the internal tissues? Do they propagate there? I can imagine that they do, and that successive births and deaths of these invisible beings, account for the periodicity of intermittent fever.

Dr. Schmidt.— Differing as intermittent and remittent fevers do in several respects, and still more in their rates of mortality, they yet agree in their mode of origin, as occasioned by effluvia emanating from putrid, stagnating water, marshy, swampy, and low grounds, and decomposed vegetable and animal matter. I have made a long continued series of microscopical examinations on the bodies of persons who died of the effects of intermittent and remittent fevers, and on patients who suffered from them. In another series of experiments I exposed water, taken in well cleaned and covered basins out of some isolated pools near the lower part of Grand River, to the rays of the sun, till it got stagnant, and till I noticed the formation of a green superficial film. This film I again subjected to miscroscopical examinations, and under a power of 800 I detected plants in their construction or shape so nearly related to those which I had observed growing in or on the different organs of the human body, that to me there is not the slightest doubt of their being of the same genera, or even of the same species. And so I can have no doubt as regards the exciting cause of the epidemic Fever, considering the large quantities of vegetable matter recently deposited in the lower parts of the Island, and there left to decompose. We can with a rare degree of safety conclude, that large numbers of these plants were generating, and, when matured, that the spores became free, and were taken up by the wind, and wafted about in their neighbourhood.

Dr. Chastellier.—The heavy rains in 1865 followed by a high temperature rapidly drying up the vegetable and animal matter accumulated on the banks of rivers and near all places where the water had stagnated.

Dr. André.—I do not hesitate to consider as the principal cause of the Epidemic the exceptional drought, without example, which reigned during the summer of 1866-67, following, as it did, the great inundation of 1865.

Dr. Finnimore.—Extensive solar heat and long drought. The drying of fish ponds at Petite Rivière. The courses of rivulets and drains choked with mud. Large and increasing masses of mud in the harbour, much of it probably not having been carried a sufficient distance into the sea to prevent its being washed up every high tide on the whole length of the coast line from the Morne to Cap Malheureux.

Dr. Small (Surgeon Major, 13th Regiment).— The long continuance of dry weather and high temperature.

Dr. Luciany.— The inundation of 1865. The absence of high tides. The persistence of winds from the N. Wrd., which spread the effluvia of the littoral over a great part of the Island.

Dr. Verdalle.—In my opinion what occasioned this fever was the persistent and altogether exceptional drought of 1866, which, in drying the marshes during the summer, exposed to powerful evaporation the mud at the bottom of these marshes, always covered with water in ordinary circumstances. Thus, in my district (Rivière du Rempart), the infected foci were (1) Poudre d'Or Village, (2) Poudre d'Or estate, (3) Schœnfeld estate.

(4) Ile d'Ambre, (5) Belmont estate, and (6) Grand Bay estate; and these are the only places in the quarter where there were marshes or sheets of stagnant water.

Dr. Menneville.—The principal cause, in my opinion, was the heat of the season, and the absolute drought, at a time when it was not common.

Dr. Lejeune.—The disease was probably imported. I find none of the causes to which the explosion of the disease *(Recurrent Fever)* in Russia was attributed.

Dr. Sauzier.—The inundation of 1865, followed by a long and very pronounced drought.

Dr. H. L. Beaugeard.—Marshes with stagnant waters. The inundation.

Dr. Bolton.—A poisonous state of the atmosphere.

Dr. Jacques.— An unusually hot and dry season — the seeds of the disease being present.

Dr. Cashman.—An unusually hot and dry season may have hurried on the inevitable results of a most insanitary condition of a crowded population. The paucity of thunder-storms would lead to the inference, that the atmosphere was in a non-electric state.

Dr. Hugon.—Dryness and extraordinary heat.

Dr. Bestel.—Long continued oblivion of the most elementary principles of *hygiene.*

Dr. Falloon.—Marsh miasma and effluvia from damp soils.

Dr. de Rosnay.—Not having practised till 1866, and having only seen persons already attacked with fever, coming from different places to Savanne, I can offer no opinion.

Dr. Fropier.—The predisposing causes were privation of pure air, filth, bad and little food, &c. As to the determining causes, I know nothing.

Determining Causes.

104. Of the 34 Medical men who deposed, and the principal parts of whose evidence are given above, 28 considered that the "exciting or determining causes" of the Epidemic Fever were one or more of the following occurrences, viz: The inundation of February, 1865; the drought of 66-67; the heat of the summer of 1866-67; the unusual prevalence of westerty winds; and the absence of hurricanes, high tides, and thunder-storms.

With regard to the other 6 witnesses, 2 had recently arrived in the Colony; 3 respectively attributed the disease to miasma, a poisonous state of the air, and to a long neglect of hygienic measures; and, 1 said that he knew of no determining cause.

Some alluded to the destruction of the forests as a primary cause.

Many "predisposing" causes were assigned, such as superabundance of population, the Railway and Gas Works, poverty, filthy state of Port Louis and the Indian Camps and Villages, improper food and drink, want of medical attendance, &c.

The exciting or determining causes, however, according to almost all the Medical men who expressed opinions on the subject, were one or more of the above-mentioned abnormal meteorological occurrences in 1865-67.

Absence of Hurricanes.

105. It will be seen that Dr. H. Rogers mentioned, as a determining cause, the absence of hurricanes, and Dr. Luciany the absence of high tides. Now, we know, from numerous observations taken daily on board ships, that the three years 1865-67 were remarkable for a comparative absence of hurricanes in the Indian Ocean, especially 1867. In those years no great hurricane occurred in the Indian Ocean, and of the very few cyclonic gales that took place in 1866 and 1867 not one passed northward and westward of Mauritius. As a necessary consequence, there were no storm-waves, such as in the hurricane season often rise high above the coral reefs, dash against the western shores, and flood the estuaries. Hence, the large quantities of organic matter, which, after the inundation, were left on the banks of the rivers, in the estuaries, and in the shallows inside the reefs, remained for months *in situ*, always partly, and at low water more or less completely, exposed to sun and air. This abnormal state of the foreshores, which was observed by many, led some to the conclusion that the level of the western seaboard had been raised by volcanic agency, which, accordingly, was considered a primary cause of the epidemic.

The Chief Determining Causes.

106. In presence of established facts, and of the almost unanimous evidence of a large number of Medical men, who were the most competent judges, it is difficult to avoid the conclusion that the "exciting or determining" causes of the Fever Epidemic were the following:

1o. The flood of February 12, 1865, which carried down to the low lands, to the mouths of the rivers, and to the shallows of salt water inside the line of coral reefs, "immense quantities" of organic matter, in the shape of leaves and branches of trees, plants, manure, the refuse of distilleries and sugar-houses, and all sorts of rubbish;

2o. The drought of April, May, and June, 1865, followed by heavy rains in December of that year; the long and severe drought of 1866, broken, however, at intervals, by heavy showers; and the continuation of dry weather in 1867, with at times sudden and short continued rains, as in February and March, on the west coast;

3o. The high temperature of the summer of 1866-67;

4o. The unusual frequency of Westerly and North-Westerly winds in February, April, and May 1865, April 1866, and January, March, May, and June, 1867 ;

5o. The almost complete absence of hurricanes in the Indian Ocean, in 1865-67, and consequently an unusual small depth of water during that period in the estuaries and low foreshores, especially on the western and northern coasts.

There were no doubt other conditions which favored the outbreak of the disease, and which were even essential to its existence. The presence of human beings was, as a matter of course, a necessary condition ; and so also, we may suppose, was the presence of water, soil, and organic matter. But these and similar conditions had existed for years. It is to the supervention of abnormal conditions which in a high degree favor processes known to be conducive to the outbreak of a specific disease that we must look for the exciting causes. How the several agencies acted in promoting the morbific influence has been described by Drs. Reid, Beaugeard, and others.

Concurrence of favorable Circumstances.

107. In all probability, it was not one or two of the exciting causes that produced the evil, but their conjoined or consecutive actions. The organic matter carried down by the floods might have been innocuous, if it had been covered with water, instead of having been exposed to sun and air. No bad consequence to the public health might have followed from unusual drought and heat, had there been no organic matter to be decomposed, and no marshy lands to be dried up. The prevalence of westerly winds might only have caused the usual feeling of lassitude, if they had not passed over muddy and marshy foreshores charged with decaying matter. In short, it seems to have been an extraordinary concurrence of circumstances, each in itself more or less unusual, that paved the way for the Epidemic, two-thirds of the population having been composed of Indians, among some of whom Malarial Fever already existed.

To the possible remark, that floods, droughts, unusually high temperatures, prevalence of westerly winds, and absence of hurricanes had occurred in former years, without producing such high death-rates, the answer is that, so far as is known, during no previous three years in the history of Mauritius did all these phenomena present themselves with so much intensity. The Indian population, also, was greater than it had ever been before.

Presence of Marshes not a necessary Condition.

108. Great stress has been laid upon the existence of marshes, lagoons, and low swampy lands. It is not, however, to the mere presence of such localities, which have existed for ages, that the fever is to be even partly ascribed, but to the alternations, with respect to moisture and dryness, to which they were subjected by extraordinary meteorological agencies. The low lands, whether naturally marshy or not, if saturated with organic matter, and alternately flooded and desiccated, might have been as prolific sources of malaria as marshes when similarly treated. In 1865-66 large tracts of land on the littoral were at times saturated with water and at times parched up by heat and drought.

109. In his recent "Inquiry into the Causes of Malarial Fever in Mauritius," Dr. Davidson considers that " the dependence of

"malaria on soil is not sufficiently appreciated." "The views," he goes on to say, "entertained regarding the causes of fever are "generally exceedingly vague. It is something in the air, or some- "ting in the water, or something in the climate; it is due to "over crowding, to over population, to dirty drains, to bad "smells, to volcanic agencies; in short, to anything. Nothing "can be more certain, however, than that this definite disease "owns a definite cause, and not an indefinite number of "causes." "It should be kept clearly in view that mala- "rial fever depends upon *one* cause, and not upon *many*; "that it is *local* and not *general*; *telluric* and not *aerial*; that "it depends essentially upon the soil; that it is *generated or* "*developed* solely by the soil; that it is not due to the tempera- "ture, or hygrometric state of the atmosphere, nor to any other "meteorological conditions whatever." *

Telluric Theory.

No doubt there is vagueness. But I do not see that the matter has been made clearer. The only difference I can find between Dr. Davidson and those to whom he refers (whoever they may be), is, that while they say malaria is *something* in the *air*, or *something* in the *water*, or *something* in the *climate*, he says it is *something* in the *soil*.

What that *something* is, we have not been told, and, until more be known about the matter, the idea of a *telluric* origin must be considered to be just as vague as the idea of a *climatic* origin. Dr. Davidson asserts that there is only *one* cause, not *many* causes. But what that *one* cause is he does not state, except by saying that it is *telluric*. Other persons also say that there is only *one* cause, but they hold that it is *climatic*. It is clear that the former statement does not convey any more definite information than the latter.

The proposition that malaria is "generated or developed *solely* by the soil" is, in my opinion, untenable. The chemical and physical properties of the soil of Mauritius are the same both in places where the fever exists and in places where it does not exist. Why, then, should the soil, by itself, without any external influences, generate malaria in the former, but not in the latter? The very fact that soils of the same composition are in some places free from malaria, and in others hot-beds of it, shows that the soil alone cannot generate malaria. It is scarcely possible to conceive that, without any perceptible external causes, the soil on the seaboards, where malarial fever had not been endemic before 1865, should all at once become so altered as to generate and develope, by itself, what it had never generated and developed at any former period. There must, one would think, have been some special circumstances that imparted to the soil additional properties or conditions which made it malarious. Now, the only known circumstances which were especially calculated to impart these conditions were the abnormal meteorological phenomena of 1865-67. It is true that the fever has been intense on low lands where the subsoil is near the surface and more or less impervious to water. But these soils have always existed. The question is, What made them malarious?

* Pages 14 and 15. The *Italics* are Dr. Davidson's.

Although, as we have seen, Dr. Davidson says that malaria is "not due to any meteorological conditions what-"ever, that it is *local* and not *general*, *telluric* and not *aerial*, "and that it has only *one* cause, and not *many*," yet, at a later stage of his inquiry, he seems to abandon these points. He says (page 22): "inundations followed by droughts and a high tem-"perature are the conditions recognised as *most* essential to the "outbreak of fatal epidemics of malarious fever in warm coun-"tries. The fever germ having already been introduced into "the Colony, and the various changes which we have described "having *prepared* the soil for its growth, the inundations of "February, 1865, and the heavy rains of December, followed by "severe droughts and a high temperature, *determined* the out-"break of the great epidemic here. The various circumstances "to which I have adverted as having *prepared* the Colony for "the evolution, or the spread, of the malarial germ, are of a "more or less *general* character. There are others of a *local* na-"ture that I can only briefly enumerate."*

Now, the statement, on the one hand, that malaria is "not "due to the temperature, or hygrometric state of the atmos-"phere, nor to any other meteorological conditions whatever," and the statement, on the other hand, that "inundations,followed "by droughts and a high temperature, are the conditions re-"cognised as *most essential* to the outbreak of malarious fever "in warm countries," are scarcely reconcilable; for Dr. Davidson seems to admit that temperature, rain, and drought, which, when intense, he calls the "most essential" conditions, are meteorological conditions. He further endeavours to show that there are *other* causes of malaria, such as déboisement, depopulation, the abandonment of recently cultivated lands, and water in which hemp, flax, jute, and indigo have been macerated. So that it would appear that instead of *one* cause, which is *local* and *telluric*, there are *many* causes, some *general* and some *local*, but that the most essential of all the conditions, in warm climates, are floods, droughts, and a high temperature.

Malarial fever in Mauritius is not due to any one single cause or condition, but to a combination of conditions, general, local, and specific; certain states of soil, air, water, &c., induced by external causes, being all essential. The idea of an exclusively telluric origin seems to have no better foundation than the circumstance that the turning up of soil or mud on low malarious lands is often followed by an increase of fever, and that the disease is generally severe in low places where water lodges near the surface. But the inquiry should not stop there. The question arises, What are the properties which give the soil its noxious character, and how did it acquire them? The soil of Mauritius was not known to be malarious till 1865. Now, the only known determining causes are those which were assigned by the Fever Commission of 1868, which Dr. Davidson, at length, considers to be the most essential, and which almost all the Medical men of the Colony had long ago pointed out.

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* The circumstances of a local nature enumerated by Dr. Davidson are marshes, *barachois*, fœtid soil, and subsoil water.

Depopulation not a Cause of Malarial Fever in Mauritius.

110. Whatever may have been the case in other countries, we may safely assert that depopulation is not a cause of malarial fever in Mauritius. If mere numerical changes in the population have had any influence, we must conclude that the rise and spread of the fever were favored, not by a decrease, but by an increase, of the inhabitants; for at the time the disease broke out the population of each District was greater than it had been at any former period. The population of Black River, for example, in which the epidemic began, was, according to the censuses of 1846, 1851, 1861 and 1871, as follows:

Population of Black River.

Years.	General Population.	Indian Population.	Total.
1846	4556	2275	6831
1851	5097	4994	10091
1861	6404	10767	17171
1871	3865	8132	11997

The decrease from 1861 to 1871 took place *after*, not *before*, 1865, and even if this had not been the case, we should still have a much greater population in 1871 than in 1846.

111. The increase of the Indian population in each District from 1846 to 1861 was as follows:

Great increase of the Indian Population probably an exciting Cause of the Fever.

Districts.	1846	1861	Increase in Percentages.
Port Louis	6131	27564	449.6
Pamplemousses	11907	35334	296.7
Rivière du Rempart ...	9503	14461	152.2
Flacq	8992	30869	343.3
Grand Port	6444	25726	399.2
Savanne	4903	15387	313.8
Black River	2275	10767	473.3
Plaines Wilhems ...	5307	20589	387.9
Moka	783	11937	1524.5
Totals	56245	192634	342.5

It thus appears that in the short space of 15 years the total Indian population increased nearly three-and-a-half fold, and that in some Districts the increase was considerably greater.

Now, although it may be quite true that in ordinary circumstances no mere agglomeration of human beings could by itself produce malarial fever, yet we have to take into account what Dr Reid called "the notorious proclivity of the Indian race to febrile disease, and the *special tendency* brought from their own land of many of them to malarious fever." * We have also to bear in mind that the Fever Commission, Dr Beaugeard, and others, considered that there had been for years, among the Indians, a fever which was of "malarious origin."

In these circumstances, it may be conceived that the number of persons subject to the disease, or who actually had it, was increasing, as the Indian population increased, and that all that was necessary to cause an outbreak was a concurrence of favorable conditions, such as a concentration of Indians, impregnated with malaria, in a locality where the ~~the~~ soil and climate were specially suitable for the propagation of the disease. Among the thousands of Immigrants that arrived in 1865 there were many cases of fever. In August, 1865, 8 of those sick Immigrants were sent to Albion estate; 24 in September; and, 1 in November. They were sent to Albion (Petite Rivière), because they were so ill that they could not be sent to Mont Trésor (an estate in Grand Port, belonging to Mr Chauvin), "even in carts." Whether or not that was the commencement of the epidemic, it is certain that in November of that year, malarial fever appeared in the neighbourhood.

112. It is well known that, *cæteris paribus*, the unhealthiness of a country increases with the population. From 1767 to 1877 the population of Mauritius increased as follows:

Density of the Population.

Years.	Total Population.	Increase in Percentages	
1767	18,777	100.0	
1777	29,761	158.5	
1787	40,439	215.3	
1797	59,020	31~~3~~.3	4
1807	77,768	414.2	
1817	97,847	521.1	
1827	92,631	493.3	
1837	~~[illegible]~~	510.6	103,935
1847	162,537	865.6	
1857	234,153	1247.0	
1867	332,968	1773.3	
1877	349,060	1859.0	

The Resident Population of each District at the taking of the last four Censuses was as follows. †

* Dr Reid's Observations, &c., page 12.

† Report on Census of 1871. (The sea-faring population and the populations of Flat, Gabriel and Fouquet Islands are not included.)

Districts.	1846	1851	1861	1871
Port Louis	45212	49909	74125	63015
Pamplemousses	28815	32036	53598	42978
Rivière du Rempart ...	15061	16030	19331	20242
Flacq	19182	24186	41468	49499
Grand Port	16756	19082	37207	44226
Savanne	9160	9871	21026	27443
Black River	6831	10091	17171	11997
Plaines Wilhems	12784	13893	28020	35147
Moka	4661	5725	17704	21236
Totals	158462	180823	309653	315783

The increase has been mainly due to Indian Immigration, which commenced in 1834. The estimated Indian population on the 31st December of each tenth year from 1837 to 1867 was as follows :

Years.	Indian Population.	Increase in Percentages
1837	11,721	100.0
1847	69,310	590.1
1857	142,534	1216.6
1867	214,694	1831.8

We see that the Indian population in 1867 was fully 18 times greater than in 1837, and that its mean decennial increase was at the rate of about 67,658 souls.

According to official returns, the area of Mauritius is 70~~8~~ 5 square miles. At each of the last four Censuses * the density of the total population of the Island was as follows :

Years	To a Square Mile
1846	225 souls
1851	255 „
1861	437 „
1871	446 „

In 1861 the density of the population of England and Wales, without distinguishing the Towns from the Country, was 344 souls to ~~an acre~~. a square mile.

* Report of the Census of 1871. Part I. pages 6, 7, 8.

The densest populations of Continental Europe, according to the "Annuaire de la Statistique" for 1862, were :

	To a Square Mile.
Belgium	415 souls
Saxony	391 ,,
The Netherlands	341 ,,

Reports published in India in 1864 and 1866 give the following as the densities of the populations of the principal Provinces of that country :

Oudh	474 souls
N. W. Provinces	361 ,,
Bengal	311 ,,
Punjab	172 ,,
Madras	170 ,,
Bombay	156 ,,
Berar	128 ,,
Central Provinces	79 ,,

The density, per square mile, of the population of each of the Districts of Mauritius at each of the Censuses was as follows :

Districts.	Area in Square Miles.	1846	1851	1861	1871
Port Louis ...	10.7	4697	4869	6928	5889
Pamplemousses.	87	328	368	616	494
Riv. du Rempart	58	257	276	333	359
Flacq	113	169	214	367	438
Grand Port ...	112	159	171	338	394
Savanne	92	99	107	225	298
Black River ...	94	72	107	182	127
Pl. Wilhems ...	70.3	179	198	400	499
Moka	68	68	84	260	312

The decrease of density in some Districts in 1871, and the increase in others, were due to the heavy mortality on the low lands, in 1867 and 1868, and to migrations to the healthiest parts of the Island.

The population was densest in 1866, just when the epidemic commenced.

It will be seen that in 1861 the population of Mauritius was denser than that of any country in Europe, and denser than that of any Province of India, except Oudh. Generally, too, the differences were very considerable.

The mean density of 781 towns in England and Wales, in 1861, was 3,665 souls to a square mile; whereas that of Port Louis, the capital of Mauritius, was 6,928.

Density of Population and Mortality from Fever not proportional.

113. Comparing the densities of the populations of the several Districts with the mortality from fever, we see that the death-rates (Table A., page 2) have no relation to the number of inhabitants per square mile; for the mortality has been greatest in Port Louis and Black River, the two Districts which differ most with respect to density, and it has been least in Rivière du Rempart, where the density of population in 1861 was nearly double that of Black River. This seems to show that the intensity of malarial fever does not depend upon density or sparseness of population per square mile. But it does not follow that, generally, the death-rates of a country do not increase as the population increases. In Mauritius, the distribution of the population is probably more unequal than in European countries. The population of this Colony is mainly concentrated in certain localities, and there it is very dense. Large portions of the Island are uninhabited. The inhabited parts of Black River are not less densely populated than those of some other Districts; and the uninhabited parts of it, consisting chiefly of mountains, might, in so far as the question of mortality is concerned, be supposed to belong to the adjoining District of Plaines Wilhems. If what is called the 'rural' population were scattered over the whole country, or if only the inhabited areas were taken into account, the relation between density and mortality would probably be more evident.

Density of Population in England.

114. In the Fortieth Annual Report of the Registrar-General of England (p. 231—238) the relation of density or proximity of population to mortality is shown by Dr. Farr. His comparisons are for the decade 1861—1870. "Nitrogen and oxigen," he remarks, "are everywhere nearly the same in proportion; but carbonic acid varies with the density of population, and there are exhalations—smokes—of various kinds from dead matter, as well as from living bodies. Every town has an atmosphere of its own. Nay, every street has its own peculiar atmosphere. I was going to say that every living being has its own atmosphere. Now, this atmosphere becomes in certain proportions deleterious, and I will proceed to show that as the population becomes more dense—within certain limits—this deleteriousness is expressed by the mortality. For example, if we arrange the 619 districts of England and Wales in groups according to the rates of mortality, we find that 18 groups follow this law; the rate of mortality increases, as the density of population increases. Thus at one end of the scale the deaths per 1000 of population are 15, 16, 17; at the other end of the scale, 31, 33, and 39. The acres to a person in the corresponding districts are 12, 4, and 3; and .01, .05, and .01."

Taking seven groups of districts, Dr. Farr makes a number of comparisons, from which the following Table has been compiled:

Groups.	Persons to a Sq. Mile.	Proximity in Yards.	Deaths per 1000 of Population.	Mean duration of Life.
Liverpool	65,823	7	39	26
Manchester	12,357	17	32	29
9 Districts	4,449	28	28	32
47 Districts	1,718	46	25	35
137 Districts ...	379	97	22	40
345 Districts ...	186	139	19	45
53 Districts	166	147	17	51

In Liverpool, the densest and the unhealthiest district in England, there were 65,823 persons to a square mile. The mean death-rate, from 1861 to 1870, was 39 per 1000 of population,* and the average duration of life was 26 years. In the least populous group, on the other hand, the mean death-rate in the same period was 17, and the mean duration of life 51 years.

Proximity of Population.

115. 'Proximity' of population is derived from the area to each person, or *areality*. Let a be the areality, A the total area, and P the total population: then $a = \frac{A}{P}$. The population being supposed to be evenly distributed over the total area, the persons composing the population are supposed to be in the centre of plots of ground forming equal hexagons. Now, when the area of the hexagon is known, the mean distance from person to person is known. The proximity being p, it may be shown that $p = 1.07457 \times a^{\frac{1}{2}}$.

Proximities of Population in Europe.

116. The proximities of the populations of twelve States of Europe in 1876 were as follows †:—

States.	Proximity in Yards.
England and Wales	92.75
Denmark	166.72
Sweden	371.30
Austria	138.65
Hungary (1875)	169.21
Prussia	135.94
German Empire...	131.55
Belgium	87.32
Netherlands	108.54
France	140.82
Spain (1870)	203.48
Italy	121.39

* The death-rate of the Liverpool district, though still relatively high, has decreased considerably.

† The proximity of the Population of Mauritius in 1866 was 83.31 yards.

The following were the proximities of the populations of some of the principal cities :

Cities.	Years.	Proximity in Yards.
Greater London	1878 ...	23.68
Inner London...	" ...	10.25
Outer Ring	" ...	48.57
Liverpool...	" ...	7.39
Manchester	" ...	8.16
Sheffield	" ...	19.48
Edinburgh	" ...	10.27
Glasgow	" ...	7.71
Dublin	" ...	13.35
Paris...	1876 ...	7.36
Berlin	1878 ...	8.96
Brussels	" ...	8.42
Vienna	" ...	10.25
Rome	" ...	8.31
New York	" ...	11.64
Philadelphia	" ...	22.99
Alexandria	" ...	19.04
Bombay	1872 ...	10.16
Madras	" ...	15.58

Proximity of Population in Port Louis.

117. The area of the District of Port Louis, including the town itself, Grand River, Rochebois, Ste. Croix, Vallée des Prêtres, &c., is 10.7 square miles. In 1866, the population was about 80,000. Taking the whole area, the proximity of the population in that year was 21.85 yards. But a considerable part of the area was uninhabited, and other parts sparsely inhabited. The proximity in the inhabited parts was about 11.13 yards.*

* According to data, with which I have been favored by the Surveyor General's Department, the areas of the inhabited parts of the District of Port Louis, in 1866, were :

Town of Port Louis...	1375 arpents.
Ste. Croix...	129 "
Grand River N. W...	100 "
Total...	1604 arpents.

Assuming the inhabited parts of Rochebois, &c., to have been 100 arpents, we have in all 1764 arpents, or 2.777 square miles ; which gives a proximity of 11.13 yards.

118. Dr. Davidson says (Inquiry, p. 18) that " it is simply absurd to speak of Mauritius being over populated." In presence of the above figures, I cannot altogether agree with him. I do not know whether the density of population that may safely exist in a country has ever been, or can be, determined. Its degree must depend a good deal upon the climate and the extent and efficiency of sanitary measures. But, considering all the circumstances, I think that if any countries in the world are over populated, Mauritius must be one of them.

Is Mauritius over populated?

Importance of Immigration.

The Colony no doubt owes a vast deal to its Indian Immigrants. Without them its agriculture, which is justly regarded as its life blood, could not have been carried nearly to so great an extent, and its exports, its revenue, its wealth, would have been very much less than they now are. In fact, without labour, Mauritius would have retrograded, in place of having advanced as it has done. Aided by the skill, the enterprise, and the energy of the Planters, the Coolie has more than quadrupled the sugar-crop of the Island since 1834, and raised its revenue from £196,888 in that year to £748,059 in 1877, a sum —as His Excellency Sir George Ferguson Bowen has lately stated—exceeding the total public revenue of England in the reign of Charles I. A more striking instance of the triumph of Free over Slave Labour does not exist. Nor is it merely in the cane-fields that the Indians have rendered service. Many of them, after their engagements had expired, settled in the Colony, and there is now a large Indo-Mauritian population, which, with the Old Immigrants not employed on sugar estates, supplies nearly all the domestic servants, gardeners, hawkers, carriers, graziers, &c., in the Island. This large class of the population has invaded every industry, and, through its superior intelligence and perseverance, has generally far outstripped others in the struggle for existence. Hence many of the requirements of domestic life are more easily obtained than they would have been had there been no Indian Immigration.

But the evils of over crowding are so great and so obvious that it may well be doubted whether it would be wise to go on increasing them. On the other hand, sanitary measures and regulations on an extensive scale, together with reboisement, would doubtless diminish the danger.

119. Much has been said about the pollution of the streams, rivers, and canals. The danger to the public health, however, from this source, does not appear to be so great as is often supposed.

Pollution of the Rivers.

The waters of Mauritius are naturally as pure as those of most other countries, and if they are more impure now than formerly, it is because the population has increased and agriculture and industry have been greatly extended. But it is by no means clear that there has been any deterioration in the quality of the waters of the Island.

120. In his " Voyage autour du Monde fait par Ordre du Roi " (Paris, 1825), M. de Freycinet, who commanded the *Uranie*, * gives a general résumé of analyses of waters by M. Delisse.

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* The *Uranie* arrived in Mauritius on the 6th May 1818.

Unfortunately, the original papers were lost in the great fire which took place in Port Louis on the 25th September, 1816; but the account given by M. Delisse to M. Freycinet conveys a good idea of the mineral composition of the waters of the Island upwards of 65 years ago. "They differed in general very little from the potable waters of other countries." Their chief characteristic was that they contained, in more or less abundance, carbonate of magnesia. The water which descended from the Pouce Mountain contained the largest quantity of that mineral; it contained also carbonate of iron, and some muriate of soda. The water of Grand River N. W., which supplied Port Louis, was the best in the Colony; one pound of it, evaporated to dryness, gave a residue of 6 grains, composed of carbonate of magnesia, muriate of soda, and carbonate of alumina. The water of Tombeau river held the second rank, for purity, among the rivers in the neighbourhood of Port Louis; its residue was 10 grains, per pound, composed of substances differing very little, in their nature, from those of Grand River. The water of the Lataniers river was not potable; two pounds of it left a residue of more than 200 grains of muriate of soda, muriate of lime, sulphate of soda, carbonate of alumina, and carbonate of iron. In dry weather, the river disappeared almost entirely. Several of the Military who were at one time employed on the fortifications, and who insisted on using the water of the Lataniers during their work, were attacked with violent dysentery, and others later on with obstructions in the viscera. The waters of wells in the lower part of Port Louis were charged with muriate of soda; nearer the mountains they contained sulphate of alumina.

Analyses of the Waters of Mauritius by M. Delisse

By Professor Guthrie.

121. Dr. F. Guthrie, F.R.S., formerly Professor of Chemistry at the Royal College, Mauritius, and now Professor of Physics at the Royal School of Mines, London, analysed some of the waters of the Island in 1865. The following Table gives a résumé of the general results obtained by Dr. Guthrie :—

Nos.	Rivers, &c.	Dates.	Hardness.	Total Residue per gallon.	Organic Matter.	Mineral Residue.
		1865	°	Grs.	Grs.	Grs.
1	Riv. du Rempart S.W.	Jan. 19	7.0	10 531	1.392	9.144
2	Black River	" "	5.6	7.414	1.043	6.371
3	Riv. des Anguilles	" 24	4.0	5.216	0.914	4.302
4	Riv. du Poste	" "	2.6	3.682	0.807	2.875
5	Riv. la Chaux	Mch. 23	3.0	4.263	0.599	3.664
6	Grand Riv. S.E.	" 30	3.4	4.597	0.722	3.875
7	Grand Riv. N.W. water taken at Royal College...	Jan. 27	3.1	5.716	1.014	4.702
8	Water taken at dam of Municipal Canal	May 15	3.7	6.829	1.068	5.761
9	Water taken from tap at Champ Delort	" "	3.1	5.804	0.823	4.981
10	Dayot Canal at R. College...	Jan. 27	4.4	6.610	1.143	5.467
11	Dayot Canal at Cassis	" "	7.2	11.413	2.296	9.117
12	Riv. Calebasses. Bathurst dam	Oct. 12	4.3	9.539	4.320	5.219
13	Bathurst Canal. Plaine Verte	" "	4.3	9.624	3.558	6.067
14	Pond in Pouce Stream near Railway	...	...	28.83	19.21	9.62
15	Pond at Caudan	...	62.0.	81.885	28.010	53.875

The tributaries of Rivière du Rempart S.W. drain the high lands of Vacoas, and the water was taken about 2 miles from the mouth of the river. The water of Black River was collected at a distance of about ½ mile from its mouth, that of Rivière des Anguilles at a distance of 2 miles, Rivière du Poste 8 miles, Rivière La Chaux 2 miles, and Grand River S.E. 1 mile.

It will be seen that the purest waters were those of the Poste, La Chaux, and Grand River S.E., and that after them came Rivière des Anguilles, and Grand River N.W. The water of the latter river collected at the Champ Delort on the 15th May was purer than that collected at the Municipal dam on the same day, as may be seen by comparing Nos. 8 and 9. Comparing Nos. 7 and 10, we see that water taken from the Dayot Canal at the Royal College was not so pure as water taken from the Municipal Canal. The water of the Dayot Canal in passing through the town from the Royal College to Cassis became much more impure (Nos. 10 and 11), owing no doubt to percolation of sewage. Water from the Bathurst Canal was not so pure as that from the Municipal Canal. The water from a pond at the Caudan was "evidently neither more nor less than sewage."

As these waters contained the same mineral ingredients, two samples of the analyses will suffice to show the nature of the residue.

Rivière du Poste.

Temperature of air ...	...	82.4°
Temperature of water ...	...	80.0
Degree of coolness ...	...	2.4
Hardness	...	2.6
Total residue	...	3.682 grs. per gal.
Organic matter ...	...	0.807 ,, ,,
Mineral residue ...	...	2.875 ,, ,,

Mineral residue.	Silica	0.171
	Alumina	0.163
	Iron (sesquioxide)	0.020
	Lime	0.636
	Chloride of Sodium	0.290
	Chloride of Potassium	0.277
	Magnesia	0.033
	Sulphuric acid (S.O. 3)	1.063
	Carbonic acid	0.189
		2.842

Municipal Canal (Royal College).

Hardness	...	3.1°
Total residue	...	5.716
Organic matter ...	...	1.014
Mineral residue ...	...	4.702

Mineral residue.	Silica	0.283
	Alumina	0.300
	Iron (sesquioxide	0.017
	Lime	1.049
	Chloride of Sodium...	0.498
	Chloride of Potassium	0.446
	Magnesia	0.058
	Sulphuric acid...	1.731
	Carbonic acid	0.357
		4.739

Waters of the Rivers generally very pure.

Professor Guthrie remarks that " the waters of Mauritius are eminently soft." " The proportion of mineral constituents is " remarkably small. The quantity of organic matter is great " compared with that of the mineral matter, but absolutely it " also is inconsiderable in most cases. Almost all the waters are " in short very pure. The waters submitted to analysis were " collected at various times. The only condition of essential im- " portance was that there should have been no heavy rain near " the water-course immediately preceding the collection ; that " the water should be pellucid and not hold any evident quan- " tity of solid matter in suspension. In order to ascertain whe- " ther the composition of the waters varied with the season, in " one important case the water was collected at different times " from the same place and analysed. It will appear that the " variation in composition due to this cause is very trifling in- " deed. The waters were in all cases analysed without being " filtered, and, previous to analysis, any sediment which might " have been formed on standing was shaken up so as to be in- " cluded in the examination. The dates of collection extended " over about twelve months."

With regard to the Bathurst Canal water, which is the least pure, Professor Guthrie compares the amount of organic matter found in it with that contained in some well-known waters. " The chief waters supplied to London from the Thames were " found, in November, 1854, to contain respectively in a gallon " 1.39, 1.92, 2.08, 3.56, and 5.41 grains of organic matter. The " waters supplied to London from other sources contained from " 1.48 to 2.33 grains. Hence the quantity of organic matter in " the Bathurst Canal is not outrageously large."

No exact comparison can be made between Professor Guthrie's results in 1865 and those of M. Delisse upwards of 65 years ago, except with respect to the residue of mineral matter in Grand River N. W. M. Delisse found 6 grains in 1 lb. (French), whereas Professor Guthrie found only 4 to 6 grains in a gallon. The conclusion is that the water supplied to the inhabitants of Port Louis, in the time of M. Delisse, contained fully nine times as much mineral matter as the water supplied to them in 1865 did, and therefore that it was less pure. It would be interesting to know how much organic matter was present in the water of Port Louis in the time of M. Delisse. That there was fully as much then as in 1865 can scarcely be doubted, for the streams and rivers were more shaded by trees.

Fever not caused by impure Water.

122. Professor Guthrie's analyses were made in 1865, the year in which malarial fever began. Now, they afford no evidence that the fever was caused or aggravated by impure water. On the contrary, in that year the waters of the Colony in general were "very pure."

Discharges from Sugar Houses and Distilleries.

123. Probably, there have been some isolated cases of a partial pollution of the waters of streams and canals by the refuse from sugar-houses and distilleries; but it does not appear that the general health has suffered from any such pollution. The situations of many of the 252 sugar-houses and 46 distilleries that existed in 1865 were such that no refuse from them could get into the water-courses, and only 79 of the sugar-houses had vacuum pans. The analyses in 1865 of the waters of rivers near which there were sugar-houses did not reveal the presence of unusual impurities.

Not a cause of Malaria.

That any refuse that may have got into the rivers from sugar-houses had nothing to do with the outbreak and continuance of malarial fever seems to be shown by two facts, viz: 1o. The fever, as has been stated by medical men, was just as general and severe in places where the water could not possibly have been polluted by sugar-houses as it was in the vicinity of sugar-houses; 2o. There has always been much less fever during crop time (September, October, November and December), when the rivers were low and the water less pure, than in the *entrecoupe* (April, May, and June), when there was more and purer water in the rivers.

November, when all the sugar-mills are at work, and have been so since the end of July, is the healthiest month in the year; whereas May, months after the sugar-houses have been closed, is the most unhealthy.

As a rule, the streams and rivers are much lower in winter than in summer, especially in September to December, and ever since the Colony was inhabited, some of them have in those months been occasionally dry, or nearly so. If they are more polluted now than formerly, it is mainly because they are in some places the wash tubs of a dense population composed chiefly of Indians, and the receptacles of filth and sewage from camps and villages.*

Land thrown out of cultivation not a cause of Malaria in Mauritius.

124. It has been said that the depopulation of certain districts in Italy and India, and the consequent diminution or abandonment of agriculture have been followed by epidemics of fever. The

* The question of the pollution of the rivers by the residue from distilleries, &c., is one of old date. A severe epidemic which occurred in 1775, and which was afterwards believed to have been cholera, was attributed to the pollution of the rivers from that cause. Baron d'Unienville, in his *Statistique de l'Ile Maurice* (Paris 1838), says, with reference to the rivers of Plaines Wilhems: "Le commissaire civil et beaucoup d'habitants de ce quartier, se plaignent de la négligence de plusieurs propriétaires à exécuter la loi concernant les puits perdus, pour éviter les inconvénients résultant de la décharge dans les rivières ou canaux, soit par cours, soit par infiltration, des eaux provenant d'alembics ou d'ingoteries, lesquelles eaux causent la destruction des poissons, et sont indubitablement fort malsaines pour les hommes et les animaux qui boivent de l'eau, parmi laquelle il se trouve un semblable mélange." (Vol. I., p. 215). Similar complaints are from time to time made at the present day, but there is no evidence that the general health of the Colony has ever suffered from pollution of the rivers.

explanation of this seems to be that "the earth becomes saturated with dead organic matter in various stages of putrefaction and decay, until at last, when evaporation takes place after the periodical inundations, poisonous emanations arise, which, if not acting at all times as specific causes of disease, must exercise a prejudicial and depressing influence on the constitution of those resident in the locality."

Acres under cultivation in Black River.

Now, the outbreak of malarial fever in Mauritius cannot be ascribed to any such cause; for, as already shown, in place of depopulation before 1865, there was an increase of population; and it was not before, but after, the appearance of the fever that a certain number of sugar-estates on the low lands were abandoned.

Let us, for example, take the District of Black River, in which the Fever Epidemic began in 1865. According to official returns the number of acres (arpents) under cultivation in 1829 was as follows: *

Mais...	428 arpents
Blé ...	20 ,,
Menus grains...	29 ,,
Manioc ...	1037 ,,
Cannes ...	1782 ,,
Café..	73 ,,
Girofle ...	26 ,,
Coton ...	3 ,,
Patates ...	231½ ,,
Cultures divers ...	305½ ,,
Total arpents ...	3935 ,,

In 1860 and 1865 the number of acres in cultivation in the same District was as follows: †

	(1860) Acres.	(1865) Acres.
Canes ...	4500	5008
Maize ...	86	100
Manioc ...	50	45
Potatoes ...	8	20
Coffee ...	3	3
Fruits and Vegetables ...	500	525
Totals...	5147	5701

In 1866 the number of acres in cultivation was 5880.

So far, then, from there having been a decrease either of population or of cultivation in Black River, previously to the Epidemic, there was an increase of both; and such was also the case in the other Districts.

Fever and abandonment of sugar estates partly due to the same causes.

125. As a matter of fact, it was not until after 1864 that the abandonment of sugar-estates on the leeward sides of the Island began; and instead of the sterility of the soil having been

* Baron D'Unienville's Statistique de l'Ile Maurice. Vol. III. Table 53.

† Blue Books for 1860 and 1865.

a cause of fever, it is much more probable, in fact almost certain, that both of them were in a measure effects of the same causes. The inundation of February, 1865, and the droughts of that year and of 1866 and 1867, which medical men consider as the chief determining causes of the Epidemic, were also prejudicial to vegetation, particularly on the low lands, where the rainfall is always less than in the interior. At the same time, there is little doubt that on the low lands the soil had been more or less exhausted.

The exciting or determining causes of the Epidemic, then, so far as can be ascertained, were those mentioned in par. 106. Whether or not, in addition to those causes and to some others to which I shall allude further on, there was something without which malarial fever could not have been produced, it is impossible to say with certainty. What is called *malaria* seems to be known only by its effects ; its essence is generally considered to be a mystery.

Germ Theory.

126. The circumstances, however, which attended the rise and spread of malarial fever in Mauritius appear to be best explained by the *germ* theory. According to it, there are, in localities where the fever is contracted, multitudes of invisible plants, which, when they find their way into the human body, through the medium of air or water, set up the morbific action which constitutes the disease. It has been affirmed that micro-organisms have been detected in air over marshes, that they have been introduced into sleeping apartments, and that the inmates have been attacked with malarial fever.

This theory would account for the propagation of the disease along the coasts and water-courses on the low lands, where the temperature, drought, and evaporation were greatest, and decaying organic matter was most abundant ; for a decrease in the prevalence and intensity of the disease, according to elevation above the sea-level, where these conditions existed in a less degree ; for a yearly periodicity following the yearly periodicities of temperature, rainfall, and humidity ; and for fluctuations from year to year, according to fluctuations in the weather. The seeds having in some way or other been sown at Petite Rivière, where the soil and climate were highly favorable, we may conceive that they speedily germinated, grew, ripened, and threw off fresh seeds, which likewise took root and thrived only where they found the conditions necessary for their development. In these respects, the organisms would be merely obeying the laws which govern the rest of the vegetable kingdom. Cast upon an unfavorable soil, and subjected to other untoward circumstances, they would die, or remain practically dead ; whereas, under propitious circumstances, they would spring into life, increase, and spread, the crops being most abundant at certain seasons, in certain years, and in certain localities, according to varying conditions of weather and soil, just as in the case of other plants.

Whence came the Germs?

127. Supposing, now, this theory to be correct, we have to ask, Whence came the germs ? Were they generated in the Colony ? Were they imported ?

128. The geographical distribution of plants is such that certain genera and species are usually found where certain conditions of

soil and climate exist, and nowhere else; but how they came there, or whence they came, is often unknown. Such, we may suppose, is the case with the lowest, as well as with the highest, forms of vegetable life. They can live and thrive only where the requisite conditions are present, and there, somehow or other, they are generally found, whatever may have been their origin, or the mode of their transference from one place to another. Now, if the theory is true, the micro-organisms, which are the immediate cause of the specific disease known as malarial fever, must have abounded in Mauritius since at least 1865; but as the doctrine of spontaneous generation is not supported by observation and experiment, we must suppose that these invisible plants, or their spores, were imported; and we know that ample facilities for their introduction, especially from Madagascar and India, have existed for many years. From 1834, when Indian Immigration began, till 1865, the Indian population increased from 84 to 245,700, and there is no doubt that during that time malarial fever has been frequently imported. The number of Immigrants introduced in 1865 alone was 20,283, on board 56 vessels from Calcutta, Madras, and Bombay, and there were cases of fever of some kind among them. Dr. Fressanges observed cases of malarial fever on board Immigrant ships in 1863 and 1864, and several Medical men had met with cases among Indian labourers on estates for years before 1865. Soldiers, also, who had contracted the disease in other countries suffered and died from it at the Military Posts in different parts of the Island, at least as far back as 1825.

Malarial Fever often imported.

Why did it not spread till 1865?

There is, therefore, ground for believing that the germs have frequently been imported into Mauritius. But why did they not take root and multiply and spread till 1865-68? The only explanation that suggests itself is that for years the local conditions were unfavorable to their propagation, and that, consequently, they were harmless. The germs may be carried, for example, to Melbourne, or Cape Town, but, the conditions necessary to their growth and spread being absent, they are innocuous. We may conceive that such was the case for many years in Mauritius. The germs were present, but the conditions necessary for their development and spread were absent.

Presence of germs not an efficient cause.

129. Granting, then, that the theory is correct, the presence of the germs was only one of the conditions essential to the outbreak and spread of the Epidemic. The other conditions, without which the germs could not have lived and multiplied, were equally essential. Those other conditions, as we have seen, may be classed under one head, namely, *the abnormal weather of the years* 1865-67, together with its effects upon the rivers, foreshores, marshes, and soils.

But to those meteorological conditions may, I think, be added as a probable exciting cause, the large Indian population which, we have been told, was strongly predisposed to malarial fever, and among which, as a matter of fact, the disease existed before the Epidemic broke out.

Having now considered the various attendant circumstances, and come to these conclusions, let us, without inquiring how far the large Indian population and the pre-existence of malaria fever contributed to the spread and intensity of the disease, fix our attention upon the determining causes mentioned by the medical men of the Colony, namely, the abnormal weather of 1865-67.

Most probable exciting causes.

130. We grant that the most probable proximate causes—not taking into account the predisposition of a large part of the population and the actual existence of cases of malaria fever—were, as far as can be seen, the meteorological occurrences of 1865-67. They are the only exciting causes—with the exception of *déboisement*, which was probably a subsidiary cause—that can reasonably be assigned. But supposing it were fully proved, that, if there had been no floods, droughts, high temperature, and absence of hurricanes in those years, there would have been no Epidemic, we should still have made but a single step in the inquiry. Admitting that the abnormal weather of those years was the proximate cause, the question arises, what was the cause of that weather? Was it local or general?

The abnormal weather of 1865-67 not of local origin.

131. In the first place, it is clear that the remarkable absence of hurricanes in the Indian Ocean, in 1866 and 1867, which was attended with unusually low tides, was not due to any local cause. To have produced such an effect over so wide an area there must have been at work some agency of a more general character than any that can be ascribed to changes that may have taken place in Mauritius. Any influence, then, that the exposure of organic matter on the foreshores and at the estuaries may have had, in consequence of low tidal waters, was the result, not of a local, but of a general, cause operating over the Indian Ocean.

Flood of 1865 not due to local circumstances,

132. With regard to the flood of the 12th February, 1865, it formed part of an extensive atmospheric disturbance.

On the 11th the S. E. trade-wind extended from at least 32° S. to Mauritius, and in 28° S. and 52° E. the barque *Velocity* had on that day a strong gale from E.S.E. At Mauritius the wind was light from E.S.E., with dull, rainy weather, and to the northward and north-westward of the Island the N.W. monsoon prevailed in light to moderate breezes. On the 12th the N.W. monsoon advanced to the southward. At Mauritius and Rodrigues, and at least over 22° in longitude (50° to 72° E.) the wind veered from E.S.E. to East and North, with much rain. The bark *Joshua*, in 19° 32' S. and 60° 55' E., at noon on the 12th, had a strong breeze from N. N. E., with torrents of rain, and dark, gloomy weather. The barque *Jane Gray*, in 27° S. and 54° E., had a fresh gale from S. E., and clear weather. North of Tamatave the wind was light from the N. Wrd. We have already seen (par. 68, p. 48) what took place in Mauritius.

The flood, then, which carried down to the low lands and the embouchures of rivers great quantities of organic matter was not caused by local circumstances, but was the result of general laws. Two opposite currents of air, different in temperature and humidity, collided; a cyclonic whirl was formed; and, as usual, torrents of rain fell. Nothing peculiar to Mauritius could have produced such an event in 1865 rather than in any other year. Similar floods had occurred in former years, as in 1834; one occurred in 1870, one in 1878, and in all probability others will occur in future years, in whatever condition the Island may be.

Mauritius droughts of 1864-67 not of local origin.

133. We come now to the droughts. As there were very few cyclones in the Indian Ocean south of the equator in 1866 and 1867, and as cyclones are almost invariably accompanied by torrential rains, we should expect a comparatively small rainfall over the Southern Indian Ocean in those years. But as the rainfall at sea was not measured, we can only have recourse for direct proof to the observations made in Mauritius, Rodrigues, India, South Africa and Australia. If these observations show that the years 1865-67, or 1864-67, were characterised by unusual droughts, we shall have reason to suppose that the droughts in Mauritius were not of local origin, but the result of some cause or causes which affected the weather over a considerable part of the earth's surface.

In Mauritius, the years 1864-67 were, upon the whole, unusually dry. In each of them the rainfall was considerably below the average, except in 1865; and although in 1865 it was 2 inches above the average, owing to floods in February and December, yet in the interval there were severe droughts. The years 1864, 1866, and 1867 were the driest years in the Island since 1842. In 1866 the rainfall was 51.8 per cent below the average.

Droughts in other places in 1864-67.

134. From Rodrigues we have not complete returns of the rainfall, the observations for several years having been made only during the rainy months of January to April. But as the total fall in those four months in 1867 was only 13.35 inches, which was greatly below the average, it is probable that that year was an unusually dry one.

The mean annual rainfall at the Cape of Good Hope (Royal Observatory) from 1842 to 1873 was 24.4 inches, and the driest year during that period was 1865, when the fall was 18.6 inches, or 23.8 per cent below the average. The rainfalls of 1864, 1866, 1867, and 1868 were also below the average.

At the Melbourne Observatory the mean annual rainfall from 1840 to 1877 was 27.5 inches,* and the driest year was 1865, when only 15.9 inches fell, which was 42.2 per cent below the average. The rainfall was also below the average in 1866, 1867, and 1868.

From 1842 to 1877 the mean annual rainfall at Sydney was 50.9 inches; whereas in 1865 it was 36.3 inches, and 36.8 inches in 1866; that is, 29 to 28 per cent below the average.

The mean annual fall at Adelaide for the period 1842 to 1877 was 21.5 inches, and the driest year from 1842 to 1868 was 1865, when 14.7 inches fell, or 31.6 per cent less than the average. The rainfall was also below the average in 1864, 1866 and 1867.

At Brisbane (Queensland) the mean annual rainfall from

* No Observations in 1851-54.

1860 to 1877 was 50.4 inches, and the least fall during those years was 24.1 inches in 1865, or 52.2 per cent below the average. The falls in 1864, 1866, and 1868 were also below the average.

The mean rainfall of Madras from 1842 to 1877 was 48.7 inches, and, with the exception of 1876, the driest year was 1867, when only 24.4 inches fell, or 50 per cent of the mean. In 1864, 1865, 1868, and 1869, the rainfall was also below the average. The fall in 1876 was 21.5 inches.

The mean rainfall of Bombay, from 1842 to 1872, was 69.7 inches and that of Calcutta 69.3 inches. At Bombay the rainfall in 1864 was 45.6 inches or 34.6 per cent below the average, and the falls in 1867 and 1868 were also below the average. In 1865 and 1866, the falls at Calcutta were respectively 11.2 and 5.2 per cent, below the average. Excepting 1855 and 1871, when the falls were 41.2 and 40.6 inches, 1864 was the driest year at Bombay. At Calcutta the driest years were 1853, 1860, and 1872.

Rainfall at seven stations.

135. The annual rainfalls at seven of the above mentioned stations in 1854-68 were as follows :

Years.	Bombay.	Madras.	Mauritius.	Cape.	Adelaide.	Melbourne.	Sydney.
	Inches.	Inches.	Inches.	Inches	Inches	Inches.	Inches.
1854 ...	82.1	43.2	39.4	20.0	15.3	......	29.3
1855 ...	41.2	32.3	42.6	24.6	23.1	28.2	52.8
1856 ...	65.9	47.0	46.2	21.9	24.9	29.7	43.3
1857 ...	51.3	52.9	43.4	22.7	21.2	28.9	50.9
1858 ...	62.4	48.5	35.3	24.1	21.5	26.0	39.6
1859 ...	77.2	55.1	56.9	36.7	14.8	21.8	42.0
1860 ...	62.1	27.6	45.2	29.1	19.7	25.4	82.8
1861 ...	76.9	37.2	68.7	25.4	25.1	29.1	58.4
1862 ...	73.6	38.2	28.4	32.0	22.9	22.1	24.0
1863 ...	77.7	54.6	33.4	25.6	22.8	36.4	47.1
1864 ...	45.6	47.2	24.1	18.9	18.8	27.4	69.1
1865 ...	77.8	41.6	44.7	18.7	14.7	15.9	36.3
1866 ...	78.4	51.4	20.6	19.2	19.8	22.4	36.8
1867 ...	62.3	24.4	36.0	23.0	19.2	25.8	59.7
1868 ...	62.1	41.4	64.2	22.9	18.0	18.3	43.6
Means ...	66.4	42.8	41.9	24.3	20.1	25.5	47.7

Rainfall at Brisbane.

136. At Brisbane the annual falls from 1860 to 1877 were as follows :

Years.	Inches.
1860	54.6
1861	69.4
1862	28.3
1863	68.8
1864	47.0
1865	24.1
1866	37.2
1867	61.0
1868	36.0
1869	54.4
1870	79.1
1871	45.4
1872	49.2
1873	62.0
1874	38.7
1875	67.0
1876	53.4
1877	31.2
Means	50.4

The weather of 1864-68 in different places.

137. We see, then, that the period 1864-68 was remarkable for droughts and great fluctuations in the rainfall, not only in Mauritius, but in other places bordering on the Indian Ocean. In each of those five years the rainfall was below the average at the Cape and at Adelaide ; in four of them at Brisbane ; in three of them at Madras, Mauritius, Melbourne, and Sydney ; and in two of them at Bombay. At Bombay the rainfall fluctuated from 45.6 inches in 1864 to 77.8 inches in 1865, at Madras from 51.4 inches in 1866 to 24.4 inches in 1867, at Mauritius from 44.7 inches in 1865 to 20.6 inches in 1866, at Sydney from 69.1 inches in 1864 to 36.3 inches in 1865, and at Brisbane from 24.1 inches in 1865 to 61.0 inches in 1867. Except at Calcutta and Sydney, the droughts in 1864, 1865, 1866, or 1867, were the severest that had occurred during periods ranging from 17 to

40 years. These circumstances, especially the droughts, gave the period in question a marked character.

138. The mean yearly rainfall at the five stations in the southern hemisphere, from 1855 to 1868, is given in the following Table; from which it will be seen that the driest year was 1866, and the wettest 1861. Denoting the rainfalls in the successive years by a, b, c, d, *&c.*, and putting $\frac{a + 2b + c}{4}$ for the rainfall of 1856, $\frac{b + 2c + d}{4}$ for the rainfall of 1857, and so on, with the view of eliminating abnormal inequalities, we get the numbers in the third column, which make 1860 the wettest year, and 1866 the driest.

Mean Rainfall at five stations in southern hemisphere.

Years.	Mean Rainfall at 5 Stations.	Reduced.
	Inches.	Inches.
1855	34.3	...
1856	33.2	33.5
1857	33.4	32.3
1858	29.3	31.6
1859	34.4	34.6
1860	40.4	39.1
1861	41.3	37.2
1862	25.9	31.5
1863	33.1	30.9
1864	31.7	30.6
1865	26.1	26.9
1866	23.8	26.6
1867	32.7	30.6
1868	33.4	...
	32.4	32.1

Mean Rainfall at sixty stations in Europe, and at seventy-nine stations over the world.

139. Yearly means of the rainfalls at 30 stations in Great Britain and at 30 stations on the Continent of Europe, from 1855 to 1867, give similar results, the wettest years having been 1861 and 1862 and the driest 1857 and 1865. Again, taking means of the rainfalls at 79 stations in Europe, America, India, Mau-

ritius, the Cape, and Australia, we find that the rainfall increased from 34.6 inches in 1855 to 42.8 inches in 1861, and then decreased to 36.5 inches in 1865. The results are given in the following Table; those for Europe in the second and third columns, and those for all the stations (79), in different parts of the world, in the fourth and fifth columns.

Years.	Mean Rainfall at 60 Stations in Europe.	Reduced.	Mean Rainfall at 79 Stations.	Reduced.
	Inches.	Inches.	Inches.	Inches.
1855	27.1	......	34.6	......
1856	30.0	28.3	36.9	36.2
1857	26.1	27.6	36.7	36.6
1858	28.1	28.5	36.4	37.6
1859	31.6	31.0	41.2	39.3
1860	32.7	32.5	38.6	40.3
1861	32.9	33.2	42.8	40.9
1862	34.5	33.3	39.6	40.4
1863	31.3	31.7	39.9	39.0
1864	29.7	29.6	36.6	37.4
1865	27.5	29.5	36.5	36.9
1866	33.5	31.9	38.3	38.1
1867	33.1	......	39.3	......
Means.	30.6	30.6	38.3	38.4

The deficits in the mean rainfall of 60 stations in Europe in 1864 and 1865 are not so great as those in the rainfall of the five stations in the southern hemisphere; but the progressions are similar. The results for all the 79 stations, also, present the same general features, the rainfall, on the whole, increasing until 1861, and then decreasing until 1865.

Weather of 1864-68 not peculiar to Mauritius.

140. When, therefore, the rainfall of Mauritius, on the whole, increased from 1854 to a maximum in 1861, and then decreased to a minimum in 1866, it merely followed the law observed by the rainfall of a considerable portion of the globe. The floods and droughts which occurred in the Island in 1864-67 were not peculiar to it, but apparently the result of a general cause, which produced similar results in other places. There was a severe drought in Mauritius in 1866. But there was also a severe

drought in Bombay in 1864; severe droughts at the Cape, Adelaide, Melbourne, and Brisbane in 1865; and a severe drought at Madras in 1867. Moreover, as there were very few cyclones in the Indian Ocean in 1866 and 1867, it is probable that in those years the rainfall there was also below the average. Although, however, in the period 1864-67, droughts prevailed, and the rainfall generally was below the average, yet heavy floods occurred in Europe, India, Australia, &c., as well as in Mauritius. For example, in Mr. H. C. Russell's interesting work on the "Climate of New South Wales" it is stated that in June and July, 1866, the Hawkesbury rose 26 feet above the mean tidal level of South Creek. In June, 1867, disastrous floods occurred in the Hunter, Hawesbury, Murrumbidgee, and other rivers. In the Hunter, the water rose as high as in the memorable flood of 1857, and on the Hawkesbury it was the highest flood ever recorded. But these floods were preceded and followed by severe droughts. At Cowga, on the Bogan River, 80 miles above Gongolgan, from 1864 to 1868 inclusive, "there were thirty-seven months absolutely without rain, unless perhaps for five or ten minutes; eleven months were distinguished by only one or two good showers, or perhaps a day or two of very light rain, leaving only twelve months in which ~~only~~ there was good rain; the river only ran five times in five years through to the Darling." In 1867 Lake Cowal (about sixteen miles long and ten in width) "was perfectly dry". The largest lake in the Colony, Lake George, diminished in 1866-67-68, until it was not more than 2 feet in average depth, and one-third its former area. In 1865 and 1866 there was a general drought, and the floods of June, 1867, were followed by a still more severe drought, which lasted from August of that year until the middle of January, 1868. At Sydney, the whole rainfall in October, November, and December, 1867, amounted to only 1.26 inch. Similar droughts and floods occurred in those years (1864-68) in the other Australian Colonies, in South Africa, and in India; but the droughts prevailed, and in general the total rainfall was below the average. It is to be borne in mind that, as in Mauritius, these droughts were not ordinary droughts, but the intensest in a long series of years. The droughts and floods which took place in Europe during the same period had a similar character.

The determining causes of Epidemic, in so far as weather was concerned, not of local origin.
the

141. We have seen that, according to the most competent judges, the "exciting or determining causes" of the Fever Epidemic of 1866-68 were the meteorological occurrences of 1865-67, and especially the floods of February, 1865, and the drought of 1866. Now, as in those years similar weather prevailed over an extensive area, and on all sides of Mauritius, we must conclude that the determining causes were not of local origin; that is, that the floods and droughts of 1865-67 were not due to any changes that had taken place in the Island, but to something that operated on an extensive scale. The floods and droughts were only local in the sense that Mauritius, in common with other places, was visited by them, but not in the sense that they were due to local circumstances which had not previously existed. They were not caused, as many suppose, by the destruction of the forests; for severe and prolonged droughts occurred from time to time when the Island was densely wooded; and, moreover, it cannot be admitted that any amount of denudation in Mauritius could affect the weather over a large portion of the earth's surface.

Was the abnormal Weather of 1865-67 accompanied or followed by an increase of Mortality in other places ?

142. The weather of 1865-67 having been abnormal in other places, as well as in Mauritius, the question arises : Had that weather, in those other places, the same, or similar effects, as regards health ? If both the local and the general conditions were the same, we should expect the effects to be the same. If the effects were different, while the general or external conditions were the same, we should ascribe the differences to differences in the local conditions. Extreme weather, in the shape of floods, droughts, &c., may have increased the mortality wherever they occurred, but the diseases may have been different according to local circumstances. Were, then, the death-rates in other places unusually high in those years ?

Was similar Weather in former years accompanied or followed by an increase of Mortality in Mauritius ?

143. Another question which suggests itself is, whether or not in former times similar weather in Mauritius was accompanied or followed by epidemics, or by an increase of mortality ? If we should find that former extremes of weather were attended by high death-rates, and that both occurred simultaneously in different parts of the world, there would be additional ground for supposing that the exciting causes, in so far as meteorology is concerned, were independent of local conditions.

Déboisement.

144. The question of déboisement, or deforestation, has also to be considered ; for although it is evident that the floods and droughts which have from time to time occurred in Mauritius were not caused either by the presence or absence of forests, yet it is likewise evident that the effects of abnormal weather, with respect to health and agriculture, are mitigated by forests, and aggravated by their destruction. Trees are not the cause of weather ; they do not increase or diminish the amount of heat and light emitted by the sun ; but they control and modify the local action and effects of the primary causes. We have to inquire, then, how far and in what way extensive denudation in Mauritius may, as a subsidiary agent, have affected the public health ?

Conclusive results not attainable.

145. With regard to most of these questions, the want of reliable statistics for a long series of years precludes the possibility of obtaining conclusive results. For that purpose we should require at least the annual death-rates of different countries, for long periods, and the annual values and fluctuations of the principal meteorological elements ; and in these respects the information available is scanty. It is possible, however, that even with the few materials at disposal, we may make some advancement in the directions indicated.

Death-rates of Mauritius previous to 1861.

146. In the first place, let us ascertain, as nearly as possible, the annual death-rates of Mauritius for the longest period. We have already (Table Z, p. 43) given these for the period 1861-1880. For previous years we have (1) Baron d'Unienville's Statistics for the period 1804-1830, together with some contained in old almanachs ; (2) Military Statistics for the period 1823-1867 ; and (3) Blue Book Statistics for the period 1831-1860.

Baron d'Unienville's Statistics.

147. In 1838, the Archiviste Colonial of Mauritius, Baron d'Unienville, published in three volumes, a work entitled *Statis-*

tique de l'Ile Maurice et ses Dépendances. This work contains much useful and interesting information, and it appears to have been carefully compiled. The vital statistics, which comprise the period 1804-1830, deal with the three classes, or sections, of which the population was then composed, namely, the Whites, the Coloured (Free), and the Slaves. Baron d'Unienville gives the number of living persons belonging to each class, in each District, on the 1st January of each of the three years 1817, 1825, 1830. He gives also the mean annual population (white, free and slave), and the mean annual number of deaths and births, for the period 1804-1825, together with the mean annual number of deaths and births for the periods 1817-1825 and 1825-1830. But the only individual year for which both the population and the births and deaths are given is 1829.

Population on 31st December 1816, 1824, and 1829.

148. The following Table gives the population on the 31st December 1816, 1824 and 1829.*

TABLE *h*.

Years.	1816			1824			1829		
Districts.	White	Free	Slaves	White	Free	† Slaves	White	Free	† Slaves
Port Louis	3047	5294	16948	3153	7273	12411	3641	8731	14905
Pampiemousses	873	853	12111	993	1117	8907	1061	1373	9658
Riv. du Rempart.........	569	1099	9519	644	1431	7515	471	1529	7945
Flacq.........................	980	1213	9892	1090	1568	8464	936	1709	8999
Grand Port	574	960	6952	735	1301	6439	836	2200	6737
Savanne	179	208	4541	206	308	4419	307	483	3836
Black River	319	313	7298	330	439	5189	251	689	5284
Plaines Wilhems	508	749	8855	526	964	7057	396	852	6621
Moka	327	308	3827	330	430	2731	236	453	2797
TOTALS...........	7376	11006	79943	8007	14831	63432	8135	18019	66782

The slave population in 1829 is for the 1st January of that year, and it comprises a few "apprentis" and Chinese, for whom a separate column was not considered necessary.

Mean death-rates among White and Free Populations for the period 1804-1825.

149. As Baron d'Unienville mentions, that, for several reasons, the statistics relating to the slaves are incomplete, we need

* The 31st December 1816, 1824 and 1829 is taken in place of the 1st January 1817, 1825 and 1830, for the sake of uniformity.

† The slave population is only estimated.

not give the death-rates for that class of the population. For the other two classes he gives the following mean population and mean death-rates, in each District, for the twenty-one years commencing with the 1st January, 1804, and ending with the 1st January, 1825 :

TABLE *i*.

Districts.	White Population.			Free Population.		
	Mean Population.	Mean No. of Deaths.	Mean Death-rates per 1000.	Mean Population.	Mean No. of Deaths.	Mean Death-rates per 1000.
Port Louis...........	2875	74.75	26.00	4282	64.23	15.00
Pamplemousses......	853	5.97	7.00	725	7.97	10.99
Rivière du Rempart.	568	10.22	17.99	1007	11.08	11.00
Flacq.................	941	15.06	16.00	1111	11.11	10.00
Grand Port	569	8.53	14.99	872	6.10	7.00
Savanne	175	3.32	18.97	179	3.04	16.98
Black River	308	4.93	16.00	281	3.09	11.00
Plaines Wilhems ...	502	7.03	14.01	685	7.53	10.99
Moka	315	4.41	14.00	277	3.88	14.01
Totals............	7106	134.22	18.89	9419	118.03	12.53

The mean white population of the whole Colony for the twenty-one years was 7,106, and the mean coloured (free) population 9,419. Among the former the mean number of deaths per annum was 134.22, and among the latter 118.03. Hence the mean annual death-rate per 1000 of the white population was 18.89, and of the coloured population 12.53. The total mean of the two populations having been 16,525, and the total mean number of deaths 252.25, the total mean death-rate was 15.26

It is difficult to account for the small death-rate among the white population of Pamplemousses and among the free population of Grand Port. The former may have been owing to sick persons from the country having died in Port Louis.

Mean death-rates from 1817 to 1825.

150. The mean death-rates among the same two sections of the population for the eight years beginning on the 1st January 1817, and ending on the 1st January 1825, were as follows :

TABLE *j*.

Districts.	White Population.			Coloured Population.		
	Mean Population.	Mean No. of Deaths.	Mean Death-rates per 1000.	Mean Population.	Mean No. of Deaths.	Mean Death-rates per 1000.
Port Louis...	3100	89.63	28.91	6283	96.00	15.28
Pamplemousses......	933	6.25	6.70	985	2.00	2.03
Rivière du Rempart.	606	7.00	11.55	1265	5.12	4.05
Flacq	1035	14.88	14.38	1390	12.05	8.67
Grand Port	654	6.60	10.09	1135	5.38	4.74
Savanne	192	3.75	19.53	258	2.88	11.16
Black River	324	5·75	17.75	376	4.63	12.31
Plaines Wilhems ...	517	7.12	13.77	856	7.50	8.76
Moka	328	5.12	15.61	369	4.63	12.55
Totals...........	7689	146.10	19.00	12917	140.19	10.86

The mean death-rate among the white population (19.00) was almost the same as for the period 1804-25 ; but the death-rate among the free population (10.86) was less ; and the rates for Pamplemousses and some other Districts were unaccountably small. The total mean death-rate for the two sections of the population was 13.89.

Mean death-rates from 1825 to 1830.

151. For the five years 1825-1830, the results are as follows :

Districts	White Population			Coloured Population		
	Mean Pop.	Mean No. of Deaths	Mean Death-rates per 1000	Mean Pop.	Mean No. of Deaths	Mean Death-rates per 1000
Port Louis	3397	127.60	37.56	8002	242.60	30.31
Pamplemousses	1027	13.00	12.66	1245	13.00	10.44
Riv. du Rempart ...	557	5.60	10.06	1480	7.20	4.86
Flacq	1013	12.00	11.84	1638	18.00	10.99
Grand Port...	785	12.00	15.29	1750	15.80	9.03
Savanne	256	4.00	15.63	395	5.40	13.67
Black River.	290	6.00	20.69	564	4.60	8.15
Plaines Wilhems. ...	461	4.80	10.41	908	4.00	4.41
Moka	283	5.20	18.37	441	6.60	14.97
Totals...	8069	190.20	23.57	16423	317.20	19.31

It would appear that in the period 1825-1830 the death-rates of both classes of the population increased considerably. The total mean death-rate for the two was 20.72.

Death Rates in 1829, according to Baron d'Unienville.

152. The numbers composing the white, free, and slave population in 1829 have been given in Table *h*. We now give the number of deaths, and the death-rates, among each class in that year.

Table *k*.

Districts	White.		Free.		Slaves.	
	No. of Deaths	Death Rates	No. of Deaths	Death Rates	No. of Deaths	Death Rates
Port Louis	144	39.55	269	30.81	535	35.89
Pamplemousses ...	13	12.25	14	10.20	343	35.51
Riv. du Rempart ...	1	2.12	5	3.27	271	34.11
Flacq.	19	20.30	24	14.04	336	37.33
Grand Port	8	9.57	17	7.73	199	29.54
Savanne...	2	6.51	11	22.77	148	38.58
Black River	1	3.98	7	10.16	143	27.06
Plaines Wilhems ...	8	20.20	10	11.74	247	37.31
Moka.	2	8.47	7	15.45	84	30.03
Totals	198	24.34	364	20.20	2306	34.53

The total population in 1829 having been 92,936, and the total deaths 2,868, the total death-rate was 30·85 per 1000 of living persons. But as the slaves and the number of deaths among them were only estimated, that large section must be omitted. The total death-rates among the other two sections were respectively 24.34 and 20·20, and the mean for the two was 21·49.

As in the mean death-rates for the periods 1804-25, 1817-25, and 1825-30, so in the year 1829 there were, for some cause or another, great differences in the death-rates of the different Districts.

General results of Baron D'Unienville's Statistics for the White and Free Populations.

153. The results of Baron d'Unienville's statistics for the white and free populations of the whole Colony are as follows :

TABLE *l*.

Years.	White.		Free.		Total.	
	Population.	Death Rates.	Population.	Death Rates.	Population.	Death Rates.
1804-25	7106	18.89	9419	12.53	16525	15.26
1817-25	7689	19.00	12917	10.85	20606	13.80
1825-30	8069	23.57	16123	19.32	24192	20.72
1829................	8135	24.34	18019	20.20	26154	21.49

Statistics from old Almanachs.

154. In the "*Almanach de l'Ile Maurice pour l'Année* 1828" there are (pp. 26-27) two Tables giving the white, free, and slave populations in each District on the 1st January, 1827, and the births, marriages, deaths, &c., among the white and free populations from the 1st January, 1826, to the 1st January, 1827. From these Tables we obtain the following statistics for the year 1826 :

TABLE *m*.

Death-Rates in 1826.

Districts.	White.			Free.			Total.		
	Population.	No. of Deaths	Death Rates.	Population.	No. of Deaths.	Death Rates.	Population.	No. of Deaths.	Death Rates.
Port Louis	3387	106	31.29	7511	186	24.76	10898	292	26.79
Pamplemousses	1009	7	6.94	1313	12	9.14	2322	19	8.18
Rivière du Rempart ...	549	4	7.29	1457	1	0.69	2006	5	2.49
Flacq	1021	8	7.84	1476	11	7.45	2497	19	7.61
Grand Port	868	14	16.13	1390	9	6.47	2258	23	10.19
Savanne	215	5	23.26	416	4	9.62	631	9	14.26
Rivière Noire	324	4	12.35	565	4	7.08	889	8	9.00
Plaines Wilhems.........	413	2	4.84	841	1	1.19	1254	3	2.39
Moka	325	6	18.46	475	6	12.63	800	12	15.60
Totals...............	8111	156	19.23	15444	234	15.15	23555	390	16.56

155. In the "*Almanach de l'Ile Maurice pour l'Année* 1837" there is (p. 223) an elaborate Table showing the births and deaths among the white and coloured populations, for the whole Colony, in each of the years 1825-35. The deaths of both sexes are given between the ages of 0 and 5 years, 5 and 10 years, and so on to upwards of 100 years. During the whole period of eleven years, the total number of deaths was 6,704; of which 2,226 occurred between the ages of 0 and 5; 450 between the ages of 30 and 35; 279 between the ages of 60 and 65; 118 between the ages of 80 and 85; 28 between the ages of 90 and 95; 13 between the ages of 95 and 100; and 10 at ages exceeding 100. The total deaths in each year were as follows:

Number of Deaths in each of the years 1825—35 among the White and Free Populations.

TABLE n.

Years		No. of Deaths
1825	....	556
1826	....	410
1827	....	494
1828	....	552
1829	....	579
1830	....	640
1831	....	613
1832	....	577
1833	....	602
1834	....	915
1835	....	766
	Total	6704

The above Table does not comprise the deaths among the 'apprentis', who were not borne on the registers of the free population until after 1835.

Results from different sources nearly the same.

156. According to Baron d'Unienville, the mean annual number of deaths among the white and free populations from the 1st January, 1825, to the 1st January, 1830, was 507.4; and according to the above Table it was 518.1 for the five years 1825-29. The number of deaths also in 1829 and 1826 (579 and 410) do not differ much from those among the two populations in those years as given in Tables *k* and *m* (562 and 390). The corresponding differences in the death-rates amount to 0.43, 0.64, and 0.83. This indicates that no great error was committed in compiling the Tables from the registers of the Civil Status. The question is whether the registers themselves were correct.

Total Death-Rates among the White and Free Populations from 1831 to 1835.

157. The almanach for 1837 does not give either the white or the coloured population, or both together, for the years 1825-35; but it gives the sum of the two for 1835. We have, however, in the Blue Books for 1831 to 1835 the totals of the white and coloured populations, under the title 'Free' or 'General Population', together with the number of deaths. Both the Blue-Book for 1835 and the almanach for 1837 make the 'Free' population (white and coloured) in 1835 the same, namely, 29,612; but the deaths in the years 1831-35, as given in the almanach and in the Blue Books, are different. The results, for the whole Colony, are as follows:

TABLE o.

Years.	Free Population (white and coloured.	From Almanach for 1837.		From Blue Books.	
		No. of Deaths.	Death Rates.	No. of Deaths.	Death Rates.
1831	26188	613	23.41	635	24.25
1832	27123	577	21.27	687	25.33
1833	30291	602	19.87	619	20.44
1834	26943	915	33.96	904	33.55
1835	29612	766	25.87	882	29.79
Total......	140157	3473	24.78	3727	26.59

Increase of Mortality in 1834 and 1835.

158. In 1831, 1833, and 1834, the deaths do not differ much; but in 1832 and 1835 the numbers in the Blue Books exceed those in the almanach by 110 and 116. Possibly, in 1832 and 1835 the deaths of 'apprentis' were included in the deaths given in the Blue Book, whereas in the almanach these deaths were not given. Be that as it may, the differences make a difference of 1.81 in the total death-rates for the five years. But, notwithstanding these discrepancies, it appears that there was a marked increase of mortality in 1834 and 1835.

The mean annual Death Rate among the White and Coloured Populations from 1804 to 1825 did not exceed 19.00 per 1000.

159. Whatever may be the explanation of the circumstance that the death-rates in some of the rural Districts were very much less than in Port Louis, and that they varied considerably among themselves, it is probable that the mean death-rate among the white and coloured classes, from 1804 to at least 1825, did not exceed 19 per 1000 of the population. Among the coloured population alone the mean death-rate for that period, according to the statistics, was only 12.53, and among the white population it was 18.89. The former rate (12.53) may have been, and probably was, too small, owing to the annual increase to the coloured from the slave population not having been accurately known,

and to all the deaths not having been registered. But as the white population was small, and did not vary much, and as Censuses were taken, and there were offices and officers for registering the deaths, it is difficult to believe that the results for that class differed much from the truth; and it may be inferred from subsequent statistics that the death-rate among the coloured population did not exceed that among the white population. As to the death-rate among the slaves, it is impossible to give even a rough approximation, as their numbers and the number of deaths among them were mere guesses.

A possible explanation of the small death-rates in some of the country Districts, and of the large rates in Port Louis, is, that in those days many families lived during the winter season in Port Louis. Not only had they residences there, but, when sick, they resorted thither for medical advice and attendance. Many of them had also their burial grounds in town.

A Death-Rate of 19 per 1000 not less than might have been expected.

160. Although a death-rate of 19 per 1000 of population, among the white and coloured classes, is small in comparison with the rates in subsequent years, yet there are no reasons, either of a general or of a special nature, for supposing that it exceeded that amount during the period 1804-1825. On the contrary, considering the smallness of the population and the general climatic conditions, we should not expect a higher death-rate, except when epidemics occurred. The death-rate of Rodrigues in recent years has been considerably less than 19 per 1000 of the population, and that of the Seychelles not much more. This will appear from the following Tables showing, according to the Registrar General, the death-rates of those Dependencies in the nine years 1872-80.

Death-Rates of Rodrigues from 1872 to 1880.

Years.	Population.	No. of Deaths.	Death Rates.
1872...	1176	19	16.1
1873...	1211	20	16.4
1874...	1253	15	11.9
1875...	1299	13	10.0
1876...	1342	20	14.8
1877...	1395	14	10.0
1878...	1456	25	17.1
1879...	1514	18	11.8
1880...	1542	48	31.1
Totals......	12188	192	15.8

Death-Rates of the Seychelles from 1872 to 1880.

Years.	Population.	No. of Deaths.	Death Rates.
1872...	12030	238	19.8
1873...	12287	223	18.1
1874...	12949	254	19.6
1875...	13075	318	24.2
1876...	12700	296	23.3
1877...	12941	242	18.6
1878...	13040	329	25.2
1879...	13240	266	20.0
1880...	13505	207	15.3
Totals......	115767	2373	20.5

The mean death-rate among the white and coloured (free) population of Mauritius in 1804-1825 was, as we have seen, 15.26; and we now see that the mean death-rate of Rodrigues in 1872-1880 was 15.8*; while that of the Seychelles was 20.5. The high death-rate at Rodrigues in 1880 was owing to an epidemic of typhoid fever.

Small Death-Rates of Rodrigues and the Seychelles indicate that the Death-Rate among the White and Coloured populations of Mauritius in 1804-25 did not exceed 19 per 1000.

161. It is possible that the death-rates given for Rodrigues and the Seychelles are not correct; but, until it be shown that both they and the death-rates of Mauritius in 1804-1825 were greater than those which have been officially assigned, we must hold that the mean of the latter during that period did not exceed 19 per 1000. According to the statistics, during the last nine years the death-rate of an island, nearly in the same latitude as Mauritius, 350 miles east of it, and almost under the same meteorological conditions, has been nearly the same as that of the white and coloured populations of Mauritius in 1804-25. This cannot be ascribed to a comparatively large adult population in Rodrigues; for the birth-rate during the last nine years has been greater than that of Mauritius, and nearly 50 per cent. of the deaths have occurred among children under five years of age. Nor need we adopt the hypothesis—which has been suggested by some one—that the small mortality of Rodrigues has been owing to the absence of doctors. So far from that having been the case, there can be no doubt that proper medical care and attendance would have reduced the death-rate (small at it is), especially the death-rate among

* For the eight years 1872-79 it was only 13.5.

infants, which is proportionally very high.* The most probable causes of the comparatively small death-rate of Rodrigues are (1) the smallness of the population, and (2) the geographical position of the island, in the region of the S. E. trade-wind, and in the heart of a great ocean. The higher death-rate of the Seychelles is probably partly due to the population being denser, the temperature higher, and the trade-wind less frequent.

Vital Statistic of H. M's. Troops in Mauritius from 1823 to 1867.

162. In the Appendix to a paper by Dr. Reid, published in the Report of the Fever Commission of 1868, there are (pp. 51-69) Returns showing the total strength of Her Majesty's Troops stationed in Mauritius, the total admissions into the Hospitals, the total deaths, the admissions and deaths from dysentery, fever, &c., from 1823 to 1867. From these Returns I have compiled Tables XXXV and XXXVI given in the Appendices; the former showing the total strength, the total admissions, the total deaths, and the total death-rates, in each year; and the latter the percentages (to total strength) of total admissions, and of admissions from dysentery and continued fever.

Mean annual Total Strength, Total Admissions, Deaths, and Death-Rates.

163. From Table XXXV it will be seen that the mean annual strength was 1696, the mean annual number of deaths 40.6, and the mean annual death-rate 23.9 per 1000 of strength. The highest death-rates were 47.2 in 1838, when typhoid fever and measles prevailed; 45.1 in 1854 (a cholera year); 41.5 in 1862 (another cholera year); 38.7 in 1828; 33.9 in 1835; 33.3 in 1829; and 33.2 in 1867 (fever epedemic.) The lowest death-rates were 5.5 in 1859; 6.9 in 1865; 8.9 in 1864; 12.3 in 1866; 15.1 in 1848 and 1853; and 15.3 in 1826. We thus see that there were great fluctuations in the death-rates. Omitting the years of greatest mortality, the mean death-rate in the remaining 38 years of the whole period was 21.1. There is no indication of a gradual increase of mortality, but rather the reverse; for, if we except 1862, the mean death-rate for the period 1859-1866 was only 10.6, which was much less than that for any previous seven years.

Percentages of Admissions into Hospitals.

164. Table XXXVI shows that the highest percentages of total admissions were 218.2 in 1867 (fever epidemic); 169.0 in 1826; 150.4 in 1832; 148.1 in 1831; 146.5 in 1833; 134.8 in 1834; 132.3 in 1858; and 128.6 in 1857. On the other hand, the lowest percentages of total admissions were 60.9 in 1861; 65.1 in 1863; 65.2 in 1842; 72.1 in 1865; and 75.8 in 1866. The highest percentages of admissions from dysentery were 32.6 in 1826, 31.5 in 1828, and 22.7 in 1833; and the lowest 3.6 in 1862, 4.6 in 1864, and 4.8 in 1863 and 1859. There was a very remarkable decrease of admissions from dysentery after 1838. The highest percentages of admissions from continued fever were 24.5 in 1832, 24.4 in 1845, 23.6 in 1844, 22.3 in 1833, 21.9 in 1825, 19.3 in 1857, and 19.1 in 1834; and the lowest 2.1 in 1861, 3.5 in 1864, and 3.81 in 1859.

Years of greatest Mortality not the years in which there was most Sickness.

165. It would appear, therefore, that the years of greatest mortality were not, as a rule, the years in which sickness was most prevalent. For example, the years of greatest mortality were

* Of the 192 persons who died in 1872-80 no less than 84 were under 5 years of age.

1838, 1854, and 1862; but the years of most admissions into the Hospitals were 1867, 1826, and 1832.

Sickliest Periods according to Total Admissions.

166. The percentages of total admissions (Table XXXVI) show that, upon the whole, the most sickly periods were 1825-28, 1831-34, 1854-58, and especially 1867-68*. From 1837 to 1842 there was a considerable decrease of sickness, and a perceptible, but not a large, increase in 1843-47. The healthiest period (according to the total admissions) was 1861-66.

Sickliest Periods according to Admissions of cases of Continued Fever.

167. According to the percentages of admissions from continued fever, the most sickly periods were 1824-28, 1831-35, 1843-46, 1856-58, and 1867-68. These periods are well marked. As in the case of the total admissions, the healthiest period was 1861-66.

168. The following Table shows the total deaths, the total death-rates, the deaths from dysentery, &c., in each quinquennial period:

Deaths from All Causes, from Dysentery, from continued Fever, &c., in each quinquennial period.

Table *p*.

Quinquennial periods.	Total Strength.	Total Deaths.	Total Death-Rates.	Deaths from Dysentery.	Deaths from Continued Fever.	Deaths from Typhoid Fever.	Deaths from Intermittent Fever.	Deaths from Remittent Fever.
1823—27 ...	6825	131	19.2	39	7	0	1	0
1828—32 ...	9091	284	31.2	111	22	0	0	0
1833—37 ...	9924	311	31.3	107	20	0	0	0
1838—42 ...	8965	257	28.7	83	12	8	0	0
1843—47 ...	8965	202	22.5	58	16	9	0	0
1848—52 ...	8299	155	18.7	49	8	14	0	0
1853—57 ...	7185	201	27.9	35	4	17	0	0
1858—62 ...	8302	173	20.8	26	6	8	2	4
1863—67 ...	8754	114	13.0	23	5	9	3	22
Yearly Means.	1695.8	40.6	23.9	11.80	2.22	1.44	0.13	0.58

* The admissions in 1868 are not given in the Table, because they are only for the first six months of the year; but they were so great for that period (2202) that probably they exceeded these in 1867 (2889).

The above Table shows that the mean yearly number of deaths from all causes was 40.6, from dysentery 11.80, from continued fever 2.22, from typhoid fever 1.44, from remittent fever 0.58, and from intermittent fever 0.13. Hence, as the mean yearly total strength was 1695.8, the mean annual death-rates were :

From	All Causes...	23.94
,,	Dysentery...	6.89
,,	Continued Fever... ...	1.31
,,	Typhoid Fever	0.85
,,	Remittent Fever	0.34
,,	Intermittent Fever ...	0.08

The only other diseases of which statistics are given are diarrhœa and liver complaints. From the 1st April, 1857, to the 31st December, 1867, the mean annual death-rate from the former was 0.26 per 1000, and from the latter 2.24.

Percentages of Admissions in each quinquennial period.

169. The admissions, and their percentages to the total strength, for five-year periods, were as follows :

TABLE *q*.

Quinquennial Periods.	Total Admissions.		Admissions of cases of Continued Fever.		Admissions of cases of Dysentery.	
	Numbers	Percentages	Numbers	Percentages	Numbers	Percentages
1823-27 ...	8503	124.6	935	13.8	1224	17.9
1828-32 ...	12686	139.5	1568	17.2	1911	21.2
1833-37 ...	13034	131.3	1790	18.0	1811	18.3
1838-42 ...	6864	76.6	953	10.6	717	8.0
1843-47 ...	8600	96.2	1474	16.4	715	8.9
1848-52 ...	8051	97.0	838	10.1	586	7.1
1853-57 ...	7584	105.6	694	9.7	422	5.9
1858-62 ...	7204	86.8	538	6.4	556	6.7
1863-67 ...	8233	94.0	635	7.2	532	6.1
Yearly Means	1794.6	105.8	209.5	12.4	188.3	11.1

Dysentery the most fatal disease.

170. Although continued fever was somewhat more prevalent than dysentery, yet, as we have seen, the latter was much more fatal. In fact, of all the diseases mentioned dysentery was the most fatal; but for some cause or another it was less prevalent and fatal after 1838 than it had been during the previous 15 years.

Comparison of the Death-Rates among the Troops and the White Population, for the period 1825-30.

171. We have seen (p. 116) that, according to Baron d'Unienville, the mean death-rate among the total white population for the five years from the 1st January, 1825, to the 1st January, 1830, was 23.57. According to the Military Statistics (Table XXXV, Appendices) the mean death-rate among the troops (total strength) for the same five years was 25.52. The higher mortality among the troops was probably due to the circumstance that most of them were stationed in Port Louis, and the rest at the Posts on the littoral; whereas more than one half of the white population lived in the rural Districts. The death-rate among the white population of Port Louis was much higher, namely, 37.56. *

Sanitary condition of temporary residents, as Troops, not so good a criterion of the healthiness of a climate as that of permanent residents.

172. It may be doubted whether statistics of sickness and mortality among troops are as good a criterion of the healthiness or unhealthiness of a country as similar statistics relating to the native or permanent population. A regiment may arrive with diseases contracted in another place, may lose a number of men in a short time, leave after a few months' residence, and be replaced by another regiment also more or less diseased. Even in the case of healthy troops, we may suppose that a certain length of residence is required for their acclimatation before their sanitary condition can be accepted as an index of the influence of climate. Nevertheless, it is considered that statistics of disease and mortality among bodies of soldiers who have lived sufficiently long in a country are a fair index of the effects of climate; and that, when these conditions exist, such statistics may, in the absence of better, be used for ascertaining approximately the relative healthiness of different countries; the more especially as soldiers are subjected to the same régime and the same medical treatment.

Relative salubrity of Mauritius and other Countries, according to Death-rates of Troops.

173. Accordingly, comparisons have been made between the death-rates among soldiers in various parts of the world, with the view of forming an idea of the relative heathiness of different climates. The following Table of the death-rates per 1000 of soldiers stationed in various Colonies and in the United Kingdom is given by Dr. Davidson (Inquiry p. 2); the rates for the several Colonies having been taken from a Table compiled by Dr. Mann from the Records of the Army Medical Department, and published in 1860. " I have myself ", remarks Dr. Davidson, " added, for the sake of comparison, that of the troops of the United-Kingdom for the years 1860—64 ".

* This high rate may have been partly owing to invalids from different parts of the Colony dying in Port Louis.

Death-rates among the Troops in Mauritius and other Countries.

Countries.	Death-Rates per 1000.
Sierra Leone	480
Jamaica	121
West Indies (generally)	78
Madras Presidency	48
Bermuda	28
Mauritius	27
St. Helena	25
Gibraltar	21
Malta	16
Canada	16
Nova Scotia	14
New Brunswick	14
Cape Colony	9—14
United-Kingdom 1860-64	9—24

With the exception of the United-Kingdom, it is not stated for what years the death-rates are given. As regards Mauritius, the period with which a death-rate of 27 agrees most (according to Dr. Reid's Tables) is 1823-37; for any decade after 1837 the death-rate was considerably less than 27; it was 23.9 for the whole period 1823-67, 25.37 for the period 1823-62, 23.69 for the period 1838-62, and 21.83 for the period 1838-67.

Dr. Davidson's conclusion.

174. Commenting on the above Table, Dr. Dadvidson says: "There is only one conclusion to be derived from this Table, viz.:—that Mauritius was never a healthy place. The mortality, although much less than that of various tropical countries, was nearly *three times** that of Great Britain."

Not in accordance with the Evidence.

175. The period for which the death-rates in the Colonies is given must have been before 1860, for the Table was published in that year; and it would appear that it did not go farther back than 1818. Now, it cannot be concluded from such a Table "that Mauritius was never a healthy place." Mauritius had been inhabited, and troops stationed in it, during 100 years before the period covered by the Table; and no evidence has been adduced to show that during that time the Colony had been unhealthy. No trustworthy conclusion can be drawn

* The *Italics* are Dr. Davidson's.

from the Table as to the health of the Island in previous years of its history. Again, the statement that the mortality among the troops stationed in Mauritius "was nearly *three times*" the mortality among the troops stationed in the United-Kingdom is not supported by proper evidence. The death-rate given for Mauritius (27) is for some period before 1860; whereas the death-rate given for the United Kingdom (9.24) is for the years 1860-64. Judging from the death-rate given for Mauritius the period was previous to 1838; for after 1838 the death-rate for any period exceeding 10 years was considerably less than 27 per 1000. Now, to compare the death-rate of the troops in the United Kingdom in 1860-64 with that of the troops in Mauritius during an earlier period (probably 30 or 40 years earlier), and then to infer from the comparison that Mauritius had never been healthy, is objectionable. One ground of objection is that, as the Army death-rates decreased generally in proportion to the introduction of improved modes of treatment, a comparison of the death-rates of one country in 1860-64 with those of another country at a former period could not be taken as a fair index of their relative healthiness. The death-rates should have been for the same years, either for 1860-64, or for the period, whatever it may be, during which the mean annual death-rate of the troops in Mauritius was 27 per 1000 of the total strength. If Dr. Davidson had taken the period 1860-64 alone he would have obtained different results.

Death-Rates of the Troops in the United-Kingdom in 1861-64.

176. I cannot find the death-rate among the troops in the United Kingdom during 1860; but the rates during the years 1861-64 are given in the Fortieth Report of the Registrar General of England (p.ci); and the approximate rate for 1860, as deduced from the rates among the general population, was 13.8 per 1000. For the years 1861-64 the total strength and total death-rates were as follows:

Years.	Total Army.	Death-Rates per 1000.
1861	97,785	13.3
1862	89,672	11.3
1863	85,262	11.2
1864	82,721	12.3

The mean death-rate for the four years was 12.02.

Death-Rates of the Troops in Mauritius in 1861-64.

177. In the same years the death-rates among the troops in Mauritius were as follows:

Years.	Total Strength.	Death-Rates per 1000.
1861	1915	11.5
1862	2049	41.5
1863	1978	9.6
1864	1789	8.9

The mean death-rate for the four years was 18.37.

Unfortunately, in Mauritius an epidemic of cholera in 1862 raised the mortality in that year far above the average. But notwithstanding this, the mean death-rate for the four years, in place of having been nearly three times the death-rate of the troops in the United-Kingdom, was not even twice that rate, the ratio being 3:2.

Death-Rates in the United-Kingdom and in Mauritius in 1861-63-64, and in 1863-66.

178. In the three years 1861-63-64, when there was no epidemic, the mean death-rate in Mauritius was only 10.0, while that in the United-Kingdom was 12.3 ; showing that, in so far as can be judged from the death-rates among the troops, Mauritius was healthier in those years than the United-Kingdom. The mean death-rate in the United Kingdom in the four years 1863-66 was 12.03, whereas the mean death-rate in Mauritius in the same years was only 9.42. Allowing for the deaths caused by cholera in 1862, the mean death-rate in Mauritius during the six years 1861—66 was less than the death-rate in the United Kingdom.*

Evidence furnished by Dr. Mann's Table.

179. Omitting the death-rate in the United Kingdom in 1860-64, which, I think, should not have been added "for the sake of comparison," what Dr. Mann's Table, as given by Dr. Davidson, shows, if the figures are correct, is, not "that Mauritius was never a healthy place," but that during the period in question the death-rate among the troops in Mauritius was less than that in every other tropical Colony, except St. Helena, but greater than those in extra-tropical Colonies. In fact, allowing for the smaller number of troops in St. Helena, we may, without much risk of error, say, that, *according to the death-rates,* Mauritius was the healthiest of all the tropical countries mentioned, and very much healthier than most of them.

With regard to the extra-tropical Colonies, the circumstance that the death-rate among the troops in Mauritius was greater than the death-rate among the troops in Gibraltar, Malta, Canada, &c., is not conclusive proof that Mauritius had always been less healthy than those places, any more than the circumstance that the death-rate among the troops in Mauritius in 1863-66 was less than that in the United Kingdom, proves that the United Kingdom had always been less healthy than Mauritius. The death-rates among the troops are at best but a rough indication of the comparative healthiness of different climates, especially when the periods of comparison are not very long, and the differences in the death-rates are not very great. We can see at once that Sierra Leone, Jamaica, and the West Indies generally, were more unhealthy than Mauritius, the differences in the death-rates being very great ; but it is not so evident that Mauritius was less healthy than Gibraltar, the difference in the death-rates being comparatively small. In such cases in particular, the death-rates among the general population are a much better criterion than those among the troops. At all events, it certainly cannot be inferred from Dr. Mann's Table "that Mauritius was never a healthy place."

* The total deaths among the troops in Mauritius in 1862 was 85, of which 66, or 30.2 per 1000 of strength, were caused by cholera.

Dr. Lawson's Death-Rates from Fever, and from Diarrhœa and Dysentery, among Troops in different places.

180. Some time ago Dr. Lawson, late Deputy Inspector of Hospitals, compiled, from statistics in the War Office, a Table showing the millesimal death-rates from fevers, and from dysentery and diarrhœa, for the years 1818-1836, among British troops stationed in different parts of the world. This Table was prepared by Dr. Lawson in connection with his theory of "pandemic waves," and it was printed in full in one of the Army Medical Reports.

Dr. Davidson's application of Dr. Lawson's Table.

181. After referring to Dr. Lawson's Table, Dr. Davidson gives (Inquiry p. 5) the portion of it containing the death-rates from diarrhœa and dysentery during the period 1827-36. "We shall," Dr. Davidson says, "select for comparison the years 1827 to "1836 inclusive, because during these years, the treatment "followed was pretty much the same at the different stations." He then presents the following statement :

Death-Rates per 1000 from Diarrhœa and Dysentery in different Countries.

Years.	England.	Canada.	Cape.	Ionian Islands.	Jamaica.	Ceylon.	Mauritius.
1827	.....	0.7	...	2.0	2.9	23.3	3.5
1828	......	......	5.6	4.3	2.0	11.6	17.7
1829	......	0.7	1.7	5.0	1.8	22.4	12.7
1830	0.8	......	1.7.	2.2	2.5	20.5	4.4
1831	0.3	0.6	1.7	0.9	5.8	14.6	14.1
1832	......	0.4	1.8	3.7	1.5	23.8	9.7
1833	0.3	0.8	...	2.1	6.4	15.0	9.4
1834	0.5	0.8	...	1.2	7.0	11.6	10.4
1835	......	......	...	1.5	3.1	26.4	12.9
1836	0.3	......	...	0.6	0.7	16.3	12.3

Remarks by Dr. Davidson.

182. "It will," Dr. Davidson remarks, "be seen from this "Table (the above) that while only one soldier in 2000 or 3000 "died of dysentery in England, from 3.5 to 17.7 in every 1000 "died in Mauritius ; the average mortality being about 12 per "1000—a rate considerably higher than that which obtained in "Jamaica, and only contrasting favourably with such notoriously "malarious countries as Ceylon. The high total mortality proves "that Mauritius was never the healthy Colony that it is often "represented to have been ; and the great prevalence of dysen- "tery clearly indicates that the coast (for the troops were chiefly "stationed along the coast line) was miasmatic even before the "advent of fever."

A comparatively high Death-Rate from Dysentery and Diarrhœa in Mauritius during the decade 1827-36, does not prove that the Colony was less healthy than places in which the Mortality from those diseases was less.

183. There is no doubt that during the decade 1827-36 the death-rates from dysentery *and* diarrhœa in Mauritius were greater than those from the same diseases in England, Canada, the Cape, the Ionian Islands, and Jamaica; but dysentery, as we have seen, having been the most fatal disease in Mauritius, a higher death-rate from it and ~~dysentery~~ diarrhœa than in other places does not show that, on the whole, those places were healthier; for the mortality in them from other diseases may have exceeded those in Mauritius. Besides, as the Table only gives the *total* mortality from dysentery *and* diarrhœa, without distinction, it is not known what was the death-rate for each of them. We only know that the death-rate for both together was greater in Mauritius than in any of the other Colonies mentioned, except Ceylon.

Death-Rates from Dysentery and Diarrhœa in different Countries in 1818 to 1836.

184. As Dr. Davidson has only given a portion of Dr. Lawson's Table, it may be well to give it here in full. It contains, as I have said, not only the death-rates from dysentery and diarrhœa, but also the death-rates from fevers, for the period 1818-36. For the sake of convenience, I will give these two classes of mortality separately. The rates for dysentery and diarrhœa together were as follows:

TABLE r.

Years.	Cape Town.	Mauritius.	Ceylon.	Jamaica.	West Indies.	Gibraltar.	Malta.	Ionian Islands.	Canada.	Means.
1818	1.5	10.7	55.5	4.7	38.3	2.9	3.0	3.1	1.3	13.4
1819	1.7	7.9	34.8	5.5	20.9	2.2	5.3	3.3	1.4	9.2
1820	1.6	12.9	23.3	4.7	12.0	0.7	2.6	3.5	0.0	6.8
1821	2.5	8.5	18.0	6.5	17.3	1.4	3.6	2.6	0.3	6.7
1822	6.5	6.7	23.2	4.3	9.4	0.7	2.4	2.6	0.0	6.2
1823	1.5	6.4	13.5	4.4	7.0	0.4	1.0	2.4	0 3	4.1
1824	0.8	8.4	29.2	3.7	8.2	3.6	8.1	3.0	0.9	7.2
1825	3.0	4.4	26.9	6.4	16.8	3.2	1.7	3.2	0.7	7.4
1826	3.0	6.7	21.6	1.5	13.2	0.8	1.9	0.3	0.7	5.5
1827	3.5	3.5	23.3	2.9	14.8	1.6	2.3	2.0	0.7	6.1
1828	0.0	17.7	11.6	2.0	12.4	1.7	2.8	4.3	0.0	5.8
1829	0.0	12.7	22.4	1.8	8.4	0.5	3.9	5.0	0.7	6.2
1830	0.0	4.4	20.5	2.5	14.8	0.8	7.0	2.2	0.0	5.8
1831	1.7	14.1	14.6	5.8	14.9	0.3	3.4	0.9	0.6	6.3
1832	3.6	9.7	23.8	1.5	23.1	0.3	2.4	3.7	0.4	7.6
1833	0.9	9.4	15.0	6.4	16.2	0.3	0.9	2.1	0.8	5.8
1834	0.9	10.4	11.6	7.0	14.1	3.5	1.8	1.2	0.8	5.7
1835	0.0	12.9	26.4	3.1	16.1	4.0	1.4	1.5	0.0	7.3
1836	1.3	12.2	16.3	0.7	24.7	1.6	4.1	0.6	0.0	6.8
Means ...	1.8	9.5	22.7	4.0	15.9	1.6	3.1	2.5	0.5	6.8

Comparatively large Death-Rates from Dysentery and Diarrhœa in Mauritius.

Comparing the above Table (the original) with that given by Dr. Davidson, it will be observed that he has excluded the West Indies, Gibraltar, and Malta, and added England; and that in the period which he selected (1827-36) the death-rates from dysentery and diarrhœa in Mauritius chanced to be greater than they had been in the previous years (1818-26), the difference amounting to 1.6 per 1,000. Still, the mean death-rate for the two diseases in Mauritius (9.5), from 1818 to 1836, was greater than in the other places, with the exception of Ceylon and the West Indies. But from this we cannot conclude that Mauritius was less healthy than those other places—less healthy, for example, than Jamaica, where the death-rate from dysentery and diarrhœa was less than one half of that in Mauritius.

Death-Rates from Fevers in different Countries in 1818 to 1836.

185. The death-rates from fevers, as given by Dr. Lawson, but to which Dr. Davidson does not allude, were as follows :—

TABLE *s*.

Years.	Cape Town	Mauritius.	Ceylon.	Jamaica	West Indies.	Gibraltar	Malta.	Ionian Islands.	Canada	Means.
1818 ...	0.0	1.1	133.8	71.0	60.9	5.8	5.6	14.0	1.8	32.7
1819 ...	2.5	1.2	40.3	273.8	39.0	2.5	3.3	19.2	1.7	42.4
1820 ...	2.5	0.7	4.4	134.6	78.7	3.0	3.2	7.0	0.6	26.1
1821 ...	0.0	1.5	10.8	94.4	67.1	3.6	1.0	21.7	2.8	22.9
1822 ...	2.5	0.0	28.8	154.6	47.0	2.2	6.2	13.5	1.3	28.4
1823 ...	1.5	0.8	20.0	52.7	23.0	0.7	1.5	19.0	3.4	13.6
1824 ...	3.0	0.8	104.9	67.4	43.2	5.3	7.0	18.7	2.3	28.1
1825 ...	6.7	0.9	27.6	287.8	38.5	3.2	2.3	8.3	4.3	42.2
1826 ...	0.8	3.0	3.2	69.6	30.3	4.2	2.4	11.0	3.2	14.1
1827 ...	4.2	0.4	12.4	213.6	52.2	1.9	2.3	16.0	4.6	34.1
1828 ...	5.2	7.0	9.3	64.3	49.0	121.1	3.3	20.8	3.2	31.5
1829 ...	0.0	1.2	3.9	40.6	21.1	1.1	0.4	13.4	1.6	9.3
1830 ...	0.9	3.1	5.0	77.4	28.5	1.4	2.6	13.3	1.6	14.9
1831 ...	1.7	0.0	4.6	106.6	30.5	3.2	3.4	7.7	1.6	17.7
1832 ...	0.9	1.6	8.3	91.3	10.8	2.5	1.0	1.8	2.9	13.5
1833 ...	0.0	2.7	2.5	61.1	13.3	0.7	1.9	5.5	0.8	9.7
1834 ...	0.0	2.7	2.9	56.4	10.0	1.3	6.4	6.1	2.4	9.7
1835 ...	3.4	0.0	11.0	54.8	22.2	0.3	0.5	3.1	2.4	10.9
1836 ...	1.0	2.6	4.3	39.9	34.1	1.9	2.3	3.6	2.4	10.2
Means ...	1.9	1.7	23.1	105.9	36.8	8.7	3.0	11.9	2.4	21.7

Comparatively small Death-Rate from Fevers in Mauritius.

The above Table gives results very different from those of Table *q*. It shows that the death-rates from fevers in Mauritius during the period 1818-36 were *less* than in any other of

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the Colonies mentioned—tropical or extra-tropical. We are not to conclude, however, that because in the years 1818-36 Mauritius stands at the head of the list, with regard to its small mortality from fevers, it was healthier than any of the other Colonies, and had always been so.

The most striking circumstance is, that while the deaths from fevers in Mauritius are now very numerous, it would appear that at one time they were very few.

Results of Dr. Lawson's Table.

186. Combining the millesimal death-rates from diarrhœa, dysentery, and fevers, we find that the results of Dr. Lawson's Table are as follows :

Countries.	Death-Rates from Diarrhœa and Dysentery.	Death-Rates from Fevers.	Total Death-Rates.
Cape	1.8	1.9	3.7
Mauritius	9.5	1.7	11.2
Ceylon	22.7	23.1	45.8
Jamaica	4.0	105.9	109.9
West Indies	15.9	36.8	52.7
Gibraltar	1.6	8.7	10.3
Malta	3.1	3.0	6.1
Ionian Islands ...	2.5	11.9	14.4
Canada	0.5	2.4	2.9

Evidence furnished by Dr. Lawson's Table.

187. What Dr. Lawson's Table shows, then, is, that during the period 1818-36 the death-rate from diarrhœa, dysentery, and fever together was not only much less in Mauritius than in any of the other tropical Colonies mentioned, but less than in the Ionian Islands, and not much more than in Gibraltar. The only places in which the total death-rate from those diseases was decidedly less than in Mauritius were Canada, the Cape, and Malta.

No Evidence that Mauritius was never a healthy place.

188. While the Tables of Dr. Mann and Dr. Lawson do not show that Mauritius was never healthy, there is strong evidence that, if it was never as healthy as some extra-tropical countries, yet it was healthier than many of them, and healthier than most, if not all, tropical countries. In his *Topographie Medicale de l'Ile de France* (Paris 1812), Dr. Ch. Chapotin, *Ex-Chirurgien major de l'hopital militaire de l'Ile de France*, begins his description of the diseases of Mauritius in the following terms: " L'île de France est très-salubre. Le particulier qui peut se

Evidence that it was healthy.

"soustraire aux grandes chaleurs, en passant l'été à la Campagne, jouit habituellement d'une bonne santé. Des personnes, "habitant depuis longtemps la colonie, pretendent que les "maladies y sont plus fréquentes et plus graves : j'ignore jusqu'à quel point cette opinion peut être fondée. Il est probable "que les *defrichés* (1) trop étendus, la population plus nombreuse, "la vie actuelle moins active et moins frugale que celle des "premiers habitants, les relations plus multipliées avec les îles "voisines, l'introduction du luxe, contribuent à développer plus "de maladies dans la ville ; mais je suis certain que les campagnes, ou ces causes n'existent pas, ont conservé leur salubrité." Now, it is not likely that an experienced medical man, who had been on the spot, and who had had the best opportunities of judging, would be so far mistaken as to say that the Colony was "very healthy," if it was really unhealthy. It appears from his book that Dr. Chapotin was in Mauritius at least in 1809 and 1810, and his statements are confirmed by Baron d'Unienville's statistics, according to which, as we have seen, the mean annual death-rate among the white population from 1804 to 1825 was only 18.89 per 1000—a rate less than the present death-rates of England and France. Besides, if Mauritius was never the healthy colony which the universal testimony of the oldest of its inhabitants represents it to have been, it is not probable that it would have been used as a sanitarium for invalids, not only from India, but occasionally from England and other places, or that children would have been sent to it for their education. The circumstance, also, that, so far as is known, the death-rates of Rodrigues and the Seychelles at the present day are not greater than those of Mauritius were in former times, goes to show that when the population was less than one fourth of what it is now, the Colony was, as stated by Dr. Chapotin, "*très-salubre.*" There is, in short, so far as I can find, no ground for disparaging the reputation which Mauritius has long had of having been a healthy place. No one supposes that the Colony ever was as healthy as some places. But if we are to judge of the comparative healthiness of different countries from the character and frequency of their diseases, from the death-rates, from longevity, and from climate, we must, I think, conclude that in former times Mauritius was one of the healthiest places in the world.

Blue Book Statistics.

189. Some time ago, Mr. D. P. Garrioch, of the Colonial Secretary's Office, and Secretary to the Sanitary Commission, favored me with Returns of all the vital statistics of the Colony obtainable from the Blue Books for the years 1831 to 1860 inclusive. Mr. Garrioch examined each Blue Book, carefully and thoroughly, on two separate occasions. But he found that, unfortunately, in some years the data were incomplete, and in others doubtful.

For each of the years 1831-34 the General Population (white and free) and the slaves are given separately, together with the births and deaths among each class.

On the 1st February, 1835, the slaves were emancipated, and, for some years after, the ex-slaves formed the class called at first Apprentices, and then Ex-Apprentices. Meanwhile, another class, the Indian Immigrants, arose.

(1) Mot adopté dans le pays pour exprimer le lieu defriché.

Data incomplete.

190. The Blue Books profess to give the total population of the Colony in each year, excepting 1854, for which they give no statistics at all. But it is evident that the numbers are often incorrect. For example, for the years 1841 and 1842 the same population is given, and also for the years 1851, 1852, and 1853. The births and deaths among the ex-slaves in 1835 and 1836 are not given, and the births and deaths among the total population in the years 1853-58 are incomplete.

Steps taken for completing the data.

191. Notwithstanding these drawbacks, I believe that I have succeeded in obtaining fairly reliable results. Finding that the data in the Blue Books, particularly the estimated populations, could not always be used, recourse was had to every available means of procuring the best possible values of the annual death-rates for the whole Colony. These means were :

1. The records of the Civil Status Office.

2. The annual arrivals and departures among the General Population, as recorded in the Department of the Port Office.

3. The annual arrivals, departures, births, and deaths among the Indian population, from 1834 to 1860, as published by the Registrar General.

4. The results of the Censuses taken in 1846, 1851, and 1861.

First of all, the Registrar General was good enough to direct some of his Assistants to compile from the records of the Civil Status Office statements of the births and deaths in 1835-36 and 1853-58, and these statements filled up some of the principal gaps.

With regard to the arrivals and departures among the General Population, the task was more formidable. The results for each year, from 1861 to 1880, which have been used in preparing Table Z (p. 43) were ready at hand, Mr. S. J. Jenkins, who has been in the Harbour Department since 1860, having compiled accurate monthly and yearly Returns for that period. But for previous years there were no such Returns; and, moreover, it was found that there were no data from which any could be formed, except for the eleven years 1850-60 ; the departures and arrivals among the General Population not having been registered, at least by the Harbour Department, before 1850. The entries for the years 1850-60, comprising the names of the vessels and of the passengers, were placed at my disposal by the Deputy Superintendent of the Mercantile Marine Office, Mr. N. Cartier; and two clerks, who completed their work in three weeks, were employed to compile Tables showing the monthly and yearly arrivals during that period. For the previous years 1831-49 all that could be done was to assume that the mean annual excess of arrivals over departures was the same, in proportion to the population, as in 1850-60.

Vital Statistics of Mauritius from 1831 to 1860.

192. The object was to obtain as accurate values as possible of the total arrivals, total departures, total births, and total deaths, in each year ; and, with these data and the enumerated populations in 1846, 1851, and 1861, to determine the living population on the 31st December of each year. With fairly accurate

values of the population in each year, if the number of deaths given in the Returns supplied by the Officers of the Civil Status were tolerably correct — approximately accurate death-rates could be obtained. Accordingly, all available means were employed to secure the most reliable estimates of the population. The final results for the period 1831-60 are as follows :

TABLE I.

Years.	Estimated Population on 31st December.	Total Births.	Arrivals.	Departures.	Total Deaths.	Death-Rates.
1831......	92951	2358	......	......	2495	26.84
1832......	93038	2624	......	......	2917	31.35
1833......	93643	2786	......	......	2561	27.35
1834......	93209	2829	75	4	3714	39.85
1835......	93631	2181	1254	26	3367	35.96
1836......	97534	2910	3823	190	3020	30.96
1837......	103935	2725	7292	134	3862	37.16
1838......	115110	2074	11808	154	3533	30.70
1839......	114989	3120	1035	173	4483	38.99
1840......	115476	3872	116	417	3464	30.00
1841......	114380	3821	542	1089	4750	41.53
1842......	112242	3770	83	2115	4760	42.41
1843......	144137	4471	34525	2902	4993	34.64
1844......	149564	4192	11549	2461	8737	58.41
1845......	156967	4408	10971	2662	6198	39.48
1846......	162170	5045	7339	2760	5305	32.71
1847......	162535	5188	5830	1784	4764	29.31
1848......	166529	5133	5395	3015	4403	26.44
1849......	169770	5059	7125	4892	5235	30.84
1850......	176307	5281	12193	5390	5547	31.46
1851......	184496	5288	12371	4580	4890	26.50
1852......	199158	5775	19674	5196	5591	28.07
1853......	208800	5864	14568	4598	6192	29.66
1854......	212482	6364	20872	5576	17978	84.61
1855......	220238	5931	15598	6504	7269	33.01
1856......	223736	6076	15378	6644	11312	50.56
1857......	234153	7110	16356	6942	6107	26.08
1858......	257736	7544	34024	10713	7242	28.09
1859......	297267	8275	48377	7942	9179	30.88
1860......	309901	9737	18289	5587	9805	31.64

In the above Table, no arrivals and departures are given for the three years 1831-33, because no Returns could be found; but to the estimated total population on the 31st December of each of those years 380 has been added, that number having been the most probable excess of arrivals over departures among the General Population. For the same reason, from 1834 to 1849 inclusive, the arrivals and departures among the Indian Immigrants only are given; but to the estimated populations of those years have also been added the probable excesses of arrivals over departures among the rest of the population. It is only from 1850 to 1860 that we have the actual total arrivals and departures, the arrivals and departures among the General Population in those years having been obtained from the records of the Port Department.

193. The enumerated populations, according to the Censuses of 1846, 1851, and 1861, were as follows:

Estimated Population on the 31st December, 1846, 51, and 61.

Total population on	1st August	1846	158,462
" "	20th November	1851	180,823
" "	8th April	1861	310,050

Allowing for the births, deaths, &c., from the 8th April to the 31st December, 1861, the population on the latter day was 324,288 (par. 56, p. 42). On the 31st December, 1851, the population, obtained in the same way from the enumerated population on the 20th November of that year, was, according to the Blue Book, 184,496. The population on the 31st December, 1846, given in the Blue Book for that year, and said to have been derived from the enumerated population and from the births, deaths, &c., from the 1st August to the 31st December, is 166,872. But this number is evidently too large; for while it shows an increase in five months of 8,410, the increase of the Indian Population for the whole year was only 3,840. The arrivals of immigrants and their families from the 1st August to the 31st December, according to a statement for which I am indebted to Mr. C. G. Hall, of the Immigration Department, were 3,820, and the departures during the year (those during the last five months are not known) 2,556. Moreover, in 1846 the total deaths exceeded the total births; and it is very improbable that 5000 persons were added to the general population through arrivals in the last five months of the year. As nearly as can be ascertained, the population on the 31st December, 1846, assuming the enumeration on the 1st August to have been correct, was 162,170.

Points of Departure.

194. Taking, then, the estimated populations on the 31st December, 1861, 1851, and 1846, as points of departure, and allowing for the annual number of births, arrivals, deaths and departures, we get the estimated populations given in the second column of the above Table. Commencing with the estimated population on the 31st December, 1851, and working backward, we find, for example, that, the population on that day having been 184,496, the total births in the course of the year 5,288 the total arrivals 12,371, the total departures 4,580, and the total deaths 4,890, the population on the 31st December, 1850, was 176,307. Again, working forward from the 31st December, 1851, we find that as the total births in 1852 were 5,775, the total

arrivals 19,674, the total departures 5,196, and the total deaths 5591, the population on the 31st December, 1852, was 199,158. In this way the estimated populations for the period 1847-60 have been obtained, and, working backward from 1846, also those for the period 1831-46.

Verifications.

195. The results of the Censuses of 1861 and 1851 serve to some extent to show the amount of probable error in the above annual estimated populations for the decade 1851-60. If the Censuses were correct, and the returns of births, deaths, arrivals, and departures also correct, we should, working forward from the enumerated population on the 20th November, 1851, to the taking of the next Census on the 8th April, 1861, find the estimated population on that day the same as the enumerated population; and working backward from the enumerated population on the 8th April, 1861, find the estimated population on the 20th November, 1851, the same as the enumerated population. The difference of the two results is 1,021; that is, working forward from 1851 to 1861 the estimated population is 1,021 greater than the enumerated population, and working backward from 1861 to 1851 the estimated population in 1851 is 1,021 less than the enumerated population. In other words, there is, in the taking of the Censuses, or in the records of the births, deaths, &c., or in all of them together, an error of 1,021. Now, this error is much less than that of 13,857 in the decade 1861-71 (par. 56, p. 42); and hence we conclude, either that the Censuses of 1851 and 1861 were more accurate than that of 1871, or that there were great defects in the registrations of births, deaths, arrivals, or departures, from 1861 to 1871.

Working backward from 1851 to 1846, we get for the estimated population on the 31st December 1846, the number 157,181; whereas, according to the Census of 1846, it should have been, as nearly as can be ascertained, 162,170*. The difference (4,989) was probably in some measure due to an imperfect Census in 1846. Nevertheless, adopting the results of that Census, and working backward, we find that the estimated population for the 31st December, 1835, differs from the population given for the 1st January, 1836, in the *Almanach pour l'Année* 1837, to the comparative small extent of 1484. Again, the estimated population, by the same process, for the 31st December 1830, is 92,710, while for the 1st January of that year Baron d'Unienville makes it 91,826. And the difference between the population given in the Blue Book for 1833, and the population obtained for that year by working backward from 1846, is only 188.

Estimated Populations in Blue Books from 1836 to 1858.

196. These results show that the estimated populations given in the Blue Books from 1836 to 1858 are very inaccurate. The population on the 31st December, both of 1857 and 1858, for example, according to the Blue Books, was 180,823; whereas, according to the Census of 1861 and the births, deaths, &c., it was 256,715 on the 31st December, 1858, and, according to the Census of 1851 and the births, deaths &c., 257,736; so that in the former case the difference between the Blue Book and the figures obtained from the Census, &c., was 75,892, and in the latter 76,913. Now, as the estimated population could only

* The Blue Book makes it 166,872, which is evidently wrong.

have been derived from the Census of 1861 and the births, deaths, &c., these large differences indicate that the estimated populations given in the Blue Books for 1857 and 1858 were put down at random; and a similar remark applies to other years.

Estimated Populations in Tables *t*.

197. On the other hand, as the difference of the results for the ten years 1851-61 obtained by calculating backward from the Census of 1861, and forward from the Census of 1851, is only 1,021, we have reason to assume that the estimated populations given for that period in Table *t* are tolerably accurate. The estimated populations given for the years 1831-50 may also be considered fair approximations, especially those for the years 1831-35 and 1847-50. Of course, the accuracy of the results depends upon the accuracy of the Censuses and the accuracy of the births, deaths, arrivals, and departures; but, beyond supplementing the arrivals and departures among the General Population for the period 1850-60, all that could be done was to adopt the returns furnished by the Census Commissioners and the Civil Status. On the whole, I think that the results given in Table *t* may be accepted as the most accurate that can be obtained at present, and as fairly reliable.

198. In Tables Z and *t*, then, we have the annual death-rates per 1000 of the total population of Mauritius (exclusive of the Military and Shipping) for the 50 years 1831-80. For the sake of comparison, these death-rates are reproduced in the following Table:

Death-Rates in Mauritius from 1831 to 1880.

TABLE *u*.

Years.	Total Pop.	Death Rates.	Years.	Total Pop.	Death Rates.
1831 ...	92951	26.84			
1832 ...	93038	31.35	1857...	234153	26.08
1833 ...	93643	27.35	1858...	257736	28.09
1834 ...	93209	39.85	1859...	297267	30.88
1835 ...	93631	35.96	1860...	309901	31.64
1836 ...	97534	30.96	1861...	324287	31.13
1837 ...	103935	37.16	1862...	330575	41.50
1838 ...	115110	30.70	1863...	335310	34.79
1839 ...	114989	38.99	1864...	341392	34.12
1840 ...	115476	30.00	1865...	360337	33.42
1841 ...	114380	41.53	1866...	365051	32.06
1842 ...	112242	42.41	1867...	332968	120.47
1843 ...	144137	34.64	1868...	324370	56.73
1844 ...	149564	58.41	1869...	322892	34.98
1845 ...	156967	39.48	1870...	328604	22.59
1846 ...	162170	32.71	1871...	319470	25.58
1847 ...	162535	29.31	1872...	325960	26.83
1848 ...	166529	26.44	1873...	332476	33.75
1849 ...	169770	30.84	1874...	339806	29.49
1850 ...	176307	31.46	1875...	345037	24.88
1851 ...	184496	26.50	1876...	346390	27.50
1852 ...	199158	28.07	1877...	349060	29.61
1853 ...	208800	29.66	1878...	355058	27.18
1854 ...	212482	84.61	1879...	357774	32.10
1855 ...	220238	33.01	1880...	360328	28.15
1856 ...	223736	50.56			

Periods and years of high Death-Rates.

199. On looking over the above Table, we are, first of all, struck with the occurrence, from time to time, of outbursts of increased mortality. It would appear that certain periods were conspicuous for their high death-rates, and that in a certain year in each period the mortality rose pre-eminently above the highest in any of the other years. These periods were 1832-35, 1841-45, 1854-56, and 1867-69; and the years of specially high mortality were 1834, 1844, 1854, and 1867. The mean death-rates of these groups of years went on increasing. Thus:

Progressive Increase of high Death-Rates.

Groups of Years.	Mean Death-Rates.
1832-35	33·62
1841-45	43·46
1854-56	55·69
1867-69	71·22

There was a progressive increase also in the death-rates of the years of highest mortality. Thus:

Years.	Death-Rates.
1834	39·85
1844	58·41
1854	84·61
1867	120·47

Years of subordinate high Death-Rates.

200. In the interval from 1834 to 1841 there were two years, 1837 and 1838, in which the death-rates increased considerably, though not to so great an extent as in 1834; and there was a similar subordinate increase in 1862. If, however, the annual death-rates from 1831 to 1880 were represented by a curve, it would be seen that the most remarkable peaks—the peaks between which the longest intervals of a comparatively small mortality occurred—were those of the years 1834, 1844, 1854, and 1867; and that the most remarkable hollows were those of the years 1831, 1848, 1851, 1857, and 1870.

Years of low Death-Rates.

An increase of Mortality in 1877-80.

201. The four consecutive years of greatest mortality from 1869 to 1880 were 1877-80; but this period was much milder than the former periods, notwithstanding that the death-rate from fever in 1877 was greater than in any year since 1869 (see Table B, p. 3, and Tables *f* and *g*, pp. 60-61.)

Results of Table *u* confirmed by other statistics.

202. What has been said regarding certain periods and years of excessive mortality, as shown by Table *u*, is confirmed by the statistics given in old Almanachs for the years 1831-35 (Table *o* p. 119), and by the amounts of sickness and mortality among the troops from 1831 to 1867 (par. 166 and 167, p. 123, and Tables XXXV and XXXVII, Appendices). Moreover, whether we take the estimated populations given in Table *u*, for 1831 to 1880, or those given in the Blue Books, we obtain the same general results. There can, therefore, be hardly any doubt as to the periods and years in question having been characterised by comparatively high death-rates.

Was the Weather in the periods of high Mortality similar?

203. Reverting, then, to the question (par. 143, p. 112), whether or not, in Mauritius, weather similar to that which prevailed in 1865-67, was accompanied or followed in former times by high death-rates, let us see what were the main features of the weather in 1832-35, 1841-45, and 1854-56, all of which were periods of high mortality.

204. The annual rainfall at the old Observatory, Port Louis, from 1831 to 1835, was as follows:

Characteristics of the Weather in Mauritius in 1831-35.

Years.	Rainfall.
1831	51·08 inches.
1832	27·54 „
1833	46·99 „
1834	43·36 „
1835	51·44 „

On the 4th January and the 4th March, 1832, there were strong gales, but no storm or hurricane occurred in that year. The dry weather which, upon the whole, prevailed in 1832, continued throughout January and February, 1833, and the latter month was exceptionally dry, there having been only 1·89 inch of rain. March, April, and May, 1833, were wet, and on the 10th April there was a strong gale. The months of June to December were comparatively dry. During the first half of January, 1834, only 1·77 inch of rain fell; but 8.86 inches fell from the 15th to the 22nd, and nearly 6 inches on the 20th alone, during a hurricane. In February the rainfall was nearly the average for the month; in March and April considerably below the average; in May nearly the average; in June to November considerably below the average; and in December much above the average, the total fall having been 9·28 inches. In Port Louis the inundations of the 20th January were the heaviest for many years. There was nothing abnormal in the weather of 1835.

Characteristics of the Weather in Mauritius in 1841-45.

205. I find no complete records of the rainfall in 1841-45; but, according to observations taken by Mr. Liénard in Port Louis, the rainfall in 1840-42 was as follows:

Years	Rainfall.
1840	43.31 inches.
1841	38.91 „
1842	25·87 „

The drought of 1842 continued in 1843, and the decrease in the rainfall since 1840 caused considerable alarm. In the minutes of the proceedings of a meeting of the *Société d'Histoire Naturelle* held on the 2nd March, 1843, we read as follows: "Les observations suivantes de M. Lienard établissent qu'en 1840 il est tombé 489 lig. 6 pts. d'eau, 438 lig. 2 pts. en 1841, et 292 lig. 1 pt. en 1842. Quelle différence à remarquer entre cette quantité toujours décroissante de pluie tombant dans l'Ile et celle qui arrive si abondamment d'autres points du globe!" At the next meeting, held on the 6th April, 1843, the following statement was made: "Des observations faites par M. Lienard, pendant les mois de Janvier, Fevrier, et Mars, qui viennent de s'écouler, constatent d'une manière affligeante le fait d'une diminution sensible dans les pluies depuis l'année 1841. En effet, en Mars de l'année 1841, il était tombé 102 lignes, 6 points d'eau, et en Mars de l'année 1843, il n'en était seulement tombé que 41 lignes 3 points, difference de près des deux tiers. "

The droughts of 1842 and 1843 were, as usual, attributed to the destruction of the forests, and it would appear that memorials on the subject were addressed to the local Government and to the Secretary of State for the Colonies. Early in 1844, however, torrential rains, which lasted for weeks, set in, and the question of *reboisement* was dropped.

A strong gale occurred on the 16th January, 1841. As usually happens in dry years, there were no gales in 1842. From the 16th to the 19th January, 1843, there was a gale from S.E. to S. and S.W., but it was not accompanied by much rain. In 1844, a strong gale occurred on the 4th January, with the wind from N.E. to N·W., and much rain; a hurricane from the 20th to the 23rd February; a strong gale on the 20th March; and a strong gale on the 20th December. A heavy gale occurred also on the 8th March, 1845.

Characteristics of the Weather in Mauritius in 1854-56.

206. In the years 1854-56 the observations were more complete. The rainfall was as follows:

Years	Rainfall.
1854	39·42 inches.
1855	42.66 „
1856	46.22 „

The total amount of rain in January, 1854, was 4·12 inches, which was 2·82 inches, or 40·7 per cent. below the average, and from the 1st to the 24th only 0·11 inch fell. In February the total fall was 11·16 inches, which was 0·71 inch above the average; but there was no rain on 15 days, namely, the 1st, 2nd, 4th, 13th to the 21st, 15th, 16th, and 18th. On the 3rd 3·04 inches fell, and from the 5th to the 12th 7·51 inches. March was drier than January, the total fall (3·49 inches) having been 46 per cent. below the average. From the 27th March to the 19th April only 0·82 inch fell; but on the latter day there was a downpour of 4·02 inches; and another of 3·12 inches on the 27th April. On the whole, although there was no rain on 15 days, April was the wettest month in the year, the total fall having been 12·13 inches, or very nearly three times the average. In each of the remaining eight months the rainfall was below the average.

January, February, and March, 1855, were wet months, the rainfall having been above the average, and well distributed. On the 5th February 5·38 inches fell, and the total for the month was 17·40 inches. With the exception of June and September, the remaining months of the year were comparatively dry, especially October, November, and December.

The drought in the latter part of 1855 continued throughout the whole of January, 1856, which was the driest January on record, the total fall having been only 0·72 inch ; of which 0·055 inch fell on the 3rd, 0·120 on the 7th, 0.090 on the 9th, 0·310 on the 12th, 0·005 on the 16th, 0.060 on the 27th, 0.060 on the 29th and 0.020 on the 31st. In February the fall (10·66 inches) was almost the average, and from the 2nd to the 4th 6.64 inches fell. March was a wet month, rain having fallen on almost every day till the 24th, and the total (10·37 inches) having been 139 per cent above the average. From April to September inclusive, the rain was below the average, and from October to the end of the year above it, particularly in November and December.

No hurricane occurred in 1854-56; but there was a gale from the 10th to the 13th February, 1854 ; one from the 22nd to the 24th January, 1855 ; another from the 27th April to the 3rd May, 1855 ; one from the 2nd to the 5th February, 1856 ; and a fifth from the 3rd to the 6th April, 1856.

The mean temperature of the air in 1854 (77°.5) was 1°.0 above the average, and in 1855 and 1856 equal to the average. During the months of January to April inclusive, in each of the years 1854-56, the temperature was 0°.5 to 0°.7 above the average. In the same years the frequency of winds from the N. W. quadrant was above the average.

Characteristics of the Weather in Mauritius in 1865-67.

207. We have already seen that the weather of 1865-67 was characterised by floods and droughts, a temperature above the average, an unusual prevalence of winds from the N.W. quadrant, and an absence of hurricanes.

The years of excessive mortality in Mauritius were attended, or immediately preceded, by abnormal Weather.

208. With regard, then, to the periods of high mortality in Mauritius, viz., 1832-35, 1841-45, 1854-56, and 1867-68, we find that they were characterised by abnormal weather. The droughts of 1832-33, and the floods of 1834, were followed by a high death-rate in 1834 ; the droughts of 1842-43 and the floods of 1844 were followed by a high mortality in 1844 ; the drought in the latter part of 1853 and in January, 1854, and the great fluctuations in the rainfall from January to April, 1854, were followed by a high death-rate in 1854 ; the high death-rate in 1856 was preceded by similar fluctuations in the weather ; and the floods and droughts of 1865-66 were followed by a high death-rate in 1867.

The extremes of weather in 1832-34, 1842-44, and 1865-67 were strongly marked. Those in 1854-56 were also well marked ; but the fluctuations, though excessive, were of shorter duration than in the other periods.

Abnormal Weather in 1837, 1839, and 1861-2, attended by an increase of Mortality.

209. The observations for the years 1836-40 are very incomplete ; but, according to Colonel Lloyd, the rainfall at the old Observatory, Port Louis, in 1836, was 45.00 inches, while from the 1st January to the 19th September, 1837, it was only 18·60 inches. I can find no record of the rainfall in 1838. In 1839 the total fall at the old observatory was only 25.53 inches, which was far below the average. It would thus appear that the subordinate high death-rates in 1837 and 1839 took place during exceptionally dry weather.

Mauritius droughts of 1837 and 1839 not local.

210. It is worthy of remark that the droughts which took place in Mauritius in 1837 and 1839, and which reduced the crops, * were not local, but apparently of wide extent. In 1837-38 the rainfall at Bombay and Calcutta was much below the average, and in those years severe droughts occurred in other parts of India. There was also an intense drought in Australia in 1838-39. "November 2, 1838, was a day of fasting and prayer on account of the alarming continuance of the drought." "With the opening of another year came no rain-bearing clouds; the air was dry, and the sky as clear as ever." In many places the country was literally dried up. Water had to be conveyed from a distance of many miles. The Murray and Ovens ceased to run at the well-known crossing places, and became a chain of ponds. The Murrumbudgee was dried up in many places, and fish were seen in a putrid state on the bed of the river. Sheep and cattle died by hundreds. From a period, according to Captain Stokes, some time previous to July, 1838, up to several months after May, 1839, not a drop of rain fell in Sydney. At Wellington, about the end of October, 1839, the weather arrived at a climax. On the 24th, 25th, and 26th of that month, fearfully hot winds occurred, doing much damage, especially at Yass, Goulburn, and in the Maneroo country. Heavy rains followed; the drought came to a close; and by the end of the year vegetation was luxuriant. †

It has been said that this drought, "after visiting the Cape and Mauritius, in its westerly course, and causing defective crops there, finally reached South America, and produced similar results." † We have seen that it visited India in 1837 and 1838.

It is impossible to believe that such effects were produced by the cutting down of trees in Mauritius.

Characteristics of the Weather in Mauritius in 1861-62.

211. With respect to the high death-rate in 1862, it is to be remarked that the years 1861-62 were characterised (par. 67, p. 48, and par. 70, p. 49,) by extraordinary floods from the 12th to the 17th February, 1861, dry weather during most of the other months of 1861, and a rainfall considerably below the average in 1862, the total fall (without correcting for the elevation of the gauge above the ground) having been only 28·40 inches. It may be mentioned also that in 1862 the rainfall was below the average in many parts of India and Australia. At Sydney, the total fall was only 23·98 inches, or 52·1 per cent., below the average.

Conclusion.

212. The question, then, whether or not in former times weather similar to that which prevailed in 1865-67, was likewise attended or followed by high death-rates in Mauritius, must be answered in the affirmative. Whenever such weather occurred the death-rates increased. Let it be borne in mind that in the intervals between the years and periods of highest mortality the weather did not present the same amount of fluctuation as it did during

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* The late Mr. Edmond de Chazal told me some years ago that in 1839 the sugar-canes were so short that they were carried to the mill in baskets.

† Data concerning the Climate of Australia and New Zealand. By W. S. Jevons.

those years and periods. This will in some measure appear from the dates of the droughts, floods, and highest death-rates, which took place from 1831 to 1867. Thus :

Droughts.		Floods.			Highest Death-Rates.	
Years.	Rainfall.	Years.	Greatest Rainfall in 24 hours.	Dates.	Years.	Rates per 1000.
	Inches		Inches			
1832...	27·54	1834 ...	5.75	Jan. 20...	1834	39.85
1839...	25·53	1844 ...	?	Jan. 4... Feb. 21...	1839	38.99
1842...	25·57	1857 ...	9·55	Jan. 28...	1844	58.41
1862...	28·40	1861 ...	10·00	Feb. 15...	1854	84.61
1864...	24·15	1865 ...	7·46	Feb. 12...	1862	41.50
1866...	20·57	......	......	......	1867	120.47

The mean annual rainfall at Port Louis, for 27 years, was 41·40 inches, and the second column of the above Table shows the rainfall in the driest years of the period 1831-67, while the fourth and fifth columns show, as far as is known, the greatest falls in 24 hours, and the dates. Now, it will be seen that five of the six years of highest mortality occurred during or soon after droughts and floods ; that is, during or after great fluctuations in the rainfall. The only exception is 1854, and it is more apparent than real, for although in that year no great floods or long-continued droughts took place, yet there was a severe drought from October, 1853, to February, 1854, followed by violent alternations in the rainfall from February to May, 1854. As to the floods of the 28th January, 1857, which were not followed by an increase of mortality, like those of the years 1834, 1844, 1861, and 1865, it is to be remarked that they were not preceded or followed by droughts.

An increase of Mortality during long periods of extreme Weather analogous to what happens during short periods.

213. An increase of mortality during years of extreme weather is what we should expect from what frequently takes place on a smaller scale. It is well known in this Colony that when heavy rains fall after warm and dry weather, and are then followed by such weather, sickness and mortality increase. The floods of 1870 and 1878 in Grand Port were followed by a great increase of mortality ; and, as a rule, the death-rates in the several Districts from 1871 to 1879 fluctuated according to the amount and distribution of the rainfall (par. 36, p. 23). We have also seen that malarial fever, dysentery, and other diseases, have yearly periodicities dependent upon the weather and seasons (par.

47, pp. 31-32). Moreover, in the case of some diseases, at least, there are diurnal periodicities, which are likewise dependent upon the elements of weather. If, then, there were a weather-cycle embracing a number of years, in place of 24 hours, or 12 months, and in which, during certain periods, meteorological extremes occurred, such as excessive rains, drought, cold, or heat, we should, reasoning by analogy, expect those periods to be attended or followed by an increase of mortality. The effects, both in the long and in the short cycles, would be instances of the operation of the same general law.

[Were the periods of high Death-Rates in Mauritius also periods of high Death-Rates in other places?]

214. Having found, then, that in Mauritius weather similar to that which prevailed in 1865-67 was attended or followed in former times by high death-rates, let us revert to the question (par. 142, p. 112), whether the death-rates in other places were high in the years 1865-68, as well as in Mauritius. We have found (pp. 105-111) that the abnormal weather of 1865-67 was not confined to Mauritius, but extended over South Africa, Australia, India, &c. Hence, according to the above hypothesis, we should expect to find that during the period in question high death-rates occurred in those other places.

But it has also been found (par. 208, p. 142) that in Mauritius there were other periods of abnormal weather and high death-rates, namely, the periods 1832-35, 1841-45, 1854-56, and (to a smaller extent) 1877-80.

What we have to do, then, is to compare, as far as possible, the weather and death-rates of Mauritius with those of other places, for the years 1831-80. For the data available for this purpose, in so far as the population and the mortality of other countries are concerned, I am mainly indebted to Mr. D. P. Garrioch.

Population and Death-rates of Ceylon from 1828 to 1878.

215. In the "Ceylon Blue Book" and in the "Statistical Tables" of the Board of Trade, are given the population and the registered deaths in Ceylon for each of the years 1828-1878, and from these data the annual death-rates of that Colony have been derived. The results are given in the following Table :

TABLE *v*.

Years	Total Population	Deaths	Death-Rates p. 1000	Years	Total Population	Deaths	Death-Rates p. 1000
1828	934260	10283	11.01	1854	1710124	51082	29.87
1829	941739	12018	12.76	1855	1625960	40542	24.93
1830	962155	14810	15.39	1856	1697356	30730	18.22
1831	959917	17998	18.75	1857	1727964	26681	15.44
1832	1009008	17025	16.87	1858	1759528	31113	17.68
1833	1126808	22380	19.86	1859	1791272	28534	15.93
1834	1167700	15424	13.21	1860	1876467	37718	20.10
1835	1241825	17486	14.08	1861	1919487	37480	15.93
1836	1240653	17439	14.06	1862	2079881	33652	16.18
1837	1256019	15051	11.98	1863	2342098	30024	12.82
1838	1283479	15875	12.38	1864	2051109	39997	19.50
1839	1368838	14238	10.40	1865	2049728	30328	14.80
1840	1400280	22480	16.05	1866	2088027	39125	19.21
1841	1365779	23377	17.12	1867	2093777	44224	21.12
1842	1364539	15784	11.57	1868	2081395	56138	26.97
1843	1442062	27396	18.99	1869	2105288	46801	22.23
1844	Figures of 1843 are repeated.			1870	2128884	40230	18.90
1845				1871	2405287	46803	19.46
1846				1872	2405287	53337	22.17
1847	1555833	25689	16.51	1873	2323760	46732	20.11
1848	1478535	21542	14.51	1874	2418741	49754	20.57
1849	1524174	25618	16.81	1875	2459542	53363	21.67
1850	1588273	22178	13.96	1876	2556777	59446	23.25
1851	1643458	24269	14.76	1877	2580395	76757	29.70
1852	1713738	25886	15.11	1878	2604014	71166	27.31
1853	1675054	28616	17.09				

Periods and years of high Death Rates in Mauritius and Ceylon nearly the same.

216. Comparing the above Table with Table *u* (p. 138), we see that there were periods of high death-rates in Ceylon, as well as in Mauritius, and that these periods were almost the same in both Colonies. The first period in Mauritius was from 1832 to 1835, while in Ceylon it was from 1831 to 1833; the second was from 1841 to 1845 in Mauritius, and from 1843 to 1846 in Ceylon; the third and fourth periods were from 1854 to 1856 and 1867 to 1869 in both Colonies; and the fifth from 1876 to 1878 in Ceylon, and from 1877 to 1880 in Mauritius. In the Ceylon Table there is a gap during 1844-46; but, as indicated by the remark in the register, it would appear that the death-rates were not less than that for 1843. As a matter of fact, the years of greatest mortality in Ceylon, according to Table *v*, were 1833, 1843, 1854, and 1868, while those of greatest mortality in Mauritius, according to Table *u*, were 1834, 1844, 1854, and 1867. We see, also, that the comparatively high death-rates in Mauritius from 1877 to 1880 were represented by high death-rates in Ceylon from 1876 to 1878. The chief differences are that in Ceylon there was no increase of mortality in 1837 and 1839, which was not the case in Mauritius, and that, while there was an increase in Ceylon in 1860, there was one in Mauritius in 1862.

Periods and years of high Death Rates in Australia.

217. From the "Statistics of the Colony of Victoria," the Blue Books of South Australia, New South Wales, and Queensland, and the "Statistical Tables" of the Board of Trade, the following Table of the death-rates of those Colonies and of Tasmania has been derived, the statistics giving the population and the number of deaths for each year. The statistics for Queensland commence in 1857, and those for the other Colonies at earlier dates. Owing to Part XIV of the Statistical Tables of the Board of Trade not having been found among the collection of those publications in the Colonial Secretary's Office, the death-rates of Tasmania for the years 1868-70 cannot be given.

TABLE *w*.

Years.	Victoria.	South Australia.	New-South Wales.	Queensland.	Tasmania.	Means.
1850 ...	10.24	15.48	9.74	......	15.75	12.80
1851 ...	11.95	14.62	13.19	......	16.00	13.94
1852 ...	12.51	16.00	17.31	......	20.85	16.67
1853 ...	14.31	16.15	18.05	......	28.78	19.32
1854 ...	20.05	14.54	17.95	......	27.35	19.97
1855 ...	18.12	17.15	14.49	......	23.84	18.40
1856 ...	14.41	10.95	14.65	......	17.38	14.35
1857 ...	16.08	11.86	15.86	14.43	17.09	12.65
1858 ...	17.87	15.71	17.20	16.95	18.58	15.04
1859 ...	17.86	15.66	16.76	14.07	16.37	13.37
1860 ...	22.42	18.82	19.12	17.04	19.84	16.72
1861 ...	19.42	15.47	14.91	14.55	16.37	16.14
1862 ...	18.18	14.17	17.75	17.68	15.01	16.43
1863 ...	16.62	15.81	17.56	20.68	15.49	17.22
1864 ...	14.78	17.40	16.31	19.53	15.35	16.67
1865 ...	16.84	13.88	16.03	19.74	13.27	15.92
1866 ...	19.29	16.84	17.06	24.55	13.63	18.24
1867 ...	18.01	17.00	19.28	17.48	14.40	17.19
1868 ...	14.92	14.27	15.48	16.75	......	......
1869 ...	15.19	12.21	13.78	16.02	......	......
1870 ...	14.34	13.84	13.04	14.23	......	......
1871 ...	13.56	12.81	12.71	14.26	13.31	13.33
1872 ...	14.39	15.06	13.85	14.50	13.74	14.31
1873 ...	14.55	13.28	13.58	15.34	14.43	14.24
1874 ...	15.12	16.78	14.81	17.09	16.21	16.00
1875 ...	18.57	19.65	17.75	22.63	20.04	19.73
1876 ...	16.14	15.73	17.77	18.53	16.40	16.91
1877 ...	14.84	13.66	14.90	16.61	19.03	15.81
1878 ...	14.44	15.07	15.51	20.05	15.46	16.11

The means in the last column of the above Table are for four of the Australasian Colonies from 1850 to 1856, and for five of them from 1857 to 1878, with the exception of Tasmania in the years 1868-70 for which no statistics have been obtained.

It will be seen that the periods of comparatively high mortality were 1853-55, 1866-67, and 1874-78; and that the years of greatest mortality were 1854, 1863, 1866, and 1875; the highest mortality of all occurring in 1854.

These periods and years do not differ much from those for Mauritius and Ceylon. It is interesting to see that 1854 was a year of unusually high mortality in Australia, Mauritius, and Ceylon, and that while in Mauritius 1867 was remarkable for an excessive death-rate, there was a very decided increase in Australia in 1866, and in Ceylon in 1868.

Although the period 1874-78 in Australia preceded the period 1876-78 in Ceylon, yet it will be observed that in both places the death-rates began to increase in 1873, and remained relatively high till 1878, beyond which we have no information. In Mauritius the period was 1877-80, but it was not a prominent one.

In 1860 there was a marked increase of mortality both in Australia and Ceylon, and in 1862 in Mauritius.

Periods and years of high Death Rates in India.

218. I regret that few of the vital statistics of India have been obtained. The following alone are those which Mr. Garrioch could find in the Colonial Secretary's Office :

	Bombay Presidency.			Madras Presidency.		
Years.	Population.	Deaths.	Death Rates.	Population.	Deaths.	Death-Rates.
1866	?	?	?	?	600106	?
1867	?	?	?	26539052	372026	14.0
1868	?	?	?	?	390959	?
1869	?	200853	?	24633127	451981	18.0
1870	?	163829	?	24125526	451021	18.6
1871	?	199334	?	24555046	444371	18.0
1872	16228774	252811	15.6	30147779	501482	16.6
1873	13983998	221148	15.8	30287842	506894	16.7
1874	?	274652	?	30360221	516848	17.0
1875	?	375718	?	30278903	641260	21.1
1876	16887728	368260	21.8	29157056	680384	23.3
1877	16181741	627708	38.8	29209542	1556312	53.2
1878	16352623	532951	32.6	29127205	810921	27.8
1879	16315969	387542	23.7	28991267	549390	18.9

All that can be gathered from the above Table is that 1875-78 was a period of high mortality, the maximum occurring in 1877; and that in the Madras Presidency 1866 was also a maximum year.

These inferences are confirmed by statistics of the mortality in the city of Bombay from 1864 to 1872, as given in the Bombay Calendar for 1873 (p. 596), and by statistics of the mortality in the cities of Bombay, Madras, and Calcutta in the years 1875-80. In short, it would appear that the periods 1864-67 and 1875-78 were remarkable for high death-rates in India.

Periods and years of high Death Rates in Gibraltar and Malta.

219. The following Table of death-rates in Gibraltar and Malta has been derived from the "Statistical Tables" of the Board of Trade :

Table x.

Years.	Gibraltar.	Malta.	Means.
1853	28.63	......	......
1854	31.03	30.30	30.66
1855	29.25	25.45	27.35
1856	22.37	24.49	23.43
1857	32.73	19.14	25.93
1858	23.79	17.99	20.89
1859	24.95	22.42	23.68
1860	32.98	21.65	27.31
1861	24.05	25.07	24.56
1862	29.14	39.63	34.38
1863	24.82	22.96	23.89
1864	25.00	25.77	25.38
1865	50.30	45.86	48.08
1866	23.25	23.86	23.55
1867	29.53	28.62	29.07
1868	......	......	......
1869	......	......	......
1870	......	......	......
1871	21.34	21.16	21.25
1872	20.03	23.36	21.69
1873	22.39	21.55	21.97
1874	21.83	31.52	26.67
1875	21.03	23.21	22.12
1876	22.14	21.67	21.90
1877	23.67	22.99	23.33
1878	22.20	23.82	23.01

The statistics for 1868-70 are wanting. For the rest of the series, the periods of greatest mortality were 1854-55, 1860-62, and 1864-67 ; while the years of greatest mortality were 1854, 1862, and especially 1865. There was also a small increase from 1874 to 1878.

Periods and years of high Death Rates in Europe.

220. Table XXXVIII (Appendices) gives the death-rates of eight European States from 1853 to 1878, according to the Reports of the Registrar General of England. Those States are England, France, Denmark, Sweden, Prussia, Belgium, Austria, and the Netherlands. The mean annual death-rates for that period were as follows :

TABLE y.

Years.	Death-Rates per 1000	Years.	Death-Rates per 1000
1853	25.4	1867...	22.9
1854	25.1	1868...	23.7
1855	27.4	1869...	23.3
1856	23.4	1870...	24.3
1857	25.3	1871...	26.3
1858	25.3	1872...	23.6
1859	25.2	1873...	24.0
1860	22.3	1874...	23.0
1861	23.2	1875...	23.9
1862	22.8	1876...	22.8
1863	23.2	1877...	22.4
1864	24.3	1878..	22.7
1865	24.8		
1866	26.7		

The periods of greatest mortality were 1853-55, 1864-66, and 1870-71. The years of greatest mortality were 1855, 1866, and 1871. The mortality was also high in 1857-59, but not so high as in the years 1855, 1865, and 1871. The high death-rate in 1870-71 was in great measure due to the Franco-German war.

It will be seen from Table XXXVIII (Appendices) that in England the periods of greatest mortality were 1853-55, and 1864-66, and that the periods 1853-57 and 1864-68 comprised the years of greatest mortality in all the States, with the exception of France, where the death-rate was greatest in 1871, and the Netherlands, where it was greatest in 1859 and 1871.

Periods and years of high Death Rates in the West Indies.

221. So far as can be judged from the following fragmentary Table derived from the Statistics of the Board of Trade, the periods of greatest mortality in the West Indies were 1853-54, 1865-67, and 1874-78; and the years of greatest mortality 1854, 1862, 1867, and 1876.

TABLE *x*.

Years.	St. Lucia.	Grenada.	Bermuda.	St. Vincent	Tobago.	Means.
1850	16.03	...	...	11.02	...	......
1851	17.00	21.88	12.08	11.15	..	15.53
1852	20.70	21.87	19.59	16.74	...	19.72
1853	17.63	17.88	38.71	...	...	......
1854	100.31	74.15	20.11	28.72	...	55.82
1855	15.06	12.27	26.40	17.11	...	17.71
1856	14.50	15.05	29.81	14.15	...	18.38
1857	15.21	...	23.85	13.44	...	......
1858	16.58	...	24.94	14.57	...	......
1859	19.10	14.89	22.66	19.06	...	18.93
1860	20.15	17.14	18.76	...	...	......
1861	19.55	19.15	18.16	18.42	...	18.82
1862	24.49	16.83	23.31	...	...	...
1863	16.95	14.39	...	...	...	...
1864	14.34	12.11	...	...	...	......
1865	17.56	13.23	...	...	...	......
1866	15.08	26.56	...	...	...	......
1867	15.77	26.67	...	...	...	......
1868	...	...	...	...	...	......
1869	...	...	...	...	...	......
1870	...	...	...	...	...	......
1871	28.50	25.77	22.11	...	23.45	24.96
1872	27.25	25.02	22.55	...	27.12	25.49
1873	28.81	26.40	26.28	...	24.33	26.45
1874	31.18	29.22	26.14	...	21.08	26.90
1875	27.14	28.46	23.15	...	28.73	26.87
1876	27.26	33.72	25.86	...	37.19	31.01
1877	26.75	29.84	22.87	...	27.15	26.65
1878	28.40	30.99	24.33	...	22.90	26.65

We know from other sources, though the details are not given, that in 1853-56 and 1865-67, the mortality in the West India Islands in general was high, particularly in the year 1854.

Resumé.

222. Having now given all the death-rates that can be obtained at present, let us see what are the results.

The following Table shows the years of highest mortality in the several countries :

Countries.	Periods.	Years of Greatest Mortality.
Mauritius	1831-80	1834, 1844, 1854, 1862, 1867, 1879
Ceylon	1828-78	1833, 1843, 1854, 1860, 1868, 1877
Australia	1850-78	.... 1854, 1860, 1866, 1875
India...	1864-80	.... 1866, 1877
Gibraltar ... } Malta... ...	1854-78	.... 1854, 1862, 1865, 1874
Europe	1853-78	.... 1855 ...... 1866 ......
West Indies ...	1850-78	.... 1854, 1862, 1867, 1876

It would thus appear that in the years, or very nearly in the years, in which there was a high mortality in Mauritius, there was also a high mortality in other parts of the world. The two years of greatest mortality in Mauritius were 1854 and 1867, while in other places they were respectively 1854 or 1855, and 1865, 66, 67, or 68. For the years 1834 and 1844 we have no vital statistics, except those of Ceylon, and there the years of greatest mortality from 1828 to 1854 were 1833 and 1843. The year 1862 was also one of high mortality in other places. On the other hand, the increase in Mauritius in 1879 was not, as far as we know, so well represented in other places ; but the statistics of most of them for that year are not yet available here.

The years of greatest Mortality in Mauritius were very nearly the years of greatest Mortality in other places.

If, omitting Mauritius, annual means of the death-rates of the other places be taken, it will be found that the periods of greatest mortality were 1831-33, 1842-45, 1853-55, 1860-63, 1865-68, and 1874-78. Now, these were very nearly the periods of greatest mortality in Mauritius.

The periods of greatest Mortality in Mauritius were very nearly the periods of greatest Mortality in other places.

223. We have found (pp. 140-144) that the periods of greatest mortality in Mauritius were characterised by abnormal weather. It now remains to be seen what weather prevailed in other places.

It has already been shown (pp. 105-111) that during the period 1865-68 abnormal weather prevailed over an extensive area, and we now know that in those years the death-rates were high, not only in Mauritius, but in Australia, Ceylon, India, the West Indies, and Europe.

Weather in other places during the periods of greatest Mortality.

We have to endeavour to ascertain, then, what weather prevailed other places during the remaining periods, viz., 1831-33, 1843-45, 1853-55, 1860-63, and 1874-78 ; and as there are few observations for the period 1831-33 it must, for the present, be omitted.

224. Column 6 of the following Table shows the mean annual rainfall at 84 stations in different parts of the world from 1843 to 1857 ; columns 1 to 5 show the mean annual rainfall in those years at stations in Great Britain, on the Continent of Europe, in America, India, and the Southern Hemisphere ; and

column 7 shows the results obtained by appying to the means in column 6 the formula given in par. 138, page 109 :

Rainfall from 1843 to 1857.

Years.	1 Great Britain. 31 Stations.	2 Continent of Europe. 20 Stations.	3 America. 28 Stations.	4 India. 3 Stations.	5 Southern Hemisphere. 2 Stations.	6 Means.	7 Reduced Means.
	Inches	Inches	Inches	Inches	Inches	Inches	Inches
1843	31.8	29.1	42.9	57.6	21.0	36.5	...
1844	26.9	30.0	37.4	68.2	17.8	36.1	35.8
1845	33.3	31.3	38.2	51.2	19.9	34.8	36.8
1846	35.1	29.8	41.5	76.7	24.7	41.6	39.6
1847	28.6	26.7	45.5	76.5	25.0	40.5	40.2
1848	37.3	30.5	40.0	63.1	21.5	38.5	39.2
1849	30.6	27.2	39.0	75.1	25.0	39.4	38.7
1850	29.9	31.2	46.5	54.5	26.4	37.7	38.4
1851	29.3	30.6	36.7	73.2	25.5	39.1	39.4
1852	39.0	28.2	43.1	74.5	25.3	42.0	39.5
1853	30.9	29.6	39.9	50.2	24.1	34.9	36.7
1854	28.4	27.0	38.9	63.9	17.7	35.2	34.7
1855	25.5	30.7	41.1	47.9	23.9	33.8	34.6
1856	31.4	29.0	35.4	59.0	23.4	35.6	34.9
1857	29.3	22.5	42.3	57.7	21.9	34.7	...
Means ...	31.2	28.9	40.5	63.3	22.9	37.4	37.5

In preparing the above Table, the rainfalls at the same stations have been used throughout ; and the stations comprise all that were available. Column 6 shows that, on the whole, the driest periods were 1843-45 and 1853-57 ; and the driest years 1845 and 1855. Now, these periods and years coincide, either wholly, or nearly, with periods and years of high mortality, viz., the periods 1843-45 and 1853-55, and the years 1844 and 1854.

According to observations taken at 31 stations in Great Britain the driest year was 1855 ; and in that and the previous year the mortality was high. On the Continent of Europe, the driest years were 1847, 1854, and 1857 ; and in 1854 and 1855 and 1857 and 1858, there was a high mortality. The driest year at 3 stations in India (Bombay, Madras and Calcutta) was 1855 ; and it would appear that the mortality was high in that year and in 1854. At Adelaide and the Cape, the driest years were 1844 and 1854 ; and in the latter year the mortality was high in Australia.*

Column 7 indicates that the rainfall increased till 1847, and then decreased till 1855.

* I have no statistics for the Cape.

Rainfall in 1864 to 1880.

225. The numerous rainfall observations which have been received from different countries for the years 1864 to 1880 have not yet been discussed, and some time must elapse before the final results can be known. Meanwhile, it may be stated that in many parts of the world there were severe droughts in the period 1875-79, as well as in Mauritius, with other extremes of weather.

Rainfall of India from 1865 to 1878.

226. In India the rainfall, on the whole, increased from 1867 to 1870-72, then decreased, and generally attained a minimum in 1877, although in some places the fall was least in 1876, and in others in 1878. At Madras, the rainfall from 1864 to 1878 was as follows :

Rainfall of Madras.

Years.	Rainfall.	Years.	Rainfall.
1864	47.2	1872	73.7
1865	41.6	1873	51.8
1866	51.4	1874	62.9
1867	24.4	1875	37.1
1868	41.4	1876	21.5
1869	32.3	1877	45.0
1870	74.1	1878	28.6
1871	56.3		

The mean rainfall of Madras from 1864 to 1878 was 45.95 inches, and the driest years were 1867 and 1876, which belonged to periods of high mortality.

Rainfall of Australia from 1864 to 1879.

227. The following Table shows the rainfall at four stations in Australia from 1864 to 1879 :

Years.	Melbourne.	Adelaide.	Sydney.	Brisbane.	Means.
	Inches	Inches	Inches	Inches	Inches
1864...	27.4	18.8	69.1	47.0	40.6
1865...	15.9	14.7	36.3	24.1	22.7
1866...	22.4	19.8	36.8	37.2	29.0
1867...	25.8	19.2	59.7	61.0	41.4
1868...	18.3	18.0	43.6	36.0	29.0
1869...	24.6	13.6	48.2	54.4	35.2
1870...	33.8	23.9	64.2	79.1	50.2
1871...	30.2	23.5	52.3	45.4	37.8
1872...	32.5	23.2	37.1	49.2	35.5
1873...	25.6	21.6	73.4	62.0	45.6
1874...	28.1	19.1	63.6	38.7	37.4
1875...	32.9	31.4	46.2	67.0	44.4
1876...	23.9	13.9	45.6	53.4	34.2
1877...	24.1	24.3	59.5	31.2	34.8
1878...	25.4	22.1	49.6	56.3	38.3
1879...	19.3	......	63.2	67.3	......
Means	25.7	20.5	53.0	50.6	37.1

The driest year was 1865, and it was followed by an increase of mortality in 1866, which itself was also a dry year. The next driest year was 1868, but we do not know whether or not it was followed by a high death-rate. There was a comparatively dry period from 1874 to 1877; but in one of those years (1875) the rainfall was considerably above the average, and the mortality increased. *

Rainfall of Ceylon, &c.

228. The rainfall of Ceylon, &c., is not known for a sufficiently long period.

Temperature.

229. According to Mr. Stone's " Results of Meteorological Observations made at the Royal Observatory, Cape of Good Hope ", from 1841 to 1870, the temperature of the air was above the average in the years 1842-44, 1854-57, 1860-61, and 1864-67, especially in 1854-57 and 1864-67; and similar results have been obtained for other parts of the world by Dr. Köppen, Professor Archibald, Mr. Hill, and others.

Recapitulation.

230. From the rainfall Tables for 1843-57 (p. 153), 1855-67 (p. 110), and 1864-79 (p. 154), we see that, upon the whole, the rain increased from 1844 or 1845 to 1847, and then decreased to 1855 or 1856; that from 1856 it increased to 1861, and then decreased to 1865 or 1866; and that from 1867 it increased to 1870-72, and then decreased to 1877 or 1878. It would thus appear that there was a rainfall cycle having a duration, from minimum to minimum, of about 11 years.

On the other hand, we have found that from 1831 to 1880 there were in Mauritius, and so far as the observations extend, in Australia, Ceylon, India, Malta, Gibraltar, Europe, and the West Indies, periods and years of high mortality; and that, generally, these years and periods were not only the same, or nearly so, but that they coincided with the years and periods of small rainfall and high temperature.

Now, the fact, that, so far as the statistics go, there were, as a rule, periods of high death-rates common to a considerable portion of the earth's surface, indicates that, independently of local causes, there was at least one other cause of a general nature; and the additional fact, that the periods of high mortality were nearly coincident with certain meteorological periods, indicates either that the two were effects of that general cause, or that one of them was the cause of the other. If, reasoning by analogy, we consider that the abnormal weather which occurred periodically in the course of 11 years was the cause of the observed increase of disease and mortality, we must ascribe that cause itself to some general cause, for it appears that the periodicity was common to places widely apart.

Sun-spot Cycle.

231. It is well known that, on an average, there is a solar cycle of 11 years, indicated by an increase from a minimum to a maximum, and by a decrease from a maximum to a minimum, of dark *spots* and bright *faculæ* on the Sun's disc, and of *protube-*

* Some floods occurred in New South Wales in March, 1875, but the spring and summer were dry.

rances around his limb. From 1831 to 1880, the epochs of minimum occurred in 1833, 1843, 1856, 1867, and 1878, and those of maximum in 1837, 1848, 1860, and 1870. During two or three years about the epochs of minimum and maximum the variation is not very great, and the three-year periods of least activity were 1832-34, 1842-44, 1854-56, 1865-67, and 1876-79, while those of greatest activity were 1836-38, 1847-49, 1859-61, and 1870-72.

The periods of high Mortality from 1831 to 1880 nearly coincident with the periods of minimum Solar Activity.

232. Now, it will be seen that the periods which were most remarkable for an increase of mortality were almost precisely the periods of least solar activity, and that this was especially the case in Mauritius and Ceylon, the two places for which we have the longest series of vital statistics. It will be observed also, that the years 1837 and 1839, and 1860 and 1862, in which the death-rates were high in some places, belonged, in whole or in part, to periods of maximum solar activity.

Extremes of Weather at the periods of greatest and least Solar Activity.

233. The exception to the general rule, in the case of the years 1837, 1839, 1860, and 1862, may be owing to the circumstance that the years of maximum, as well as the years of minimum, solar activity, are characterised by great fluctuations of weather. In the years of minimum activity droughts prevail, but there are also floods; in the years of maximum activity heavy rains and floods prevail, but occasionally there are droughts. The two periods (the three years of least and the three years of most activity) may be described as periods of extreme weather, of great oscillations, of violent changes; and hence the mortality might increase in one or in both extremes, according to circumstances. As a matter of fact, however, during the years 1831-80, the years of greatest mortality, so far as is known, were, with few exceptions, those of minimum sunspot-frequency.

Possibility of high Death-Rates at both extremes of Solar Activity.

234. The possibility, or probability, of a connexion between epidemics and the solar period has been suggested by Prof. Balfour Stewart, Prof. W. Stanley Jevons, and others; and the facts which have been given above appear to support the hypothesis of a periodicity of mortality, in general, connected with the periodicity of solar activity. The mean duration of the solar period being about 11 years, we should expect, if the hypothesis is correct, to find the mean interval between successive periods of high rates of mortality also 11 years. It would appear, however, that now and again there are breaks in the series-that the 10 or 11-year recurrence of high mortality holds good for a time, but that occasionally it makes a jump of several years. Now, as there are extremes of weather, both in the years of minimum and maximum solar activity, we might expect some such apparent irregularity, the maximum mortality occurring sometimes in the former and sometimes in the latter years. Dr. Lawson considered that the periods of maximum mortality were connected with the variations in terrestrial magnetism (which we now know are themselves connected with the solar period), and he came to the conclusion, that the years of highest death-rates were the years of greatest magnetic range and disturbance, that is, years of maximum solar activity. But since that time it would appear that the reverse has been the case, the years of least magnetic range having been the years of greatest

mortality. Possibly, with more information, it may be found that the death-rates in general, are higher at the two extremes, or turning-points, of the solar cycle, than in the intervals, but, upon the whole, highest of all at or near the epoch of minimum. The possible periodicity of commercial crises related to the solar cycle may, from the same cause, be subject to similar variations, the crises generally occurring in the minimum periods, but occasionally in the maximum. In other words, excessive rains and cold might be as destructive of life and property as excessive droughts and heat.

Simultaneous high Death-Rates in different parts of the world probably partly due to solar causes.

235. That the high-death-rates which are found to have occurred almost simultaneously in distant regions, when the weather was abnormal, and the state of the Sun's surface also abnormal, should be ascribed to solar causes, will surprise no student of science, nor any one who has considered how great is the influence of the Sun upon the weather, and, through it, upon animal and vegetable life. We have seen how closely connected with the weather is the annual mortality from different diseases in Mauritius ; and in a lecture delivered by Mr. Alexander Buchan, Secretary to the Scottish Meteorological Society, at the Royal Institution, on the 25th March last, similar connexions were shown to have existed between the weather and mortality of London, during the period 1845-75*. Hence, similar results for a weather-cycle of 10 to 11 years, of the existence of which we have strong evidence, is what might have been expected.

The Mauritius Epidemic of 1866-68 partly due to a general cause.

236. But whatever may be the explanation, it is, as far as the data go, a statistical fact, that the periods of high mortality in Mauritius were periods of high mortality in other places ; and this in itself goes to show that the great Epidemic of 1866-68 in Mauritius was not altogether due to local causes, although no doubt there were local causes which greatly aggravated the effects of the general cause, whatever it may have been.

Decennial Death Rates of Mauritius from 1831 to 1880.

237. Reverting to Table *u* (p. 138), we find that the mean decennial death-rates in Mauritius from 1831 to 1880 were as follows :

Decades.	Death Rates.
1831-40	32.97
1841-50	36.11
1851-60	36.44
1861-70	44.00
1871-80	28.55

Great improvement in the Death Rates of Mauritius since 1870.

238. It is a striking fact, and one which must be gratifying to all interested in Mauritius, that notwithstanding the notoriety which the Colony has of late acquired for unhealthiness, its death-rates have greatly diminished. In fact, they have, during the decade/ 1871-80 been much less than during any other decade in the course of the last half century.

Its probable causes.

239. We may presume that the most probable causes of this marked improvement are : (1) The sanitary measures adopted by the General Board of Health ; (2) The establishment, extension, and amelioration of Poor Law Hospitals for the General Popu-

* Weather and Health of London. By Alex. Buchan, M.A., F.R.S.E.

lation, and of Hospitals for the Indians on sugar-estates; (3) The circumstance that, since 1867, the prevailing disease, *malarial fever*, has in a measure absorbed other diseases, nearly 50 per cent. of the total mortality being ascribed to it; and the further circumstance that, as a rule, malarial fever yields to quinine, the consumption of which has enormously increased, "no less a sum," according to a recent Minute of His Excellency the Lieutenant Governor, "than Rs. 111,000 being annually drawn from this Colony for the purchase of drugs prepared from the Chincona tree"; (4) The circumstance that of the 42,843 persons who died of fever alone in 1867 and 1868 (Table X, p. 39) there were doubtless many who, had there been no Epidemic, would have died in 1870-80, and increased the mortality of those years.

Probable causes of the comparatively high Death Rates of Mauritius from 1834 to 1870.

240. Besides the causes already mentioned of the high death-rates in certain years and periods, there were other circumstances which seem to have contributed to the comparatively heavy mortality in the period 1834-70. (1) Until 1831 the deaths among the slaves were seldom registered, and after 1834, when they were emancipated, the deaths among them were included in those of the General Population. Now, as might be expected, the mortality among the ex-slaves, who numbered about 67,000, was higher than among the other classes. Not only had they lived under different conditions before emancipation, but they did so after that event. "These people," remarks Dr. Fitz Patrick, "accustomed to be taken care of by others, had no notion whatever of providing for the future: to earn enough for their daily wants was all they aimed at. Consequently they were always in a state of pauperism." When, therefore, epidemics and contagious diseases broke out, that large class, weakened by intemperate habits, as well as by poverty, suffered greatly. (2) Indian Immigration, which began in 1834, opened a door to the importation of disease, and as the resident Indian population increased, so did the poverty among the lower classes. (3) For many years sanitary measures did not keep place with the rapid increase of population, and the conditions were such that competent judges dreaded and predicted calamitous consequences.

Mauritius at one time a healthy place.

241. Down to 1834, however, and even to a later date, Mauritius in itself was not unhealthy. Its climate, in fact, was one of the finest and most salubrious in the world. This is partly shewn by the small mortality among the White and Free populations from 1804 to 1830, amounting to a mean annual rate of only 16.62 per 1000 (par. 153, p. 117); and partly by the present death-rates of Rodrigues and the Seychelles (par. 160, pp. 120-121), amounting to 15.8 and 20.5 per 1000 *—Rodrigues in particular being very nearly under the same climatic conditions as Mauritius. But a great increase of population, without sanitary measures, would increase the death-rate of any country, however salubrious its climate might be.

* The death-rates among the White and Coloured populations in the rural Districts of Mauritius from 1804 to 1830 (pp. 114-116), though remarkably small, were oten not smaller, considering the fewness of the residents, than recent death-rates among the liberated Africans in the Seychelles. According to a note kindly furnished by Mr. J. H. Ackroyd, the Visiting Magistrate of the Minor Dependencies, the number of deaths in 1880 among 1840 of these Africans was only 19, or 10.33 per 1000.

Death Rates of Mauritius since 1870 less than in some European States, but greater than in many other places.

242. From Table XXXVIII (Appendices) it will be seen that the death-rates of Mauritius, since 1870, have been less than the death-rates of Austria, Hungary, Spain, and Italy. On the other hand, as may be seen from Tables *v*, *w*, *x*, and *z*, they were higher than the death-rates of Ceylon, the Australian Colonies, India, Gibraltar, Malta, and the West Indies. But it is to be remarked that probably the calculated death-rates of several of these places are, owing to incomplete registration, less than the real rates.

Mauritius the most densely inhabited country, of the same or greater area, in the world.

243. The densities of the populations of several countries have already been given (pp. 93-96), and we have seen that, with the exception of Oudh in India, Mauritius was more densely populated than any of them. I find, however, that the population of some other places is greater than that of Mauritius. The most densely populated countries in the world, so far as I have been able to ascertain, are the following:

Countries.	Years	Areas in sq. miles.	Population	Persons to a sq. mile.
Gibraltar	1878 ...	1.87	25,721	13,718
Hongkong	1876 ...	32.14	139,144	4,329
Malta	1878 ...	119	159,011	1,336
Barbadoes	1871 ...	166	162,042	976
Bermuda.	1878 ...	19	13,812	727
Mauritius	1880 ...	705	360,326	511
Belgium.	1876 ...	...	......	470
England and Wales	1876 ...	...	......	416
Oudh	1866 ...	27,890	8,071,075	394

Gibraltar and Hongkong, compared with Mauritius, may with regard to size and population, be regarded as towns; Malta is a little larger than the District of Flacq; Barbadoes nearly as large as Plaines Wilhems and Black River; and Bermuda about one fifth part of Savanne. It is, of course, less expensive to carry out sanitary measures in these than in much larger places: Gibraltar is healthy because it is well drained and well supplied with water.

The density of the population of Oudh (474 persons to a square mile), given on page 93, seems to be too great; according to the Statistics of the Board of Trade for 1866, it was only 394.

China and Japan are usually supposed to be densely inhabited; but according to a Table in the Bombay Calendar and Directory for 1873 (p. 598), the number of persons to a square mile in Japan in 1870 was only 224, and in China in 1812 only 283.

Influence of Forests upon Climate.

244. Before considering the effects of déboisement in Mauritius, it may be useful, in the first place, to refer briefly to a few fundamental facts and principles; and, in the second place, to state

the results of observations which have of late years been made, in some parts of Europe, for determining the effects of forests upon climate.

Capacity of the air for Moisture dependent upon the Temperature.

247. Temperature and humidity are the two main elements of climate. Aqueous vapor comes directly or indirectly from the sea, and more or less of it is always present in the atmosphere. The rate at which evaporation of water proceeds depends upon the temperature, the amount of vapor already in the air, the velocity of the wind, the atmospheric pressure, and the extent of the evaporating surface. Now, the quantity of vapor which a given volume of air can hold in suspension increases with the temperature, though not in the same ratio. This will be seen from the following figures showing the number of grains of vapor contained in a cubic foot of *saturated* air at temperatures rising from 0° to 100° Fah., and under a barometric pressure of 30 inches of mercury:

Temp. Fah.	Weight (in grains) of vapor in a cubic foot of saturated air.
0°	0.55
10	0.84
20	1.30
30	1.97
40	2.86
50	4.10
60	5.77
70	8.01
80	10.98
90	14.85
100	19.84

Temperature of the Dew-Point.

248. Generally, the air is not completely saturated, but the presence in it at all times of invisible vapor may be shown by lowering the temperature. If in this climate, even when the air is very dry, a piece of ice be placed in a glass, moisture will soon be deposited on the exterior surface of the glass, and in a few minutes drops of water may be seen trickling down its sides. The temperature of the air in contact with the glass, at the instant the moisture begins to be deposited, is the *dew-point*, or the temperature at which that portion of the air becomes saturated.

Temperatures of the air and evaporation.

249. During the evaporation of water heat is absorbed from surrounding bodies, and the temperature of the air decreases. The

warmer and drier the air in the vicinity of the evaporating surface, the more rapid is the evaporation, and the greater the reduction of temperature. On the other hand, if the air is saturated no evaporation takes place. Suppose, then, that we have two thermometers, similar in every respect and giving the same indications when they are under the same conditions; but that the bulb of one of them is covered with moist muslin, while the bulb of the other is freely exposed to the air. If the thermometers be suspended near one another in the same current of air, the one with the *dry bulb* will show the *temperature of the air*, and the one with the *wet bulb* the *temperature of evaporation*. When the air is saturated the two thermometers will show the same temperature. But when the air is not saturated, its temperature, as shown by the dry-bulb thermometer, is higher than the temperature of evaporation, as shown by the wet-bulb thermometer; and the drier the air, the greater is the difference between the readings of the two thermometers.

Mason's Hygrometer.

250. Knowing the temperatures of the air and evaporation at a given moment, we may, by means of Tables based upon the results of experiments, ascertain the quantity of vapor in a cubic foot at that moment, the temperature of the dew-point, and, in short, all the hygrometric conditions of the air in which the dry-and-wet-bulb thermometers, commonly called Mason's Hygrometer*, are placed.

Other Hygrometers.

251. Daniell's and Regnault's hygrometers show the dew-point directly, by the actual deposition of moisture on a cooled surface, the temperature of which is known; but they are less convenient and more expensive than Mason's hygrometer.

Before the invention of these instruments, the variations of the hygrometric state of the air were roughly measured through the lengthening or shortening of certain organic substances, such as catgut, wood, hair, &c., according as they lost or absorbed moisture. The best known of these early hygrometers are De Luc's whalebone-hygrometer and De Saussure's hair-hygrometer, but they are now seldom used.

A lowering of the Temperature of Saturated Air produces condensation of vapor.

252. No rain, snow, or dew is formed until the air is saturated, or until it has been cooled down to the temperature of the dew-point. In completely saturated air, the temperatures of the air, evaporation, and dew-point are practically identical; in air not saturated, they all differ. Now, from the above Table we see that the quantity of vapor in a cubic foot of saturated air varies much, according to the temperature. At a temperature of 100°, with the barometer at 30.00 inches, a cubic foot of air can hold 19.84 grains of vapor in suspension, whereas at 70° it can hold only 8.01 grains. If, then, from any cause, a body of saturated air, having a temperature of 100°, be cooled down to 70°, it will part with 11.83 grains of vapor (per cubic foot), which will be precipitated as rain. Similarly, a fall of the temperature of saturated air from 80° to 70° will cause a condensation of 2.97 grains of vapor per cubic foot, and a fall from 40° to 30° a condensation of 0.89 grains. Hence, in tropical climates, the rainfall is heavier than in temperate climates.

* The dry-and-wet-bulb thermometers are also known under the name of August's Psychrometer.

Relative Humidity.

253. The expression *saturated air* gives no information as to the quantity of vapor in a cubic foot. To know the quantity we must know, not only that the air is *saturated*, but also its temperature. The words *relative humidity*, also, or *degree of humidity*, which are used to denote the ratio of the quantity of vapor in a cubic foot of air to the quantity which it would contain if saturated, convey no information as to the absolute quantity of vapor present. The *degree of humidity* of saturated air is usually denoted by 100, and that of absolutely dry air by 0; so that when it is said that the *relative humidity* is 50, the only information conveyed is that the air is *half* saturated. The quantities of vapor corresponding to any one percentage of humidity from 0 to 100, depend upon the temperature, and are all different from each other. At temperatures of the air from 0° to 100°, the quantity of vapor corresponding to the same relative humidity of 50 per cent, for example, varies from 0.27 to 9.92 grains per cubic foot. In short, we have to bear in mind, that the *relative humidity*, or the *degree of humidity*, is simply a ratio or percentage, showing the degree of dryness or dampness of the air, but not the amount of vapor in it.

Absolute Humidity.

254. The *absolute humidity* is the actual quantity of vapor in a cubic foot of air, whatever may be the degree of dryness or dampness, or the temperature of the air, at the instant of observation. It may be expressed also by the temperature of the dew-point, or by the elastic force, tension, or pressure, which the vapor, like air, exerts on the mercury in a barometer. The higher the temperature of the air, and the nearer the dew-point to that temperature, the greater is the absolute humidity; that is, the greater is the quantity of vapor, and the greater the vapor-tension. If, for example, the temperature of the air is 80°, and the temperature of the dew-point also 80°, that is, if the air is saturated, the absolute humidity is represented by 10.98 grains of vapor per cubic foot, or by a vapor tension of 1.023 inch of mercury, or simply by the dew-point 80°, that dew-point always corresponding to the same amount of vapor and the same tension. But if, with the temperature of the air at 80°, the temperature of the dew-point is only 48°, then the absolute humidity is expressed by 3.62 grains, or a tension of 0.335 inch, or a dew point of 48°, that dew-point always denoting 3.62 grains per cubic foot, or a vapor tension of 0.335 inch. In the former case the *relative humidity* is 100, that being the centesimal ratio of the quantity of vapor in the air to the quantity required for complete saturation, both quantities being equal: in the latter case, the *relative humidity* in round numbers is 33, that being the centesimal ratio of 0.335 to 1.023, or of 3.62 to 10.98.

Very damp air may contain much less vapor than very dry air.

255. From what has been said it follows that very damp air may contain much less vapor than very dry air. At a temperature of 40°, for example, saturated air contains 2.86 grains per cubic foot, but at 90° air containing 7.42 grains per cubic foot is only half saturated. In the one case, the degree of humidity is 100, in the other only 50.

A comparatively high Absolute Humidity compatible with Aridity.

256. However much vapor may be contained in the atmosphere, it is not available for the formation of rain, until the air has been cooled down to the dew-point, or point of saturation, or un-

til that point has been attained through an accession of additional vapor. Rain, springs, and streams, may exist, and vegetation flourish, in places where the absolute humidity is small, but the relative humidity great; whereas in places where the absolute humidity is great, but the relative humidity small, agriculture may be impossible from want of water and moisture. We thus see the great importance of maintaining the relative humidity of the air at a degree which is favorable to vegetation. Climates having an average relative humidity of 86 to 100 per cent. are considered *very damp;* 71 to 86 *moderately damp*; 56 to 70 *moderately dry*; 55 *very dry.*

Hygrometric effects of changes of Temperature.

257. Whatever tends to raise the temperature of the air, without increasing the vapor, tends to diminish the relative humidity and the chances of rain; and whatever tends to lower the temperature of the air tends to increase the relative humidity and the chances of rain.

A lowering of the Temperature of the air in Mauritius to a certain degree would produce perpetual Rain, and a certain elevation of Temperature perpetual Drought.

258. We may conceive the temperature of the air in Mauritius to be so low that there would be perpetual rain, or so high that there would be perpetual drought. Suppose that the temperature of the air arriving from the sea is 80°, that the temperature of the dew-point is 77°, and that in passing over the high land the air is cooled down to 70°. At the former temperature a cubic foot of this air would contain 9.99 grains of vapor, but at the latter temperature a cubic foot of the same air could contain only 8.01 grains. The difference (1.98 grains) would be precipitated. Now, so long as these relations lasted there would be constant precipitation. On the other hand, if the air from the sea were not cooled down below 77° during its passage over the Island there would be no rain.

Why the Rainfall of Mauritius is greater in some parts than in others.

259. The rainfall is greater on the windward than on the leeward side of Mauritius, at the same elevations, because in the former the temperature is somewhat lower than in the latter, and because, before reaching the leeward side, the air has lost a portion of its moisture; and it is greatest of all on the elevated lands, especially those exposed to the prevailing wind, because there the temperature is lowest.

And greater in Summer than in Winter.

260. More rain falls in Mauritius from November to May than during the other six months of the year, not only because more vapor is present in the air, evaporation being then more rapid, but because the conditions are such that the relative humidity is also greater. When, in these circumstances, the temperature of the vapor-bearing winds is lowered in passing over the Island, the amount of precipitation is proportionally greater than in the winter months.

Effects of Forests upon Temperature, Humidity, and Evaporation.

261. Forest Meteorology is still in its infancy. It is only of late years that the subject has to some extent been studied practically, and there are problems connected with it which have not yet been solved. The diversity of opinion which has long existed, and which still exists, respecting the effects of forests upon climate, is in great measure due to the want of observations for sufficiently long periods.

No comparative observations in Mauritius.

In Mauritius, the question of the influence of forests has been more or less discussed for upwards of a hundred years, but with few practical results. If throughout that period systematic observations of the temperature, humidity, and rainfall had been made on the high lands in the interior of the Island, both in places covered with forest and in similarly situated places which had been denuded, and if at the same time the depths of some of the streams and rivers, or the volumes of water discharged by them, had been measured, we should know more than we now do of the climatic changes which may, or may not, have been brought about by extensive déboisement. With regard to many parts of Mauritius, it is now rather late to make observations for that special purpose; but there are other parts which still afford the necessary conditions; and it is desirable that advantage should be taken of them with the view of ascertaining, from a a series of comparative observations, the influence of the few remaining forests. In 1868 and 1876, attention was called to the importance of such observations, * but nothing was done.

Comparative observations in Europe.

Meanwhile, comparative meteorological observations in the forests and in the open fields have been made in some parts of Europe. "In 1868, the Royal Ministry of Finances in Bavaria directed the establishment of several meteorological stations, at each of which two series of observations were to be made: one in the open fields, exposed to all the influences of sun and winds, and the other within the shelter of the woods. Care was taken that the conditions of exposure should be as nearly alike as possible, so that the influences of the forests might be fully known." Similar observations were commenced in Switzerland in January 1869, and in Prussia in April, 1874. Still more recently, the Swedish Government has ordered the establishment of scientific stations with the view of studying the influence which forests exert upon the surrounding country. In France, Prof. Mathieu, of Nancy, commenced observations at three stations in 1866, for the purpose of ascertaining the influence which a wooded or unwooded country has upon evaporation, humidity, rainfall, &c., and in the same year, observations were made, under the direction of Marshal Vaillant, in the forests of Fontainebleau and Gonards, with the view of determining the influence of a covering of wood upon the amount of rain reaching the earth. M. Fautrat also made similar observations at Hallette and Ermenonville from June, 1875, to October, 1877.

The results of these observations are given by Dr. Franklin B. Hough, of the United States of America, in his "Report upon Forestry," a work replete with information on the subject of which it treats. † As there can be no doubt that these results differ only in degree from those which would be obtained from similar observations in Mauritius, it may be well to give here a summary of the most important of them.

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* Proceedings of the Meteorological Society of London for June, 1868. Monthly Notices of the Meteorological Society of Mauritius for December, 1876.

† Report upon Forestry. Prepared under the direction of the Commissioner of Agriculture, in pursuance of an Act of Congress approved August 15, 1876. (Washington, 1878.)

Results of Comparative Observations in Bavaria.

262. *Mean Monthly Absolute Humidity* (Millimeters). In open fields 3.39 mm., and in wood lands 3.45 mm. The difference is small; but we have to bear in mind the distinction between *absolute* and *relative* humidity.

Mean Monthly Temperature of the Air at the surface of the ground (Réaumur). In open fields 7°.72; in wood lands 5°.99. Difference 1°.73. The difference was greater in summer, and amounted to 3°.13.

Mean Monthly Temperature of the Soil at a Depth of 1 *Foot.* In open fields 7°.32; in woodlands 5°.86. Difference 1°.46. In winter the temperature in the fields was 0°.04 *lower* than in the woods. In summer the temperature in the fields was 3°.33 *higher* than in the woods.

" The relatively colder soil of woodlands in summer has a close relation to the retention of water and the maintenance of springs in wooded regions."

Annual Amount of Evaporation from a free water surface. In open fields 597.93 mm.; in woodlands 215.64 mm. Difference 382.29 mm.

" In the forests, the evaporation from a free water surface was, in the yearly average, 64 per cent. less than in the open fields; or in other words, where 100 inches would be evaporated from a square foot in an open exposure, only 36 inches would be changed to vapor in the woods. This reduced evaporation in the latter is, of course, the principal cause of the greater moisture of the soil in the woodlands."

The evaporation was four times as great in summer as in winter; and at all seasons it was about 63 per cent. less in the woods than in the open fields.

" Clearings must, therefore, accelerate evaporation in a high degree, particularly in summer, and most in warm seasons and climates; and from these facts alone we can see the great importance of the forests in retaining the moisture of the earth and the abundance of springs during the warm season."

Difference in Evaporation from saturated soil, in cubic inches, from a square foot of surface. In open fields the mean monthly evaporation from a saturated stratum of uncovered soil half a foot deep, from April to October, was 215.21 cubic inches more than from saturated soil in woods in which the ground was not covered with litter (leaves, moss, &c.); and in woods in which the surface of the ground was not strewed with litter the evaporation from saturated soil was 80.92 cubic inches more than in litter-covered woods. Hence, the mean monthly evaporation from saturated soil in uncovered fields was 296.13 cubic inches more than in litter-covered woods.

The following were the conclusions arrived at:

1. The forests, alone, without litter, diminish the evapora-

tion of water in the soil, as compared with the open fields, 62 per cent.

2. The litter covering in the forest diminishes the evaporation 22 per cent. further.

3. Forests and litter together reduce evaporation 84 per cent.

4. In litter-covered forests the evaporation is 60 per cent. less than in uncovered forest soil.

While in the open fields 100 parts of water evaporate from saturated naked earth, the uncovered soil of woods yield but 38 per cent., and the litter-covered soil but 15 per cent. Or, calling the loss from uncovered-wood soil 100, the amount from the same covered with litter is 40 per cent.

The total evaporation from April to September, inclusive, from a square foot of surface, was as follows : In open fields 2,174.60 cubic inches of water ; in woods without litter 847.03 ; and in woods with litter 333.04.

These figures afford means for estimating the loss of water in the soil, caused by extensive clearings and the removal of litter.

Percentage of rain and snow reaching the earth in the woods. The rain and snow reaching the ground in the open fields being represented by 100, the amount reaching the ground in the woods was 72, or 28 per cent less than in the fields. This, of course, was owing to a part of the water being intercepted by the branches and foliage of the trees, and less was intercepted in winter than in summer.

In Prussia.

263. The following are the results of observations made at three stations in Prussia in 1875 :

Mean Monthly Temperature of the Air (Centigrade). In open fields 6°·74 ; in woods at 1.5 meters high 6°·04 ; in woods at tree-tops 6°·40.

The difference between fields and woodlands was greatest in the growing months. In winter, the woods were warmer than the open fields.

Mean Monthly Absolute Humidity (in millimeters). In open fields at 1.5 meters 6.720 mm. ; in woods at 1.5 meters 6.723 ; in woods at tree-tops 6.660 mm.

There was very little difference between the *absolute* humidity of the fields and woods, the deviation in no case amounting to a millimeter of pressure.

Mean Monthly Relative Humidity (Percentages). In open fields at 1.5 meters 82.93 ; in woods at 1.5 meters 86.50 ; in woods at tree-tops 84.07.

The *relative* humidity was greater in the woods than in the fields, and the difference in favor of the former was greatest in summer. For the months of June, July, and August, the mean humidity in the fields was 74.17, in the woods at 1.5 meters 80.49, and in the woods at the tree-tops 76.80.

Mean Monthly Evaporation (Millimeters). In open fields 26.7 mm.; in woods 11.9 Difference 14.8 mm.

For June, July, and August, the mean monthly amount of evaporation in the fields was 49.10 mm., and in the woods 20.20 mm.; but in December, January, and February the amounts were respectively 5.65 and 2.63.

These results, like those for Bavaria, show the extraordinary increase of evaporation in summer, and the great excess of its amount in the open fields, as compared with woods.

In Switzerland.

264. *Mean Monthly Temperature (Centigrade) of the Air for the eight years* 1869—76 *at Interlaken, Berne,* and *Pruntrut.*

1. Interlaken (forest of larch). In fields 9°.92; at breast height in forest, 9°.12; at tree-tops 9°.38.

2. Berne (forest of red fir). In fields 9°.24; at breast height in forest 8°.54; at tree-tops 8°.09.

3. Pruntrut (forest of beech). In fields 9°.51; at breast height in forest 8°.70; at tree-tops 9°.23.

For the months of June, July, and August the mean temperature in the larch forest (breast height) was 1°.33, and at the tree-tops 1°.18, lower than in the fields; in the fir forest the temperature (breast height) was 1°.24, and at the tree-tops 1°.45, lower than in the fields; and in the beech forest the differences were 1°.53 and 0°.91.

Mean Monthly Temperature of the Soil (Centigrade). At the surface of the ground, the mean temperature in the woods was 2°.33 lower than in the fields; at a depth of 0.3 meter the temperature of the soil was 1°.75 lower than in the fields; at a depth of 0.6 meter 1°.90; at a depth of 0.9 meter 1°.78; and at a depth of 1.2 meter 1°.81 lower than in the fields.

The greatest differences occurred in summer, and amounted at the surface to 4°.66, at 0.3 meter to 3°.72, at 0.6 meter to 3°.46, at 0.9 meter to 3°.81, and at 1.2 meter to 3°40. In the fir forest the difference was greater than in the beech or larch forest.

Mean Monthly Relative Humidity (Percentages). 1. Interlaken. In the fields 71.19; in larch forest 74.95; difference 3.76.

2. Berne. In the fields 78.34; in fir forest 85.80; difference 7.46.

3. Pruntrut. In the fields 78.12; in beech forest 81.55; difference 3.43.

The differences were greatest in June to September, inclusive, and on an average amounted to 13.91.

In France.

265. *Temperature of the Air* (Centigrade). M. Mathieu found that at 1.5 meter above the soil the temperature of the air at all seasons, and especially in summer, was lower within the woods than in the fields. The mean annual difference, however, was not large. At Asschaffenburg, the results of several years' observation made the difference 0°.78.

According to M. Fautrat's observations, extending over two years, the mean monthly temperature in leaf-woods was 0°·31, and in pine-woods 0°·87, lower than in the fields; and the differences were greatest in June, July, and August.

Evaporation. According to M. Mathieu's observations, the evaporation from an open surface of water in the woods was 63.0 per cent. less than in the fields. The evaporation from a free water surface was the same as from an equal surface of saturated soil. A covering of dead leaves had the same protecting influence on the soil as a dense growth of trees.

Rainfall. Marshal Vaillant's observations at Fontainebleau in 1866 showed that while 859.5 mm. of rain-water reached the ground in the open fields, only 512.7 mm. reached it in fir woods, 524.7 in leaf woods, and 227.5 in spruce woods. At Gonards, near Versailles, 562.3 mm. reached the ground in the open fields, 459.5 under oaks, 428.0 under leaf-woods, and 285.2 under fir (*pinus sylvestris*). It would thus appear that at Fontainebleau 73.5 per cent of the rainfall was retained by the pines, and 49.3 per cent at Gonards.

M. Mathieu found that about 26 per cent of the rain was intercepted by the foliage of the trees. The amount differed much between forests of different kinds.

In 1874, M. Fautrat found that a rain-gauge fixed on the top of a large poplar, in a dense wood of 500 hectares, received much more water than one of similar height 300 meters beyond the borders of the wood. These experiments were continued for two years longer, and they confirmed the first results. A rain-gauge placed over the *pinus sylvestris*, in a dense forest, at 12 meters elevation, was found to receive 10 per cent more water than in the fields at the same height. Pines, therefore, were considered to have the property of condensing the vapors in a higher degree than leaf-woods. Hygrometrical observations showed also a considerable excess of moisture within the pine forest, as well as over it, as compared with fields, and that the evaporation under pines was considerably more rapid than under deciduous trees.

M. Mathieu found that a wooded country tends to increase the precipitation of atmospheric moisture, most sensibly in sloping and mountainous regions, and that on plains this effect is scarcely appreciable.

Other effects of Forest.

266. There are other effects of forests, some of which are con-

sequences of those which have been mentioned above, some mechanical, and some physiological.

Evaporation from the leaves of trees tends to keep the air moist.

Trees withdraw moisture from the soil. "The tree is, in one sense, a stream of water, which, during the growing season, is moving from the fibers of the roots, through the outer body of the wood, into the limbs and branches and into the leaves." In this way forests remove a great amount of water from the soil at various depths, and give it off as vapor. An enormous evaporation is constantly going on through the leaves, &c., in the growing season, especially in the day-time. Trees thus increase the moisture of the air, inasmuch as without them the water at certain depths would not be available for evaporation. They also give rise to a more prolonged evaporation than naked soil.

Trees tend to prevent surface drainage.

When rain falls in forests, a portion of it is retained by the leaves and branches. Another portion runs along the branches and stems to the ground, and thence along the roots to different depths. In this way surface drainage is diminished, and more water passes by infiltration to the low lands, where it reappears as springs.

Forests prevent inundations.

Forests, by retaining a large portion of rain-water, prevent inundations of low-lying plains. Floods in the Alps and Pyrenees were so disastrous that the Governments of France and Switzerland have adopted measures for replanting the mountain slopes.

Trees act as conservators of the water of springs, streams, &c.

By direct protection from the sun, by lowering the temperature, and by diminishing evaporation, trees act as conservators of springs, streams, and rivers. They, also, by absorbing water from the soil, and by giving it off as vapor, still further increase the humidity of the air. Thus charged with moisture and cooled, the air does not take up by evaporation the rains which fall, and the surplus water goes to feed the springs and streams.

Trees reduce the velocity of the surface winds.

The amount of evaporation from an exposed surface of water, or from moist soil, depends much upon the motion of the lower currents of air. In calm weather, evaporation is, *ceteris paribus*, much less than in windy weather. Hence, by reducing the velocity of the stratum of air immediately over the soil, trees diminish evaporation.

Sanitary effects of forests.

It is generally believed that the destruction of forests has an injurious effect upon health. Many cases in support of this belief might be adduced. Dr. Hough gives the following: Palo, a railway station between Civita-Vecchia and Rome, was healthy until a piece of wood, which for many years had stood between it and a malarious district to the south, was cut down; the south winds brought in the fevers from the pestilential districts. Manziana, a place lately almost entirely free from malaria, has suffered in like manner, since an adjacent forest was destroyed by fire. A similar phenomenon was observed at Sezzé. Supino formerly passed for healthy, but after the cutting down of woods the malaria soon became seated, and, in a short time, many of the inhabitants fell victims to disease.

Lancisci relates that the insalubrity of Rome was notably increased in the days of Gregory XIII, when a pine forest to the south was cut down because infested by brigands.

On the other hand, there are cases of the happy effects of planting trees. The Abbey of Trois Fontaines, near Rome, was one of the most insalubrious and fever-breding places in all the campagna; but for the last three years it has enjoyed some relief from a young plantation of the *Eucalyptus*. Similar examples are reported from Algeria. The *Eucalyptus* is supposed to operate on pestilential emanationsfrom marshes partly by absorbing humidity from the soil, and partly through the camphorated exhalations from its leaves, purifying the atmosphere to their leeward *

The hygrometric state of the air has great influence upon human health, and the degree of humidity is affected by forests. "Dry air has very often an injurious effect upon the organs of respiration, and the fact that we breathe easier in forest air is due to the greater relative moisture. In dry air the cutaneous perspiration is increased, and more warmth is taken from the body."

Probably, plants and trees, through exhalations from their leaves, &c., have sanitary and other effects which are still unknown.

Summary of the Effects of Forests.

267. The principal known effects of forests may be briefly stated as follows: (1) By screening air, soil, and water from the direct action of the sun's rays, forests keep down the temperature, increase the relative humidity, diminish evaporation, and protect springs, streams, and rivers. (2) By lowering the temperature, and at the same time by exhaling from their leaves aqueous vapor taken up as water by their roots, trees keep up a certain degree of moisture in the air, and tend to produce rain. (3) The leaves and branches of trees retain a considerable portion of the rain-water that falls upon them, and the evaporation of this water lowers the temperature and increases the humidity still further. (4) The roots of trees promote the infiltration of the rain-water which reaches the surface of the ground, and thus tend to keep up a supply of pure water in springs, ponds, and marshes at lower levels. (5) As retainers of rain-water, forests prevent floods, or at least diminish their effects. The water which is thus kept back, instead of inundating the lowlands, or running into the sea and being lost, is stored up for future evaporation, for the requirements of vegetation, and for the gradual feeding of springs, streams, and rivers. (6) Through their effects on the temperature and humidity of the air, on evaporation, on springs, rivers, and storm-rains, and through emanations from their leaves, forests have sanitary influences.

Explanation of the effects of Eucalyptus.

"The generally received explanation of the sanitary activity of the various species of *Eucalyptus* is that they exhale large quantities of volatile oil. This oil, and indeed all the oils upon which the aroma of herbs and flowers depends, generate peroxide of hydrogen by their action upon air and watery vapor. Now as peroxide of hydrogen acts very energetically upon decompos-

* Report upon Forestry, p. 285.

ing animal and vegetable matter, we can see why a Eucalyptus forest should have a beneficial effect upon the health of the surrounding country" *

Topography of Mauritius

268. Mauritius lies between 19° and 21° South latitude, and 57° and 58° East longitude. It is irregularly pear-shaped with the broad end towards the South. From North to South its greatest length is 39 miles, and its greatest width from East to West 28 miles.

Table lands.

The principal feature in the conformation of the Island is, that it consists of a central table-land, which is separated from the littoral plains, in some places by lofty mountain chains, in others by steep precipices, and in others by more gradual, but still rapid, descents. The ridge of this table-land, is the principal water-shed, and it extends irregularly from the Savanne mountains, in the S. W., to the northern limits of Moka, towards the North end of the Island, over a distance of about 20 miles; and, like the table-land itself, it is most elevated in its southern half, at the extremity of which it has an altitude of nearly 2,000 feet above the sea-level.

From this central ridge the ground generally slopes on either side, but forms, here and there, extensive plains, which, in some places, are abruptly separated from those near the sea, by almost perpendicular cliffs.

Except in the northern districts of Pamplemousses and Rivière du Rempart, and in a large portion of Flacq, which, generally, are one extensive plateau, not exceeding 300 feet above the sea-level, the more gradual ascents in the intervals between the mountains, commence at short distances from the sea, and continue up to heights of 1,200 to 2,000 feet.

Thus, the railway from Port Louis on the N.W. to Mahebourg on the S.E. coast crosses the table-land obliquely, and the heights of the stations show the ascent and descent in that part of the Island. At 4 miles from Port Louis, the elevation is 392 feet, at 8 miles 923 feet, at 11 miles 1,311 feet, and at 16 miles, or about half way, 1,822 feet. The line then descends to 1,000 feet at 12 miles, 559 feet at 7 miles, and 253 feet at 5 miles, from Mahebourg.

Again, the Moka branch line, which, when completed, will extend in an easterly direction from Rose Hill, in Plaines Wilhems, across Moka to Sans Souci, on the confines of Flacq, and which is entirely on the elevated table-land, rises from 923 feet at Rose Hill to 1,436 feet at Verdun, 6 miles farther east, and then descends to 900 feet at Sans Souci, 8 miles east from Verdun, the central ridge being crossed near Verdun.

On the other hand, the Savanne branch line, which extends in a S. b. W. direction from Rose Belle, in Grand Port, to Souillac in Savanne, over a distance of 11 miles, descends from 920 feet, at a distance of 2¾ miles from Rose Belle, to 42 feet at Souillac.

* Nature's Hygiene. By C. J. Kingzett.

Over considerable extents, however, the table-land in the interior is separated from the littoral plains by mountains, of which there are three principal groups or ranges, namely, the Savanne and Black River range in the South and S.W., the Bambou range in the S.E., and the Port Louis range in the N.W. From these principal chains, which rise to heights of 1,000 to 2,800 feet, secondary chains branch off towards the sea, and these secondary chains send off spurs which often terminate abruptly. In the interior and other parts of the Island there are, here and there, isolated elevations.

Mountains.

From Souillac, at the southern extremity of the Island, round to the Morne Brabant, at the S.W. extremity, and thence northward to Roche Bois, a little beyond Port Louis, the distances between the mountains and the sea are generally short, seldom exceeding 2 miles; except in the space between the southern extremity of the Port Louis mountains and the northern extremity of the Black River mountains, where the ground slopes to the sea, and where, at intervals, are situated the Corps de Garde, Grand Malabar, and Petit Malabar mountains, which, though isolated, are apparently a continuation of the main chains. The Port Louis range extends at first in an E. N. E. direction over a distance of 7 miles, and then trends to East and S.E., terminating in the Moth à Thérèse in Flacq, between which and the Bambou Mountains (8 miles to the S.E. rd.) are the Fayence and Blanche mountains. The distances between the Bambou mountains and the sea are also short; but from their southern extremity to the eastern extremity of the Savanne mountains, the ground slopes to the sea.

Generally, therefore, the table-land of the interior is surrounded by mountains, between which and the sea there are low-lying plains of varying width; and the most extensive of these plains are to the North, N.E., and East of the Port Louis range of mountains.

Between the secondary chains, which radiate towards the sea from the main chains, there are deep valleys or gorges, which extend to the bases of the mountains.

Rivers.

With the exception of Rivière du Rempart and a portion of Pamplemousses, in the north, the Island is drained by many streams and rivers, the largest of which, as Grand River N.W., Grand River S.E., the Tamarind, and the Poste, take their rise on the highest parts of the central table-land. There are numerous streams and tributaries, also, which have their sources among the mountains.

Marshes.

Frequent reference has already been made to marshes on the low lands, all round the Island. Baron D'Unienville gives lists of the largest marshes and ponds in each District, but there are a good many smaller ones, of which he makes no mention. It would be interesting to know what is the total area of these marshes, marsh-lands, and ponds, and of the salt-water or brackish lagoons and *barachois* around the coasts. That it is considerable there can be no doubt, but I have no means of forming an estimate. In his Report on the Epidemic Fever of

1866-67, Dr. A. R. Barraut alludes (p. 3) to "large tracts of marshy ground" in Black-River, Pamplemousses, and Flacq. Other medical men make mention of marshes and ponds on the low lands of these Districts and of the Districts of Grand Port and Savanne; but I can find no data for forming an opinion of the aggregate area. The Fever Commission of 1868 remark (p. 29): "Our marshes consist of marshes proper, and of wet and marshy ground. We need not enumerate them in detail. The General Board of Health can easily ascertain, through its engineer and its officers, the nature and extent of the marshes or marshy ground, lagoons, and mouths of rivers, throughout the Island." I do not know whether any step has been taken in that direction. The only statement I have met with as to the areas of the marshes, is one made by the late Dr. C. Régnaud, who says, in his Second Report on the "Causes of the Pollution of the Water Courses, &c.," dated the 8th June, 1874: "Il existe dans la Colonie, des marais, mares ou terrains marecageux, en nombre considerable, et plus ou moins étendus, dont la superficie varie de 1 à 60 arpents, dont le trop plein se déverse dans les rivières, et dont les eaux croupissantes piétinées par le bétail, particulièrement dans le district de la Rivière Noire, empoisonnent l'atmosphère aux époques de sécheresse".

Origin of the Marshes.

The fresh-water marshes, whatever may be their extent, are fed by the infiltration and percolation of rain-water, which, falling chiefly in the interior of the Island, reappears at the surface on the low lands. Hence, the quantity of water in the marshes, with its variations, depends not only upon the amount and variation of the rainfall, but upon the portion of it which finds its way to the low lands.

Geology.

Mauritius is of volcanic origin, and its rocks consist almost entirely of basalt and its varieties, trap, trachyte, lava, &c. There are no sedimentary, and only traces of metamorphic rocks. Hollows, such as the Trou aux Cerfs and Grand Bassin, and conical elevations in different parts of the Island, are supposed to be indications of extinct volcanoes. According to some, the greater part of the central table-land, more or less encircled by mountains, is also an extinct crater; while according to others, it was formed by subsidence, the greater part of the Island having previously been one lofty mountain. But whatever may have been the case in these respects, there is evidence of successive upheavals, and of successive overflows of lava. It is difficult to account otherwise for the terraced table-lands, steep precipices, and horizontal stratifications.

Soils.

The soils of Mauritius are, of course, formed chiefly of decomposed volcanic rocks and products, and to a small extent of vegetable mould. Generally, they are of small depth and very porous, and their colour and composition vary according to the nature of the surface rocks from which they have been derived. As a rule, their colour is black, brown, or red. The black soil is argillaceous, contains a large amount of organic matter, and is very fertile. The brown and red soils, which are the most common, contain a good deal of iron. In many parts of the low lands, and elsewhere, the subsoil is clayey and near the surface, and more or less ~~to~~ impervious to water. This is particularly the case in the Districts of Black River, Port Louis, and Pamplemousses.* In Rivière du Rempart, the soil is generally pervious down to

* There are several potteries, and at one time there were brickeries.

considerable depths. From the comparative absence of streams in that District it is necessary to have recourse to wells, and these vary from 20 or 40 to 150 feet in depth ; but at Poudre d'Or, on the coast, the water appears at the surface, and forms marshes. Here and there, over the island, are tracts of free soil (*terre franche*),which contains few or no stones, and has depths of 3 to 10 or more feet, below which is solid rock. Generally, however, the cultivated lands are thickly strewed with loose stones of various sizes, particularly in the low parts of Pamplemousses, Rivière du Rempart, and Flacq. In some parts of the Island there are level tracts of hard solid rock, spread out horizontally like a sheet or carpet, and almost devoid of vegetation. The most extensive of these is the Plaine des Roches in Flacq. In other places, and particularly in Black River and Plaines Wilhems, there are caverns and subterranean passages.

Coral Reefs and Islets.

The Island is surrounded by a belt of coral reefs, from 300 to 500 feet in width, through which there are at intervals passages to the open sea. The average distance of the reefs from the shore is nearly a mile. Generally, they are only a few feet below the surface, while some of them are above it, especially at low water. On the south-east side of the harbour of Port Louis, where the Port Office stands, there are coral banks, from 8 to 12 feet above the present sea-level, showing that there must have been either an upheaval or a subsidence. There are a good many islets all round the coast.

Primeval Forests of Mauritius.

269 When the Island was discovered by the Portuguese, in or about 1505, it was covered with almost one dense forest from the mountain tops to the sea.

The first settlements were made by the Dutch, in 1664-68, in the lower parts of Grand Port and Flacq, and on the N. W. coast, in the neighbourhood of Grand River.

Having been finally abandoned by the Dutch at the beginning of the 18th century, the Island was taken possession of by the French in 1715 ; but no permanent establishment was made by them till 1721 ; and it was only in 1734, when Labourdonnais arrived as Governor, that real progress commenced.

The descriptions given of the native forests of Mauritius, as they existed in the days of Labourdonnais, and long after his administration, are such that, in presence of what is now seen, one is apt to think they were exaggerated. It is somewhat difficult to realize that, in a not remote past, extensive tracts which are now covered with sugar-canes, or are teeming with human life and industry, were so densely wooded that it was impossible to traverse them, and that the branches of the trees high overhead, and of the lower thick undergrowths, with their rich ever-green foliage, were so closely interlaced as almost to shut out the light of day. But such was no doubt the case.

Mr. Thompson's Report.

A full description of the trees and shrubs which formed the primeval forests of Mauritius is given in the admirable Report recently drawn up by Mr. R. Thompson, Deputy Conservator of the Forests of India. † There were forests within forests. The oldest and largest trees, 50 to 70 feet in height, towered above the tops of younger undergrowths, and lower down there was an impenetrable tangle of brushwood, ferns, and creeping plants.

† Report on the Forests of Mauritius, their present Condition and future Management. By R. Thompson, Esq., Deputy Conservator of Forests, India.

Clearings.

The clearings were commenced on the littoral, at first on the S.E., East, and N.W. coasts; were gradually extended round the Island; and, as population and agriculture increased, were pushed on inwards and upwards towards the high lands in the interior.

Forests in 1753.

In 1753, the Abbé de la Caille, who was then in Mauritius, estimated that one-tenth part of the Island had been cleared; but Baron Grant states, in his History of Mauritius, that by that time one-eighth had been cleared.

Forests in 1770.

Towards 1770, according to Dr. Régnaud's Second Report (Water Pollution Commission, 1874), the number of *arpents* * in wood was 372,680, while the total superficies of the Island, according to de la Caille, was 432, 680 arpents. It would thus appear that at that time 86 per cent. of the surface of the Island was in wood (Report p. 17).

Forests in 1846.

From a Report of the Surveyor General, dated the 27th March, 1847, it appears that in 1846, the total number of arpents still in forest was about 136,000.

Forests in 1874.

In 1874, Mr. G. Reid, Government Surveyor, furnished to the Water Pollution Commission data from which it was inferred, that the number of arpents of forest destroyed by private proprietors, since 1847, was 40,000. The total number of arpents in wood in 1874 was estimated at 82,000. But these woods, for the most part thinned out and composed of brushwood, were very different from the virgin forests.

Forests from 1835 to 1872.

Mr. Thompson (Report, pp. 12-13) contrasts the forest-area of Mauritius, as shown by a map of the Island published by Major F. A. Mackenzie Fraser, in 1835, with the forest-area, as shown by a map published in 1872. According to the former map, in 1835 "nearly two thirds of the total area of the Island "was under primeval forests. There was then an unbroken "mass of forest extending from the sea-coast, in the south, across "to the Calebasses mountains, in the north. The greater part of "Savanne, Grand Port, and the southern half of Black River, "were then in forest. On the table-land itself the forests had "only disappeared in Moka, westward from a point near Mont "Thérèse, but a considerable gap had been made in Plaines "Wilhems, while on the low country and bordering the coast "all forests had been cleared away, excepting small plots scat-"tered about here and there, and evidently indicating that the "land thus occupied was not culturable—for instance the whole "of the Plaine des Roches and other tracts similarly circumstan-"ced." According to the map of 1872, "the great mass of the "aboriginal forests had then disappeared from the central parts "of the Island, and they had also receded from the coast up-"wards to the heights. The whole of Savanne and a great part "of Grand Port had been cleared. So that, from occupying an "area equal to that of two thirds of the Island in 1835, the forests, "in 1872, were reduced to about 70,000 acres; and at the present "day (1880) the area of what were once aboriginal forests, but

* An arpent is equal to 1.043 Eng. acre.

"now more or less dilapidated and ruined, is reduced to about "35,000 acres. With the exception of such forests as the Crown "holds, private proprietors, up to the present moment, are actively "engaged in still further reducing those areas, by extending the "cultivation of the sugar-cane, and by leasing the right to fell "timber and to burn charcoal to the natives of India."

Crown Forests.

"The total determined area of the Crown lands," observes Mr Thompson, "amounts to 34,342 arpents (or 35,750 acres), and "these lands in a great measure constitute what are called Moun-"tain and River Reserves, besides great tracts which lie in the "lower parts of the Black River District, and which have been "entirely denuded of all forest growth. Viewed as a whole, the "Crown forests of the Colony, of indigenous growth, whether class-"ed as ordinary forests, or Mountain and River Reserves, pre-"sent a picture, with some slight exceptions, of doleful ruin. "From most or all of them the valuable kinds of timber yielding "trees have been cut down and removed. What now remain are "the dead, the dying and diseased trees, of mature and immature "growth, of the less valuable species, the timber of which was not "worth the trouble of felling, or the cost of carrying away." (Report, pp. 23—24).

Private Forests.

Like the Crown forests, the forests in the hands of private owners "are in a state of utter dilapidation. The only forests "worth anything at the present day are those belonging to the Ho-"norable Mr. Pitot, situated in the south of the Savanne District, "and measuring some 2,000 arpents; and a considerable forest, "though not uncut, lying near the Quartier Militaire in Moka, "and measuring 4,171 arpents. With these two exceptions, the "private forests of Mauritius may be said to have been worked "out of all valuable timber. It is estimated that, including the "above 6,171 arpents, there are not, at the present day, 16,000 "arpents of private forest which contain trees of large size, and "that at the most 10,000 arpents contain nothing but the dead, "the dying, and diseased trees of mature and immature growths "of inferior species. And even these (remaining) forests are fast, "*daily*, disappearing beneath the axe of the wood-cutter and "sugar-planter combined" (Report, pp. 24—25).

Mr. N. Cantley's estimate of the areas of Government and Private Forests.

In 1878, Mr. N. Cantley, who was then Acting Director of Woods and Forests, and who had carefully studied the matter, submitted to the Government a valuable Memorandum (with map) embodying the results of his own personal inspections and measurements of the public and private forests of the Colony, and of information supplied to him by the Surveyor General's Department. From Mr. Cantley's detailed accounts and tabular statements it would appear that in that year the extent of Government forests was 19,000 acres, and of private forests 16,354 acres, making in all 35,354 acres. But these forests were far from being intact.

Extent of denudation from 1846 to 1878.

Assuming, then, the Surveyor General's estimate of the total forest-area of the Colony in 1846 (136,203 *arpents*) to have been approximately correct, and that of Mr. Cantley in 1878 (35,354 *acres*) also so, it would follow that in the 32 years 1846-78 about 106,706 acres of forest land were denuded.

Increase of Population and Exports in 1846-1879.

From 1846 to 1879 the Indian population increased from 65,441 to 243,386, and in 1878 the number of Indian *Immigrants* in the Colony was 140,698. In 1845-46 the exports of sugar amounted to 102,168,168 lbs. from which they rose to 316, 322,276 lbs. in 1862. Since 1862 they have fluctuated between 297,687,662 lbs. in 1878-79 and 156,563,284 lbs. in 1868-69, having, however, been nearer the former than the latter figures.

Denuded lands not all cultivated.

The destruction of the forests, then, was closely related to the increase of population and the extension of agriculture. But only a portion of the denuded lands was cultivated. Many forests were cut down, or thinned, solely for firewood, charcoal, and timber.

Concessions and Sales of Land.

All the lands now in possession of private persons were originally either conceded, or sold, by the Government, and by far the greater portion was conceded. Dr. Régnaud (Second Report of Water Pollution Commission, p. 17) states that, according to a map which was prepared in 1773, it is clear that the concessions which had been made down to 1770 amounted to 60,000 arpents, the remaining 372,680 arpents being still Government property. According to the Surveyor General's Report of the 27th March, 1847, the number of *conceded* arpents amounted in 1846 to no less than 318, 504. Only comparatively small plots had been sold.

Under what conditions were the Concessions made?

270. It would be interesting to know what were the conditions upon which these concessions were made. As yet, I have obtained no precise information on the subject, but I hope to do so before closing this Report.

Forest and River Legislation in Mauritius,

271. The Regulations, Arrêtés, Notices, Proclamations, Laws, and Ordinances, which have been made and promulgated, during more than 100 years, for the conservation and protection of the forests and rivers of this Colony, are numerous and instructive. The following, so far as I have been able to ascertain, is a list of them :

Ordinance of Sept. 25, 1766.

(1). Constituting a "Tribunal Terrier" for regulating the distribution and passage of water for irrigation.

Ordinance of June 17, 1769.

(2). All houses and plots of ground conceded within the boundaries of Port Louis to be enclosed with thick-set hedges of bambous, acacias, &c. Owners of plots of ground bounded by four streets to plant trees and protect them. Goats and pigs to be shut up. No persons whatever to injure, cut down, or uproot the trees and hedges, on pain of being prosecuted and punished.

Ordinance of Nov. 15, 1769.

(3). Prepared, under the title of "Réglement Économique," with the object of preventing the reckless destruction of the forests. This was a most stringent ordinance. It exacted a *reservation*, for forests, *of one fourth part of all the concessions* ; forbade the use of wood in building, the carrying of firebrands, the clearing of land within ten perches of the banks of streams, the cutting of trees on the Kings' reserves, and the cutting of wood for forges, without the direction of a conservator ; required the owners of land *to get licenses* before clearing, ordered them to maintain a watch over their forests, held them responsible for damages, and enjoined them to plant trees along the public roads, at their own expense ; and laid down regulations as to the making of charcoal, the grazing of cattle, the manner in which trees were to be cut, &c.

Ordinance of Sept. 21, 1772.

(4). All persons, without distinction, are forbidden under any pretence to carry embers of wood into fields, roads, or forests, on pain, as to persons belonging to the white population, of a fine of fifty " livres ", and, as to blacks, of being flogged in the public square.

Ordinance of Sept. 26, 1772.

(5). Persons not having regular title-deeds of concessions to stop entirely all works on the lands they were clearing. Owners of land in the vicinity of the coast to allow a width of 400 toises of forests from the border of the wood which faces the sea, and not to cut down any kind of wood, or to allow any to be cut down. The borderers of the Grand River canal not to injure it, or to erect any works within 24 feet of it.

Réglement of Nov. 3, 1774.

(6). Prohibiting the erection of wooden buildings in Port Louis.

Réglement of Dec. 29, 1777.

(7). Also prohibiting the erection of wooden buildings in Port Louis, and appointing an Inspector.

Ordinance of May 17, 1781.

(8). Preventing people from turning aside for their own use the waters of the Pamplemousses and Calebasses streams, and enjoining proprietors to take care that their cattle, and especially their pigs, should not injure the dikes and works connected with those streams, and with the marshes, rivulets and ponds, where rain-water was collected.

Arreté of June 29, 1799.

(9). Preventing people from washing and bathing in Grand River N. W., especially persons attacked with contagious diseases. It enacted ten days' imprisonment and a fine of fifty dollars for the first offence, and double that punishment for the second.

Arrêté of January 3, 1803.

(10). For protecting the water of the Terre Rouge Canal in Plaines Wilhems. It prohibited the washing of clothes and animals in the canal, and the planting on its banks of trees or shrubs the roots of which might reach the water ; and enjoined care and circumspection with regard to the residue from distilleries and indigoteries.

Arrêté of Oct. 31, 1803.

(11). This arrêté extended to the Pamplemousses and Calebasses rivers, and to all the streams, sources, and canals which supplied the Powder Mills, the Arsenal, and other establishments with water, the provisions of the arrêté of January 3, 1803.

Arrêté of Oct. 5, 1804.

(12). Promulgated with the object of enforcing the observance of the old Regulations for the conservation of the rivers and forests, &c., and of adding thereto " dispositions the utility of which is shown by the experience and circumstances of everyday life." This arrêté prohibited proprietors from cutting down wood of any description, until they had made certain declarations ; required them to maintain in forest *at least the sixth part* of their lands, in addition to the woods existing along the beds, banks, and escarpments of the rivers and streams, over a width of 120 feet on each side, at all distances less than two leagues from the sea, and over a width of 60 feet beyond two leagues ; prevented the cutting of wood on the *mornes* and *pitons*, above one third of their altitude ; and ordained that the proprietors, at their own expense, should replant the woods which they ought to have reserved, and that every proprietor of land on the limits of the reserves on the sea-shore should maintain a belt of wood of 180 feet in breadth, and, towards that end, should renew the woods that had been destroyed.

Arrêté of May. 5, 1807.

(13). The reserves on the sea-shore, called the 50 " pas géométriques ", being occupied by persons, some of whom have no title-deeds, the said reserves are maintained and declared to be inalienable. Ponds, salt-water marshes, lakes, bogs and basins, situated wholly or partly on the " pas géométriques," are declared to be annexes thereof. All permissions of settlement and all title-deeds are to be produced by the persons claiming under them.

Proclamation of Sept. 5, 1811.

(14). Appointing a Conservator of Waters and Forests, and two principal Inspectors.

Proclamation of May. 13 1812.

(15). Making provision for the maintenance and protection of the Grand River canal.

Proclamation of June 3, 1812.

(16). Prohibiting the cutting and felling of any kind of wood in the Reserves near Port Louis, namely, the Pouce Valley, the Valley des Prêtres, Anse Courtois, &c. ; appointing a special Forest Guardian ; and instructing the Conservator of Waters and Forests to prepare a Report on the actual state of certain parts of the Colony, on the extent and the condition of the concessions of land which had been made, on the extent and condition of the lands which had not been conceded, and on the localities which it was essential to maintain in forest, for the conservation of the rivers, &c.

Proclamation of Feb. 3, 1813.

(17) Transferring to the Surveyor General all the functions, powers, and attributions, which belonged to the Department of Waters and Forests.

Proclamation of July 26, 1821.

(18). The maintenance and repairs of the Grand River canal to be under the surveillance and inspection of the Civil Engineer and Inspector General, and the Commissary of Police. No plantations or buildings to be near the canal.

Proclamation of July 31, 1823.

(19). The provisions of the proclamation of May 13, 1812, with some exceptions, to be applicable to the Tombeau River canal.

Committee appointed in 1826.

For inquiring into, and reporting upon, the state of the forests and canals of the Colony ; the necessity of a strict execution of the Laws and Regulations relating to this matter ; and especially the means of ameliorating the system of canals in general.

Ordinance of March 12, 1828.

(20) By this ordinance some of the Regulations of the arrêté of Jan. 3, 1803, were extended to all the rivers, streams, and ca-

nals of the Colony. It also fixed at 30 toises from rivers, &c., the distance within which no buildings, distilleries, sugar-houses, &c., should in future be allowed.

Ordinance of Dec. 15, 1830. (21). For the better prevention of abuses in the use and economy of the water of the Bathurst canal. Trees, shrubs, buildings, &c., not allowed within 12 feet of the borders of the canal.

Ordinance No. 4, of 1838. (22). For determining the mode of superintending and keeping in repair the Bathurst canal.

Ordinance No. 6, of 1838. (23). For establishing a Penal Code. Any person who shall throw filth or any other thing into or near any stream, canal, or running water, fountain, or public reservoir, or shall wash, or bathe therein, to be liable to pay a fine not less than 4 sh., and not exceeding £ 4.

Ordinance No. 23 of 1839. (24). For placing the Ville Bague and Bois Rouge canals under the administration of the co-borderers.

Ordinance No. 37 of 1851. (25). Appointing, for the first time in Mauritius, Boards of Health. This ordinance enacted, *inter alia*, that any person found to have polluted, or to have caused others to pollute, the water in any stream, river, or canal, should be liable to pay a fine not exceeding £ 5.

Ordinance No. 30 of 1854. (26). For amending the laws relating to the conservation of woods and forests. By this ordinance most of the provisions of the arrêté of October 5, 1804, were repealed. It prohibited the cutting of wood within 50 feet of the banks of rivers and streams, on the sides and slopes of mountains beyond one third of the heights from their bases, and wherever the dip or inclination exceeded 45°, even if the land was private property, except with the authorisation of the Governor, or by a judgment of the Tribunal Terrier. It also prescribed the replanting, in the course of 12 months, of the lands which had been denuded within the above limits, and the maintenance of the young plantations ; and empowered the Government to nominate, and maintain at the expense of the proprietors, guardians of the woods and plantations.

Proclamation of Dec. 15, 1854. (27). Guardians of Crown Lands to be deemed Rangers of Woods and Forests.

Ordinance No. 1 of 1855. (28). This ordinance repealed that of March 12, 1828, and fixed at 70 yards the distance from rivers, streams, and canals, within which no buildings, &c., should be allowed ; and empowered the Surveyor General to order the removal of nuisances at a less distance, to prohibit the deflection of streams and rivers from their natural channels, the return to the rivers of waste water and residue from sugar-houses, &c., and the construction, without his approbation, of any sugar-house, distillery, or manufactory, within 500 yards of a river, stream, or canal.

Ordinance No. 21 of 1856. (29). To make provision for the engagemet, for limited periods, of Forest Rangers.

Ordinance No. 18 of 1860. (30). Ordinance No. 37 of 1851 was abrogated by ordinance

No. 18 of 1860, which empowered the Local and General Boards of Health to construct public fountains and lavatories.

Ordinance No. 36 of 1860.

(31). To make provisions regarding the management, &c., of the New Canal from Grand River to Port Louis, and to amend the law regarding the administration of the Bathurst and Dayot canals. These canals to be under the management of the Municipal Corporation. Penalties to be imposed for injury to fountains, &c.

Ordinance No. 35 of 1863.

(32). Ordinance No. 1 of 1855 was in its turn repealed by ordinance No. 35 of 1863, which enacted that no building, sugar-house, or manufactory whatever, no park, poultry-yard, or water-closet, should be erected within 100 feet of any river or stream, without a written authorisation from the Surveyor General. It prescribed the removal of all buildings, cess-pools, manures, dirt, or other accumulations of matter, placed so that water passingfrom them might pollute a river or stream. Pains and penalties were enacted against those who should corrupt sources or streams. The local Boards of Health were not allowed to establish fountains, reservoirs, lavatories, &c., without the sanction of the Executive Council; but they were authorised to prevent the washing of clothes, animals, &c., in rivers or water-courses near which public lavatories had been established.

Commission of 1867.

On the 23rd September, 1867, Sir Henry Barkly appointed a Commission to consider the best means for preserving the trees on the mountains, and for augmenting the water supply of the Colony. This Commission consisted of eleven Members, who divided themselves into four Committees, of which only two presented Reports.

Draft Ordinance of March 1, 1870.

(33). On the 1st March, 1870, the draft of a new ordinance for the better protection and conservation of the forests and rivers was laid before the Council of Government; but having met with much opposition, this projected ordinance was withdrawn, in November, 1870.

Draft Ordinance of December, 1870.

(34). An amended draft ordinance was published in December, 1870, and referred to a Select Committee, who reported upon it in July, 1871. There was much diversity of opinion in the Committee and in the Council, and the ordinance made little progress.

Ordinance No. 9 of 1872.

(35) Meanwhile, the Surveyor General reported that "the cutting down of timber was proceeding with a rapidity unexampled in the history of the Island," and suggested the advisability of passing a short provisional ordinance for arresting the devastation. Accordingly, an ordinance was prepared and passed, increasing the penalty against the illegal cutting of wood, and prohibiting proprietors to plant anything but trees on the borders of rivers.

Ordinance No. 12 of 1872.

(36) In March, 1872, the Legislative Council adopted, after many amendments, the new draft ordinance on woods, forests and rivers; and this ordinance and also ordinance No. 9 of 1872 were transmitted to the Secretary of State, who approved of the latter, but rejected a great part of the former.

Water Pollution Commission of 1872.

On the 19th July, 1872, a Commission was appointed by Sir Arthur Gordon to inquire into, and report upon, the causes of the pollution of the water-courses, canals, mouths of rivers, creeks, &c., of the Colony. This Commission (which was preceded by a similar one appointed on the 14th February, 1871) presented a "First Report." on the 20th September, 1873, and a "Second Report" on the 8th June, 1874.

Mr. Bernard's analyses.

These Reports were drawn up by Dr. C. Régnaud, and they contain valuable information. The "Second Report" gives the results of six analyses of water made by Mr. C. Bernard, and I find that Mr. Bernard's results confirm those of Dr. Guthrie (pp. 98-100). * In fact, there is no evidence that the general health of the Colony has suffered from pollution of the rivers. Dr. Régnaud, however, gives several instances of partial pollution by the residue from sugar-houses, and the subject is one which merits attention.

Committee of 1873.

On the 12th September, 1873, a Committee of the Legislative Council was appointed by the Hon. Ed. Newton for the purpose of inquiring into the state of the villages of the Colony, and suggesting what measures should be adopted in the interest of their inhabitants.

Ordinance No. 18 of 1874.

(37). The object of this ordinance was to make better provision for the protection and disposal of the Crown lands, and to provide for the powers and duties of Forest Rangers. It enacted penalties for the cutting of trees, provided for the planting of the "Pas Géométriques," laid down regulations for leases and sales, and defined the duties, &c., of Forest Rangers.

Ordinance No. 13 of 1875.

(38). This ordinance was passed for the purpose of providing for the conservation of woods and forests on the Crown reserves and of other plantations and forests of the Colony; and protecting the water-courses of the Colony. It defines mountain and river reserves, water-courses, rivers, rivulets, &c.; enacts penalties; makes it unlawful to plant reserves, except with trees; provides for the survey of reserves and the making of regulations; and repeals the ordinance of the 17th June, 1769, the "Reglement Economique" of 15th November, 1769, ordinance of September 21, 1772 (Code Delaleu), article 2nd of ordinance of September 26, 1772 (Code Delaleu), arrêté of 5th May, 1807, ordinance No. 30 of 1854, ordinance No. 21 of 1856, proclamation of the 11th May, 1865, ordinance No. 9 of 1872, ordinance No. 12 of 1872, and all parts of the Colonial laws, arrêtés, proclamations, notices, or ordinances, contrary to, or inconsistent with, its own provisions.

Ordinance No. 1 of 1881.

(39). For preventing the undue destruction of timber. Prohibits the destruction of trees upon all unsurveyed forest lands. The Governor may from time to time prohibit, by proclamation, the destruction of trees upon any lands specified in such proclamation. A fine of Rs. 100 to be imposed for each tree destroyed, removed, or unlawfully possessed. Any person found with an axe, or similar implement, on land the destruction of trees on which is pro-

* It is only within the last week that I have had Dr. Regnaud's Reports.

hibited, to be fined Rs. 100. Forfeiture of all trees cut in contravention of the ordinance, and of all axes, implements vehicles, cattle, or other articles, used in such contravention. Suspected offenders to be arrested.

Ordinance No. 10 of 1881.

(40). To make better provisions for the conservation, restoration, and management of forests. A "Woods and Forests Board" to be appointed to advise the Government as to the purchase of forest land, to prepare schemes of expenditure, to receive and consider reports, to supervise the administration of the Government forests, &c. A "Woods and Forests Fund" to be constituted for the purchase, maintenance, and preservation of forest-lands, the maintenance and preservation of mountain and river reserves, the protection of springs, streams, water-courses, and rivers, the salaries and allowances of forest officers, &c. A "Forest Lands Purchase Commission" to be constituted for appraising the value of lands to be acquired. The purchase of lands to be compulsory. Destruction of trees upon unsurveyed forest-lands prohibited, and fines and forfeitures enacted.

Proclamation No. 24 of 1881.

(41). Prohibits, in virtue of ordinance No. 1 of 1881, the destruction of trees upon all lands, not under cultivation, forming parts of two concessions in Savanne, eight in Plaines Wilhems, and four in Moka.

Draft Ordinance No.—— of 1881.

(42) The object of this ordinance is to give effect to Mr. Thompson's recommendations respecting the lowering of the mountain-reserve lines, and the widening of the belts of river reserves. As the slopes of mountains and the banks of rivers have always been treated, in the interest of agriculture and for the promotion of public health, as reserved lands ; as the extent of such lands has varied from time to time, according to the exigencies of the period ; and as it is now expedient that the woods and forests of the Colony should be better protected than they have ever been ; mountain and river reserves shall henceforth mean the areas comprised within certain limits and boundaries ; and, therefore, portions of ordinance No. 13 of 1875, portions of ordinance No. 10 of 1881, and all laws and ordinances, in so far as they are contrrary to, or inconsistent with, the provisions of the present ordinance, are to be repealed.*

Practical results of Legislation.

272. The above list, though probably incomplete and imperfect, suffices to show that the forests and rivers of Mauritius have received no small amount of consideration. Their conservation and protection have successively engaged the attention of every Governor and Government of the Island since at least 1766. And what has been the practical outcome of the endless inquiries, discussions, memorials, reports, arrêtés, proclamations, notices, ordinances, and laws on this subject during so many years? The answer is plain and peremptory. In his Report of the 8th June, 1874, Dr. Régnaud, after enumerating what had been done with the view of protecting the streams, rivers, and canals, says : " tel est, Excellence, l'ensemble des Lois promulguées et des mesures adoptées par les différents Gouvernements qui ont précédé le vôtre dans la Colonie,

* This ordinance, which has just passed the first reading, has raised a storm of opposition, upon the ground that it makes no mention of indemnities.

depuis sa fondation. Il ne saurait suffire à la Commission, quoique les faits soient evidents pour la population entière, de *déclarer que les efforts des autorités locales n'ont abouti à aucun résultat avantageux, et que, bien plus, la " pollution " des eaux a marché en sens inverse des moyens appliqués pour l'empêcher et est arrivée aujourd'hui à un degré effrayant pour l'avenir de l'Ile Maurice.*" Such was the deliberate opinion of the Water Pollution Commission as to the practical result of all the legislation that had taken place respecting the rivers and streams. With regard to the forests, Mr. Thompson states in his Report of the 23rd August, 1880, that " with the exception of the blocks known as Grand Bassin and Piton du Milieu, comprising about 8,240 ar- 420 pents, of which 2,410 arpents are shallow and rocky soil, there are no Government forests worthy of the name," and that " there are not, at the present day, 16,000 arpents of private forests which contain large trees." There are, in short, at this moment barely 24,000 acres of the primeval forests left, and, generally, these remnants " present a picture of doleful ruin."

Forest Legislation a failure.

273. It would thus appear that the forest legislation of Mauritius has been a complete failure. Law after law was passed, each more or less stringent, and yet the destruction of the forests proceeded. The only effect, if any, of those laws was merely to retard the rate of destruction. They never put an effectual stop to the cutting of trees on the reserves; for each arrêté or ordinance began by lamenting the injury which had already been committed.

The Laws not enforced.

274. Yet, one would suppose that at least down to 1846 there was no great difficulty in enforcing the observance of the forest laws. In that year, the number of conceded arpents amounted to 318, 504 Now, it appears from the old title-deeds, the originals of which, through the courtesy of Mr. J. Henry Finniss, I have had an opportunity of consulting,—that, most, if not all, concessions of land were made upon the condition that certain portions of them should be maintained in forest. The first concessions were made by the French East India Company in 1726; and from that year till about 1769, the principal conditions were that the lands should be put " en valeur " within a certain time, and that the grantees should give the Company one-tenth part of the produce. If the conditions should not be fulfilled, the concessions were to revert to the Government. The " Reglement Economique " of the 15th November, 1769, as we have seen, decreed that the *concessionnaires* should preserve *one-fourth* part of their lands in forest; and all concessions from 1726 to 1769, amounting to about 60,000 arpents, and all subsequent concessions down to 1804, were subject to that condition. By the arrêté of 14 Vendémaire, an XIII. (Oct. 5, 1804), proprietors were bound to preserve at least *one-sixth* of their lands in forest, *over and above* the wood existing on the river reserves, &c. The concessions made after 1804 were subject to that condition as well as to other conditions mentioned in former ordinances.

Conditions upon which Concessions of land were made.

Sufficient reserves provided for by law.

275. If, then, the law had been enforced, there would, in 1846, when the concessions amounted to 318,504 arpents, have been about 79,626 arpents of that conceded land in forest, which, according to agreement, the *concessionnaires*, or their successors, were not at liberty to cut down. These 79,626 arpents, with the present 34,

342 arpents of Crown lands, amount to 26 per cent. of the total superficies of the Island; and this exceeds the area which it is now proposed, at an enormous expense, to reforest.

But although for many years the Government had a right to insist upon certain proportions of private lands being kept in forest, it would seem that, for some reason or another, all it did was to pass laws which only had the appearance of severity, inasmuch as they were not put in force.

Conflicting opinions and interests.

276. Possibly, some Governments did not choose to incur unpopularity. There were persons who considered that the destruction of the forests was more beneficial than hurtful, while many of the Colonists held a contrary opinion. Two parties holding opposite views existed throughout, and it looks as if laws were made to please the one, and then disregarded to please the other. Droughts occurred periodically; and when cattle and crops suffered from a scarcity of water, those who attributed such visitations to the cutting down of the forests appealed to the Government, which published an arrêté, or a proclamation, or passed an ordinance. But when the drought was over, and as long as abundant rains and favorable weather prevailed the new law was forgotten, or at all events became a dead letter. The destruction of the forests was carried on as before, until another drought came, which was followed by another prohibitive law. The consequence was that the more numerous the forest laws became, the more the forests disappeared.

Every severe drought that has taken place within the last century has called forth a memorial, a proclamation, a notice, or a draft ordinance for the protection of the forests. As these droughts are usually followed by wet years, and as time is required to prepare ordinances, the projected laws have frequently been discussed during abundant rains. It has long since been proverbial that a discussion on a new forest ordinance is a sure sign of rain. The explanation of this seems to be that there is a rainfall cycle, and that before the outcry made, during the drought, has produced the desired effect, and an ordinance has been framed, the wet years of the cycle have set in.

The enforcement of the laws depended upon the Government, and those who happened to be in power did not always believe in the climatic effects of forests. There were, apparently, no fixed views or principles of action. One ordinance made the river reserves 50 feet wide, another 100 feet, another 120 feet, and another 210 feet. The limits of the mountain reserves were changed several times. One Surveyor General might order the destruction of trees, and his successor the planting of trees. *

In addition to those circumstances, there was a growing external pressure, which, as the population increased and the demand for cultivable lands became greater, tended to break down

* A case of this kind occurred once in Government street. Madame F. was fined for refusing to cut down in conformity with a new regulation some trees in front of her house. A few years later, she was fined for refusing to plant in conformity with another regulation trees where the former ones had stood.

all barriers and obstacles. And when the door to Indian Immigration was thrown open, and the fertilizing effects of guano upon the moist soils of the interior became known, the prospect of an increase of public and private wealth overcame every scruple.

If the Government and the *concessionnaires*, or their successors, had been unanimous as to the importance of reserving certain lands in wood, and if a well-considered scheme, based upon known and acknowledged principles, and in harmony with the circumstances and wants of the Colony, had been brought forward 35 years ago, it is not improbable, that, with the large powers conferred by former laws, a considerable portion of the native forests would have been preserved. But there was too much diversity of opinion for combined action, some strongly maintaining that forests had no climatic influence, many others that they had, and others expressing doubts.

Difficulty of carrying out the objects of the new Ordinances.

277. If the new ordinances of this year (1881) achieve the objects for which they have been framed, they will be the first of their kind to have done so in Mauritius; and their merit will be the greater that the difficulties to be contended with far exceed those of former times. With a population of 360,000 souls, with 135,000 acres under cane cultivation, out of a total superficies of about 450,000 acres, with only 35,000 acres of remaining forests (in a dilapidated state), and with the necessity of purchasing valuable land, it will be no easy task to carry out Mr. Thompson's recommendation to rewood 20 per cent. of the total area of the Island, and a scarcely less easy task to protect the plantations. But there can be no doubt that, with the combined efforts of all interested in the welfare of the Colony, much good may be done.

Effects of déboisement in Mauritius.

278. As a clear perception and appreciation of the effects, certain or probable, of the extensive déboisement which has taken place may conduce to the attainment of the objects in view, it may be well to enumerate those effects. Before doing so, however, it is important to bear in mind, that, strictly speaking, there has been no real *denudation* in Mauritius. If the cutting down of dense forests on upwards of 350,000 acres of land had laid the soil bare, and completely exposed it to the sun's rays, the effects would have been disastrous. But this is not the case. Even if the soil had at one time been completely stripped, not only of trees, but of brushwood and every green plant, its fertility was so great that, in a few weeks, it would have been clothed with vegetation. There is scarcely (in a state of nature) a single acre of land in the Colony which is not covered, and, as a rule, well covered, with vegetation of some kind or another. The low lands, which are not under sugar canes, are covered, partly with grass, partly with trees, and partly with scrub. Thousands of acres are more or less covered with the *vieille fille* (Lantana Mutabilis), *bois noir* (Albizzia Lebbek), *bois d'oiseau* (Tetranthera Laurifolia), *filaos* (Cassuarina Equisitifolia), *acacia*, &c., &c., besides a large number of fruit trees. Extensive tracks in the uplands, where forests once stood, are now run over with the *framboisier marron* (Rubus Hamiltonianus), which affords even a denser covering and protection to the soil than the *vieille fille*. Moreover, the sugar-canes themselves, which in many places have replaced the forests, which

Denudation not complete.

grow quickly, are close to each other, attain heights of 4 to 10 or 12 feet, and with their long spreading leaves cover large tracts of country, furnish excellent protection to the soil. Public and private plantations of exotics, also, have of late years been made in various parts of the Island.

Although, therefore, the old native forests have in a great measure been destroyed, yet the soil has not been altogether unprotected ; and if the growths which have sprung up were thoroughly protected, there would probably, in the course of time, be little need of rewooding. " We have endeavoured in the pre-" paration of this Report," remarks Mr. Thompson, " to show " clearly, and to emphasise the fact as much as possible, that the " denuded lands of Mauritius do not require planting so much " as protection of the spontaneous growths coming up every " where on them ; and which, as far as concerns reforesting the " land, is all that is now absolutely necessary." (Report, p. 53).

But though the destruction of the primitive forests has not caused as much climatic change as might have been the case, yet there is no doubt that its effects have been considerable. The exotics which have spread over the Island, the fields of sugar-canes, and the native growths which are springing up on the high lands, have not nearly the same effect that the ancient forests had. Compared with some places Mauritius may be said to be still fairly wooded ; but compared with what it was itself, at the time of its discovery, and for many years after, it is now bare and bleak, for its present wood-lands are not a tithe of its former impenetrable forests.

Effects of déboisement upon Climate.

279. The climatic effects of the destruction of upwards of 350,000 acres of dense forests, composed chiefly of trees the average height of which was 30 feet, are evident from the results of the comparative observations which have been made in Europe (pp. 165-168, par. 262-265), and from what has been said concerning temperature, humidity, and evaporation (pp. 160-163, par. 247-261). They may be briefly stated as follows :

(1) From the time when the cutting down of the forests commenced on the sea-shore to the present day a gradual process of desiccation has been going on.

(2) The mean *temperature* of the air near the ground is greater over the whole of the denuded area than it was before denudation.

In Bavaria the *summer* temperature in the open fields was ~~was~~ found to be 7°.04 F. higher than in the woods ; and 2°.5 higher in Switzerland. In France the mean monthly temperature was 1°.5 F. less in pine woods than in the fields.

(3) The *relative humidity* of the air over the denuded area is less than before denudation.

In Bavaria the relative humidity in summer was 6.32 per cent. greater in the woods than in the fields, and 13.91 per cent. greater in Switzerland.

(4) The rate of *evaporation* over the denuded area is much greater than it was when the same area was in forest.

In France the evaporation from an open surface of water in the woods was found to be 63 per cent. less than in the fields; in Bavaria 64 per cent. less; and in Prussia 59 per cent. less. In litter-covered woods (such as existed in Mauritius) evaporation was 84 per cent. less than in fields.

(5) The increased rate of evaporation over a large part of the Island has reduced the volumes of water in the rivers and streams, and assisted in drying up springs.

(6) A large portion of the rain-water, being no longer retained by dense forests, speedily finds its way to the water-courses, and is hurried to the sea, inundating during its passage the low lands.

Marshal Vaillant found that at Fountainebleu 73.5 per cent. of the rain-water was retained by a forest of pines. We may assume, therefore, that the old forests of Mauritius retained at least 50 per cent. of the rain-water; that is (the mean annual rainfall of the low lands being 44 inches, of the midlands 71 inches, and of the uplands 142 inches), about 50 inches per annum.

(7) The rain-water which is thus carried to the sea is lost for future evaporation in the Island, and the relative humidity is diminished still further.

(8) Surface drainage has increased, and underground drainnage has diminished.

The roots of the trees facilitated the penetration of the rain-water into the soil, and, by infiltration, a portion of this water fed the marshes, ponds, and springs on the low lands. A greater or less amount of this water now finds its way by surface drainage into the rivers; and the heavier the rains the greater is the loss by drainage.

(9) The destruction of the forests has increased the velocity of the lower currents of the air, and this increase of velocity has also increased the rate of evaporation.

Evaporation is very much less in still air than in air in motion.

Effects of déboisement upon Agriculture.

280. Like every other plant, the sugar-cane requires for its full development a certain amount of heat, light, and humidity. It will not grow and flourish where the temperature is too low and the humidity too great any more than it will do where the temperature is too great and the humidity too small.

Previously to 1846, by far the greater portion of the sugar-crop was produced on the littoral plains, below elevations of 400 feet above the sea level. It was universally believed that the high tablelands were too wet and too cold for the sugar-cane. There were, it is true, some plantations in parts of Plaines Wilhems where the forests had years ago been cut down ; but the sugar obtained was of an inferior quality ; and it was considered that in existing circumstances the extensive tracts of land in the interior were generally quite unfit for cane cultivation. *

But as the clearings extended inwards and upwards towards the central heights, the upper plantations improved ; and it became apparent, and was in the course of time universally admitted, that the more the forests were cut down, the warmer and drier did the climate become, and the more favorable the conditions for the cultivation of the sugar-cane on the high lands. At first, the new plantations were not very successful, the canes, though large and of fine appearance, containing little sugar ; but the previous similar experience of older plantations, and the prospective effects of further déboisement, gave confidence of ultimate success.

Increase of Agriculture on the uplands.

With the assurance thus acquired, and the stimulus imparted by an abundant supply of labor and guano, agriculture extended rapidly, and at the present day a great part of the staple of the Colony is produced at elevations of 400 to 1,800 feet, nearly all the table-lands, which were formerly considered to be too wet and too cold, forming almost one continuous cane-field.

The years of greatest activity in extending cane-cultivation were 1851-63. In the course of those 12 years the exports of sugar rose from 137,375,179 lbs to 316,322,276 lbs ; and the greater part of this increase of 232 per cent. was due to the extension of agriculture on the uplands. During the same 12 years, 197,536 Indian Immigrants arrived, and the Indian population increased from 86,404 to 209,712. The imports of guano in 1861 alone amounted to 28,335 tons.

Decrease of Agriculture on the low lands.

Meanwhile, the yield of sugar-estates on and near the western, north-western, and northern coasts, began to decline, and, their unproductiveness continuing to increase, some of them were at length abandoned. Since 1864 or 1865, about 35 sugar-houses on the low lands have been closed, and extensive plains, which at one time were highly fertile, are now barren.

Its causes.

The present sterility of these lands is generally ascribed to the want of sufficient moisture. It is said that, owing to the clearings which have been made on the elevated lands to windward, the soil and air on the low lands to leeward have become too hot, and, above all, too dry, for the sugar-cane. Others, again, while not disputing that déboisement on the high lands has produced injurious effects on the low lands, consider that the principal cause of the sterility is exhaustion of the soil, induced by long-continued cultivation of the same plant.

Those who maintain that the abandonment of these formerly rich lands is due to déboisement point to the circumstance that, with a sufficient supply of water, remunerative crops could still be raised from them, as is shown in the case of some old estates which are now maintained in cultivation almost entirely by irri-

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* The forest-lands in the interior were for many years considered of little value. Even as late as 1848, nearly the whole of those lands could have been purchased at rates varying from 8 sh. to 40 sh. per acre.

gation. Another circumstance which seems to confirm that view of the question, is, that the abandoned estates are on the leeward sides of the Island, and chiefly in those parts which are most remote from the mountains and the elevated table-lands, as in the neighbourhood of Grand Bay on the N.W. coast. On the windward side of the Island, exposed to the prevailing wind, as it comes from the sea, and not far from mountains, as in the lower parts of Grand Port, on the S. E. coast, where the earliest settlements were made, no estates have been abandoned. It is also asserted, as further proof of desiccation and sterility in consequence of déboisement, that in the driest parts of the Island even virgin land, or well manured land, will not produce canes, without irrigation.

Granting that the soil has been more or less exhausted, there can be no doubt that the low lands in the leeward parts have suffered seriously from denudation. The temperature over a large portion of the Island having increased, and the relative humidity having diminished, it may well be supposed that the air-currents, when they reach the leeward plains, are not so moist as they were before the forests were cut down. Probably, also, the surface motion of the air is greater than formerly. In these circumstances, it may be inferred that the amount of evaporation on the low lands has much increased, and that as the sugar-cane requires a good deal of moisture, the demand created by increased evaporation from its leaves cannot now be supplied, except by artificial means.

On the whole, Agriculture has gained by déboisement.

Thus, while the produce of the Colony, as a whole, has greatly increased, that of the low lands has decreased. Individual planters have suffered, but the agricultural interest in general has gained. Without déboisement, it would have been impossible to have increased the exports of sugar to the same extent, and without an increase of exports the wealth and commerce of the Colony would be less than they now are. It is, in short, evident that the effects of déboisement upon the agriculture and commerce of the Colony in general have been favorable.

Believing that their lands have suffered by déboisement, the planters on the low lands are, as a body, in favor of rewooding the interior, and the planters in the interior, believing that their lands have gained by déboisement, are, as a body, against the rewooding of the interior.

Remedy proposed for the low lands.

The great *desideratum*, according to many, is *to restore the humidity and fertility of the low lands*, and the means proposed for this is to *rewood large tracts of the table-lands, including the whole of the central water-shed.*

Its doubtful utility.

Now, if it is true, on the one hand, that, owing to the influence of the forests, the uplands were at one time unfit for cane-cultivation, and, on the other hand, that rewooding the interior would restore to the low lands the humidity which they are supposed to have lost through déboisement, we must conclude that what would be good for the low lands would be bad for the

* Could not the causes of the sterility of Estates on the low lands be ascertained beyond all doubt by chemical analyses of the soils and by the results of experiments made with and without manures, irrigation, &c.? The matter is so important that there should be no doubts that can be removed.

high lands. When the low lands were sufficiently moist and sugar-canes flourished upon them, the high lands were universally considered to be too moist, and no canes would grow upon them. If, then, their former moisture be restored to the low lands by extensive plantations of forests in the interior, will not the moisture on the high lands, considering the enormous effects of forests upon humidity and evaporation, again become too great? We will grant that extensive forests in the interior would produce the desired effects on the low lands. But would not this result be obtained at a great sacrifice? In the first place, it would be necessary to disburse large sums for the purchase of thousands of acres of valuable land; in the second place, supposing the experiment succeeded, it would be necessary to recreate the abandoned estates on the low lands, for most of the buildings have been dismantled or abolished, and the machinery and other apparatus been sold; in the third place, the loss to the agriculture of the Colony in general would be much greater than the gain, inasmuch as productive estates in the interior would be thrown out of cultivation; and, lastly, after incurring a heavy expense, the exports and revenue would fall off.

Problem to be solved.

The problem to be solved, if I may be allowed to express an opinion on the subject, is not how to increase the humidity and water-supply of the low lands (at any price), but how to do so in the most effectual way possible, without interfering with cane-cultivation on the uplands, and running the risk of doing more harm than good. Without a well-considered scheme of reboisement, based upon a knowledge of the physical geography of the Colony, its topography, its meteorology, its soils, and the requirements of its agriculture and population, large sums may be expended to no good purpose.

Effects of déboisement upon Horticulture.

281. That the climate of the Colony has been more or less changed by déboisement is also shown by the fact that some fruit trees, such as the mangoe, now flower and bear at higher elevations above the sea-level than in former times. Some 40 years ago, the mangoe did not bear at " La Grande Rosalie," in Pamplemousses, about 600 feet above the sea, nor in Plaines Wilhems beyond an altitude of 900 feet. The indigenous evergreen trees which at one time formed the forests of the low lands cannot grow there at the present day. All the trees now on these lands are exotics. The native trees exist only on the mountains and the upland plains, where the relative humidity is great, and even there they are in danger of being killed through thinnings, for they require a deep shade, as well as moisture. *

Effects of déboisement upon Health.

282. Besides the general effects which an increase of temperature and a decrease of humidity may have had upon the public health, and the consideration of which is beyond my competence, there are some points bearing upon the rise and continuance of malarial fever, which seem to merit attention.

* The statement regarding the mangoe, which I have often heard, requires further confirmation. With regard to the native forest trees, I have the high authority of Mr. Horne, the Director of Woods and Forests, for saying that young plantations of the former indigenous growths of the low lands, such as the ebony, would not thrive there now. Mr. Horne has kindly promised me some notes on the subject.

One of the principal exciting causes of the outbreak of the fever was, according to Medical men, the floods of the 12th February, 1865, which carried down to the low lands and to the mouths of the rivers "immense quantities of organic matter." Now, the destruction of the forests with which the mountain sides and declivities were clothed has greatly aggravated the effects of floods. The deluge of the 12th February, 1865, was, as we have seen, mainly confined to the mountain chains on the western and northern sides of the Island; and the distances between them and the sea, from the Morne Brabant to Rochebois, are generally short. These mountain chains, and the gorges between their offshoots, have been nearly stripped of their forests. The consequence is that when torrential rains occur much débris is brought down, and spread along the coast.

It is the general opinion that the production of malaria is closely connected with evaporation from marshes and with alternate soakings and dryings of low lands having impervious subsoils near the surface. Now, there can be little doubt that the destruction of the forests has subjected the subsoils and marshlands of the littoral plains to greater and more rapid alternations (with respect to dryness and moisture,) than existed formerly. A portion of the rain-water, which, by infiltration from the highlands, formerly went to feed the marshes and ponds and subsoils, now goes direct to the sea. On the other hand, during torrential rains the low lands are more or less swamped. The consequences are that when a drought comes, the underground supply of water failing sooner than it did formerly, the marsh-lands and subsoils are now dried up more rapidly and to a greater degree than before, while in wet weather they are in the opposite extreme. The underground drainage being now less in amount, less constant, and less equable than formerly, and evaporation being greater, the low-lying lands have become drier, and subject to greater hygrometric variation.

Effects of Déboisement upon the distribution of the Population.

283. If, which is propable, the present unhealthiness of the low lands is in a measure due to déboisement, we must mainly ascribe to the same cause the migrations which have taken place from all the low Districts to the higher parts of the Island.

The town of Port Louis, Black River, the lower parts of Pamplemousses, Rivière du Rempart, Flacq, Grand Port, and Savanne, have been deserted by almost every one who can afford to live on the higher and healthier lands of Plaines Wilhems and Moka.

The table-land of Curepipe, about 1,800 feet above the sea-level, which, not many years ago, was in forest, and only frequented by the huntsman or the woodman, is today dotted over with human habitations. It is surprising to see with what rapidity elegant buildings spring up on that elevated plateau, in all directions, amid uninviting wastes, marshes, jungles, and the remnants of the ancient forests. The population is already fully 9,000, and it is yearly increasing. Land which, not many years ago, could be bought for a few shillings per acre, cannot now be had for less than Rs. 200 to Rs. 1000 or more per acre.

Nearly all along the public road, from Beau Bassin to Curepipe, wherever land could be obtained, and in the neighbourhood of the railway stations of Beau Bassin, Rose Hill, Phœnix, and Vacoas, the population has received numerous accessions from the low lands. A similar increase will propably take place along the new Moka railway.

Nor is it the weathier classes alone that have left the pestilential plains on the littoral. Thousands of Indians have settled at Curepipe and in its vicinity, on the slopes of the Trou aux Cerfs, at Eau Coulée, Mesnil, Vacoas, and on all available parts of the uplands. The Pieterboth, Montagne Longue, Calebasses, and other mountains, to considerable heights, are studded with Indian huts.*

Other effects of déboisement.

284. It is a common remark that, thirty years ago, a person travelling from Port Louis to Mahébourg experienced a certain freshness in the air on reaching Coromandel (200 feet above the sea), and a still greater change at Beau Bassin (700 feet.) Today, the same sensation is scarcely felt before reaching Rose Hill or Quatre Bornes (1,000 feet). Some of the inhabitants of Beau Bassin now spend the summer months at Vacoas or Curepipe.

At Moka and in the upper parts of Plaines Wilhems clothes could be dried with difficulty, and when dried it was necessary to expose them frequently in order that they might not be injured by mould.

That a great change has taken place since the time when most of the wealthier classes lived at lower levels than 400 feet, and that this change is owing to déboisement, an increase of population, an extension of agriculture, and fever, is certain. Matters are now nearly reversed. Instead of the majority of the rural population and the greater part of the cultivated lands being below 300 or 400 feet, they are now above that level, and some of the towns which are springing up on the table-lands bid fair to rival Port Louis.

Results of Meteorological observations in Mauritius.

285. What has been said respecting the *climatic* effects of déboisement in Mauritius follows as a necessary consequence from certain broad facts, which are patent to every one, and from the results of comparative observations made in other places. But when we turn to the meteorological observations which have been made in the Colony, we find that they do not throw much light upon the subject, probably either because they extended over short periods, or because they were made in a spot where no clearings had taken place for years before they were commenced. No *comparative* observations have been made in forests and in open fields.

Temperature at Port Louis.

The longest series of observations was made at the Caudan and the old Observatory, both on the south side of the harbour

* This, however, was to some extent the case before the Epidemic of 1866-68.

of Port Louis. We have the results of daily observations of the temperature of the air made by M. Lislet Geoffroy during three complete years, namely, 1789, 1790, and 1791; 11 months of 1787; 9 months of 1788; 9 months of 1792; 8 months of 1803; and 10 months of 1804. We have also the results of daily observations made in the same locality during the 14 years 1853-66. The mean monthly and mean annual temperatures, according to both sets of observation, are given in the following Table:

Months.	1 Mean. Temperature.	2 Mean Temperature.
January	83°.3	81°.4
February	82.9	81.1
March..	81.6	80.5
April...	79.7	79.5
May	75.3	76.0
June	71.4	73.1
July	70.5	71.7
August.	70.1	71.9
September	72.2	72.8
October	73.9	74.8
November...	78.2	77.8
December	81.6	80.0
Means....	76.9	76.9

Column 1 gives the results for 1787 to 1804, and column 2 those for 1853 to 1866. Now it will be seen that the mean annual temperatures are the same.

The principal differences between the two results are that from May to October the mean monthly temperatures in column 1 are on an average 1°.3 lower than in column 2, and from November to April 1°.0 higher; and that the mean annual range in column 1 is 13°.2, whereas in column 2 it is 9°.7. Similar differences exist also between the results of observations of the highest and lowest temperatures, the range having been greater in the older observations. But the differences are not greater than may well be accounted for by differences of exposure. Nothing is known as to the hours of observation, or as to the character and exposure of the thermometers used, from 1787 to 1804. From 1853 to 1866 the observations were taken at 3½ a. m., 9½ a. m., 3½ p. m., and 9½ p. m., with thermometers which had been verified and the index errors of which were known.

Relative humidity at Port Louis.

The following Table shows the mean monthly relative humidity from 1787 to 1792, as derived from observations made three times a day (hours not stated), by M. Lislet Geoffroy, with Goubert's whalebone hygrometer, and from observations made four times a day ($3\frac{1}{2}$ a. m., $9\frac{1}{2}$ a. m., $3\frac{1}{2}$ p. m., and $9\frac{1}{2}$ p. m.), from 1853 to 1866, with Mason's hygrometer :

Months.	1 Mean Relative Humidity.	2 Mean Relative Humidity
	°	Percentages.
January	14.1	68.1
February	13.5	71.7
March	14.7	69.1
April	12.7	68.2
May	14.4	68.5
June	15.3	65.7
July	16.1	65.3
August.	16.5	66.3
September...	17.7	65.6
October	17.1	66.2
November...	16.3	66.7
December...	15.1	67.7
Means.	15.3	67.4

The results in column 1 (older observations) are not comparable with those in column 2 (later observations), the hygrometers used having been of a different nature, and there being no reliable means of converting the indications of the one into corresponding indications of the other. All that can be said is that according to column 2, the humidity was greatest from December to May, and least from June to November ; and, according to column 1, greatest from December to June, and least from July to November, the larger the numbers in column 1 the less the humidity.

M. Geoffroy also gives the *highest* and the *lowest* humidity in each month of the years 1821, 1827, and 1831, as shown by de Saussure's hair hygrometer. But the utmost that can be inferred from these observations, when compared with more recent ones, is, that there are indications of greater fluctuations in the relative humidity than in former years.

Rainfall at Port Louis.

The results of the rainfall observations are much more decisive. The following Table shows the mean monthly rainfall, as derived from (1) observations made in 1789, 1790, 1791, 1821, 1827, and 1831; (2) observations made in 1833, 1834, 1839, 1841, and 1842; and (3) observations made in the years 1853-70:

Months.	1 Mean Rainfall.	2 Mean Rainfall.	3 Mean Rainfall.
	Inches.	Inches.	Inches.
January	3.55	6.97	6.94
February	8.49	5.12	10.45
March	4.07	6.42	6.45
April	6.48	5.77	4.34
May	1.33	3.01	2.51
June	0.90	0.51	1.39
July	1.65	0.90	0.94
August	1.51	0.84	1.57
September	1.66	0.51	0.46
October	0.57	0.74	0.87
November	2.27	1.18	1.76
December	1.37	4.16	5.05
Annual Means ...	33.85	36.13	42.73

The above Table shows that the mean annual rainfall was considerably greater in the period 1853-70 than in either of the two former periods.

The mean annual fall in the three years 1789-91 was 30.02 inches; and in the three years 1821, 1827, and 1831 it was 37.69 inches.

The least annual falls were 21.18 inches in 1789 and 20.54 inches in 1866; and the greatest fall was 68.72 inches in 1861.

It is to be regretted that the series of observations is not longer and more complete. There are many gaps. All that can be inferred is that there is no evidence of any permanent change in the temperature or humidity of the air in Port Louis, and that the rainfall seems to have increased.

From 1853 to 1866 the mean annual temperature of the air (in the shade) fluctuated between 77°.5, in 1854 and 1862, and 75°.6 in 1857; and the mean relative humidity between 70.4, in 1857 and 1858, and 65.1 in 1866.

Results of Observations made in other parts of the Island.

The observations which have been made in other parts of the Colony are chiefly on the rainfall, for short periods; and it has been pointed out on several occasions, and recently by M. Jules Langlois, that, like the Port Louis rainfall observations, they do not indicate any permanent diminution in the annual amount of the rainfall, although there have been great fluctuations.

Rainfall at Argy.

In 1837, the rainfall at Argy, in Flacq, about 150 feet above the sea-level, was, according to observations made by Mr. Julien Desjardins, 47.41 inches, and the amount of evaporation 70.70 inches. The mean annual fall on an adjoining property (Riche Mare) from 1871 to 1880 has been 62.85 inches.

Rainfall at Mont Choisy.

The mean annual rainfall at Mont Choisy, near Grand Bay, and about 60 feet above the sea-level, from 1849 to 1872, was, according to Mr. Poulin's observations, 47.42 inches. For the first five years (1849-53) it was 41.94 inches, and for the last five years (1868-72) 46.62 inches.

At Labourdonnais, St. André, Beau Séjour, and Cluny, rainfall observations were commenced in 1862. As these are now the oldest stations in the Colony, it may be well to give here the mean annual rainfall at each of them for the five years 1862-66 and the five years 1875-79 :

Rainfall at four Stations in 1862—66 and 1875—79.

Stations.	Height above sea.	Mean Annual Rainfall from 1862 to 1866.	Mean Annual Rainfall from 1875 to 1879.	Mean Annual Rainfall for 18 years.
	Feet.	Inches.	Inches.	Inches.
Labourdonnais..	300	63.62	73.12	64.62
St. André ...	180	50.11	46.08	46.96
Beau Séjour ...	967	71.04	67.73	71.05
Cluny* ...	1000	130.70	156.32	151.22
Means	610	78.87	85.81	83.46

* No observations having been made at Cluny in 1875-76 it has been necessary to compare, for this station, the years 1862-64 with the years 1877-79.

Rainfall at other Stations.

The next oldest stations, namely, Trianon, Gros Bois, Espérance (Moka), St. Aubin, Gentilly, Beau Vallon, and Joli Bois, give similar results for shorter periods ; that is, the rainfall of the last five years of observation has not, upon the whole, been less than that of the first five years.

Rainfall, &c., at the new Observatory.

At the new Observatory (Royal Alfred), Pamplemousses, the mean annual rainfall from 1875 to 1880 has been 48.25 inches, which is nearly the same as that of St. André (a mile distant) for the period 1862-79 ; the mean annual relative humidity 71.3 ; and the mean temperature of the air 74°.2. The rate of evaporation in a wood of *bois d'oiseaux* is 54 per cent less than on an adjoining open plain.*

Humidity and Temperature at different Altitudes.

From some observations which have lately been made at Eau Coulée (Curepipe) by Mr. L. Ehrmann, and by myself at Forest Side (Curepipe), it would appear that the mean annual relative humidity of that locality is 87.0. At Beau Séjour (Plaines Wilhems) it is 73.1, and at Port Louis 67.4.

The mean annual temperature of the air at Port Louis (20 feet above the sea-level is 76°.7; at Beau Séjour (967 feet) 71°.8; and at Curepipe (1820 feet) 66°.3.

The observations which have hitherto been made do not prove that no Climatic Change has taken place.

Although the observations which have hitherto been made do not show that there has been an increase of temperature and a decrease of rainfall and humidity, yet we are not to conclude that there has been no climatic change in the Island as a whole. We have to bear in mind that the Port Louis observations were commenced after the forests in the vicinity had been destroyed, and that they were made within a few feet of the harbour, under the lee of the Signal Mountain (1,100 feet high). With regard to the other observations, they were all, with the exception of those made at Argy in 1837, and the rainfall observations made at Mont Choisy from 1849 to 1872, commenced in or after 1862, when most of the forests had disappeared. As far as is known, no observations were made in the interior of the island, before déboisement.

The rainfall may have decreased.

In the absence of observations made in different localities *before*, during, and after déboisement, no one can say that within the last 100 years the rainfall of the island has not decreased. Observations made in France show that the rainfall over forests is greater than in open fields, the conditions being in other respects the same. We should expect similar results in Mauritius. But whatever may be the case in this respect, it is not improbable that whether the rainfall is greater or less than formerly, or whether its mean amount, for a certain period of years, is the same, its distribution is now more unequal; for the temperature having no doubt increased, and the humidity diminished, over the extensive tracts which were once densely wooded, more vapor is required than formerly to produce saturation, and without saturation no rain can be formed. We may thus suppose that, if the rainfall has not decreased, it is less frequent than it was, and heavier during the time it falls; that is, that the Island, upon the whole, is now more subject to droughts and floods than it was before the forests were destroyed. The observations show no material change in the distribution of the rainfall, but they were not made under favorable conditions.

Mauritius has always been subject to Droughts.

286. There is abundant evidence, however, that the general causes of periodic changes of weather over large portions of the earth's surface are so powerful that no amount of forests will ever prevent droughts in Mauritius. The Island has always

* This is clear proof that evaporation has greatly increased over the entire area formerly under forests.

Severest Droughts from 1726 to 1867.

been subject to droughts, and they were apparently as severe during the last century as they have been during the present. The years of great droughts were 1726-27, 1734-35, 1741, 1745, 1748, 1764-67, 1776, 1783-85, 1789, 1796, 1822-23, 1832-33, 1839, 1842-43, and 1866-67. The following brief notes will give some idea of the severity of these droughts :

(1) 1726-27. M. Ceré, a former Director of the Botanical Gardens, states that "there was a scarcity of water for domestic animals, and that the forests, which were so dense that a person could with difficulty read in them at noon, were stripped of every green leaf, as high up as the deer could reach," there being nothing else for them to live upon.

(2) 1734—35. An account of this drought is contained in the archives of the Ministry of Marine in Paris. There was a scarcity of grass for cattle.

(3) 1741. Baron Grant (History of Mauritius, p. 194) remarks : " This year has been marked by sterility, and our Island is menaced with dearth : indeed, it has happened that the Negroes annd labourers have been necessarily sent to live by hunting in the woods, or the produce of the waters."

(4) 1745. Referring to Labourdonnais' expedition to India in 1746, Baron Grant (p. 227) says : "an extraordinary drought had occasioned an alarming scarcity in the previous year."

(5) 1748. Writing on the 10th March, 1748, Baron Grant (p. 293) remarks : " We live at present in a most wretched state of incertitude, in want of everything ; and, to complete our misery, afflicted with a continued drought, which has known no interval throughout the year, but from an hurricane that visited as during the last month." Probably this drought, though intense, did not last long.

(6) 1764-67. The droughts which took place in these years are mentioned by Le Gentil and Bernardin de St. Pierre, who attributed them to déboisement, and declared that " if the destruction of the forests were continued, it would be necessary to abandon the Island." * Some of the rivers, as the Calebasses, were almost dried up.

(7) 1776. Dr. Régnaud mentions in his Report of 1874 (p. 26) that there was " a great drought," but I find no details.

(8) 1783-85. Prolonged droughts. The crops failed. The proprietor of *Constance* estate (in Flacq), which for many years since has been one of the most productive in the Colony, abandoned the property in despair, and retired to France. His agent, in passing through the forests of Quartier Militaire, to take possession of the estate, found the usually moist soil cracked (*gercée*).

* This may have induced the Government to prepare and pass the ordinances of 1769.

(9) 1789. The drought of this year is mentioned by Lislet Geoffroy. The rainfall at Port Louis was only 21.18 inches.

(10) 1796. There was a severe drought in this year, but I find no details of it.

(11) About the commencement of this century, prayers for rain were offered up in the Churches" (*Cernéen* of November 16, 1867).

(12) 1822-23. "A prolonged drought" (Dr. Régnaud's Report, p. 25.)

(13) 1832-33. These droughts have already been mentioned. The rainfall at Port Louis, in 1832, was 27.54 inches.

(14) 1839. Crops much reduced; canes brought to the mills in baskets; rainfall at Port Louis 25.53 inches.

(15) 1842-43. Crops reduced; rainfall at Port Louis, in 1842, 25.57 inches.

(16) 1866-67. Severe and prolonged droughts; rainfall at Port Louis in 1866 only 20.57 inches.*

There were, of course, shorter and less pronounced droughts, such as those of 1853-56, 1862, and 1878-80.

Floods.

287. The years in which the greatest floods occurred, so far as I have yet ascertained, were 1815, 1830, 1834, 1844, 1845, 1861, 1865, 1870, and 1878. Those of 1830, 1845, 1870, and 1878, were, according to notes obligingly communicated by the late Mr. A. de Rochecouste, severest in Grand Port and Savanne.

Forests do not prevent Droughts.

288. As the great droughts of last century took place when the Island was almost covered with forests, it may safely be said that no amount of reboisement will ever prevent the recurrence of such droughts in Mauritius. They are due to general causes which are independent of local circumstances. All that forests can do is to mitigate their effects. By reducing the temperature, forests may tend to ward off droughts, but they are insufficient to counteract the much more powerful influences which affect the weather over extensive areas.

Droughts and Floods related to the Sun-spot Cycle.

289. That these droughts and floods are in some way related to the sun-spot cycle seems to be shown by the following comparison of their dates with those of the epochs of maximum and minimum spot-frequency.

* I owe most of the details of the droughts of last century to the courtesy of Mr. Fournier, the Editor of the "Cernéen," who placed at my disposal the number of that journal, dated November 16, 1867, containing a letter by "A. D.", which was brought to my notice by Mr. Donald Stuart, Secretary to the Council of Government.

Years of Max. of Sun-spots.	Years of Droughts	Years of Floods.	Years of Min. of Sun-spots.	Years of Droughts	Years of Floods.
1727 ...	1726–27	...	1723 ...	...	...
1738 ...	...	...	1733 ...	1734–35	...
1750 ...	1748	...	1745 ...	1741–45	...
1761 ...	...	...	1756 ...	...	...
1769 ...	...	...	1766 ...	1764–67	...
1779 ...	...	...	1776 ...	1776	...
1789 ...	1789	...	1784 ...	1783–85	...
1804 ...	...	...	1798 ...	1796	...
1816 ...	...	1815	1810 ...	...	...
1829 ...	...	1830	1823 ...	1822–23	...
1837 ...	1839	...	1833 ...	1832–33	1834
1848 ...	...	...	1843 ...	1842–43	1844–45
1860 ...	...	1861	1856 ...	...	...
1870 ...	...	1870	1867 ...	1866–67	1865
			1879 ...	1878–80	1878

It will be seen that of the 16 greatest known droughts of Mauritius 10 occurred at the epochs of minimum spot-frequency, and 4 at or near the epochs of maximum frequency; and that of the 9 floods 4 occurred at the epochs of maximum and 5 at those of minimum. This goes to confirm what has been said (pp. 155—156, par. 230—234) respecting the extreme oscillations of weather-changes, in different places, at the turning-points of the curve representing the increase and decrease of solar activity.

Déboisement has greatly increased the produce and wealth of the Colony.

290. The conclusion arrived at from all the evidence bearing on the subject, is, that déboisement, notwithstanding that Mauritius suffered from droughts when the greater part of it was wooded, has produced certain changes, and that it is owing to these changes that the produce of the Colony has increased. Formerly, the greater part of the Island was unfit for cane-cultivation, because it was too cold and too wet. Déboisement, by increasing

the temperature and diminishing the moisture of the uplands, has made them productive, and thereby more than doubled the exports and wealth of the Colony. The low lands have suffered much, but the agricultural interests of the Island in general have gained immensely.

Extensive reboisement would have contrary effects.

291. These having been the agricultural effects of déboisement, it must be inferred that reboisement, if carried to a certain extent, would have contrary effects. If, by some process, other than rewooding, the uplands became as cold and as wet as they were formerly, the sugar-cane would not grow upon them. The greater the extent of reboisement, then, in the interior, not only the greater is the quantity of land directly withdrawn from cultivation, but the greater the danger of rendering the remaining lands there unproductive, for reboisement would diminish the temperature and increase the humidity. Granting that by rewooding the interior and the main water-sheds the humidity of the low lands would be fully restored, this restoration implies the throwing of the uplands out of cultivation.

It is said that because the low lands have become more unhealthy and less productive than formerly, and that because this is owing to déboisement, therefore it is necessary to restore the Colony to its former condition.

Impossible to restore the Colony to its former state.

292. To restore the Colony to what it was 40 years ago is impossible, without throwing thousands of acres out of cultivation, shutting up establishments which have cost large sums, and reducing the population to less than one half of what it now is. The low lands, which were formerly the most populous, have been more or less deserted, and towns and villages have sprung up in the interior.

A large proportion of the sugar-crop is now grown on the uplands.

Chief requirements under present circumstances.

293. There can, I venture to think, be no satisfactory scheme of reboisement which does not take all these circumstances into account. Instead of running the risk of curtailing the productiveness of the Colony, considering its large and increasing population, every means should be used for bringing more land under cultivation, wherever that can be done without detriment to the public health.

What is required seems to be :

(1) The restoration, as far as possible, of the health and fertility of the low lands.

(2) The maintenance and the extension of cultivation on the uplands.

The best means for attaining these objects appear to be :

(1) The planting of a broad belt of wood on the seaboards all round the Island, with the view of increasing the humidity

and diminishing the evaporation, and counteracting the effects of organic matter brought down by the rivers and streams.

(2) The planting, on the low lands, of hedges and strips of dense forest at right angles to the prevailing direction of the wind, with the view of reducing the velocity of the surface currents, and thus diminishing evaporation, and increasing the humidity of the air.

(3) The draining, as far as possible, of all marshes and marsh-lands on the low-lying plains and seaboards, and the planting, around all marshes that cannot be drained, of such species of Eucalyptus as thrive in the Colony.

(4) The rewooding, as far as possible, of all mountains and slopes, such as the Black River mountains, the Port Louis mountains, the Calebasses mountains, the Grand and Petit Malabar mountains, the Mont Piton (Pamplemousses), the Butte aux Papayes, the Fayence, Blanche, Bambou, and Savanne mountains, &c., with the view of increasing the humidity of the air, and at the same time of preventing inundations, and of keeping up a supply of pure water in such marshes as cannot be drained.

(5) The planting, as far as possible, of all low lands which are unfit for cultivation, such as the Plaine des Roches, in trees or shrubs.

(6) The rewooding of the banks of rivers and streams, and of certain spaces around all sources and springs.

(7) The planting of trees along the public roads.

(8) The preventing of the washing of clothes, animals, &c., in the rivers and streams which supply water for domestic purposes, and of the pollution of such water by the residue from sugar-houses, &c.

(9) The conservation of all private forests on lands which are unfit for cultivation, and the maintenance of which in wood might protect springs and streams, and be beneficial to cane plantations in the neighbourhood.

(10) The damming of rivers and streams, and the creation of reservoirs, in the interior, with the view of retaining a portion of the large volumes of water which yearly flow to the sea, or inundate the low lands, and the storing up of which would increase the humidity of the air, and afford means of irrigating the plains on the littoral. *

(11) The repatriation of time-expired Immigrants, and the subjection of the remaining Indian population, and the population in general, to strict sanitary rules and regulations.

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* The damming of streams and rivers at elevations above 800 feet would not be subject to the sanitary objections urged against similar undertakings on the low lands.

To carry out some such scheme as the above would of course be the work of years, and be attended with difficulties, to which allusion will be made presently.

Reboisement.

294. As fever and drought are most severe on the low lands, and especially the low lands of the *northern* half of the Colony, comprising a portion of Black River, the lower parts of Plaines Wilhems, the whole of Port Louis and Pamplemousses, and portions of Rivière du Rempart and Flacq, these are the localities which, standing, as they do, most in need of reboisement and sanitary improvements, should be the first to receive attention. *

The temperature of the interior being from 4° to 10° or 12° lower than that of the plains near the sea, the high table-lands will always be moister than the low lands, even if the former were entirely denuded.

Forests on the uplands in the south-west would not benefit the northern Districts.

It has not, so far as I know, been determined at what distance and to what degree a given area of dense forest affects the humidity of the surrounding country ; † but it is clear that no forests in the neighbourhood of the Mare aux Vacoas and Grand Bassin, in the south-western portion of the Island, would benefit the fever-stricken and parched up plains of the northern Districts ; the prevailing wind being from the eastward, and the distance being from 12 to 25 miles. What is required for the northern Districts is the rewooding of the "pas géométriques", the Port Louis, Calebasses, Nouvelle Decouverte, and Fayence mountains, Mont Piton, Plaine des Riches, Butte aux Papayes, &c., and irrigation. The places which suffer most should be the first to receive the benefits of reboisement. It would be a waste of the public funds to buy up forest-lands which would hardly be of any public use.

Forests for industrial purposes of secondary importance.

The creation of forests for industrial purposes appears to be of secondary importance in Mauritius. The main object, I presume, is to obtain and to keep up a sufficient supply of water and moisture for health and agriculture. To withdraw land from cane-cultivation, merely for the sake of producing timber, so long as sugar pays better, and timber can be obtained at a cheaper rate from other places, would be to incur unnecessary expenditure and loss. Every inch of land that can be spared should be devoted to agriculture, which is the main-stay of the colony, and without the complete maintenance of which it will be impossible to support the large and increasing population. It is no doubt important that the plantations to be made should in course of time afford timber ; but no land should be thrown out of cultivation for that special purpose.

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* It is hard to conceive why the Southern and most elevated parts of the Island, about Curepipe and Grand Bassin, where the humidity and rainfall are at a maximum, should at this moment be receiving special attention, while the northern Districts are utterly neglected. No amount of forests at the Grand Bassin will benefit the suffering population of Port Louis and the northern plains.

† It would appear that déboisement in the interior of the Island has had no permanent effect upon the temperature and humidity of the air at the old Observatory in Port Louis.

To purchase, for rewooding, tracts of rich table-land which might be turned to more profitable account, and at the same time to leave the mountain chains, ridges, and slopes, bare, as most of them now are, would not be to the advantage of the Colony. It is not the rains which fall upon the level table-lands that are the principal cause of inundations, but those which fall upon the unwooded mountain chains, ridges, and slopes, between the table-lands and the seaboards. The vapor which comes up from the sea is not condensed first upon the table-lands, but upon the still higher and colder mountain ranges. There are thousands of acres on the mountains and elsewhere, which are useless for cane-cultivation, but available for rewooding. So long as this is the case, it would appear to be a needless expenditure to buy up other lands. Before spending large sums in purchasing additional lands, without being sure of the consequences, it would, I think, be well to rewood the present "mountain and river reserves," and the "pas géométriques" on the seaboards. That in itself would require time and money; but it would be a good beginning, and set a good example.

The Mountain and River Reserves are the most important places for reboisement.

The next step would be to buy such private lands as, after due examination, might be considered necessary for gradually carrying out the objects in view. The old forests having already been almost as much destroyed as they can well be, there need, one would think, be no particular haste in buying up the remnants. As mentioned by Mr. Thompson, on all the denuded and abandoned lands of the Colony there is a young spontaneous growth, which, if protected, "would reforest the Island without a cent being spent on planting" (Report, p. 25). It is impossible to destroy that growth all at once, except by cultivating the land; and if it were destroyed, it would soon spring up again under protection.

Private lands to be bought after planting the Reserves.

Although the degree of the influence of a given area of forest upon temperature, humidity, and evaporation, at a given distance, is not known, yet it is certain that it depends much upon the *density* of the forest. An acre of thickly planted trees, with a dense undergrowth, mosses, ferns, litter, and humus, might produce double or triple the effect of an acre thinly planted. This circumstance, in a Colony the population of which is dense, and where every inch of cultivable land is valuable, seems to point to the importance of not rewooding large areas merely in order that as the plantations grow up they may be thinned for commercial gain. If this principle were carried into full effect, more than double the area of land strictly necessary for the main objects, would probably be handed over to the Forest Department. So impressed was Mr. Thompson with the importance of "compact forests" that frequent reference is made to it in his Report. "No forests can be said to be in healthy vigorous growth, unless the canopy of foliage above is sufficiently compact to *obstruct* the direct rays of sun-light from reaching the soil below" (p. 28). "Every endeavour should be made to maintain a dense undergrowth... it is only with perfect cover overhead, and immediately in contact with the soil, that the forest growth will not only be vigorous, but the soil, which is of a porous nature, be kept perpetually moist, when shaded from the sun, and screened from the drying action of the winds" (p. 29). "It must be remembered that we are dealing with ever-green tropical forests (the native forests), of which there are rarely few species that cannot

Importance of compact forests.

stand shade, and which are not *permanently injured by isolation and exposure*" (p. 31). Thinnings, "with the view of improvement and making money," have, Mr. Thompson remarks, already severely injured some young plantations.

For these reasons, it seems to be desirable, that all idea of making the Crown forests a direct source of revenue, should be abandoned, for at least many years to come. What these forests require most, and what Mr. Thompson strongly insists upon, is *protection*. Experience seems to show that if their success is in any degree to be measured by the revenue which they may annually yield, they will run the risk of becoming almost useless for climatic purposes.

The Mountain Reserves, as defined by Ordinance No. 13 of 1875, insufficient.

By ordinance No. 13 of 1875 the "Mountain Reserves" are the lands comprised between the "Ridge Line" and the "Reserve Line" on the slopes on either side of the Ridge Line. The position of the "Reserve Line" depends upon the position of a "Base Line". The altitudes of this "Base Line" and the "Ridge Line", above the sea-level, being supposed to be known, the "Reserve Line" is at one third of the distance between the "Base Line" and the "Ridge Line", measuring upwards from the "Base Line". Thus, if the Ridge Line is 1,100 feet, and the Base Line 800 feet, above the sea-level, the Reserve Line is 900 feet above the sea-level, and the width of the Reserve on that side of the slope is 200 feet.

Hence the extent of the Reserves depends a good deal upon the position of the Base Line.

But the Base Line is fixed arbitrarily. For the Port Louis mountains, comprising Mont Ory, the Pouce, Pieterboth, &c., it is "a horizontal contour line, 150 feet above mean sea-level"; for the mountains in some other Districts it is a line passing along public roads and up rivers and streams; for the Black River range it is a horizontal contour line, 150 feet above mean sea-level, in the north, to Baie du Cap, in the south, and then a line passing up the courses of rivers; for the Savanne range it is, on the side towards the sea, a horizontal contour line of 600 feet above mean sea-level, and after this line, running eastward, cuts the Savanne River, the Base Line, turning inland, follows the main stream of that river up to its source, &c.; for the Bambou and Creole ranges, the Base Line, towards the sea, between the rivers Creole and Grand River S.E., is a horizontal contour line of 600 feet above mean sea-level, and it then follows the courses of those rivers, &c.

After laying down the positions of the Base Lines as above, schedule A. of the ordinance makes the following reservations:

1o. "Provided always that for the Savanne and Bambou ranges the *Reserve Line* shall in *no* case have a *less* altitude than 1,200 feet above mean sea level;

2o. "Provided, also, that when a River is mentioned, the *top of the escarpment* shall be meant, and not the bed of the River."

Practically, the first of these provisos authorised the destruction of trees on two of the principal mountain chains at all altitudes below 1,200 feet, and the second that of trees in ravines. And the effect of schedule A., generally, was to court the destruction of all trees, not only around the bases of the mountains, but to very considerable heights above their bases; which, of all others, were the places where trees were most required to prevent inundations.

Mr. Thompson's remarks on Ordinance No. 13 of 1575.

Regarding this ordinance, Mr. Thompson, who had a practical knowledge of its working, makes the following apposite remarks: "As time went on, and population began to press "onwards from all sides, its provisions (the provisions of the "old regime) were relaxed, in so much that, at the present day, "what were formerly considered as Mountain Reserves are now "no longer such but in name. Under the provisions of Ordi-"nance No. 13 of 1875 considerable alterations were made. "These alterations would appear not to have been judicious, "in so far as regards what should constitute Mountain Re-"serves and rules for their preservation; inasmuch as ex-"isting Mountain Reserves — since the passing of this Or-"dinance — which originally meant the protection of the "woods and forests covering the mountains, are represented at "the present day by, in most cases, a mere ribbon of thinned "out forest growth along their crests; their *sides and bases* "*having been cleared away* and brought under cultivation. In "some cases, the *imaginary* lines constituting the Reserve Lines "of the Code (Ordinance) pass *over and above the mountains and* "*their spurs*. Hence no Reserves are possible under such cir-"cumstances. A study of the new Law, and of its interpreta-"tion of what constitutes Mountain Reserve Lines, on the ground, "will make this subject clear to any one desirous of making the "experiment. This subject has already been brought to the "notice of His Excellency the Governor by personal communi-"cation." (Report, p. 22.)

No experiment is required; the matter is perfectly clear and comprehensible to every one who knows the Colony.

The rivers and streams are better protected. The ordinance enacts that "River Reserves" shall mean the ground on either side of a stream between the ordinary edge-line and a perpendicular let fall, in the case of a *river* on a line of 50 feet in length, in the case of a *rivulet*, on a line of 25 feet in length, and, in the case of a *feeder*, on a line of 10 feet in length, projected horizontally to the said edge-line.

Consequences of the said Ordinance.

The old mountain and river reserves were not maintained by the ordinance, and yet it must have been evident that it was of greater importance than ever that the mountains should be wooded. As a rule, forests on the declivities are much better adapted for the objects in view than forests on the plains, while the plains are better adapted for cane-cultivation than the declivities. So that to purchase now less suitable lands, or to take back at a high price lands which might have been still in forest, is a serious disadvantage. The curtailment of the mountain reserves, or rather, in many instances, their entire effacement, has produced the consequences which might have been foreseen, namely, the destruction of trees for firewood, charcoal, and other purposes, or the leasing or selling of the land to Indians and others, or the creation of new cane-plantations. Many mountain ranges, such as the Calebasses range, have been almost laid bare. What is remarkable is that while in the body of the ordinance the "Reserve Lines" are clearly defined, schedule A has been drawn up so that, practically, hardly any "Mountain Reserves" are left in some places, and none at all in others. The schedule states that for the Savanne and Bambou ranges the "Base Line" shall be "a horizontal contour line, 600 feet above mean sea-level"; but it is added, at the end of the schedule, "*provided* the 'Reserve Line', for those ranges, shall in no case have a less altitude than 1,200 feet above mean sea-level." The "Base Line," therefore, for those ranges, is a fiction in the case of all ridges and spurs having a less altitude than 1,200 feet.

Extent of the Crown Lands and Reserves.

But, notwithstanding this ordinance, certain mountain reserves still remain, amounting to about 18,242 arpents. The river reserves, secured by the ordinance, may be roughly estimated at 4,000 arpents. In all, it would appear that, including the Crown lands, the Government has at its disposal, for reboisement, about 40,000 arpents, viz:

(1)	Pas Géométriques...	7,500	arpents
(2)	Grand Bassin Block	5,801	,,
(3)	Piton du Milieu Block...	2,798	,,
(4)	Mountain Reserves	18,242	,,
(5)	River Reserves	4,000	,,
(6)	Curatelle Lands	1,684	,,
	Total	40,025	,,

The Crown Lands and Reserves should be planted first.

Now, it would seem that these lands, or as much of them as possible, should be planted before incurring additional expense. If the Colony is not in a position to do this, it is difficult to see how it can undertake to rewood and protect a larger extent.

Meanwhile, the destruction of trees on such lands as it might be considered desirable to purchase, could, if judged expedient, be prevented, as at present, until such time as the scheme proposed by Mr. Thompson should be definitively adopted, or modified, and the Colony be in a position to make the necessary outlay. What is required, first of all, is a scheme of reboisement that shall be practicable, equitable, and best calculated to attain the objects in view; and such a scheme cannot be elaborated without a knowledge and a detailed discussion of local as well as of general circumstances and conditions. To attempt what is impossible would of necessity lead to useless expenditure, failure, and disappointment.

The Mountain and River Reserves should belong to the public domain.

Any scheme of reboisement that may be adopted is almost certain to fail, unless the "Mountain and River Reserves," which are by far the most important lands for the purpose, belong exclusively to the public domain, and be entirely and absolutely under the control and management of the Government.

The experience of upwards of a hundred years shows that there is little chance of being able to maintain the mountain and river reserves in forest, so long as the land belongs, either nominally or really, to private proprietors. Not one of the laws which have been enacted for the conservation of woods on these reserves has succeeded. There is a deeply rooted idea that if people are the nominal owners of land, it is unjust to deprive them of the use of it.

The Reserves should from the outset have been demarcated.

This nominal ownership and its supposed obligations have been unfortunate. When the concessions were made, the reserves should have been clearly marked out, once and for all, declared to belong exclusively to the public domain, and to be inalienable. Or, if the *concessionnaires* were allowed to have the *jouissance* of the reserves, or of a portion of them, under certain restrictions, it should have been made clearly known to all that such a favor did not constitute a relinquishment of the reserves, but that the Government might at any time claim them as its own property. If from time to time it had been proclaimed that the reserves were public property and liable to be used by the Government for public purposes, and if every one was perfectly aware of this, proprietors of the lands which include the reserves, and capitalists, could scarcely call the taking by the Government of what had always belonged to it, an act of "confiscation," or claim an "indemnity" after having, as a favor, been allowed the use of the reserves for years. Even if additional relaxations had at times been made in favor of the *concessionnaires*, this would not imply that the Government had renounced its rights.

The old laws became obsolete.

But it would seem that there was remissness, and that purchasers and others were not always aware that there were reserves which might be claimed by the Government. The laws became more or less obsolete, and proprietors now regard as "reserves" only the lands which have been defined as such in the most recent ordinances on the subject. But these latter reserves, Mr. Thompson says, are only reserves in name. The Government, it would appear, wishes to extend them, and the proprietors strongly object, unless they obtain compensation. When the Colony suffers from a scarcity of water, the press is unanimous in blaming the Government for neglecting the vital interests of the public, and urges it to plant trees; but when the Government takes steps for planting trees in the best possible localities, the press condemns it for not respecting "the sacred rights of property", as if it intended to take, without a fair remuneration, what does not belong to it.

Forest reserves under former conditions impossible.

We shall suppose that the question as to the extent of the reserves has been settled, and that they are to be private property; that the proprietors are to be obliged to plant certain portions of the reserves in trees, and to protect the plantations; but that they are not to be allowed to cut down a single tree, except under certain conditions.

Long experience has shown that under such an arrangement—an arrangement of doubtful equity, and one which opens the door to abuses—no forest reserves are possible. People will insist that if they are the owners of land they have a right to use it, and that if they plant it in trees they have a right to cut down those trees, without restriction. They cannot be brought to comprehend that it is their duty, more than that of any other class, to sacrifice their own interests for the interests of the public at large.

In these circumstances, it would appear that the best plan would be for the proprietors and the Government to come to an agreement by which the mountain and river reserves should become the exclusive property of the latter. It is the only chance of establishing and maintaining a successful scheme of reboisement in Mauritius. A certain extent of mountain and river reserves, belonging exclusively to the public domain, is essential to a practicable and efficient scheme of reboisement, and for this purpose recourse must probably be had, sooner or later, to some system of general taxation.

Difficulty of conserving forests under any circumstances.

The difficulty, however, of protecting the plantations would still be great, considering the large number of Indians, and their predatory habits. When the population was much less than it is now, the Government forest-reserves of Bois Rouge and Poudre d'Or, in Pamplemousses, were pillaged. In about and Riv. du Rempart 1756, the Government placed at the disposal of a Company, which had been formed for manufacturing iron, 10,000 arpents of forests. In 1776, when this enterprise was finally abandoned, there were still 6,000 arpents, and, after disposing of 1,000 of them, the Government proclaimed the remaining 5,000 to be special forest-reserves. But according to a Report by M. Malavois (Conservateur des Eaux et Forêts), dated April 1, 1806, these reserves were then in a most ruinous state (ruinés par dévastations), and he recommended that they should be sold, excepting 2,000 arpents. In 1811, the reserves were reduced to 823 arpents, and they were then so dilapidated that the Government thought it best to sell them. If, in those days, when the population was less than 80,000, it was difficult to protect forest-reserves, it will be much more difficult to do so now.

The large Indian population a serious obstacle.

With the view of facilitating reboisement and the conservation of the forests, and of improving the sanitary condition of the Colony generally, time-expired Immigrants should, I venture to suggest, be sent back to their own country, where there is much more room for them than in Mauritius. According to the results of the Census of the 3rd April last, with a copy of which I have just been favored, the total population of the Island, on that day, was 359,874 (510 souls to a square mile,) of which 248,993, or more than two thirds, were Indians. The estimated expenditure of the General Board of Health and of the Poor Law Department, for 1880, was Rs 736,826, * or more than one-tenth of the whole estimated revenue of the Colony ; and for 1881 it is Rs 650,445. * This, of course, is exclusive of the Medical Department.

Extent of forests considered necessary.

The total superficies of the Island is about 451,300 acres. Judging from the extent of forests considered necessary in other places, and bearing in mind that Mauritius is within the tropics, it is estimated that one-fourth of the Island (112,825 acres) should be in forest. The extent of land now under cane-cultivation is variously estimated at 125,000 to 135,000 acres ; but we shall suppose that it is 150,000 acres. Other plantations, we shall say, occupy 50,000 acres ; roads, rivers, buildings, towns, villages, &c., 55,000 acres ; rocks, precipices, and ravines 12,000 acres : and pasturage 55,000 acres. There would still remain for forests 129,300 acres.

* Including works and buildings.

A large portion of these forests might perhaps belong to private proprietors, who, while protecting and improving their lands by planting trees in their own interest, would at the same time confer a public benefit. The Government would perform its part of the undertaking by planting and protecting, first of all, the "mountain and river reserves" and the "pas géométriques" around the coasts, these being the parts of the Island which it is most important to rewood in the general interests of the Colony. After the reserves had been planted, it could be seen better than now what further steps should be taken.

It being at length unanimously admitted that forests are necessary, and that it is essential to rewood extensive tracts, the difficulties that formerly existed in this particular respect have disappeared. All that is now wanted is, apparently, a general agreement as to the measures to be employed, and a determination to carry them out. The subject has been favorably entertained by some of our late Governors, as Sir Arthur Phayre and Sir George Bowen, and his Excellency the Hon. F. Napier Broome has given it a fresh impulse. It is now for every one interested in the welfare and prosperity of the Colony to assist in carrying out a fair and practicable scheme of reboisement calculated to attain the important objects in view.

Summary of Results.

295. I will now give a brief summary of the principal results, not in the order in which they are presented in the preceding pages, but in that which is considered the most convenient :

1. *Topography.*—The greatest length of Mauritius from north to south is 39 miles, and its greatest width from west to east is 28 miles. It is irregularly pear-shaped, with the broad end towards the south. The interior consists chiefly of high tablelands, which, as a rule, are separated from the littoral plains by lofty mountain ranges. Numerous streams take their rise on the high lands. On the low plains all round the Island there are marshes and marsh-lands. The Island is of volcanic origin. The soils are variegated, generally porous, rich and fertile, and thickly strewed with loose stones of various sizes, especially on the low lands. In many places the sub-soil is near the surface and impervious to water.

Districts.—According to official returns, the total superficial area is 705 miles. This area is distributed among the nine Districts into which the Island is divided, as follows :

Districts	Area in sq. miles	Pop. on 3rd April 1881*	Pop. to a sq. mile
1 Port Louis	10.7	66,466	6,211
2 Pamplemousses	87.0	37,670	433
3 Rivière du Rempart	58.0	20,726	357
4 Flacq	113.0	56,022	496
5 Grand Port	112.0	52,982	473
6 Savanne	92.0	34,447	374
7 Black River...	94.0	15,292	163
8 Plaines Wilhems	70.3	46,315	659
9 Moka	68.0	29,768	438
Totals	705.0	359,688	510

* I have just received the figures in this column.

From the accompanying map it will be seen that *Black River* extends along the west coast, from Baie du Cap to the mouth of Grand River N.W., over a distance of about 23 miles. Its average width is about 4 miles. The greater part of its southern half consists of mountains.

Port Louis (the capital) and its suburbs are also on the west coast, and comprise the space between the embouchures of Grand River and the Latanier, on the one side, and mountain ridges to the eastward, on the other side. The length from south to north is about 3 miles, and the average width about 3 miles.

Pamplemousses, which is also on the west coast, extends northwards from the Latanier to Grand Bay, over a distance of about 10 miles, and eastward over an average width of about 9 miles, its southern boundaries being the ridges of the Pieterboth, Calebasses, and Nouvelle Découverte mountains.

Rivière du Rempart is on the north and east coasts, north and east of Pamplemousses. Its seaboard from Grand Bay round by Cap Malheureux and thence to Roches Noires is about 17 miles ; and its average width inland is about 4 miles.

Flacq extends along the east coast from Roches Noires to Pointe aux Feuilles, over a distance of about 14 miles, and inland over an average distance of 8 miles. It is bounded on the south by the Bambou mountains, and partly on the east by the Nouvelle Découverte mountains.

Grand Port extends along the south-east and south coasts from Pointe aux Feuilles to the mouth of Rivière du Poste over a distance of about 20 miles, and inland over an average distance of 6 miles. It is bounded on the north chiefly by the Bambou chain of mountains, and on the west by the Rivière du Poste.

Savanne is in the south and south-west, extending along the shore from the Rivière du Poste to Baie du Cap over a distance of about 17 miles, and inland over an average distance of nearly 6 miles.

Plaines Wilhems and *Moka* are almost entirely in the interior of the Island, their lower extremities, however, extending to the vicinity of Grand River mouth in the north-west. They form the greater part of the central table-lands.

Table-lands, Mountains, and Rivers. The central table-land is highest in the southern part of the Island, in the vicinity of the Grand Bassin and Mare aux Vacoas, where it has an elevation of 2,000 to 2,400 feet, and it extends northward to the Nouvelle Découverte mountains, on the northern confines of Moka, where it has an elevation of about 1,200 feet. Its medial ridge, which extends irregularly in a N. b. E. direction, is the principal water-shed of the Island, where the largest rivers and streams, as the Rivière du Poste, the Black River, the Tamarin, Grand River N.W., and Grand River S. E., take their rise. Three principal chains of mountains from 800 to 2,800 feet in height, namely, the Black River and Savanne mountains in the south and south-west, the Bambou mountains in the east and south-east, and the Port Louis mountains in the north and north-west, separate the table-lands in the interior from low-lying plains on the coast ; while in some other places there is a more gradual, but still rapid, descent.

2. *Forests*—When the Island was discovered in 1505, it was covered with almost one dense impenetrable forest from the mountain tops to the sea, composed of ever-green trees and undergrowths, the average height of which was 30 feet.

The clearings commenced on the south-east, east, and north-west coasts, and were gradually extended round the Island, and ultimately inland and upward to the central heights.

In 1753, about one-tenth of the Island had been cleared, the remaining nine-tenths (406,157 acres) being all in forest, with the exception of some steep rocky precipices and patches of savanna. In 1770, the forest-area was 388,705 acres ; 142,000 acres in 1846 ; 85,526 acres in 1874 ; and 35,000 acres in 1880. Considerable portions of the forests existing in 1846 and 1874 were then in a dilapidated state, and at the present day there are not more than 16,000 acres of what can properly be called forests.

The greater portion of these remaining forests is in the vicinity of Grand Bassin, in the south-west, and the rest near the Piton du Milieu and the Quartier Militaire, in the centre of the Island.

All the accessible parts of the mountain chains and valleys have been stripped of their forests, but there are young spontaneous growths which only require protection.

The indigenous trees which once formed the forests on the low lands have almost, if not entirely, disappeared ; and it does not seem to be well known to what genera or species they belonged. The trees and shrubs now growing on these lands are exotics.

Forest legislation during the last hundred years has completely failed to prevent the destruction of trees on the " Mountain and River Reserves." The banks of the rivers and streams, especially on the low lands, and most of the mountain slopes, have been denuded.

3. *Quality of the Waters*. According to numerous analyses made in 1865, 1872, and 1873, the waters of the rivers, streams, and canals of the Colony, are generally very pure. There have been some instances of streams having been more or less polluted by residue from sugar-houses and sewage from camps, as well as by the washing in them of clothes, animals, &c. ; but there is no evidence that the general health of the Colony has ever suffered from such isolated cases of pollution.

4. *Meteorology*.—The mean annual temperature at Port Louis (20 feet above the sea-level) is 76°.7, at the new Observatory (180 feet) 74°.2, at Beau Séjour (967 feet) 71°.8, and at Curepipe (1820 feet) 66°.3.

The mean annual relative humidity at Port Louis is 67.4, at the new Observatory 71.3, at Beau Séjour 73.1, and at Curepipe 87.0.

On the low lands on the western and northern sides of the Island, the mean annual rainfall ranges from 33 inches at Gros Cailloux, in Black River, to 47 inches at Mont Choisy, in the northern part of Pamplemousses; on the low lands on the eastern side, from 50 inches at St Antoine, in Rivière du Rempart, to 63 inches at Riche Mare, in Flacq, and 65 inches at Beau Vallon, in Grand Port; and on the low lands on the southern side, from 85 inches at St Aubin, to 77 inches at l'Union, both in Savanne. As the altitude increases, the rainfall increases, and it is greatest on the declivities facing the east and south-east. From the neighbourhood of the Grand Bassin northward along the central water-shed on the table-lands to the northern limits of Moka, the mean annual fall is 142 inches, and it is greatest on the southern half of the water-shed, where the elevation is greatest. At Curepipe (1,820 feet) it is 145 inches, and at Espérance in Moka (1,400 feet) 126 inches. At Midlands (1,200 feet), to the eastward of Curepipe, it is 152 inches, and at Cluny (1,000 feet), to the south-eastward of Curepipe, 147 inches. By far the driest parts of the Island are the low lands of Black River, Port Louis, Pamplemousses, Rivière du Rempart, and portions of Flacq. On the southern and south-eastern coasts, the rainfall is double of what it is on the western and northern coasts.

The mean annual direction of the wind is E. 15° 53' S., and the points from which it comes least frequently are South to S.W. (see Table XXXVI., Appendices.)

The temperature increases from July to January, and then decreases to July; its mean annual range at the sea-level is 23°, and at 967 feet 30°. The relative humidity increases from November to March, and the rainfall from September to February or March.

The element which is subject to greatest variation is the rainfall.

From December to April, the Island is subject to hurricanes, and they are most frequent and severe in February and March.

Mauritius has always been subject to droughts, and the droughts of last century were as frequent and severe as those of the present.

None of the observations show that there has been any permanent change in the temperature, humidity, or rainfall; but it cannot be inferred from this that there has been no change, because the observations were made after the destruction of the forests.

5. *Agriculture*—For a number of years, the chief productions of the Island were cotton, indigo, cloves, coffee, rice, maize, and manioc; but in the course of time sugar became the principal and almost the only production. In 1808, 26,451 arpents were

in grain-crops (maize, oats, rice, &c.), 19,057 in manioc, 10,908 in sugar-canes, 1,656 in indigo, 7,298 in cotton, 2,188 in coffee, 272 in clove-trees, and 11,987 in fruit-trees, vegetables, &c. The progress made in sugar-cane cultivation will appear from the following Table showing the number of arpents in canes in each District in 1808, 1827, 1836, 1846, 1861 and 1879 :

Districts	1808	1827	1836	1846	1861	1879
Pamplemousses	1,542	4,586	17,000	21,160	14,000	8,293
Riv. du Rempart	1,865	7,054	14,850	11,910	11,350	11,745
Flacq	1,169	6,894	7,858	12,058	26,000	27,262
Grand Port	1,234	2,883	4,450	15,185½	20,000	23,320
Savanne	1,952	3,156	4,859	3,922	15,360	18,068
Black River	445	870	1,190	2,130	4,500	4,746
Plaines Wilhems	1,983	4,120	7,764	6,187	12,970	12,800
Moka	718	398	357	198	8,750	10,714
Totals	10,908	30,261	58,328	76,025½	112,930	116,948

The numbers in the above Table are only approximations, but they serve to give an idea of the progress which has been made in agriculture at the expense of the primeval forests.

Since 1865, a number of sugar-estates on the western and northern plains, which are the remotest from the mountains and the high table-lands, have been abandoned, in consequence, according to many, of a decrease of humidity, but according to others, of exhaustion of the soil. The produce of the Island, as a whole, however, has greatly increased.

6. *Population.*—In 1767 the total population was 18,777, from which it increased to 59,020 in 1797, 92,631 in 1827, 158,462 in 1846, 315,783 in 1871, and 359,874 in 1881*.

Until 1834, the population consisted of three classes, namely, the White Population, composed of Europeans and their descendants; the Free (or Colored) Population, composed chiefly of mulattoes ; and the Slave Population, composed chiefly of Africans. The latter were by far the most numerous.

In 1767, the number of Whites was 3,163, of Free 587, and of Slaves 15,027 ; in 1797 there were 6,237 Whites, 3,703 Free, and 49,080 Slaves ; in 1817 there were 7,375 Whites, 10,979 Free, and 79,493 Slaves ; and in 1827 there were 8,111 Whites, 15,444 Free, and 69,076 Slaves.

When the slaves were emancipated, in 1834, they were 64,331 in number, or a little more than two-thirds of the total population.

Immigration from India commenced in 1834, and the Indian population of the Colony increased rapidly. In 1837 it was 11,721 ; 69,310 in 1847 ; 142,534 in 1857 ; and 214,694 in 1867.

* Census of 3rd April 1881.

According to the Census of 11th April 1871, it was 216,258, and 248,993 according to the Census of 3rd April 1881, or more than two-thirds of the total population.

Besides the Indians and the natives of the Colony, there are Chinese, Malays, Malgassies, Africans, and representatives of almost every race, language, and creed in the world.

The number of living persons to a square mile is 510, and Mauritius is now the most densely populated country, of the same or greater area, in the world.

7. *Death-rates.*—From 1804 to 1825 the mean annual death-rate among the White and Free Populations was 15.26 per 1,000 ; 13.89 from 1817 to 1825 ; 20.72 from 1825 to 1830 ; and 24.78 from 1831 to 1835.

For the *total* population, the mean annual death-rate from 1831 to 1880 was 35.95 per 1,000 , and the mean decennial death-rates for that period were as follows :

Decades	Death-rates
1831—1840	32.97
1841—1850	36.11
1851—1860	36.44
1861—1870	44.00
1871—1880	28.55

The vital statistics from 1831 to 1880 show that certain periods and years were remarkable for excessive death-rates. These periods and years, and the death-rates, were as follows :

Periods	Mean Death-rates
1832–35	33.62
1841–45	43.46
1854–56	55.69
1867–69	71.22

Years	Death-rates
1834	39.85
1844	58.41
1854	84.61
1867	120.47

It will be seen that there was a progressive increase in the death-rates both of the periods and years of exceptionally high mortality.

Between the years of highest death-rates there were some years of high, though lower, death-rates, viz :

Years	Death-rates
1837	37.16
1839	38.99
1862	41.50

From a note with which Dr. Vitry has favored me it appears that in 1832-35 there were several epidemics, namely, one of *barbiers* in 1832, *measles* in 1834, and *dysentery* in 1835. In 1837 or 1838, there was an outbreak of *small-pox*, and of *typhoid fever* in 1839. Small-pox occurred again in 1842 and typhoid fever in 1844.* In 1854-56 and in 1862, there were visitations of *cholera*, and in 1866-69 *malarial fever* was epidemic and extremely fatal.

The death-rates of Rodrigues and the Seychelles at the present day, namely, 15.8 and 20.5, respectively, are nearly the same as those of Mauritius in former times.

The death-rates among H. M's troops in Mauritius, from 1823 to 1867, were lower than the death-rates among the troops stationed in other tropical countries from 1818 to 1836. The mean rate in Mauritius from 1823 to 1867 was 23.9 per 1,000.

During the last ten years the death-rates in Mauritius have been less than in any previous decade since 1831, and less than in some European States, as Austria, Spain, and Italy.

8. *Rise and spread of Malarial Fever.*—Previously to 1865, malarial fever was not a local disease. No person who had never left the Colony was ever known to have had that fever till that year. The cases of malarial fever which had been treated before 1865 were confined exclusively to persons who had contracted the disease in India, Madagascar, or other places.

The disease made its appearance, for the first time, among natives of the Island who had never left it, in November, 1865, on the low lands of Petite Rivière, in the neighbourhood of the Albion sugar-estate, on the west coast, where marshes had been drying up during a drought. Among the 20,000 Indian Immigrants that arrived in that year there were numerous cases of fevers of some kind. In August, 8 of those sick Immigrants were sent to Albion, 24 in September, and 1 in November. The proprietor threw up on the banks and sides of a *barachois*, the bed of which had been nearly dried, a quantity of black fœtid mud which was carted to the cane-fields for manure, and when the wind came from the westward a " horrid stench " spread over the adjacent country. This took place, according to some, in November or December of that year, but according to others early in January, 1866.

From Petite Rivière the fever spread north and south, along the coasts and low lands, and to short distances inland, along the rivers and streams. In its northern course, it reached the Salines (Port Louis), and Rochebois (north of the Harbour of Port Louis), in January, 1866, the Arsenal in April, and Canonnier's Point in December, 1866, whence it passed round, before the end of the year, to Poudre d'Or and Rivière Sèche on the

* In April, 1844, a violent epizootie broke out and raged till the end of the year. Upwards of 12,000 horned cattle, about 6,000 pigs, and many goats, were swept away. Another epizootie occurred in 1878-79. A complete list, with dates and details, of the epidemics and epizooties with which the Colony has been visited, would be highly interesting.

east coast. In its southern course, it reached the Morne Brabant towards the close of the year. During 1867, it raged with great intensity on all the low lands which it had attacked in 1866, and made its appearance in some other localities, radiating inland to considerable heights, where, however, it was less severe. From some cause or other it did not pass from the mouth of Grand River S. E. (in Flacq) to Grand Port, or from the Morne (in Black River) to the Savanne, till January, 1868. By the end of that year it had established itself all round the coasts, and it has remained there ever since. It has been most severe on the littoral, especially near marshes and streams, milder at higher elevations, and almost unknown on the high table-lands.

The total number of deaths in 1867 was 40,114, of which 31,920 were ascribed to malarial fever.

The character of the disease is shown in a remarkable manner by the enormous increase in the consumption of quinine. The Colony now pays Rs 110,000 per annum for drugs prepared from the bark of the cinchona.* Mr. Baschet has favored me with a note from which it appears that before the outbreak of the fever he barely sold from 4 to 6 ounces of quinine per annum, whereas he now sells about 2,225 ounces per annum, for families alone, not including employés and laborers on sugar-estates, and the experience of other Pharmacists is probably similar.

9. *The Fever subject to a Yearly Inequality or Periodicity.*— A discussion of the monthly mortality from malarial fever in the whole Colony, for the nine years 1871-79 shows that, on an average, the number of deaths rose from a minimum of 276.2, in November, to a maximum of 547.2, in May, that it then decreased to 299.9, in September, increased to 306.0, in October, and then decreased to 276.2 in November; so that there was a strongly marked yearly periodicity, which had a minimum in November and a maximum in May, with a slight increase in October. During the five months of December to April, the mortality was above the monthly mean, and during the seven months of May to November it was below the monthly mean.

This inequality or periodicity corresponds with the yearly inequalities or periodicities of the temperature, humidity, and rainfall, for the same period, and especially with that of the rainfall, which increases from a minimum in September to a maximum in March, with a slight increase in August. The maximum and minimum of the mortality occur, respectively, two months after the maximum and minimum of the rainfall, and the slight increase of rain in August is followed by a slight increase of mortality in October. In other words, the fever-mortality lags two months behind the rainfall. Both of them are five months above and seven months below their monthly means.

In the individual years, however, there are deviations from the average results, and these deviations are such that if the rainfall attains its maximum a month or two months earlier or later than its mean epoch (March), the mortality also attains its

* This estimate is supposed to be too low.

maximum a month or two months earlier or later than its mean epoch (May).

There can be no doubt as to the existence of this periodicity, for it is found in each of the Districts, and the results do not depend upon the estimated populations, but upon the number of registered deaths from fever. The causes of death have not always been certified, but in some of the Districts at least this has generally been done.

10. *The Total Mortality subject to a Periodicity.*—The mortality from all causes during the period 1871-79 was also subject to a periodicity, similar in every respect to that of the fever-mortality; but its periodicity was imparted to it by the fever-mortality; for when the latter is subtracted from the total mortality the remainder is found to have no periodicity.

11. *Other Diseases subject to Yearly Periodicities.*—Dysentery has almost the same annual variation as malarial fever; diarrhœa attains its maximum in February and its minimum in October; while consumption and other pulmonary diseases have their maxima in July and August, and their minima in February to April. These periodicities are respectively dependent upon those of the rainfall and the temperature. *

12. *Non-Periodicity of the Total Mortality* minus *the Fever and Dysentery Mortalities.*—The curve representing the annual inequality of the total mortality is made up of the curves representing the inequalities of the mortalities from the several diseases, and as the most prominent disease is malarial fever it imparts its character of periodicity to the total mortality. Dysentery has a similar curve; but, as the number of deaths from this disease is comparatively small, it affects the total mortality curve to a much less extent than the fever-mortality. When both the fever and the dysentery mortalities are deducted from the total mortality the annual variation of the remainder (the mortality from the other diseases) has no resemblance to that of the total mortality, or the mortality from fever, but it approaches the variations of consumption and other pulmonary diseases, which have their maxima in July and August.

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* From a Report drawn up by Dr. A. R. Barraut in 1864, it would appear that the mortality from "Bombay Fever" is greatest in August and September. The following Table shows (1) the number of cases of that fever which occurred in each month, in Flacq, from 1855 to 1863, as given by Dr. Icery, and (2) the number of cases in each month, in Grand Port. from the 1st January to the 30th September, 1863:

January	(1) 277	(2) 0
February	218	0
March	211	96
April	220	105
May	277	66
June	243	79
July	247	120
August	358	153
September	326	185
October	232	......
November	187	......
December	221	......

13. *Previously to* 1867 *the Total Mortality had no Yearly Periodicity.*—The total mortality in the years 1861-63-64-65-66* had no yearly periodicity. The curve of the total mortality for those years is entirely different from that of the total mortality since 1866. A complete change took place during the epidemic of 1867. In that year, the total mortality assumed, in consequence of the fever, a well-marked periodicity which it has since retained, but which it did not previously possess. The annual variation of the total mortality before 1867 resembles that of the total mortality *minus* the fever-mortality since 1867.

14. *Total Death-rates and Death-rates from Fever in the several Districts during* 1871-79.—The mean annual total death-rates and the mean annual death-rates from fever alone in each District for the nine years 1871-79, with the percentages of deaths from fever, were as follows :

Districts	Total Death Rates	Death Rates from Fever	Percentages of Death Rates from Fever
Port Louis	40.11	20.75	51.7
Pamplemousses	25.20	14.18	56.3
Rivière du Rempart...	21.06	9.89	46.9
Flacq	24.72	12.81	51.8
Grand Port	27.05	12.28	45.4
Savanne	25.99	11.50	44.3
Black River	31.57	18.71	59.3
Plaines Wilhems	29.13	12.02	41.3
Moka	26.94	10.17	37.8
Means	27.98	13.65	48.8

According to the above results, which have been derived from the statistics of the Board of Health, and which are nearly the same as those deduced from the statistics of the Registrar General, the Districts in which the total death-rates were greatest are Port Louis (40.11), Black River (31.57), Plaines Wilhems (29.13), and Grand Port (27.05) ; and those in which they were least Rivière du Rempart (21.06), Flacq (24.72), Pamplemousses (25.20), Savanne (25.99), and Moka (26.94).

But as these results depend upon the *estimated* populations, which, owing to migrations from District to District, are necessarily but rough approximations, they only afford rude indications of the relative death-rates. According to the Census of the 3rd April last, the estimated population of Pamplemousses on the 31st December, 1880, was nearly 7,000 too high, that of Rivière du Rempart 5,000 too high, that of Flacq 3,800 too high, that of Plaines Wilhems 6,000 too low, and that of Moka 5,500 too low. The differences for Port Louis, Grand Port, and Savanne, were less. (See Table XL., Appendices.)

* The year 1862 has been omitted, because there was a Cholera-epidemic.

Taking the enumerated populations in 1871 and 1881, the total death-rates in 1871 and 1880 would be as follows :

Districts	Total Death Rates in 1871	Total Death Rates in 1880	Mean Death Rates for 2 years
Port Louis	32.20	32.75	32.47
Pamplemousses	24.46	32.55	28.50
Rivière du Rempart	23.17	24.90	24.03
Flacq	20.24	24.38	22.31
Grand Port	27.07	26.01	26.54
Savanne	29.30	29.00	29.15
Black River	25.09	29.43	27.26
Plaines Wilhems	24.04	29.73	26.88
Moka	22.37	21.97	22.17
Means	25.33	26.95	26.59

These results for two years would make Port Louis, Savanne, Pamplemousses, and Black River, the Districts of highest mortality, and Moka, Flacq, and Rivière du Rempart those of lowest mortality. But the period is too short.

Means of the enumerated populations in 1871 and 1881, of the total deaths, and the deaths from fever, in the nine years 1871-79, give the following results :

DISTRICTS.	Mean population	Mean No. of total deaths	Total death-rates	Mean No. of deaths from fever	Fever death-rates	Percentages of death-rates from fever
Port Louis	64740	2596	40.10	1343	20.74	51.7
Pamplemousses	40348	1116	27.66	628	15.56	56.3
Rivière du Rempart ...	20484	482	23.54	226	11.03	46.9
Flacq	52760	1353	25.63	701	13.28	51.8
Grand Port	48604	1294	26.62	587	12.08	45.4
Black River	30945	791	25.56	350	11.31	44.3
Savanne	13644	403	29.54	239	17.52	59.3
Plaines Wilhems	40731	1088	26.71	449	11.02	41.3
Moka	25502	620	24.31	234	9.18	37.8
Totals	337758	9743	28.85	4757	14.08	48.8

According to the above results, which are probably the most accurate, the mean total mortality for the nine years 1871-79 was greatest in Port Louis (40.10), Black River (29.54), and Pamplemousses (27.66 ; and least in Rivière du Rempart (23.54), Moka (24.31), and Savanne and Flacq (25.56 and 25.63).

The death-rate from fever was greatest in Port Louis (20.74), Black River (17.52), and Pamplemousses (15.56); but the percentages of deaths from fever (to total deaths) were greatest in Black River (59.3), Pamplemousses (56.3), and Port Louis and Flacq (51.7 and 51.8).

As the percentages of deaths from fever do not depend upon the estimated populations, but upon the number of deaths, there can be no doubt that the Districts which have suffered most from fever are those on the west coast; and those which have suffered least Moka and Plaines Wilhems in the interior.

Judging from the mortality, then, the healthiest Districts are Rivière du Rempart and Moka, and the most unhealthy Port Louis, Black River, and Pamplemousses.

15. *Opinions of the Medical Men of the Colony as to the Determining or Exciting Causes of the Fever Epidemic.* The Medical men of the Colony, with scarcely an exception, were of opinion that the determining or exciting causes of the outbreak of malarial fever were, (1) the flood of the 12th February, 1865, followed at first by dry weather, and then by torrential rains in December, 1865; (2) severe droughts in 1866, with occasional heavy rains, a high temperature, and a prevalence of westerly and north-westerly winds; and (3) a continuance of similar weather in 1867. Some alluded also to the absence of hurricanes during that period, and to the prevalence of low tides on the western coasts. *

Several Medical men considered that, in addition to these causes, the destruction of the forests had had a good deal to do with the outbreak of the fever, trees having certain climatic effects.

16. *Questions suggested by these Opinions.* These opinions (of the most competent judges) suggested the following questions: (1) Was the abnormal weather of 1865-67 confined to Mauritius? If it was not, was it attended or followed by epidemics, or an increase of mortality, in other places? Did similar weather occur in Mauritius in former times, and, if so, was it attended or followed by epidemics or an increase of mortality? Was similar weather in other places, in former times, attended or followed by epidemics, or an increase of mortality? What climatic or other changes have been brought about in Mauritius by the cutting down of the forests?

17. *The Weather of* 1865-67 *in Mauritius not of local Origin.* With regard to the first of these questions, it was found that the abnormal weather of 1865-67 was not confined to Mauritius, but that it extended over the Indian Ocean, South Africa, Australia, India, &c., and that it was attended by a remarkable increase of mortality in the Australian Colonies, Ceylon, India, &c., as well as in Mauritius.

18. *Similar Weather in Mauritius in former times accompanied*

* Dr. Fallier (Médecin en Chef de l'escadre des mers de Chine et du Japon), who was in Mauritius in September, 1867, also considered that the exciting causes were the flood of February, 1865, and the droughts which followed it.

by an increase of Mortality. The next step was to ascertain the yearly death-rates of Mauritius for the longest possible period. A Table of these death-rates for the fifty years 1831-80 showed that certain periods and years were remarkable for an excessive mortality, namely, the periods 1832-35, 1841-45, 1854-56, and 1867-69, and the years 1834, 1844, 1854, and 1867, and that there was an increase of mortality, though smaller, in 1877-80. The meteorological records also showed that the weather during those periods was abnormal, and similar to that which prevailed in 1865-67.

There was also a subordinate increase of mortality in 1837, 1839, and 1862.

19. *Periods and years of excessive Death-rates in other places nearly the same as in Mauritius.*—In Ceylon, from 1828 to 1878, the periods and years of highest mortality were almost the same as those in Mauritius, the periods having been 1831-33, 1843-46, 1854-56, 1867-69, and 1876-78, and the years 1833, 1843, 1854, 1868, and 1877, with a smaller increase in 1860; in the Australian Colonies, from 1850 to 1878, the periods were 1853-55, 1866-67, and 1874-78, and the years 1854, 1866, and 1875, with a smaller increase in 1863; in India, from 1866 to 1879, the periods were 1864-67 and 1875-78, and the years 1866 and 1877; in Gibraltar and Malta, from 1853 to 1878, the periods were 1853-55, 1860-62, and 1864-67, and the years 1854, 1862, 1865, and 1874; in Europe, from 1853 to 1878, the periods were 1853-55, 1864-66, and 1870-71, and the years 1855, 1866, and 1871; and in the West Indies, from 1850 to 1878, the periods were 1853-56, 1865-67, and 1874-78, and the years 1854, 1862, 1866 or 1867, and 1876.

The following Table, showing the years of greatest mortality in the several countries*, is given for the sake of comparison:

Countries	Periods	Years of Greatest Mortality
Mauritius ...	1831-80	1834, 1844, 1854, 1862, 1867, 1879
Ceylon	1828-78	1833, 1843, 1854, 1860, 1868, 1877
Australia ...	1850-78	... ... 1854, 1863, 1866, 1875
India	1864-80	... ... 1866, 1877
Gibraltar ... / Malta ...	1854-78	... ... 1854, 1862, 1865, 1874
Europe	1853-78	... ... 1855 ... 1866, 1871
West Indies ...	1850-78	... ... 1854, 1862, 1867, 1876

* So far as I have yet ascertained, it would appear that the high mortality in those years was mainly due to one or other of the *miasmatic* diseases, namely, *cholera, malarial fever, typhus* or *typhoid fevers, small-pox, measles,* &c. In Mauritius there was an epidemic of measles in 1834, of typhoid fever in 1844, of cholera in 1854 and 1862, of malarial fever in 1867, and an increase of malarial fever in 1877 and 1879. Ceylon, Gibraltar, Malta, portions of Europe, and the West Indies, were visited by cholera in 1854 and 1855; but what epidemics, if any, occurred in

20. *Weather during the periods of greatest Mortality.*—As a rule, the weather during the periods of greatest mortality was subject to great fluctuations, especially with respect to the rainfall, floods and droughts having occurred, but the latter having been predominant.

21. *The periods of greatest Mortality, with few exceptions, nearly coincident with the periods of minimum Solar Activity.*—From 1831 to 1880, the years of least solar activity were 1833, 1843, 1856, 1867, and 1878-79, and the years of most activity 1837, 1848, 1860, and 1870. The triennial periods of least activity were 1832-34, 1842-44, 1854-56, 1865-67, and 1876-79, and those of most activity 1836-38, 1847-49, 1859-61, and 1870-72. In Ceylon and Mauritius, the periods of greatest mortality were nearly those of least solar activity, the exceptions being 1837, 1839, 1860, and 1862, which, on the whole, were years of smaller mortality, in or near the periods of most solar activity. With the exception of 1863, which was also a year of smaller mortality, the periods of greatest mortality in Australia were nearly coincident with the minimum periods 1854-56, 1865-67, and 1876-79. The periods of greatest mortality in India were coincident with the minimum periods 1865-67 and 1876-79 ; those of Gibraltar and Malta nearly with the minimum periods 1854-56, 1865-67, and 1876-79, and with the maximum period 1860-62 ; those of the West Indies, excepting the year 1862, with the minimum periods 1854-56, 1865-67, 1876-79 ; and those of Europe with the minimum periods 1854-56 and 1865-67, and with the maximum period 1870-72.

22. *Characteristics of the Weather at or near the epochs of least and greatest Solar Activity.*—At or near the turning-points of the curve representing the inequality of solar activity, as manifested by the comparative presence or absence of spots, faculæ, and prominences on the sun, the weather is subject to great extremes. Both floods and droughts occur ; but generally the former prevail at the epoch of maximum, and the latter at the epoch of minimum ; and, as a rule, the rainfall is greater at the maximum than at the minimum epoch.

23. *General Effects of Déboisement in Mauritius.*—In consequence of the destruction of upwards of 350,000 acres of dense

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those places in 1860-63, I do not know. Cholera appeared also in Europe and other parts of the world in 1865-67.

I do not know what diseases prevailed in Australia.

The comparatively high death-rate in Europe in 1871 was partly due to small-pox, and partly to the Franco-German war.

The prevalence of cholera in 1854-56 over a considerable part of the world is remarkable. The disease broke out in Mauritius on the 15th May, 1854; it broke out in Barbadoes on the 14th May. On the 10th June, the number of deaths in Mauritius was 322 ; on that day it was 300 in Barbadoes. At the same time, the disease prevailed to a great extent in Jamaica, St-Lucia, Grenada, Mexico, the United States, Canada, Europe, India, Ceylon, &c.

Granting that the cholera-germs radiate from India, why does the disease spread so rapidly and so extensively in certain years and not in others. ?

Another interesting point for consideration is that although Australia was not visited by an epidemic of cholera in 1854 or 1866, yet the mortality there rose fully as much above the average as it did in Europe. Again, while cholera raged in other places in 1866-67, there was none in Mauritius, but the Colony suffered more from another *miasmatic* disease than ever it had done from cholera.

forests, the temperature of the air and the soil, and the rate of evaporation, where the forests stood, have increased, and the relative humidity has diminished. The volumes of running water in the rivers and streams have decreased, and such springs and wells as have not entirely disappeared, have been more or less dried up. More of the rain-water now flows to the sea than formerly, and the low lands are more subject to inundations, and the ponds, lagoons, marshes, and marsh-lands there more liable to desiccation in times of drought.

An increase of temperature and a decrease of humidity on the high lands have rendered them fitter for cane-cultivation, but a decrease of humidity and an increase of evaporation have been prejudicial to cane-cultivation on the low lands.

SUMMARY OF CONCLUSIONS.

296. The above are the chief results which have been derived from the statistics, observations, and facts, which were available, and they are independent of hypotheses and theories. I will now give a summary of the principal deductions.

1. *Probable causes of the Outbreak of Malarial Fever in Mauritius.*—The circumstances which attended the rise and spread of malarial fever in Mauritius seem to be best explained by the "germ theory."

The germs, or the fungi, or whatever micro-organisms they may be, were probably imported from India, and finding a suitable soil and climate at Petite Rivière in November, 1865, they spread from that locality north and south along the coasts, inland along the rivers, in the vicinity of marshes, and wherever the local conditions were favorable for their growth, until by 1868 they had established themselves on all the low lands, right round the Island.

On this hypothesis, the fact of a strongly-marked annual periodicity in the mortality from malarial fever is accounted for by similar periodicities in the meteorological elements upon which the growth and development of the organisms must depend.

The mere presence, however, of germs imported from another country was not in itself sufficient to cause the outbreak of the fever. It was essential that the germs should be surrounded by the conditions necessary for their development and spread. There had frequently been cases of malarial fever in the Colony before 1865, but till that year no natives of the Island, who had never left it, were attacked with the disease. We must suppose, therefore, that changes took place which rendered the Colony fit for the propagation of the germs.

Three great local changes have taken place: (1) The destruction of the forests; (2) A large increase of the Indian population; (3) A great extension of agriculture.

The Indians, we are told by Dr. Reid, have a "notorious proclivity to febrile disease," and many of them bring with them from their own country "a special tendency to malarious fever."

Probably, however, the most potent of all the local causes of the malarial fever is the destruction of the forests, which has altered the hygrometric conditions of the low lands. When a drought occurs the marshes, rivers, and streams on the low lands, are now dried up sooner and to a greater extent than formerly, and when torrential rains fall on the denuded mountain chains and ridges, especially those running along the coasts, the rivers and plains on the low lands are flooded, and organic matter is brought down from the uplands.

Forests do not prevent floods and droughts, but they mitigate their effects. The floods and droughts of 1865-67, which are considered to have been the chief determining causes of the epidemic were not of local origin, but if the forests had existed less organic débris would have been carried down to the low lands and estuaries, and the rivers, streams, ponds, marshes, and cane-fields would have resisted the droughts for a longer time and to a greater extent.

The floods and droughts which were concerned in producing the epidemic, were themselves the effects of a general cause; for similar weather occurred over a large part of the earth's surface. And considering that that weather was attended by an increase of mortality in many other places, and that similar weather both in those places and in Mauritius, in former times, was also attended by an increase of mortality, it is not improbable that, even if the forests had not been cut down, the death-rates of Mauritius in 1866-68 would have been above the average, in consequence of an epidemic of some kind or another, though one that might have been less deadly in its effects.

It would thus appear that, in the first place, there was a general cause, which operated over an extensive area, and, in the second place, that there were local causes or conditions, which aggravated the effects of the general cause. In short, there was, apparently, a chain of causes to none of which can the epidemic be exclusively ascribed. The general cause produced abnormal weather, floods and droughts, which, under any circumstances, would probably have affected the public health. In the absence of forests,—and the physical conformation and conditions of the Island being what they were,—the floods and droughts produced on the rivers, marshes, soils, estuaries, seashores, and organic matters, certain effects (described by the Medical men of the Colony), which favored the development of the malarial germs already present, and the spread and multiplication of the germs, under a continuance of favorable conditions, produced the epidemic.

The germs, or organisms, may be said to have been the specific cause; but their mere presence in a certain spot was not sufficient; if they could not have multiplied and spread, there would have been no fever epidemic. Referring to the propagation of cholera, the specific cause of which is also supposed to be micro-organisms, the late Dr. N. Arnott remarks: "Observation has now "clearly ascertained that the travelling morbific cause, what-"ever it be, can no more produce a true pestilence, unless it meet "with much filth of decomposing animal and vegetable matters—

" of which air which has served for respiration is one kind—
" than coal gas can produce an explosion without being mixed
" with many times its volume of common air, or than sulphur
" alone can produce the effects of gunpowder, when not mixed
" with the certain known proportions of nitre and charcoal".
(Report on the Cholera Epidemic in England in 1854, p. 168) It may similarly be doubted whether the morbific cause of malarial fever can travel at all, except in a passive form, without the presence of the conditions necessary for its constant re-production.

2. *Bearing of the Germ Theory upon the Periodicity and Nature of Epidemics.*—The data upon which the evidence in favor of a periodicity of epidemics, related to the sun-spot cycle, is based, are as yet scanty, and it would be rash to lay much stress upon them; but, so far as they go, they seem to justify the conclusion that such a periodicity is possible. If future investigations should place the matter beyond doubt, there would be some ground for believing that the micro-organisms of different kinds, which produce different kinds of epidemics in different countries, at the periods of least or greatest solar activity, when the weather generally is abnormal, are always more or less present, and that the multiplication and spread of the particular species which produces a particular disease, depends upon local circumstances and conditions All the outbreaks of cholera, which have hitherto taken place in Mauritius, were, according to the official Reports, preceded by sporadic cases, which occurred before the arrival of vessels having the disease on board.

There being a close connexion between the weather and the mortality of a place in the course of a year (or weather-cycle of twelve months), we should expect to find a similar connexion in the course of a weather-cycle of eleven years; and there is strong evidence of the existence of such a cycle, at the maximum and minimnm epochs of which there are great extremes and fluctuations of weather. Since 1831, nearly all the great epidemics seem to have occurred at the minimum epochs, but a few occurred at the maximum epochs. The years at or near the epochs being characterised by the occurrence of floods and droughts, and extremes of temperature, it is possible that the weather which then prevails is more than usually favorable to the development and spread of the organisms which are supposed to give rise to miasmatic diseases.

3. *Malarial Fever a preventible Disease.* It is generally believed that malarial fever is preventible, or, at all events, that, if it cannot be entirely eradicated, it is possible greatly to reduce its intensity and prevalence. This has been done in other places, and there seems to be no reason why the means that have succeeded there should not succeed in Mauritius. The main object should of course be to destroy, or remove, or counteract, the causes which favor the growth and propagation of the morbific influence, whatever it be, and the means which have been proved to be most efficacious in other countries are *drainage* and the *planting of trees*.

All the marshes and marsh-lands on the low lands should, as as far as possible, be thoroughly drained, and the water-courses confined within limits which would prevent inundations. Trees, and especially such species of the Eucalyptus as grow well in the Colony, should be planted along the banks of rivers and streams, on the outskirts of towns, villages, and camps, and around the coasts and estuaries.* Epidemics of some kind cannot be prevented, more than floods or droughts can, but there are means by which the effects of the one and the other may be mitigated.

4. *The Death Rates of a place increase with the Population.*—Dr. Farr has shown that there is a close relation between density of population and mortality. All other conditions being the same, the denser the population the higher the death-rates, and the shorter the average duration of life. If, then, the population of Mauritius go on increasing, we may expect that the death-rates will increase, unless sanitary measures and improvements keep pace with the growing increase of inhabitants.

5. *Probable causes of the decrease in the Death-Rates of Mauritius since* 1870. The remarkable decrease in the death-rates of Mauritius, since 1870, is probably due (1) to the sanitary improvements which have been made and to the establishment of hospitals and poor-houses; (2) to the excessive mortality in 1867-69, thousands having died, who, if there had been no epidemic, would probably have died in the period 1870-80 ; (3) to the migrations which have taken place from the fever-stricken plains on and near the coasts to the higher and healthier parts of the Island ; and (4) to the circumstance that malarial fever, the deaths from which are nearly 49 per cent of the total deaths, has to some extent absorbed other diseases, while, as a rule, it yields to quinine, the annual consumption of which is now many hundred times more than it was before the fever broke out.

6. *Mauritius once a healthy Colony.*—The death-rates of the general population having for many years been nearly one half of what they are now, and the universal testimony of the Colonists and of medical men who lived in the Island 70 years ago, being that Mauritius was remarkably healthy, there is no ground for supposing that it has *always* been unhealthy ; and this is confirmed by the fact that at the present day the death-rate of the island of Rodrigues, some 400 miles to the eastward, is only 15.8 per 1000, or nearly one half that of Mauritius.

7. *The healthiest and the unhealthiest Districts.*—During the last ten years, the death-rates have been greatest in (1) Port Louis, (2) Black River, and (3) Pamplemousses ; and least in Rivière du Rempart and Moka, after which come Savanne and Flacq. The Districts in which the highest percentages of deaths from malarial fever have occurred are (1) Black River, (2) Pamplemousses, and (3) Port Louis and Flacq ; and those of least percentages Moka and Plaines Wilhems.

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* *Eucalyptus Calophyilla* grows remarkably well on the low lands. Some trees of this species, planted by Mr. Horne about 8 years ago, behind the Powder Mills (Pamplemousses), at 160 feet above the sea-level, are now fully 40 feet in height, and have stems of 3 feet and 3 inches in circumference.

The fever appears to be most prevalent in Black River, Pamplemousses, and Port Louis, because they are on the west coast, where the rainfall is least, the temperature highest, evaporation greatest, the subsoil impervious, and marshes and marsh-lands most abundant. There are also marshes and impervious soils on the low lands of Flacq.

Moka and Plaines Wilhems seem to owe their comparative freedom from fever to their elevation.

In Rivière du Rempart, except near the coast, in the neighbourhood of Poudre d'Or, there are no marshes, and very few streams. The soil also is generally deep and porous, and in many places well-water alone is used. Probably, the low death-rate of that District is due to those circumstances.

8. *Effects of Déboisement.*—The destruction of the forests, by increasing the temperature and diminishing the humidity of the air over the areas which they covered, and by making room for the cultivation of the sugar-cane, has greatly contributed to the wealth, industry, and commerce of the Colony; but it has, at the same time, been prejudicial to health and agriculture on the low lands.

That the physical conditions of the Island have been altered by the destruction of more than 350,000 acres of forests necessarly follows from the known effects of forests; but the extent of the climatic changes is not known, because neither have observations been made at any station before the forests were cut down in the neighbourhood, nor comparative observations in forests and open fields.

It is, however, well known that springs and rivulets have disappeared, and rivers decreased; that the sugar-cane grows where it could not grow before, and does not now grow where it once flourished; and that the indigenous evergreen trees, &c., which composed the forests on the low-lands could not live there now.

Mr. J. Horne on the fruiting of the mangoe tree and on the former forests on the low lands.

With regard to the effects of déboisement upon the fruiting of trees and upon arboriculture, Mr Horne, the Director of Woods and Forests, has been good eneough to favor me with the following remarks in reply to questions as to whether the mangoe tree bears fruit at higher altitudes than it formerly did, and whether plantations of the indigenous trees of the Colony would thrive on the low lands:

"The free fruiting of the mangoe, in even its most favorable districts, depends greatly upon whether the weather was dry or showery when the trees were in flower. I do not know whether it now bears fruit at a higher elevation than it formerly did; but for the reason that it does not anywhere *set* its flowers freely in dull, cloudy, showery weather, it would be necessary to notice particularly the state of the weather at a place, and at the time of flowering.

"Mauritius, as you remark, is said to have been covered with forests, even to the water's edge, when it was discovered. Most, if not all, of the indigenous trees, &c., are ever-greens, which is not the case of those which have replaced them. This is worthy of notice. The latter (exotics) have, therefore, an immense advantage, in the struggle for existence, over the indigenous kinds, as they are at rest during the dry weather; whereas the indigenous ever-green trees are always evaporating, less undoubtedly in the dry season than in the wet, but still always more or less. It may, from want of proof, be doubted if they have the power of shutting the pores, or stomata, of the leaves during strong droughts. If they have not, this still further unfits them for competing with deciduous trees in a dry climate, the less perhaps in the vicinity of springs, &c.

"I have no reason to suppose that the trees, &c., which composed the forests on the lowlands, were essentially different from those in the forests of the wet, cool highlands. However, certain kinds, and varieties of species, predominated. The remains of these may still be seen on the western slopes of the Black River mountains, and in various other parts of that District. There were certain kinds which ranged from the seashore to the tops of the highest mountains; but, generally speaking, there was not in any locality any line at which the different kinds ended or began. In fact, they likely dove-tailed, according to local circumstances.

"The *bois puant* (Fœtida mauritiana) was likely a common tree in the dry lowlands, and doubtless so were several species of ebonies (Diospyros). Jossinias of several species or varieties were also, most likely, common, especially J. cordifolia, a species which has many varieties, some of which still abound in waste places in the low country. *Bois de Natte à petites feuilles* (Labourdonnaisia calophylloides, or rather the L. revoluta, Bojer, which is a variety of the former) probably abounded, for it is the form generally found in dry districts. Mimusops angustifolia, Bojer, which is a variety of M. Erythroxylon (*bois de natte rouge*) was also likely not uncommon. The *bois de natte rouge*, or "makak," is the form of this plant peculiar to the wet districts. Fernelias would likewise abound; they prefer hot, dry, stoney districts, perhaps because faster growing plants will not allow them to grow in any other place. The *bois d'olive* (Elœodendron orientale) is still frequently seen in the low lands, and it is by no means rare in higher-lying lands, but its number seems to diminish in the forests, with elevation. One or more species of Erythroxylon are also common in hot dry places, namely, the *bois ronde* and the *bois de balai*. *Bois benzoin* (Terminalia benzoin) has, I think, almost disappeared. It is said to have abounded.

"I should be very sorry, indeed, to plant any of the indigenous trees in any plantations in the low lands, unless under exceptionally favorable circumstances. I know what would be the result. Indeed, I eschew ever-greens generally for these lands, until I can get shelter. Even at the gardens, Pamplemousses, few of the native trees thrive. They merely exist, even in the best sheltered places, and when raised from seed. Exposure would be too much for them."

As the fruiting of the mangoe depends greatly upon the weather, it follows that if, as is said, it now bears fruit at higher elevations than formerly, the weather there is now less cloudy and less damp than it was formerly.

The fact that the ever-green native trees have almost entirely disappeared from the low lands, and that plantations of them would not thrive there now, also goes to show that the relative humidity has decreased and evaporation increased. It will be observed that Mr Horne says that few of the native trees thrive even at the Botanical Gardens (Pamplemousses), where the altitude is 220 feet, and shade and shelter are afforded. Such being the case, it cannot be expected that they would thrive at lower levels ; and yet they once covered the low lands to the water's edge.

Now, the same causes, namely, a decrease of moisture, an increase of evaporation, and want of shelter, which render the cultivation of the indigenous trees on the low lands impossible, may be the principal causes of the failure of cane-cultivation in the hottest and driest parts of the Island. The rainfall may not have decreased, but owing to a smaller relative humidity, a higher temperature, and a greater velocity of the surface winds, evaporation from the leaves of the canes may now be too great and too rapid for their full development, without irrigation. On the other hand, we may suppose that it is the same causes that have rendered the uplands, which were formerly too cold and too moist, productive.

The increased unhealthiness of the low lands and the consequent migrations to the uplands (favored by the railways) are likewise probably in a measure due to the same causes.

In short, through déboisement, an increase of population, and an extension of agriculture, great changes have taken place.

9. *Impossibility of restoring the Colony to what it was 40 years ago.*—The population is now so great, and agriculture has been so much extended, that it is impossible to restore the Colony to what it was 40 years ago, without throwing extensive tracts out of cultivation, and reducing the population to less than one half of its present amount. But much may be done to improve the present state of matters.

10. *Reboisement.*—No scheme of reboisement will succeed, unless it be practicable, equitable, and advantageous, and unless the altered conditions of the Colony be taken into account.

By far the most important localities for reboisement are the mountain chains, ridges, and slopes, the banks of the rivers and streams, the vicinities of wells and springs, and the seaboards.

Experience shows that there is little hope of ever being able to replant the denuded mountain and river reserves, and to protect the plantations, unless the reserves belong to the public domain, and be wholly and exclusively under the control and management of the Government.

The localities which are the driest, and where health and agriculture suffer most, being the low lands on the western, north-western, and northern coasts, the mountain and river reserves and seaboards in the northern parts of Black River, and in the Districts of Port Louis, Pamplemousses, Rivière du Rempart, and Flacq, together with the mountains in the northern parts of Moka, should undoubtedly be the first to receive attention in any scheme of reboisement to be undertaken at the public expense. The Port Louis mountains, the Moka mountains, Montagne Longue, the Calebasses and Nouvelle Découverte mountains, the Fayence mountains, &c., have all been stripped of timber; and the young growths which are struggling for life on some of them are being daily destroyed. Strictly speaking, there are no river reserves in the northern Districts; as a rule, the streams and rivers there are entirely unprotected from the sun, the so-called reserves being generally without trees or undergrowths of any kind.

The Island being longest from south to north, and it being, as it were, tilted up, the southern half having the highest elevation, and the central table-land sloping irregularly from the neighbourhood of Grand Bassin, where its altitude is upwards of 2,000 feet, to the northern limits of Moka, where it has about half that altitude, and the southern half being also the coldest, the most wooded, and the most humid and rainy, it is difficult to understand why, of all others, that part of the Island should be the first in which lands are to be purchased for reboisement, while the parched up plains to the leeward and northward of the Port Louis mountains are comparatively, if not wholly, neglected. A glance at the accompanying map, and a knowledge of the fact that the prevailing direction of the wind is E. b. S., and that it very rarely comes from any point between South and S.W., will show that if the whole of Savanne and Grand Port, from the Grand Bassin and Lagrave mountain to the seashore, were covered with one dense forest, the northern Districts would not benefit in the least. At the same time, we know that Savanne and Grand Port themselves are two of the best watered and two of the rainiest Districts in the Colony. Forests on the highest of all the table-lands, in the southern and south-western part of the Island, will only increase the already high humidity which prevails there, without benefiting even the nearest littoral plains to the westward and southward of them, for they are separated from these plains by mountain ranges. It is those ranges, especially their slopes facing the sea, that should be rewooded, and not the lower table-lands to windward of them.

For these reasons, I cannot but think that the reboisement of the Island has been commenced, or is about to be commenced, at the wrong end, and that large sums may be spent uselessly. That the north end, and not the south, is the one that stands most in need of reboisement, must be evident to all. To the north-east, north, and north-west of the Port Louis mountains are extensive plains which were once, and to a certain extent are still, highly productive, but they suffer greatly from want of moisture. The low lands of the northern parts of Black River, the town of Port Louis, with its 66,000 inhabitants, and the low arid plains of Pamplemousses, Rivière du Rempart, and Flacq, are a prey to malarial fever. No forests in the southern parts of the Island can give the slightest relief to those localities. On the other hand, there is every reason to believe that the rewooding of the Moka, Port Louis, Calebasses, and Nouvelle Découverte mountains, Mont Piton, the Butte aux Papayes, the river reserves, and the seaboards, would be highly beneficial. These localities, one would suppose, have much higher claims to immediate consideration than elevated plateaux in the southern extremities of the Colony.

11. *Irrigation.*—Mauritius is overdrained. By damming up streams and rivers at intervals, and forming reservoirs, much might be done both towards increasing the humidity of the air and supplying water for irrigating the low lands which are now unproductive. Such retention of portions of the large volumes of rain water which now annually flow into the sea would also assist in preventing inundations.

The objection to the storing up of water on the low lands, upon the ground that in times of drought the reservoirs might become partially or wholly dried up and their muddy beds dangerous to health, would not apply, at least in the same degree, to reservoirs at elevations above 700 or 800 feet. It is also possible that means might be devised for preventing danger to health from reservoirs at lower levels.

In so far as agriculture is concerned, especially on the low lands, irrigation seems to offer a better chance of success than reboisement, at least for many years to come. However vigorously rewooding may be prosecuted, and however successful the plantations may be, a long time must elapse before the full effects can be produced, and in the mean time the number of abandoned sugar-estates may increase.

As a mere enterprise, irrigation would probably be less costly and much more expeditious than reboisement, while, in the long run, it might be as successful, if not more so. It would certainly not be attended with the same difficulties as reboisement. The difficulties of reboisement, considering the large population, the price of land, and other circumstances, are so great that it may be doubted whether more than a small fraction of the superficial area of the Island can be rewooded; and if the mountain and river reserves and the seaboards be planted, at the public expense, much more can hardly be expected. Every attempt that has yet been made, not only to restore the forests, but to preserve those existing, has failed; and, if we are to judge from experience, such will be the fate of the present attempts, especially if they be not moderate and practicable. There has always been an apparently irresistible pressure which has borne down all obstacles, and that pressure is now greater than ever.

I can find no instance of a country the forests of which, when once destroyed, have ever been restored to anything equal to their former extent. All the attempts that have been made with that object in Madeira and St. Helena, for example, have failed. The former island, which, like Mauritius, was originally covered with forests, was denuded long ago, and for many years cultivation has been maintained by an extensive system of irrigation. At the time of its discovery in 1502, St. Helena "had heavy forests," which were gradually destroyed. Toward the end of the last century strenuous measures were adopted to restore the forests, but since 1836 the plantations have been neglected, and, "for the last thirty years at least, a score of trees have been cut down to one planted." *

The question of irrigation seems to be of so much importance in Mauritius that it might be well to make experiments with the view of ascertaining how much water could be stored up under certain conditions, how much of it would be required for irrigating an acre of canes under various circumstances, and what would be the probable net profit.

Suggestions.

297. In order to be able to carry on in future (with a fair prospect of obtaining results which might be of much practical utility) the inquiries which have been commenced in the preceding pages, I would take the liberty of calling attention to the following *desiderata* :

First.—The printed tables of mortality from different diseases in the several Districts, should give the *daily*, or at least the *weekly*, number of deaths, as well as the monthly or quarterly number. With such additional data the relations of weather to mortality could be traced more closely than they can be at present.

The death-rates being based upon the *estimated* population of each District, it is important for purposes of comparison that the estimated population should not differ so much from the actual population as to render the comparisons useless. On the 31st December, 1880, for example, the *estimated* population of the District of Pamplemousses was 44,570, but the *enumerated* population on the 3rd April, 1881, was only 37,670. Again, the estimated population of Plaines Wilhems on the 31st December, 1880, was 40,420, while the actual population on the 3rd April, 1881, was 46,315. On the 11th April, 1871, the enumerated populations of Pamplemousses and Plaines Wilhems were 42,978 and 35,147, respectively; so that in the ten years 1871-80 the former population diminished to the extent of 5,308, and the latter increased to the extent of 11,168. Hence for the decade 1871-80 the death-rates which have been assigned to Pamplemousses are too low, while those which have been assigned to Plaines Wilhems are too high; and the results for some other Districts are similar. †

It is well known also that some parts of the same District are much more healthy than others.

For these reasons, it is desirable to establish "Sanitary

* Dr Hough's Report upon Forestry, p. 303.

† For the whole Colony, however, the enumerated population, by the Census of the 3rd April, 1881, is remarkably close to the estimated population on the 31st December, 1881, the difference being only ~~114~~. This indicates that the annual death-rates for the *whole* Colony are reliable.

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Districts," the limits of which should be clearly defined, and the average population of which in each year should be accurately known, together with the number of deaths from each disease on each day. Each Sanitary District should be the best possible representative of one or other of the extreme conditions of climate, soil, density of population, &c., in the Colony; and observations of the temperature, humidity, rainfall, and wind, should be made and recorded daily at fixed hours.

Second.—The vital statistics of the Colony from the earliest times should be re-discussed, and at least the monthly and yearly results be published.

Baron d'Unienvielle gives the mean annual births, deaths, &c., from 1804 to 1830, but not those for each year. The results given by him must have been derived from detailed statistics, and these should be collected and printed.

The statistics from 1831 to 1861 should also be re-discussed. I have done so as far as the materials I could obtain permitted, but more remains to be done. It is desirable to know whether the yearly periodicity of the total mortality, which now exists, ever occurred before 1867; we only know at present that it did not do so in 1861-66.

All that is known or recorded respecting the epidemics and epizooties with which the Colony has been visited from the earliest times should be collected and discussed, and a summary of the results, with the dates, the nature of the disease, &c., be printed. It would appear that there were epidemics in 1775, 1772, 1792, 1812, 1819-20, &c.

Third.—The causes of the sterility of formerly fertile sugar-estates on the low lands being doubtful, it is important that those causes should, as far as possible, be fully determined. With this view, chemical analyses should be made of different soils, and experiments in cultivating sugar-canes, with and without manures, irrigation, &c., be undertaken and continued for some time.

Fourth. It is important that, as has of late years been done by the Governments of several European States, stations should be established for the purpose of ascertaining the influence of forests upon the climate, health, rivers, soils, and productions of the Colony. There is no country in the world in which simultaneous meteorological observations made in open fields and in forests would be more interesting or productive of more useful results than in Mauritius. At present, we only know in a general way the effects of the destruction of the forests. It is desirable to ascertain, as far as possible, the numerical values of those effects.

TABLE OF *ERRATA*.

Page.	Line.	Errata.
2	31	For 56·1 *read* 51·6.
3	11	„ Port Louis „ Port Louis and Flacq.
—	4 from bottom	„ which „ while.
5	13	„ containd „ contained.
6	Last heading	„ poch „ epoch.
7	1	„ whole „ a whole.
—	2	„ progession „ progression.
—	2nd heading	„ Deviation „ Deviations.
11	Table G.	Var. of Rainfall for December, for 0.63 *read* 0.03.
26	Table O.	For + (January and February) *read* —
29	1st heading	For 1871-7-75 &c. *read* 1871-72-75 &c.
46	40	„ that „ than.
53	17	„ Jannary „ January.
55	Last line of foot-note	„ 1865 „ to 1865.
65	23	„ Johnson „ Johnston.
74	15	„ Gand „ Grand.
—	16	„ nothern „ northern.
75	40	„ tbe „ the.
87	7 from bottom	„ narshy „ marshy.
88	10	„ upone „ upon.
89	19	„ malaria „ malarial fever.
91	6	„ te „ to.
—	18	„ the the „ the.
—	24	„ Mont „ Mon.
—	Par. 112	Population in 1837, for 95,888 *read* 103,935.

TABLE OF *ERRATA*.—Continued.

Page.	Line.	Errata.
91	Par. 112	Increase in percentages 1797, for 315.3. *read* 314.3.
—	Foot note	For pape *read* page.
92	1	Population of Port Louis in 1861, for 74,125 *read* 74,128.
—	11 from botton	„ 708 „ 705.
—	Last	„ an acre „ a square mile.
102	3 from bottom	„ 1864 „ 1865.
105	1 and 7	„ malaria „ malarial fever.
111	13	„ Hawesbury *read* Hawkesbury.
—	22	*Dele* only.
—	heading	For Epidemic *read* the Epidemic.
112	8 from bottom	„ these „ those.
122	15	„ XXXVI „ XXXVII.
123	3	„ XXXVI „ XXXVII.
127	2nd heading	„ Troop „ Troops.
128	10	„ for „ far.
130	6	„ dysentery „ diarrhœa.
131	2 from bottom	„ Table *q* „ Table *r*.
136	1st heading	„ he „ the.
—	„	„ 1 „ 51.
139	6 from bottom	„ XXXVI „ XXXVII.
145	20	„ pleces „ places.
152	6	„ 1860 „ 1863.
—	8 from bottom	„ other „ in other.
156	6	„ 1875 „ 1877.
159	heading	„ daath „ death.

TABLE OF *ERRATA*.—Continued.

Page.	Line.	Errata.
169	4 from top	An error in the numeration of the paragraphs.
173	3 from bottom	For to impervious *read* impervious to.
179	9 ,, ,,	,, buildiugs ,, buildings.
180	3 from bottom	,, engagemet ,, engagement.
183	14 ,, ,,	,, repealed ,, repealed.
184	12 ,, ,,	,, 8,240 ,, 8,420.
—	13 ,, ,,	,, rock ,, rocky.
186	5 ,, ,,	,, tracks ,, tracts.
—	8 ,, ,,	,, was was ,, was.
199	10 ,, ,,	For abandou *read* abandon.
211	Summary of Results	Insert parag. 295.
224	11	For 1876 *read* 1877.
—	29	,, *or* ,, or.
235	4 from bottom	,, known ,, know.
I	In No. 8 of Contents	,, seven ,, fourteen.

INDEX.

APPENDICES.

TABLE

SHOWING THE NUMBER OF DEATHS FROM FEVER (F), THE TOTAL MORTALITY (T),

FOR EACH OF THE

Districts.	Port-Louis.			Pamplemousses.			Riv. du Rempart.			Flacq.			Grand Port.		
Years.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
1871......	1001	2029	32.14	482	1051	24.40	209	469	23.10	418	1002	20.16	511	1197	27.01
1872......	1332	2305	35.88	460	935	21.41	166	374	18.44	635	1239	23.93	724	1419	31.48
1873......	1717	3412	52.46	748	1396	31.76	237	472	21.46	665	1493	28.05	557	1362	29.72
1874......	1233	2436	37.65	677	1284	29.06	195	486	21.30	555	1399	25.91	435	1277	27.28
1875......	1140	2322	35.99	584	1023	23.08	196	465	20.11	607	1154	21.20	474	1046	22.17
1876......	1158	2392	36.36	546	964	21.37	255	505	21.33	841	1382	24.56	642	1243	25.57
1877......	1700	3041	46.83	917	1334	29.66	327	579	24.43	969	1521	26.82	422	1024	20.79
1878......	1377	2577	39.67	617	951	21.32	241	506	20.82	759	1272	22.15	737	1355	26.47
1879......	1427	2848	43.98	621	1106	24.48	211	485	19.40	862	1717	29.57	787	1721	32.90
Means ...	1342.8	2595.8	40.11	628.0	1116.0	25.20	226.3	482.3	21.16	701.2	1353.2	24.72	587.7	1293.8	27.05

I.

AND THE DEATH-RATE PER 1000 OF ESTIMATED POPULATION IN EACH DISTRICT

NINE YEARS 1871—79.

Savanne.			Black River.			Plaines Wilhems.			Moka.			TOTALS.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
373	804	29.24	184	301	24.96	250	845	23.99	164	475	22.30	3592	8173	25.26
313	745	26.28	154	293	23.63	350	919	25.65	166	517	23.57	4300	8746	25.59
298	746	25.74	217	377	29.61	502	1303	36.05	231	661	29.51	5172	11222	31.59
247	848	28.35	245	445	34.69	384	1107	30.10	207	707	31.30	4178	9989	29.52
271	617	20.38	225	374	29.14	472	1056	28.57	201	529	23.33	4170	8586	24.88
490	817	26.20	279	453	34.71	486	1161	30.55	278	624	26.39	4975	9541	27.45
406	770	24.48	303	455	35.54	536	1012	26.23	306	620	26.61	5886	10360	29.04
346	699	21.42	260	442	34.33	517	1114	28.83	286	691	29.26	5138	9608	27.16
408	1070	31.79	282	486	37.52	543	1267	32.59	270	758	30.28	5411	11458	31.39
350.2	790.7	25.99	238.8	402.9	31.57	448.9	1087.1	29.17	234.3	620.2	26.95	4758.0	9742.6	27.98

TABLE

SHOWING THE NUMBER OF DEATHS FROM FEVER (F.), THE TOTAL MORTALITY

THE DISTRICT OF **PORT LOUIS**, FOR EACH

Years.	1871.			1872.			1873.			1874.			1875.		
Months.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
January	91	178	2.82	89	150	2.38	142	252	3.90	97	237	3.64	80	166	2.57
February	97	192	3.04	92	195	3.09	186	253	3.92	104	189	2.90	102	185	2.87
March	117	195	3.09	120	223	3.53	198	303	4.69	107	193	2.96	113	208	3.22
April	86	165	2.61	152	228	3.53	232	340	5.22	113	228	3.53	103	202	3.13
May	76	151	2.39	160	248	3.84	202	305	4.68	166	285	4.42	114	205	3.18
June	68	153	2.42	145	221	3.42	150	238	3.65	123	215	3.33	107	230	3.57
July	132	254	4.03	104	194	3.00	118	203	3.11	138	246	3.81	129	248	3.85
August	62	144	2.28	96	197	3.05	107	188	2.88	112	226	3.50	95	203	3.14
September ...	70	152	2.41	86	144	2.23	103	188	2.88	78	177	2.74	74	175	2.71
October	71	154	2.44	87	159	2.46	107	346	5.31	74	147	2.28	71	167	2.59
November	56	133	2.11	84	134	2.07	75	485	7.45	48	128	1.98	76	160	2.48
December	75	158	2.50	117	212	3.28	97	311	4.77	73	165	2.56	76	173	2.68
Totals ...	1001	2029	32.14	1332	2305	35.88	1717	3412	52.46	1233	2436	37.65	1140	2322	35.99

II.

(T.), AND THE TOTAL DEATH-RATE PER 1000 OF ESTIMATED POPULATION (R.), IN MONTH OF THE NINE YEARS 1871-79.

1876.			1877.			1878.			1879.			Means.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
77	163	2.47	81	167	2.55	150	257	3.95	135	239	3.53	104.7	201.0	3.09
124	208	3.16	105	212	3.45	119	198	3.05	107	244	3.77	115.1	208.4	3.25
146	246	3.73	201	322	4.92	130	222	3.41	108	272	4.21	137.8	242.7	3.75
106	197	2.99	279	405	6.18	104	188	2.89	135	247	3.80	145.6	244.4	3.76
100	213	3.23	282	416	6.36	98	202	3.10	139	258	3.98	148.6	253.7	3.91
113	245	3.72	157	290	4.44	112	203	3.13	142	273	4.24	124.1	229.8	3.55
91	209	3.18	117	246	3.79	126	228	3.52	116	244	3.91	119.0	230.2	3.58
77	205	3.13	97	213	3.28	107	220	3.39	117	236	3.65	96.7	203.6	3.14
56	138	2.10	100	199	3.07	94	205	3.16	130	254	3.92	87.9	181.3	2.80
85	191	2.91	107	204	3.14	106	205	3.16	106	208	3.21	90.4	197.9	3.06
80	168	2.56	67	159	2.45	130	249	3.83	88	184	2.84	78.2	200.0	3.09
103	209	3.18	107	208	3.20	101	200	3.08	104	189	2.92	94.8	202.8	3.13
1158	2392	36.36	1700	3041	46.83	1377	2577	39.67	1427	2848	43.98	1342.9	2595.8	40.11

TABLE

SHOWING THE NUMBER OF DEATHS FROM FEVER (F.), THE TOTAL MORTALITY

THE DISTRICT OF **PAMPLEMOUSSES**, FOR EACH

Years.	1871.			1872.			1873.			1874.			1875.		
Months.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
January	38	101	2.35	34	75	1.74	44	101	2.30	48	143	3.25	49	86	1.94
February	45	98	2.27	31	75	1.74	49	83	1.89	47	119	2.71	47	82	1.85
March	65	103	2.39	51	82	1.90	86	122	2.78	57	113	2.57	64	104	2.35
April	44	85	1.97	58	94	2.14	109	168	3.82	68	120	2.71	47	87	1.96
May	41	86	2.00	47	85	1.94	105	167	3.80	66	110	2.48	57	107	2.42
June	40	84	1.95	33	80	1.82	75	127	2.89	85	149	3.37	56	98	2.21
July	34	99	2.30	29	60	1.37	51	100	2.27	80	123	2.78	57	91	2.05
August	41	89	2.07	36	83	1.89	50	96	2.18	63	117	2.64	64	108	2.44
September ...	35	85	1.97	39	78	1.78	52	96	2.18	38	74	1.67	46	85	1.92
October	35	82	1.90	28	70	1.60	40	90	2.05	53	84	1.90	38	64	1.44
November	33	68	1.58	25	60	1.37	48	116	2.64	38	71	1.60	23	53	1.19
December	31	71	1.65	49	93	2.12	39	130	2.96	34	61	1.38	36	58	1.31
Totals ...	482	1051	24.40	460	935	21.41	748	1396	31.76	667	1284	29.06	584	1023	23.08

III.

(T.), AND THE TOTAL DEATH-RATE PER 1,000 OF ESTIMATED POPULATION (R.), IN MONTH OF THE NINE YEARS 1871-79.

1876.			1877.			1878.			1879.			Means.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
45	81	1.79	42	75	1.66	60	91	2.04	70	130	2.91	47.8	98.1	2.22
63	97	2.15	64	101	2.15	49	74	1.65	49	134	3.00	49.3	95.9	2.16
49	86	1.91	72	107	2.37	49	68	1.52	55	130	2.91	60.9	101.7	2.30
41	74	1.64	153	197	4.37	54	75	1.68	51	75	1.45	69.4	108.3	2.41
52	84	1.86	197	243	5.40	42	71	1.59	54	93	2.08	73.4	116.2	2.62
57	103	2.28	94	145	3.23	51	86	1.93	57	98	2.16	60.9	107.8	2.43
54	89	1.97	76	120	2.70	61	92	2.07	68	107	2.39	56.7	97.9	2.21
50	90	2.00	44	81	1.82	47	70	1.57	41	78	1.75	48.4	90.2	2.04
29	66	1.47	51	77	1.73	42	76	1.71	41	72	1.61	41.4	78.8	1.78
32	66	1.46	47	76	1.71	55	74	1.66	59	82	1.83	43.0	76.4	1.73
36	58	1.29	33	47	1.06	55	88	1.97	31	43	0.96	35.8	67.1	1.55
38	70	1.55	44	65	1.46	52	86	1.93	45	64	1.43	40.1	77.6	1.75
546	964	21.37	917	1334	29.66	617	951	21.32	621	1106	24.48	627.1	1116.0	25.20

TABLE

SHOWING THE NUMBER OF DEATHS FROM FEVER (F.), THE TOTAL MORTALITY

THE DISTRICT OF **RIVIERE DU REMPART**, FOR EACH

Years.	1871.			1872.			1873.			1874.			1875.		
Months.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
January	22	39	1.92	17	34	1.67	18	39	1.80	15	57	2.57	13	32	1.38
February	17	39	1.92	23	42	2.07	22	35	1.62	20	58	2.62	12	31	1.34
March	20	36	1.77	9	33	1.63	29	46	2.17	12	42	1.89	12	32	1.38
April	16	43	2.12	18	34	1.57	33	60	2.71	12	32	1.38	19	40	1.73
May	19	38	1.87	19	33	1.52	30	50	2.25	16	34	1.47	33	62	2.68
June	20	40	1.97	7	24	1.11	27	39	1.76	30	48	2.07	26	64	2.77
July	16	42	2.07	11	24	1.11	16	31	1.40	27	55	2.38	7	33	1.43
August	13	39	1.92	13	41	1.90	17	32	1.44	12	36	1.56	11	36	1.56
September ...	17	40	1.97	5	15	1.52	11	33	1.49	9	28	1.21	18	36	1.56
October	13	32	1.58	13	35	1.62	10	21	0.94	13	36	1.56	15	30	1.30
November ...	13	30	1.48	12	25	1.15	12	37	1.67	12	25	1.08	15	34	1.47
December	23	51	2.51	19	34	1.57	12	49	2.21	17	35	1.51	15	35	1.51
Totals ...	209	469	23.10	166	374	18.44	237	472	21.46	195	486	21.30	196	465	20.11

IV.

(T.), AND THE TOTAL DEATH-RATE PER 1000 OF ESTIMATED POPULATION (R.) IN MONTH OF THE NINE YEARS 1871—79.

1876.			1877.			1878.			1879.			Means.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
9	28	1.18	8	23	0.97	23	41	1.71	16	41	1.64	15.7	37.1	1.65
31	55	2.32	18	38	1.60	24	39	1.62	19	52	2.09	20.7	43.2	1.91
25	49	2.07	32	51	2.15	22	36	1.50	20	52	2.10	20.1	41.9	1.85
30	63	2.66	50	80	3.37	13	39	1.62	16	49	1.96	23.0	48.9	2.12
31	53	2.24	68	96	4.04	21	39	1.62	25	42	1.67	29.1	49.7	2.15
25	48	2.02	41	62	2.61	21	44	1.82	19	44	1.75	24.0	45.9	1.99
21	39	1.65	26	51	2.16	19	49	2.03	19	35	1.40	18.0	39.9	1.74
11	33	1.40	25	50	2.12	19	48	1.95	17	32	1.32	15.3	38.6	1.69
12	26	1.10	14	37	1.57	18	43	1.76	18	34	1.35	13.6	32.4	1.41
19	34	1.44	17	33	1.39	23	45	1.84	16	44	1.74	15.4	34.4	1.49
19	35	1.48	15	31	1.31	16	38	1.53	10	27	1.07	13.8	31.3	1.36
22	42	1.77	13	27	1.14	22	45	1.82	16	33	1.31	17.7	39.0	1.70
255	505	21.33	327	579	24.43	241	506	20.82	211	485	19.40	226.4	482.3	21.06

SHOWING THE NUMBER OF DEATHS FROM FEVER (F.), THE TOTAL (MORTALITY (T,

DISTRICT OF **FLACQ**, FOR EACH

YEARS.	1871.			1872.			1873.			1874.			1875.		
MONTHS.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
January ...	23	68	1.37	31	79	1.59	48	114	2.17	26	217	4,07	46	79	1.45
February ...	35	81	1.63	37	90	1.81	46	91	1.73	41	171	3.21	41	79	1.45
March ...	40	93	1.87	69	114	2.30	76	123	2.35	48	139	2.61	59	97	1.78
April ...	55	95	1.91	77	136	2.59	96	160	3.00	43	99	1.82	51	97	1.78
May ...	46	100	2.02	80	120	2.29	104	150	2.81	73	115	2.11	64	117	2.15
June ...	31	87	1.75	86	135	2.58	55	98	1.84	96	156	2.87	63	105	1.93
July ...	46	115	2.30	49	108	2.06	57	113	2.12	52	120	2.21	57	113	2.08
August ...	32	93	1.87	50	114	2.17	45	102	1.91	39	89	1.63	46	110	2.02
September ...	22	71	1.43	42	100	1.91	41	94	1.76	33	71	1.30	43	92	1.69
October ...	32	72	1.45	37	76	1.45	28	82	1.53	36	69	1.27	42	85	1.56
November ...	21	65	1.31	33	81	1.54	40	156	2.92	40	73	1.34	42	82	1.51
December ...	35	62	1.25	44	86	1.64	29	210	3.91	28	80	1.47	53	98	1.80
Totals ...	418	1002	20.16	635	1239	23.93	665	1493	28.05	555	1399	25.91	607	1154	21.20

V.

AND THE TOTAL (DEATH-RATE PER 1000 OF ESTIMATED POPULATION (R.), IN THE MONTH OF THE NINE YEARS 1871-79.

1876.			1877.			1878.			1879.			Means.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
52	110	1.95	38	84	1.48	68	113	1.98	83	153	2.63	46.1	113.0	2.08
69	117	2.08	50	88	1.55	54	84	1.47	118	214	3.68	54.6	112.8	2.07
128	175	3.11	77	114	2.01	68	105	1.83	92	204	3.52	73.0	129.3	2.38
114	162	2.88	177	222	3.91	61	96	1.68	78	165	2.83	83.6	136.9	2.49
95	128	2.28	171	232	4.08	54	89	1.55	105	203	3.64	88.0	139.3	2.55
87	143	2.54	111	186	3.27	63	117	2.04	96	180	3.07	76.4	134.1	2.43
81	143	2.54	95	156	2.76	75	133	2.33	64	128	2.19	64.0	125.4	2.29
53	105	1.87	53	99	1.75	66	118	2.05	57	124	2.12	49.0	106.0	1.93
41	81	1.44	62	101	1.79	66	113	1.96	47	95	1.62	44.3	90.9	1.66
33	68	1.21	52	90	1.59	62	99	1.72	40	86	1.46	40.2	80.8	1.47
45	83	1.47	43	77	1.36	57	106	1.83	46	82	1.40	40.8	89.4	1.63
43	67	1.19	40	72	1.27	63	99	1.71	36	83	1.41	41.2	95.2	1.74
841	1382	24.56	969	1521	26 82	757	1272	22.15	862	1717	29.57	701.2	1353.1	24.72

TABLE

SHOWING THE NUMBER OF DEATHS FROM FEVER (F.), THE TOTAL MORTALITY (T.),

DISTRICT OF GRAND PORT, FOR EACH

Years.	1871.			1872.			1873.			1874.			1875.		
Months.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
January	20	70	1.58	40	88	1.98	47	122	2.69	25	120	2.61	24	70	1.48
February ...	28	62	1.40	46	92	2.08	66	125	2.76	32	117	2.55	32	77	1.63
March	39	81	1.83	88	147	3.32	67	129	2.85	38	136	2.96	26	73	1.55
April	63	128	2.89	98	159	3.51	98	156	3.40	44	135	2.86	33	76	1.61
May	98	179	4.04	130	189	4.18	66	138	3.00	52	119	2.52	55	106	2.25
June	60	114	2.57	100	150	3.31	46	113	2.43	73	131	2.78	59	124	2.63
July	47	134	3.02	56	135	2.98	51	117	2.55	40	108	2.29	58	115	2.44
August	60	131	2.96	36	103	2.27	30	109	2.37	27	98	2.08	54	108	2.29
September ...	25	81	1.83	36	86	1.90	22	86	1.87	26	81	1.72	26	62	1.31
October	25	80	1.80	33	89	1.96	17	71	1.54	23	80	1.69	35	77	1.63
November ...	26	79	1.78	30	87	1.92	25	86	1.87	33	79	1.67	33	81	1.72
December ...	20	58	1,31	31	94	2.07	22	110	2.39	22	73	1.55	39	77	1.63
Totals ...	511	1197	27.01	724	1419	31.48	557	1362	29.72	435	1277	27.28	474	1046	22.17

VI.

AND THE TOTAL DEATH-RATE PER 1000 OF ESTIMATED POPULATION (R.), IN THE MONTH OF THE NINE YEARS 1871—79.

1876.			1877.			1878.			1879.			Means.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
42	87	1.79	29	67	1.37	25	79	1.56	58	119	2.28	34.4	91.3	1.93
49	104	2.14	19	63	1.31	43	75	1.48	84	157	3.01	44.3	96.9	2.04
84	140	2.88	35	93	1.90	50	87	1.71	108	221	4.23	59.4	123.0	2.58
116	167	3.44	55	112	2.29	67	121	2.38	91	182	3.49	73.9	137.3	2.87
103	160	3.29	50	105	2.13	78	132	2.60	90	184	3.51	80.2	145.8	3.06
70	135	2.77	39	96	1.95	90	152	2.98	79	169	3.22	68.4	131.6	2.74
59	121	2.49	39	86	1.75	102	156	3.06	65	156	2.97	57.4	125.3	2.62
27	81	1.67	34	94	1.91	67	127	2.47	45	112	2.14	42.2	107.0	2.24
14	59	1.22	28	77	1.56	57	104	2.02	44	105	2.01	30.9	82.3	1.72
24	67	1.17	29	80	1.60	51	107	2.08	41	112	2.14	30.9	83.7	1.73
19	51	1.05	27	68	1.36	45	91	1.75	39	97	1.85	30.8	79.9	1.66
35	81	1.66	38	83	1.66	62	124	2.38	43	107	2.05	34.7	89.7	1.86
642	1243	25.57	422	1024	20.79	737	1355	26.47	787	1721	32.90	587.5	1293.8	27.05

TABLE

SHOWING THE NUMBER DEATHS OF FROM FEVER (F.), THE TOTAL MORTALITY (T)

DISTRICT OF **SAVANNE**, FOR EACH

Years.	1871.			1872.			1873.			1874.			1875.		
Months	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
January ...	29	69	2.51	26	56	2.04	26	61	2.13	22	96	3.29	19	52	.72
February ...	28	55	2.00	20	47	1.71	30	63	2.24	20	82	2.81	15	45	.49
March ...	45	78	2.84	28	60	2.18	36	71	2.48	27	84	2.88	25	56	.85
April ...	76	108	3.93	25	51	1.78	35	73	2.50	30	101	3.34	25	51	.68
May ...	52	114	4.15	38	78	2.73	25	52	1.78	17	62	2.05	30	53	.75
June ...	27	67	2.44	25	61	2.13	25	69	2.37	34	83	2.74	30	63	2.08
July ...	28	74	2.69	32	76	2.66	34	72	2.47	21	62	2.05	40	66	2.18
August ...	14	47	1.71	26	69	2.41	26	67	2.30	12	61	2.02	27	61	2.02
September ...	19	45	1.63	20	61	2.13	14	54	1.85	15	58	1.92	11	31	.02
October ...	22	46	1.67	28	66	2.31	15	55	1.88	20	60	1.98	18	46	.52
November ...	18	50	1.82	23	66	2.31	14	40	1.37	11	43	1.42	15	50	.65
December ...	15	51	1.85	22	54	1.89	18	69	2.37	18	56	1.85	16	43	.42
Totals ...	373	804	29.24	313	745	26.28	298	746	25.74	247	848	28.35	271	617	20.38

VII.

AND THE TOTAL DEATH-RATE PER 1000 OF ESTIMATED POPULATION (R), IN THE MONTH OF NINE YEARS 1871-79.

1876.			1877.			1878.			1879.			Means.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
25	58	1.86	24	45	1.43	35	71	2.21	41	90	2.69	27.4	66.4	2.21
36	61	1.95	27	56	1.78	24	47	1.46	43	116	3.46	27.0	63.6	2.10
67	87	2.79	49	72	2.29	26	61	1.90	24	132	3.95	36.3	77.9	2.57
71	88	2.82	40	60	1.92	31	63	1.96	40	104	3.10	41.4	77.7	2.56
56	80	2.56	53	85	2.70	30	54	1.68	39	106	3.14	37.8	76.0	2.50
50	77	2.50	34	71	2.25	33	63	1.92	41	81	2.40	33.2	70.6	2.31
56	91	2.91	30	67	2.14	39	65	1.98	41	93	2.75	35.7	74.0	2.43
38	85	2.73	36	62	1.98	17	51	1.55	24	70	2.07	24.4	63.7	2.09
20	48	1.54	32	73	2.33	30	62	1.88	30	82	2.43	21.2	57·1	1.86
17	42	1.34	26	61	1.93	23	52	1.58	24	68	2.01	21.4	55.1	1.80
19	33	1.06	28	63	1.99	33	54	1.62	18	47	1.39	19.9	49.6	1.63
35	67	2.14	27	55	1.74	25	56	1.68	43	81	2.40	24.3	59.1	1.93
490	817	26.20	406	770	24.48	346	699	21.42	408	1070	31.79	350.0	790.8	25.99

TABLE

SHOWING THE NUMBER OF DEATHS FROM FEVER (F.), THE TOTAL MORTALITY

THE DISTRICT OF **BLACK RIVER**, FOR EACH

Years.	1871.			1872.			1873.			1874.			1875.		
Months.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
January... ...	13	19	1.58	17	31	2.58	16	26	2.08	24	43	3.36	15	28	2.18
February ...	20	31	2.50	13	22	1.83	15	32	2.55	21	36	2.81	13	24	1.87
March	22	34	2.83	7	11	0.91	27	37	2.96	22	38	2.97	18	30	2.34
April	26	34	2.83	20	42	3.36	28	34	2.66	20	48	3.74	33	45	3.51
May	22	29	2.41	19	33	2.64	24	36	2.81	23	52	4.05	30	39	3.04
June	11	17	1.41	12	25	2.00	22	29	2.26	31	54	4.21	33	50	3.90
July	15	28	2.33	11	24	1.91	17	30	2.34	26	45	3.51	17	27	2.10
August	19	30	2.50	18	28	2.24	12	28	2.19	21	30	2.34	13	28	2.18
September ...	8	18	1.50	12	21	1.68	11	19	1.48	17	26	2.02	15	27	2.10
October... ...	11	26	2.16	10	22	1.76	13	20	1.56	13	29	2.26	17	34	2.65
November ...	3	12	1.00	8	15	1.20	12	32	2.50	10	17	1.32	10	24	1.87
December ...	14	23	1.91	7	19	1.52	20	54	4.22	17	27	2.10	11	18	1.40
Totals ...	184	301	24.96	154	293	23.63	217	377	29.61	245	445	34.69	225	374	29.14

VIII.

(T.), AND THE TOTAL DEATH-RATE PER 1,000 OF ESTIMATED POPULATION (R.), IN MONTH OF THE NINE YEARS 1871-79.

1876.			1877.			1878.			1879.			Means.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
18	30	2.29	17	30	2.32	27	39	3.04	20	29	2.24	18.6	30.6	2.41
31	40	3.05	26	32	2.55	11	20	1.55	32	53	4.09	20.2	32.2	2.53
21	41	3.13	21	35	2.71	25	37	2.88	26	50	3.84	21.0	34.8	2.73
28	42	3.21	48	60	4.64	20	32	2.49	18	36	2.77	26.8	41.4	3.25
31	52	3.97	43	62	4.81	20	47	3.66	28	42	3.24	26.7	43.6	3.40
28	42	3.21	27	43	3.34	23	43	3.32	28	44	3.39	23.9	38.4	3.00
23	41	3.13	21	33	2.60	34	54	4.18	34	48	3.70	22.0	36.7	2.87
19	32	2.47	22	33	2.60	18	38	2.94	23	43	3.33	18.3	32.2	2.53
22	34	2.62	19	33	2.60	17	30	2.32	25	45	3.48	16.2	28.1	2.20
21	36	2.77	29	46	3.61	26	40	3.09	19	34	2.63	17.7	31.9	2.50
21	35	2.70	17	29	2.27	23	35	2.70	10	31	2.41	12.7	25.6	2.00
16	28	2.16	13	19	1.49	16	28	2.16	19	31	2.40	14.8	27.4	2.15
279	453	34.71	303	455	35.54	260	443	34.33	282	486	37.52	238.9	402.9	31.57

TABLE

SHOWING THE NUMBER OF DEATHS FROM FEVER (F.), THE TOTAL MORTALITY

THE DISTRICT OF PLAINES WILHEMS, FOR

Years.	1871.			1872.			1873.			1874.			1875.		
Months.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
January... ...	23	76	2.16	30	87	2.47	46	115	3.19	19	110	3.04	43	86	2.33
February. ...	16	55	1.56	24	63	1.79	46	106	2.94	20	89	2.46	42	79	2.14
March	32	76	2.16	23	79	2.24	70	125	3.47	32	80	2.21	48	92	2.49
April	21	75	2.13	24	69	1.91	76	134	3.70	37	105	2.84	40	88	2.38
May	21	71	2.02	38	77	2.14	46	112	3.10	37	98	2,65	53	105	2.84
June	15	64	1.82	34	77	2.14	40	97	2.68	38	114	3.08	46	90	2.43
July.	26	79	2.24	31	89	2.47	43	98	2.71	42	110	2.98	40	103	2.79
August	25	91	2.58	27	78	2.16	29	80	2.21	23	87	2.35	37	104	2,81
September ...	18	76	2.16	26	71	1.97	29	80	2.21	32	85	2.30	31	82	2.22
October... ...	19	78	2.21	28	68	1.89	24	85	2.35	36	78	2.11	33	90	2.43
November ...	16	56	1.59	24	63	1.75	25	120	3.82	35	76	2.05	20	48	1.30
December ...	18	48	1.36	41	98	2.72	28	151	4.17	33	75	2.03	39	89	2.41
Totals... ...	250	845	23.99	350	919	25.65	502	1303	36.05	384	1107	30.10	472	1056	28.57

IX.

(T.), AND THE TOTAL DEATH-RATE PER 1000 OF ESTIMATED POPULATION (R.) IN EACH MONTH OF THE NINE YEARS 1871-79.

1876.			1877.			1878.			1879.			Means.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
37	101	2.66	44	81	2.12	45	90	2.32	48	117	2.97	37.2	95.9	2.58
30	81	2.13	48	92	2.04	45	84	2.16	69	134	3.40	37.8	87.0	2.29
45	105	2.76	55	94	2.46	52	102	2.63	56	133	3.38	45.9	98.4	2.64
38	93	2.45	81	120	3.14	46	95	2.45	42	90	2.68	45.0	97.3	2.63
42	105	2.76	48	103	2.70	38	80	2.32	40	98	2.46	40.3	94.3	2.55
52	114	3.00	45	86	2.25	45	92	2.37	49	110	2.76	40.4	93.8	2.50
47	110	2.89	46	96	2.52	54	110	2.83	59	130	3.27	43.1	102.3	2.74
34	95	2,50	40	82	2.15	35	90	2.30	52	113	2.85	33.6	91.1	2.43
29	81	2.14	36	70	1.84	21	85	2.17	29	84	2.11	27.9	79.3	2.12
32	82	2.16	30	56	1.46	41	96	2.46	35	90	2.50	30.9	80.3	2.17
40	84	2.21	26	66	1.72	52	100	2.54	36	76	1.90	30.4	76.6	2.04
60	110	2.89	37	70	1.83	43	90	2.28	28	92	2.31	36.3	91.4	2.44
486	1161	30.55	536	1016	26.23	517	1114	28.83	543	1267	32.59	448.8	1087.7	29.13

TABLE

SHOWING THE NUMBER OF DEATHS FROM FEVER (F.), THE TOTAL MORTALITY

IN THE DISTRICT OF **MOKA**, FOR EACH

Years.	1871.			1872.			1878.			1874.			1875.		
Months.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
January ...	11	31	1.45	14	40	1.88	18	53	2.39	21	88	3.92	9	33	1.45
February ...	25	52	2.44	13	42	1.97	15	42	1.90	13	69	3.07	13	38	1.68
March ...	18	37	1.74	16	41	1.93	27	63	2.85	23	79	3.52	24	52	2.29
April ...	17	40	1.88	15	41	1.85	28	48	2.13	18	81	3.58	18	39	1.72
May ...	11	36	1.69	10	40	1.81	28	58	2.57	24	66	2.91	18	42	1.85
June ...	13	36	1.69	18	43	1.94	22	46	2.05	37	76	3.36	20	54	2.38
July ...	13	40	1.88	11	36	1.62	16	44	1.96	14	50	2.21	22	69	3.05
August ...	13	52	2.44	11	43	1.94	18	39	1.74	14	47	2.07	16	44	1.94
September ...	11	39	1.83	18	42	1.90	14	50	2.22	10	39	1.72	24	62	2.74
October ...	10	37	1.74	13	46	2.08	20	44	1.96	15	44	1.94	14	34	1.50
November ...	14	40	1.88	12	49	2.21	17	89	3.96	8	32	1.41	9	32	1.41
December ...	8	35	1.64	15	54	2.44	13	85	3.78	10	36	1.59	14	30	1.32
Totals ...	164	475	22.30	166	517	23.57	231	661	29.51	207	707	31.30	201	529	23.33

X.

(T.), AND THE TOTAL DEATH-RATE PER 1000 OF ESTIMATED POPULATION (R.), MONTH OF THE NINE YEARS 1871-79.

1876.			1877.			1878.			1879.			Means.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
15	34	1.45	18	40	1.71	30	51	2.16	37	76	3.16	19.2	49.6	2.17
18	34	1.45	19	37	1.67	31	64	2.71	27	87	3.66	19.3	51.7	2.28
32	62	2.65	48	73	3.12	37	66	2.80	30	86	3.66	28.3	62.1	2.73
32	55	2.35	35	50	2.14	21	64	2.71	28	73	2.18	23.6	54.6	2.28
25	63	2.70	50	87	3.71	25	55	2.33	17	62	2.60	23.1	56.6	2.46
18	61	2.61	34	63	2.69	22	53	2.24	28	77	3.23	23.6	56.6	2.47
35	77	3.29	27	60	2.58	23	63	2.67	20	62	2.60	20.1	55.7	2.43
21	56	2.40	12	37	1.59	23	61	2.59	14	44	1.80	15.2	47.0	2.06
21	46	1.67	18	45	1.93	19	45	1.91	15	62	2.60	16.7	47.8	2.06
15	35	1.50	15	39	1.67	17	50	2.12	25	49	1.44	16.0	42.0	1.77
24	50	2.14	13	45	1.92	18	55	2.32	10	36	1.51	13.9	47.6	2.08
22	51	2.18	17	44	1.88	20	64	2.70	19	44	1.84	15.3	49.2	2.15
278	624	26.39	306	620	26.61	286	691	29.26	270	758	30.28	234.3	620.5	26.94

TABLE

OWING THE MEAN MONTHLY NUMBER OF DEATHS FROM FEVER (F), THE MEAN MONTHLY TOTAL

AND THE MEAN MONTHLY DEATH-RATE PER 1000 OF ESTIMATED

istricts.	Port Louis.				Pamplemousses.				Riv. du Rempart.				Flacq.				Grand Port.			
Months.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.
uary	104.7	201.0	96.3	3.09	47.8	98.1	50.3	2.22	15.7	37.1	21.4	1.65	46.1	113.0	66.9	2.08	34.4	91.3	56.9	1.93
oruary ...	115.1	208.4	93.3	3.25	49.3	95.9	46.6	2.16	20.7	43.2	22.5	1.91	54.6	112.8	58.2	2.07	44.3	96.9	52.6	2.04
rch.........	137.8	242.7	104.9	3.75	60.9	101.7	40.8	2.30	20.1	41.9	21.8	1.85	73.0	129.3	56.3	2.38	59.4	123.0	63.6	2.58
il	145.6	244.4	98.8	3.76	69.4	108.3	38.9	2.41	23.0	48.9	25.9	2.12	83.6	136.9	53.3	2.49	73.9	137.3	63.4	2.87
y	148.6	253.7	105.1	3.91	73.4	116.2	42.8	2.62	29.1	49.7	20.6	2.15	88.0	139.3	51.3	2.55	80.2	145.8	65.6	3.06
ne	124.1	229.8	105.7	3.55	60.9	107.8	46.9	2.43	24.0	45.9	21.9	1.99	76.4	134.1	57.7	2.43	68.4	131.6	63.2	2.74
y	119.0	230.2	111.2	3.58	56.7	97.9	41.2	2.21	18.0	39.9	21.9	1.74	64.0	125.4	61.4	2.29	57.4	125.3	67.9	2.62
gust	96.7	203.6	106.9	3.14	48.4	90.2	41.8	2.04	15.3	38.6	23.3	1.69	49.0	106.0	57.0	1.93	42.2	107.0	64.8	2.24
tember ...	87.9	181.3	93.4	2.80	41.4	78.8	37.4	1.78	13.6	32.4	18.8	1.41	44.3	90.9	46.6	1.66	30.9	82.3	51.4	1.72
ober	90.4	197.9	107.5	3.06	43.0	76.4	33.4	1.73	15.4	34.4	19.0	1.49	40.2	80.8	40.6	1.47	30.9	83.7	52.8	1.73
vember ...	78.2	200.0	121.8	3.09	35.8	67.1	31.3	1.55	13.8	31.3	17.5	1.36	40.8	89.4	48.6	1.63	30.8	79.9	49.1	1.66
cember ...	94.8	202.8	109.1	3.13	40.9	77.6	37.5	1.75	17.7	39.0	21.3	1.70	41.2	95.2	54.0	1.74	34.7	89.7	55.0	1.86
Yearly Means	1342.8	2595.8	1254.0	40.11	627.9	1116.0	488.9	25.20	226.4	482.3	255.9	21.06	701.2	1353.1	651.9	24.72	587.5	1293.8	706.3	27.05
Monthly Means	111.9	216.3	104.5	3.34	52.3	93.0	40.7	2.10	18.9	40.2	21.3	1.75	58.4	112.8	54.3	2.06	49.0	107.8	58.9	2.25

I.

ORTALITY (T); THE MEAN MONTHLY MORTALITY FROM ALL CAUSES EXCEPTING FEVER (Di
)PULATION (R), FOR EACH DISTRICT FOR THE NINE YEARS 1871—1879.

Savanne.				Black River.				Plaines Wilhems.				Moka.				Monthly Means.				Districts.
F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	Months.
7.4	66.4	39.0	2.21	18.6	30.6	12.0	2.41	37.2	95.9	58.7	2.58	19.2	49.6	30.4	2.17	39.0	87.0	48.0	2.26	January.
7.0	63.6	36.6	2.10	20.2	32.2	12.0	2.53	37.8	87.0	49.2	2.29	19.3	51.7	32.4	2.28	43.1	88.0	44.9	2.29	February.
.3	77.9	41.6	2.57	21.0	34.8	13.8	2.73	45.9	98.4	52.5	2.64	28.3	62.1	33.8	2.73	53.6	101.3	47.7	2.61	March.
.4	77.7	36.3	2.56	26.8	41.4	14.6	3.25	45.0	97.3	52.3	2.63	23.6	54.6	31.0	2.28	59.1	105.2	46.1	2.71	April.
7.8	76.0	38.2	2.50	26.7	43.6	16.9	3.40	40.3	94.3	54.0	2.55	23.1	56.6	33.5	2.46	60.8	108.4	47.6	2.81	May.
.2	70.6	37.4	2.31	23.9	38.4	14.5	3.00	40.4	93.8	53.4	2.50	23.6	56.6	33.0	2.47	52.8	100.9	48.1	2.60	June.
.7	74.0	38.3	2.43	22.0	36.7	14.7	2.87	43.1	102.3	59.2	2.74	20.1	55.7	35.6	2.43	48.4	98.6.	50.2	2,55	July.
.4	63.7	39.3	2.09	18.3	32.2	13.9	2.53	33.6	91.1	57.5	2.43	15.2	47.0	31.8	2.06	38.1	86.6	48.5	2.24	August.
.2	57.1	35.9	1.86	16.2	28.1	11.9	2.20	27.9	79.3	51.4	2.12	16.7	47.8	31.1	2.06	33.3	75.3	42.0	1.96	September.
.4	55.1	33.7	1.80	17.7	31.9	14.2	2.50	30.9	80.3	49.4	2.17	16.0	42.0	26.0	1.77	34.0	75.8	41.8	1.97	October.
.9	49.6	29.7	1.63	12.7	25.6	12.9	2.00	30.4	76.6	46.2	2.04	13.9	47.6	33.7	2.08	30.7	74.1	43.4	1.89	November.
.3	59.1	34.8	1.93	14.8	27.4	12.6	2.15	36.3	91.4	55.1	2.44	15.3	49.2	33.9	2.15	35.6	81.2	45.6	2.10	December.
	790.8	440.8	25.99	238.9	402.9	164.0	31.57	448.8	1087.7	638.9	29.13	231.3	620.5	386.2	26.94	528.5	1082.4	554.3	27.98	Yearly Means.
	65.9	36.7	2.17	19.9	33.6	13.7	2.63	37.4	90.6	53.2	2.43	19.5	51.7	32.2	2.24	44.0	90.2	46.2	2.33	Monthly Means.

TABLE XII.

SHOWING THE MEAN ANNUAL VARIATION OF DEATHS FROM MALARIAL FEVER IN THE SEVERAL DISTRICTS FOR THE NINE YEARS 1871–9. (−BELOW MONTHLY MEAN, + ABOVE MONTHLY MEAN.)

Districts	Port Louis.	Pamplemousses.	Riv. du Rempart.	Flacq.	Grand Port.	Savanne.	Black River.	Plaines Wilhems.	Moka.	Mean variation for Island.
January	− 7.2	− 4.5	− 3.2	−12.3	−14.6	− 1.8	− 1.3	− 0.2	− 0.3	− 5.0
February	+ 3.2	− 3.0	+ 1.8	− 3.8	− 4.7	− 2.2	+ 0.3	+ 0.4	− 0.2	− 0.9
March	+25.9	+ 8.6	+ 1.2	+14.6	+10.4	+ 7.1	+ 1.1	+ 8.5	+ 8.8	+ 9.6
April	+33.7	+17.1	+ 4.1	+25.2	+24.9	+12.2	+ 6.9	+ 7.6	+ 4.1	+15.1
May...	+36.7	+21 1	+10.2	+29.6	+31.2	+ 8.6	+ 6.8	+ 2.9	+ 3.6	+16.7
June	+12.2	+ 8.6	+ 5.1	+18.0	+19.4	+ 4.0	+ 4.0	+ 3.0	+ 4 1	+ 8.7
July	+ 7.1	+ 4.4	− 0.9	+ 5.6	+ 8.4	+ 6.5	+ 2.1	+ 5.7	+ 0.6	+ 4.4
August	−15.2	− 3.9	− 3.6	− 9.4	− 6.8	− 4.8	− 1.6	− 3.8	− 4.3	− 5.9
September	−24 0	−10.9	− 5.3	−14.1	−18.1	− 8.0	− 3.7	− 9.5	− 2.8	−10.7
October	−21.5	− 9.3	− 3.5	−18.2	−18.1	− 7.8	− 2.2	− 6.5	− 3.5	−10.1
November.	−33.7	−16.5	− 5.1	−17.6	−18.2	− 9.3	− 7.2	− 7.0	− 5.6	−13.3
December.	−17.1	−11.4	− 1.2	−17.2	−14.3	− 4.9	− 5.1	− 1.1	− 4.2	− 8.5
Monthly Means ...	111.9	52.3	18.9	58.4	49.0	29.2	19.9	37.4	19.5	44.0

TABLE

SHOWING THE NUMBER OF DEATHS FROM MALARIAL FEVER (F.), THE TOTAL DEATHS

PER 1000 OF ESTIMATED POPULATION (R.), IN EACH MONTH

Years	1871.				1872.				1873.				1874.				1875.			
Months.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.
January	270	651	381	1.97	298	640	342	2.04	405	883	478	2.52	297	111	814	3.31	298	632	334	1.83
February.........	311	665	354	2.08	299	668	369	2.01	475	830	355	2.39	318	930	612	2.79	317	640	323	1.81
March	398	733	335	2.28	411	790	379	2.22	616	1019	403	2.95	366	904	538	2.73	389	744	355	2.14
April	404	773	369	2 47	487	854	367	2.47	735	1173	438	3.24	385	949	564	2.88	369	725	356	2.17
May	386	804	418	2.51	541	903	362	2.57	630	1068	438	2.98	474	941	467	2.74	454	836	382	2.46
June	285	662	377	2.00	460	816	356	2.27	462	856	394	2.43	547	1026	479	3.09	440	878	438	2.65
July..............	357	865	508	2.54	334	746	412	2.13	403	808	405	2.32	440	919	479	2.69	427	865	438	2.44
August	279	716	437	2.26	313	756	443	2.22	329	741	412	2.13	323	791	468	2.24	363	802	439	2.27
September	225	607	382	1.86	284	618	334	1.89	297	700	403	1.99	258	639	381	1.84	288	652	364	1.92
October	238	607	369	1.88	277	631	354	1.90	274	814	540	2.12	283	627	344	1.89	283	627	344	1.85
November	200	533	333	1.62	251	580	329	1.72	268	1161	893	3.08	235	544	309	1.54	243	564	321	1.62
December	239	557	318	1.78	345	744	399	2.14	278	1169	891	3.44	252	608	356	1.78	299	621	322	1.72
Totals......	3592	8173	4581	25 25	4300	8746	4446	25.59	5172	11222	6050	31.59	4178	9989	5811	29.52	4170	8586	4416	24.88
Monthly Means	299.3	681.1	381.8	2.10	358.3	728.8	370.5	2.13	431.0	935.2	504.2	2.63	348.2	832.4	484.2	2.46	3475	715.5	368.0	2.07

FROM ALL CAUSES (T.), THE DIFFERENCES BETWEEN T. AND F. (DIF.), AND THE DEATH-RATES OF THE NINE YEARS 1871-79, FOR THE WHOLE ISLAND.

1876.				1877.				1878.				1879.				Monthly Means.				Years.
F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	F.	T.	Dif.	R.	Months.
320	692	372	1.94	301	612	311	1.73	463	832	369	2.33	508	994	486	2.67	351.1	783.0	431.9	2.26	January
451	797	346	2.27	376	719	343	2.01	400	685	285	1.91	548	1191	643	3.35	388.3	791.7	403.4	2.29	February
597	991	394	2.78	590	961	371	2.66	459	784	325	2.24	519	1280	761	3.53	482.8	911.8	429.0	2.61	March
576	941	365	2.72	918	1306	388	3.55	417	773	356	2.21	499	1021	522	2.70	532.2	946.1	413.9	2.71	April
535	938	403	2.77	962	1429	467	3.99	406	769	363	2.27	537	1088	551	2.92	547.2	975.1	427.9	2.81	May
500	968	468	2.74	582	1042	460	2.89	460	853	393	2.42	539	1076	537	2.91	475.0	908.6	433.6	2.60	June
467	920	453	2.67	477	915	438	2.56	533	950	417	2.74	486	1003	517	2.80	436.0	886.8	450.8	2.55	July
330	782	452	2.24	363	751	388	2.13	399	823	424	2.31	390	852	462	2.34	343.2	779.3	436.1	2.24	August
244	579	335	1.70	360	712	352	2.05	364	763	399	2.10	379	833	454	2.35	299.9	678.1	378.2	1.96	Septemb.
278	611	333	1.77	352	685	333	2.01	404	768	364	2.19	365	773	408	2.11	306.0	682.5	376.5	1.97	October
303	597	294	1.77	269	585	316	1.72	429	816	387	2.23	288	623	335	1.70	276.2	667.0	390.8	1.89	Novemb.
374	725	351	2.08	336	643	307	1.74	404	792	388	2.19	353	724	371	2.01	320.0	731.4	411.4	2.10	Decemb.
4975	9541	4566	27.45	5886	10360	4474	29.04	5138	9608	4470	27.14	5411	11458	6047	31.39	4757.9	9741.4	4983.5	27.90	Totals
414.6	795.1	380.5	2.29	490.5	863.3	372.8	2.42	428.2	800.7	372.5	2.26	450.9	954.8	503.9	2.62	396.5	811.8	415.3	2.33	Monthly Means

TABLE XIV.

SHOWING THE ANNUAL VARIATION OF DEATHS FROM MALARIAL FEVER FOR THE WHOLE ISLAND FOR EACH OF THE NINE YEARS 1871—79 (− BELOW AND + ABOVE MEAN FOR YEAR).

Months.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Means.
January	− 29.3	− 60.3	− 26.0	− 51.2	− 49.5	− 94.6	−189.5	+ 34.8	+ 57.1	− 45.4
February	+ 11.7	− 59.3	+ 44.0	− 30.2	− 30.5	+ 36.4	−114.5	− 28.2	+ 97.1	− 8.3
March	+ 98.7	+ 52.7	+185.0	+ 17.8	+ 41.5	+182.4	+ 99.5	+ 30.8	+ 68.1	+ 86.3
April	+104.7	+128.7	+304.0	+ 36.8	+ 22.5	+161.4	+427.5	− 11.2	+ 48.1	+135.8
May	+ 86.7	+182.7	+199.0	+125.8	+106.5	+120.4	+471.5	− 22.2	+ 86.1	+150.7
June	− 14.3	+101.7	+ 31.0	+198.8	+ 92.5	+ 85.4	+ 91.5	+ 31.8	+ 82.1	+ 77.8
July	+ 57.7	− 24.3	− 28.0	+ 91.8	+ 79.5	+ 52.4	− 13.5	+104.8	+ 35.1	+ 39.5
August	− 20.3	− 45.3	−102.0	− 25.2	+ 15.5	− 84.6	−127.5	− 29.2	− 60.9	− 53.3
September...	− 74.3	− 74.3	−134.0	− 90.2	− 59.5	−170.6	−130.5	− 64.2	− 71.9	− 96.6
October	− 61.3	− 81.3	−157.0	− 65.2	− 64.5	−136.6	−138.5	− 24.2	− 85.9	− 90.5
November	− 99.3	−107.3	−163.0	−113.2	−104.5	−111.6	−221.5	+ 0.8	−162.9	−120.3
December	− 60.3	− 13.3	−153.0	− 96.2	− 48.5	− 40.6	−154.5	− 24.2	− 97.9	− 76.5
Monthly Means	299.3	358.3	431.0	348.2	347.5	414.6	490.5	428.2	450.9	396.5

TABLE

SHOWING THE MEAN TEMPERATURE OF THE AIR IN EACH MONTH

BEAU SÉJOUR,

Years.	Observatory, Pamplemousses.									
	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Means.
	°	°	°	°	°	°	°	°	°	°
January	79.2	78.4	80.2	79.1	80.0	79.7	80.3	80.7	78.6	79.6
February	79.6	79.0	79.1	78.8	80.1	79.1	78.0	81.0	78.7	79.3
March	78.6	77.3	78.0	78.1	79.3	77.4	78.7	79.6	77.3	78.3
April...	76.3	76.7	76.8	76.4	77.9	76.5	78.0	77.1	75.6	76.8
May	72.2	73.9	72.9	75.3	73.7	72.4	72.4	75.2	72.2	73.4
June	69.7	71.2	70.0	71.1	70.2	69.9	70.4	70.5	70.0	70.3
July	68.4	69.4	69.0	67.9	68.3	67.9	69.8	69.1	69.2	68.8
August	68.4	70.1	68.4	68.9	69.6	69.1	69.6	70.3	68.1	69.2
September	69.5	71.1	70.4	70.5	70.8	70.1	71.7	70.0	69.5	70.4
October	73.9	74.3	72.9	73.9	73.0	72.2	71.9	72.2	70.6	72.8
November	75.7	75.7	76.6	75.8	77.5	76.5	75.0	75.5	74.3	75.9
December	77.8	78.4	78.1	78.4	79.9	78.9	78.1	77.9	77.7	78.4
Means	74.1	74.6	74.4	74.5	75.0	74.1	74.5	74.9	73.5	74.4

XV.

OF THE NINE YEARS 1871—79 AT THE OBSERVATORY, PAMPLEMOUSSES, AND AT PLAINES WILHEMS.

Beau Séjour, Plaines Wilhems.										Variations.		
1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Means.	Observatory.	Beau Séjour.	Means.
°	°	°	°	°	°	°	°	°	°	°	°	°
74.6	76.3	77.4	76.2	75.8	76.3	77.1	77.9	76.3	76.4	+5.2	+4.6	+4.9
75.6	76.4	76.4	76.3	76.5	76.7	75.6	78.4	76.4	76.5	+4.9	+4.7	+4.8
75.6	75.0	75.3	76.0	76.1	74.7	76.4	77.8	75.7	75.8	+3.9	+4.0	+3.9
73.1	74.0	75.0	73.7	75.7	73.2	75.5	75.0	74.6	74.4	+2.4	+2.6	+2.5
69.0	71.0	71.0	72.5	71.6	69.0	70.0	73.4	71.1	71.0	—1.0	—0.8	—0.9
67.8	69.3	67.5	68.6	67.8	67.1	68.5	68.5	68.2	68.1	—4.1	—3.7	—3.9
66.5	66.8	66.2	65.4	66.2	65.4	68.0	67.5	68.1	66.7	—5.6	—5.1	—5.3
65.8	67.5	65.8	66.0	68.0	66.8	67.7	69.2	66.7	67.1	—5.2	—4.7	—4.9
66.2	67.8	67.5	67.4	68.7	67.8	69.6	67.7	68.1	67.9	—4.0	—3.9	—3.9
70.2	71.1	69.9	69.6	70.2	70.3	69.8	70.4	69.1	70.1	—1.6	—1.7	—1.6
72.7	71.9	72.9	71.3	73.1	70.6	71.0	72.7	72.6	72.1	+1.5	+0.3	+0.9
75.3	75.2	75.0	74.6	75.6	76.3	75.8	75.2	75.5	75.4	+4.0	+3.6	+3.8
71.0	71.9	71.7	71.5	72.1	71.2	72.1	72.8	71.9	71.8			

TABLE

SHOWING THE RAINFALL IN EACH MONTH OF THE NINE YEARS 1871—79 AT THE

Years.	Observatory, Pamplemousses.									
	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Means.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	14.72	11.60	10.79	5.23	3.13	10.81	11.17	5.15	3.20	8.42
February	4.29	9.27	26.04	4.48	2.78	7.88	15.66	3.94	7.77	9.12
March	2.75	7.52	7.74	36.66	2.18	4.80	8.12	3.45	11.87	9.45
April	3.05	1.66	14.48	2.45	5.27	5.48	12.48	8.47	2.31	6.18
May	1.11	1.37	2.23	2.44	13.78	2.43	1.34	2.97	6.44	3.79
June	1.94	4.66	0.99	2.90	2.07	1.31	1.90	1.64	1.78	2.13
July	1.40	2.48	2.23	2.18	1.04	1.49	1.59	5.71	1.11	2.14
August	1.87	2.29	2.57	0.70	2.54	1.67	2.90	2.06	3.01	2.18
September	1.00	1.19	1.28	1.79	2.23	0.51	0.61	0.76	2.79	1.35
October	1.67	1.87	2.69	0.51	2.55	2.65	2.10	0.46	1.35	1.76
November	2.11	0.94	0.82	0.79	2.82	0.66	9.22	1.06	0.45	2.10
December	6.71	2.90	3.68	4.69	9.59	2.18	4.27	7.58	7.08	5.41
Annual Fall	42.62	47.76	75.54	64.82	49.98	41.87	71.36	43.25	49.16	54.04

XVI.

OBSERVATORY, PAMPLEMOUSSES, AND AT BEAU SÉJOUR, PLAINES WILHEMS.

Beau Séjour, Plaines Wilhems.										Variations.		
1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Means.	Observatory.	Beau Séjour.	Means.
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
18.00	10.81	20.65	12.90	3.25	14.90	16.05	10.98	3.32	12.32	+3.92	+6.38	+5.15
3.00	13.38	25.54	4.50	2.28	14.76	28.58	6.53	7.68	11.81	+4.62	+5.87	+5.24
4.58	8.00	6.30	59.01	6.92	5.98	8.45	9.92	22.99	14.68	+4.95	+8.74	+6.84
4.76	4.10	10.51	6.75	6.77	2.54	12.15	9.37	1.90	6.54	+1.68	+0.60	+1.14
1.24	3.16	0.71	3.60	8.08	1.99	1.11	6.86	7.06	3.76	—0.71	—2.18	—1.44
2.08	7.73	1.85	4.73	3.13	2.20	3.36	1.72	1.51	3.15	—2.37	—2.79	—2.58
1.17	2.02	2.95	3.44	1.40	2.88	2.98	6.04	1.80	2.74	—2.36	—3.20	—2.78
2.78	3.96	2.89	1.80	3.40	1.78	3.42	2.21	3.74	2.89	—2.32	—3.05	—2.68
1.20	1.66	1.81	1.84	1.95	0.77	3.04	1.28	2.26	1.76	—3.15	—4.18	—3.66
0.73	0.75	2.52	0.48	3.34	5.51	1.14	0.18	1.34	1.78	—2.74	—4.16	—3.45
2.16	0.85	2.32	2.27	3.27	2.00	6.09	1.30	1.13	2.38	—2.40	—3.56	—2.98
4.26	6.26	4.84	9.04	17.13	2.98	6.54	7.26	8.16	7.39	+0.91	+1.45	+1.18
45.97	62.68	82.89	110.36	60.92	58.29	92.91	63.65	62.89	71.17			

Mean monthly rainfall at Observatory ... ... 4.50 inches.
" " " Beau Séjour ... ... 5.94 "

TABLE

SHOWING THE RELATIVE HUMIDITY FOR EACH MONTH OF THE YEARS

OF THE YEARS 1873-79 AT BEAU

Observatory, Pamplemousses.

Years.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Means.
January	69.8	78.2	80.0	77.7	68.8	76.7	74.8	76.9	72.6	75.1
February	71.0	78.9	81.5	77.3	69.9	78.2	78.0	74.3	74.3	75.9
March	73.4	79.5	78.7	82.5	69.9	75.6	78.2	76.1	76.7	76.7
April	74.3	77.9	81.3	77.3	75.2	73.0	78.7	73.9	75.8	76.4
May	70.7	75.6	75.4	76.4	77.3	72.8	71.7	75.5	75.5	74.5
June	72.5	77.3	71.8	77.3	73.2	72.0	73.0	72.8	73.2	73.7
July	72.6	75.8	73.4	74.6	71.9	71.2	74.3	73.1	69.0	72.9
August	73.1	73.6	73.2	75.3	75.7	73.1	73.9	73.9	72.7	73.8
September	69.4	71.0	72.6	71.7	74.2	70.2	72.4	69.3	74.8	71.7
October	69.8	71.1	74.8	67.7	70.8	72.6	70.4	69.4	72.5	71.0
November	69.7	70.4	74.4	68.0	73.0	70.6	73.2	67.5	69.9	70.7
December...	74.7	73.8	76.1	73.7	74.8	69.5	75.3	74.9	73.1	74.0
Means...	71.8	75.3	76.1	75.0	72.9	73.0	74.5	73.1	73.3	73.9

XVII.

1871-79 AT THE OBSERVATORY, PAMPLEMOUSSES, AND FOR EACH MONTH

SÉJOUR, PLAINES WILHEMS.

Beau Séjour, Plaines Wilhems.								Variations.		
1873.	1874.	1875.	1876.	1877.	1878.	1879.	Means.	Observatory.	Beau Séjour.	Means.
75.4	76.0	70.3	77.5	76.8	76.9	76.3	75.6	+ 1.2	+ 2.5	+ 1.8
80.2	73.2	69.4	77.6	78.4	75.0	76.0	75.7	+ 2.0	+ 2.6	+ 2.3
76.2	80.3	70.6	74.4	78.5	73.5	76.1	75.7	+ 2.8	+ 2.6	+ 2.7
76.0	75.9	71.6	72.3	79.5	76.9	71.7	74.8	+ 2.5	+ 1.7	+ 2.1
72.0	74.8	77.4	72.5	71.4	78.5	74.4	74.4	+ 0.6	+ 1.3	+ 0.9
71.3	74.6	73.3	73.4	73.0	73.0	71.9	72.9	— 0.2	— 0.2	— 0.2
74.2	72.2	70.2	75.0	74.6	74.2	70.5	73.0	— 1.0	— 0.1	— 0.5
71.4	73.0	74.4	70.3	74.3	70.7	73.8	72.6	— 0.1	— 0.5	— 0.3
71.3	69.1	70.0	67.3	67.6	69.2	76.7	70.2	— 2.2	— 2.9	— 2.5
70.1	65.4	71.3	69.3	66.8	64.7	72.1	68.5	— 2.9	— 4.6	— 3.7
71.8	69.5	71.0	69.1	69.7	66.6	66.8	69.2	— 3.2	— 3.9	— 3.5
73.2	74.7	76.6	67.9	74.2	83.4	71.8	74.5	+ 0.1	+ 1.4	+ 0.7
73.6	73.2	72.2	72.2	73.7	73.5	73.2	73.1			

TABLE

SHOWING THE MONTHLY RAINFALL IN PAMPLEMOUSSES AND RIVIÈRE DU

IN RIVIÈRE

Districts.	Pamplemousses.									
Years.	1871	1872	1873	1874	1875	1876	1877	1878	1879	Means.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	18.02	11.65	12.64	5.54	3.27	11.43	15.16	5.79	3.39	9.65
February	5.83	9.81	26.18	4.53	2.99	9.17	17.97	4.44	8.85	9.97
March	3.10	8.53	8.15	38.45	2.33	4.89	7.91	4.05	12.49	9.99
April...	3.22	1.55	13.53	2.42	5.87	5.72	12.92	8.64	2.70	6.28
May	1.31	2.03	2.39	2.68	14.04	2.71	1.45	3.20	6.79	4.07
June	2.17	5.30	1.44	3.98	2.41	1.70	2.64	2.17	2.08	2.66
July	1.57	2.47	2.22	2.48	1.36	1.98	1.94	6.27	1.42	2.41
August	1.97	2.68	2.17	1.11	2.59	1.96	3.58	2.35	3.50	2.43
September..	0.98	1.16	2.10	1.94	2.26	0.76	0.81	1.01	3.60	1.62
October	1.71	1.75	2.69	0.55	2.83	2.59	3.41	0.69	1.48	1.98
November	2.04	1.03	0.82	1.07	3.28	0.63	7.88	1.22	0.51	2.05
December...	7.15	2.88	4.12	4.43	9.76	2.55	3.85	7.99	7.36	5.57
Totals	49.07	50.85	78.45	69.29	52.99	46.09	79.52	47.82	54.16	58.69

Mean monthly rainfall in Pamplemousses 4.89 inches.

XVIII.

REMPART FROM 1871 to 1879. (TWO STATIONS IN PAMPLEMOUSSES AND ONE DU REMPART.

Rivière du Rempart.										Variations.	
1871	1872	1873	1874	1875	1876	1877	1878	1879	Means.	Pamplemousses.	Riv. du Rempart.
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
16.91	8.99	8.04	6.67	3.53	17.99	17.20	7.64	2.11	9.90	+4.76	+4.39
3.67	9.15	21.12	5.37	5.19	12.33	21.24	3.83	8.22	10.01	+5.08	+4.50
5.44	4.30	8.04	25.30	5.13	4.92	17.54	4.76	16.90	10.26	+5.10	+4.75
6.31	3.06	10.16	1.97	6.29	9.27	18.46	10.71	3.25	7.72	+1.40	+2.21
2.23	1.70	2.36	4.74	20.48	5.44	2.62	4.50	6.73	5.64	−0.82	+0.13
2.22	5.66	1.61	4.89	2.49	3.50	3.86	1.90	3.11	3.25	−2.28	−2.26
1.61	2.47	2.71	3.04	1.78	2.80	2.99	8.67	2.23	3.14	−2.48	−2.37
1.44	2.19	2.71	1.10	5.93	2.42	4.93	1.40	4.69	2.98	−2.46	−2.53
0.56	0.96	2.10	2.22	3.48	2.08	1.83	1.22	3.82	2.03	−3.27	−3.48
2.83	1.85	3.82	0.12	4.63	3.32	3.88	0.61	1.57	2.51	−2.91	−3.00
3.27	0.94	1.26	2.13	2.24	0.76	5.94	2.05	0.95	2.18	−2.84	−3.33
4.03	2.93	6.11	6.93	14.83	5.77	2.85	5.57	9.22	6.47	+0.68	+0.96
50.52	44.20	70.04	64.48	76.00	70.60	103.34	52.86	62.80	66.09		

Mean monthly rainfall in Rivière du Rempart 5.51 inches.

TABLE

SHOWING THE MONTHLY RAINFALL IN **GRAND PORT** AND **SAVANNE** FROM

DISTRICTS.	GRAND PORT.									
YEARS.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	MEANS.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January ...	20.83	14.69	11.81	8.95	8.12	16.59	20.11	10.08	4.74	12.88
February ...	4.82	9.38	17.49	6.72	2.74	8.28	18.21	5.35	9.14	9.13
March	4.64	6.68	13.53	41.64	3.93	9.03	13.95	11.92	23.19	14.28
April	15.39	5.03	18.60	3.98	10.72	5.19	19.10	32.66	4.47	12.79
May	7.05	6.98	3.10	7.02	13.79	6.17	3.92	7.60	9.79	7.27
June	4.88	10.80	1.60	13.29	4.78	7.57	8.16	3.26	7.21	6.84
July	3.33	4.33	4.05	4.20	2.55	3.74	7.39	11.69	3.08	4.93
August... ...	4.60	7.67	4.10	3.55	12.95	3.60	8.55	2.11	8.52	6.18
September ...	1.64	2.75	4.57	1.87	5.54	2.47	2.23	3.81	8.24	3.68
October ...	5.57	2.71	7.34	0.91	6.16	3.28	4.07	1.06	4.03	3.90
November ...	8.30	2.10	2.18	4.54	15.22	1.46	5.82	4.22	1.38	5.02
December ...	6.51	8.41	6.04	12.34	13.74	6.99	10.52	8.90	9.73	9.24
Totals	87.56	81.53	94.41	109.01	100.24	74.37	122.03	102.66	93.52	96.15

Mean monthly rainfall 8.01 inches.

XIX.

1871 TO 1879. (THREE STATIONS IN GRAND PORT AND TWO IN SAVANNE).

SAVANNE.										VARIATIONS.	
1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	MEANS.	GRAND PORT.	SAVANNE.
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
24.11	8.93	14.12	6.23	5.37	23.15	20.28	7.53	2.43	12.46	+4.87	+5.43
3.99	12.33	16.77	2.62	3.26	7.49	15.20	9.18	7.29	8.68	+1.12	+1.65
2.95	7.57	11.63	45.24	2.12	5.70	13.74	8.62	15.10	12.58	+6.27	+5.49
14.67	5.60	14.84	3.38	6.59	3.20	27.38	23.24	3.02	11.32	+4.78	+4.29
4.57	6.06	3.05	3.99	6.92	5.89	3.18	6.44	8.07	5.35	—0.74	—1.68
3.50	9.19	1.25	9.19	3.16	3.30	7.10	2.82	4.26	4.86	—1.17	—2.17
2.63	5.93	3.25	3.98	1.56	3.84	5.41	10.36	3.02	4.44	—3.08	—2.59
3.05	6.86	4.91	2.82	13.30	3.16	7.51	1.02	7.02	5.52	—1.83	—1.51
1.65	3.73	2.16	0.90	8.67	2.95	2.45	4.52	7.13	3.80	—4.33	—3.23
3.80	2.82	5.89	0.32	5.41	2.96	4.82	0.74	2.41	3.24	—4.11	—3.79
6.17	1.91	1.96	1.81	12.54	3.39	3.53	1.64	0.67	3.74	—2.99	—3.29
5.02	6.40	9.95	10.99	16.53	4.58	8.56	8.15	5.75	8.44	+1.23	+1.41
76.11	77.33	89.78	91.47	85.43	69.61	119.16	84.26	66.17	84.37		

Mean monthly rainfall 7.03 inches.

TABLE

SHOWING THE MONTHLY RAINFALL IN PLAINES WILHEMS AND MOKA FROM 1871

Districts.	Plaines Wilhems.									
Years.	1871	1872	1873	1874	1875	1876	1877	1878	1879	Means.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	19.71	10.83	17.26	12.16	3.96	15.35	16.26	10.12	3.72	12.15
February...	4.36	14.93	24.69	4.36	2.49	15.59	27.04	7.09	7.81	12.04
March	4.04	8.51	7.95	54.12	4.99	6.75	8.49	9.15	21.44	13.94
April	4.33	3.94	11.71	5.85	8.62	2.56	13.99	10.48	1.92	7.04
May	1.86	3.00	0.86	3.19	9.31	2.63	1.95	5.37	7.00	3.91
June...	2.85	7.94	1.97	7.03	3.75	2.95	4.61	2.11	2.07	3.92
July...	1.64	2.61	3.38	4.08	2.34	3.51	3.16	6.13	2.16	3.22
August	3.77	5.17	3.74	2.46	5.25	2.82	4.68	2.14	4.63	3.85
September	1.53	2.44	2.42	2.56	2.79	1.20	2.11	1.76	3.12	2.21
October	0.76	0.90	2.78	0.30	4.50	5.42	1.39	0.34	1.66	2.00
November	3.42	1.09	2.23	2.38	3.14	1.44	5.56	1.23	0.92	2.38
December	4.94	4.82	3.70	7.07	15.96	3.79	6.96	7.19	8.53	6.99
Totals	53.21	66.18	82.69	105.56	67.10	64.01	96.20	63.11	64.98	73.65

XX.

TO 1879. (THREE STATIONS IN PLAINES WILHEMS AND TWO STATIONS IN MOKA.)

Moka.										Variations.	
1871	1872	1873	1874	1875	1876	1877	1878	1879	Means.	Plaines Wilhems.	Moka.
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
29.63	21.59	16.50	10.08	8.84	19.16	29.06	11.87	12.61	17.70	+6.01	+7.53
8.61	19.01	27.20	6.68	5.75	21.72	29.43	9.23	21.41	16.56	+5.90	+6.39
7.75	14.21	13.60	53.99	5.49	13.28	20.53	14.40	26.32	18.84	+7.80	+8.67
12.97	6.44	21.37	5.16	9.93	8.05	26.87	18.81	4.53	12.68	+0.90	+2.51
4.39	4.46	3.57	5.37	22.77	5.97	2.57	8.11	12.93	7.79	—2.23	—2.38
5.36	13.36	2.03	18.50	6.48	6.36	5.75	3.10	6.46	7.49	—2.22	—2.68
8.36	5.55	5.64	3.78	3.00	7.07	7.28	12.73	6.04	6.60	—2.92	—3.57
6.85	10.39	4.76	4.85	7.93	4.82	12.94	4.61	9.67	7.42	—2.29	—2.75
2.20	4.04	6.03	5.70	6.96	3.01	1.91	7.34	7.94	5.01	—3.93	—5.16
2.32	6.23	7.65	1.41	6.39	4.30	4.62	1.88	4.48	4.36	—4.14	—5.81
13.08	2.37	3.14	4.07	6.12	1.87	6.23	4.14	1.33	4.70	—3.76	—5.47
17.54	9.97	11.39	9.26	17.28	5.52	10.78	12.17	21.87	12.86	+0.85	+2.69
119.06	117.62	122.88	128.85	106.94	101.13	157.97	108.39	135.59	122.01		

TABLE XXI.

SHOWING THE MONTHLY RAINFALL IN FLACQ FROM 1871 TO 1879 (ONE STATION—RICHE MARE.)

Months.	1871	1872	1873	1874	1875	1876	1877	1878	1879	Means.	Variation.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January...	15.51	10.57	5.46	5.02	3.54	10.50	14.69	6.79	3.77	8.43	+ 3.06
February	4.27	6.48	13.76	2.77	2.61	7.39	15.48	4.76	7.30	7.20	+ 1.83
March	4.80	4.90	8.50	26.97	3.01	7.88	7.53	7.73	13.20	9.39	+ 4.02
April	13.74	4.53	12.95	1.78	4.94	6.32	11.90	15.58	2.50	8.25	+ 2.88
May	1.90	3.87	6.20	3.21	12.47	4.13	4.30	5.03	5.47	5.18	— 0.19
June	3.41	8.53	0.91	8.96	2.40	3.14	7.17	2.25	3.63	4.49	— 0.88
July	2.04	4.34	1.68	2.92	1.40	2.16	5.85	8.47	3.10	3.55	— 1.82
August	2.06	3.91	1.61	2.61	3.91	2.16	6.89	1.81	7.28	3.58	— 1.79
September	0.75	1.22	3.51	1.51	1.80	1.33	1.26	1.56	3.90	1.87	— 3.50
October...	2.75	3.36	4.49	0.57	3.90	2.29	3.20	0.75	2.20	2.61	— 2.76
November	5.12	0.98	0.84	2.57	1.09	0.50	8.28	2.19	0.79	2.48	— 2.89
December	5.53	5.70	4.95	17.07	11.55	3.91	6.99	3.13	7.83	7.41	+ 2.04
Totals	61.88	58.39	64.86	75.96	52.62	51.71	93.54	60.05	60.97	64.44	

Mean Monthly Rainfall : 5.37 inches.

TABLE XXII.

SHOWING THE MEAN MONTHLY RAINFALL OF SEVEN DISTRICTS FOR EACH OF THE NINE YEARS 1871-79.

MONTHS.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Means.	Variation.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	20.67	12.46	12.26	7.81	5.23	16.31	17.55	8.55	4.68	11.72	+ 5.08
February	5.08	11.58	21.03	4.72	3.58	11.71	19.55	6.27	10.00	10.39	+ 3.75
March	4.67	7.81	10.20	40.81	3.86	7.49	11.78	8.66	18.38	12.63	+ 5.99
April	10.09	4.31	14.74	3.51	7.57	5.76	15.97	17.16	3.20	9.15	+ 2.51
May	3.33	4.01	3.08	4.31	14.25	4.71	3.34	5.75	8.11	5.64	—1.00
June	3.48	8.68	1.54	9.41	3.64	4.07	5.70	2.52	4.12	4.80	—1,84
July	3.03	3.96	3.28	3.50	2.00	3.59	4.83	9.19	3.01	4.04	—2.60
August	3.39	5.55	3.43	2.64	7.41	2.99	5.85	2.21	6.47	4.44	—2.20
September	1.33	2.33	3.27	2.39	5.50	1.97	1.96	3.03	5.39	2.91	—3.74
October...	2.82	2.80	4.95	0.59	4.83	3.45	3.58	0.87	2.55	2.94	—3.70
November	5.91	1.49	1.78	2.65	6.23	1.44	5.55	2.38	0.94	3.15	—3.49
December	7.25	5.87	6.61	9.74	14.24	4.73	4.96	7.59	10.04	7.89	+ 1.25
Annual Rainfall	71.05	70.85	86.17	92.08	77.34	68.22	100.62	74.18	76.89	79,70	6.64

TABLE XXIII.

SHOWING THE ANNUAL VARIATION OF THE RAINFALL OF SEVEN DISTRICTS

FOR EACH OF THE NINE YEARS 1871—79.

MONTHS.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Mean var:
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	+14.75	+ 6.56	+ 5.08	+ 0.14	— 1.22	+ 10.62	+ 9.16	+ 2.37	— 1.73	+ 5.08
February	— 0.84	+ 5.68	+13.85	— 2.95	— 2.87	+ 6.02	+11.16	+ 0.09	+ 3.59	+ 3.75
March	— 1.25	+ 1.91	+ 3.02	+ 33.14	— 2.59	+ 1.80	+ 3.39	+ 2.48	+11 97	+5.99
April	+ 4.17	— 1.59	+ 7.56	— 4.16	+ 1.12	+ 0.07	+ 7.58	+ 10.98	— 3.21	+ 2.51
May	— 2.59	— 1.89	— 4.10	— 3.36	+ 7.80	— 0.98	— 5.05	— 0.43	+ 1.70	— 0.99
June	— 2.44	+ 2.78	— 5.64	+ 1.74	— 2.81	— 1.62	— 2.69	— 3.66	— 2.29	— 1.84
July	— 2.89	— 1.94	— 3.90	— 4.17	— 4.45	— 2.10	— 3.56	+ 3.01	— 3.40	— 2.60
August	— 2.53	— 0.35	— 3.75	— 5.03	+ 0.96	— 2.70	— 2.54	— 3.97	+ 0.06	— 2.20
September...	— 4.59	— 3.57	— 3.91	— 5.28	— 1.95	— 3.72	— 6.43	— 3.15	— 1.02	— 3.74
October	— 3.10	— 3.10	— 2.23	— 7.08	— 1.62	— 2.24	— 4.81	— 5.31	— 3.86	— 3.70
November	— 0.01	— 4.41	— 5.40	— 5.02	— 0.22	— 4.25	— 2.84	— 3.80	— 5.47	— 3.49
December	+ 1.33	— 0.03	— 0.57	+ 2.07	+ 7.79	— 0.96	— 3.43	+ 1.41	+ 3.63	+ 1.25
Monthly Means	5.92	5·90	7.18	7.67	6.45	5.69	8.39	6.18	6.41	6.64

TABLE XXIV.

SHOWING THE NUMBER OF DEATHS FROM DYSENTERY IN MAURITIUS, IN EACH MONTH OF THE NINE YEARS 1871—79.

Months.	1871	1872	1873	1874	1875	1876	1877	1878	1879	Totals.	Monthly Means.	Var :
January	64	84	78	112	47	56	53	55	98	647	71.89	— 0.36
February	80	90	88	122	63	47	75	48	108	721	80.11	+ 7.86
March	55	99	101	114	71	84	96	60	156	836	92.89	+ 20.64
April	84	76	115	156	85	61	123	83	103	886	98.44	+ 26.19
May	104	80	126	107	83	67	116	71	129	883	98.11	+ 25.86
June	75	89	101	123	97	66	93	63	127	834	92.67	+ 20.42
July	67	85	69	118	75	57	76	66	99	712	79.11	+ 6.86
August..	50	88	63	62	68	55	43	58	75	562	62.44	— 9.81
September... ...	54	64	75	49	54	29	37	52	54	468	52.00	— 20.25
October.	36	40	54	53	36	26	30	49	34	358	39.78	— 32.47
November	57	53	66	46	39	22	47	48	39	417	46.33	— 25.92
December	53	51	82	56	47	44	34	63	49	479	53.22	— 19.03
Totals... ...	779	899	1018	1118	765	614	823	716	1071	7803	866.99	

Mean monthly Mortality 72.25.

TABLE XXV.

SHOWING THE NUMBER OF DEATHS FROM DIARRHŒA IN MAURITIUS IN EACH MONTH OF THE NINE YEARS 1871—79.

Months.	1871	1872	1873	1874	1875	1876	1877	1878	1879	Totals.	Monthly Means.	Var:
January	9	11	5	23	19	11	14	7	30	129	14.33	+ 1.79
February	9	10	9	44	16	11	15	10	25	149	16.56	+ 4.02
March...	9	8	12	13	20	9	13	12	35	131	14.56	+ 2.02
April	11	5	16	24	12	7	14	13	20	122	13.56	+ 1.02
May	4	10	16	19	10	8	16	14	23	120	13.33	+ 0.79
June	5	6	12	15	8	12	14	7	22	101	11.22	— 1.32
July	9	11	10	19	15	15	11	10	24	124	13.78	+ 1.24
August..	4	9	5	14	19	6	15	9	13	94	10.44	— 2.10
September	7	5	16	13	7	11	10	9	9	87	9.67	— 2.87
October.	6	12	6	6	7	7	9	3	16	72	8.00	— 4.54
November	15	13	11	5	9	8	12	17	11	101	11.22	— 1.32
December	15	9	20	10	11	10	10	18	21	124	13.78	+ 0.24
Totals... ...	103	109	138	205	153	115	153	129	249	1354	150.45	

Mean monthly Mortality 12.54.

TABLE XXVI.

SHOWING THE NUMBER OF DEATHS FROM CONSUMPTION IN MAURITIUS IN EACH MONTH OF THE NINE YEARS 1871-1879.

MONTHS.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Totals.	Monthly Means	Var.
January	43	38	50	31	45	37	46	44	51	385	42.78	— 2.84
February	48	38	41	33	34	42	33	42	49	360	40.00	— 5.62
March	40	47	24	32	54	44	43	13	42	339	37.66	— 7.96
April	41	58	24	57	38	41	40	9	49	357	39.67	— 5.95
May	40	47	44	48	30	55	43	47	44	398	44.22	— 1.40
June	33	40	20	37	52	43	67	41	49	382	42.44	— 3.18
July	67	40	41	45	42	49	43	43	66	436	48.44	+ 2.82
August...	57	56	56	55	67	56	47	62	82	538	59.78	+ 14.16
September	54	29	38	52	48	40	54	45	50	410	45.56	— 0.06
October	63	56	44	55	52	45	53	44	44	456	50.67	+ 5.05
November	47	39	53	44	43	46	55	63	46	436	48.44	+ 2.82
December	49	49	55	51	49	43	51	49	34	430	47.78	+ 2.16
Totals	582	537	490	540	554	541	575	502	606	4927	547.44	

Mean Monthly Mortality 45.62.

TABLE XXVII.

SHOWING THE NUMBER OF DEATHS FROM OTHER PULMONARY DISEASES IN MAURITIUS IN EACH MONTH OF THE YEARS 1871—79.

MONTHS.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Totals.	Monthly Means.	Var.
January	47	36	130	47	27	51	19	34	28	419	46.56	+ 5.27
February.	30	32	42	31	37	50	17	28	24	291	32.33	— 8.96
March	20	48	35	49	36	46	20	34	45	333	37.00	— 4.29
April.	39	32	51	32	40	45	15	36	13	303	33.67	— 7.62
May	45	30	28	64	40	52	24	18	18	319	35.44	— 5.85
June.	22	29	36	46	30	87	30	29	26	335	37.22	— 4.07
July	76	39	55	58	66	89	36	36	19	474	52.67	+ 11.38
August	60	60	55	64	52	77	25	46	30	469	52.11	+ 10.82
September	43	59	53	53	58	38	44	35	40	423	47.00	+ 5.71
October	39	59	55	51	38	29	36	37	54	398	44.22	+ 2.93
November	23	59	50	37	46	26	22	43	33	339	37.67	— 3.62
December	33	85	38	39	31	40	18	32	40	356	39.56	— 1.73
Totals	477	568	628	571	501	630	306	408	370	4459	495.45	

Mean Monthly Mortality 41.29.

TABLE XXVIII.

SHOWING THE NUMBER OF DEATHS FROM ALL CAUSES IN EACH DISTRICT DURING EACH MONTH OF THE YEAR 1861.

Months.	Port Louis.	Pamplemousses.	Riv. du Rempart.	Flacq.	Grand Port.	Savanne.	Black River.	Plaines Wilhems.	Moka.	TOTAL.
January	383	151	69	111	94	44	34	62	40	988
February	223	136	57	96	79	40	29	68	25	753
March	378	130	50	118	100	48	24	65	36	949
April	246	119	44	122	99	31	27	65	32	785
May	280	115	38	114	103	44	34	72	40	840
June	261	103	30	97	92	40	29	73	44	769
July	314	109	46	128	79	57	31	60	37	861
August	294	101	37	129	80	49	28	58	49	825
September	323	112	42	132	75	37	30	58	50	859
October	327	105	47	126	72	42	32	64	38	853
November	223	97	42	101	74	37	24	49	30	677
December	382	119	58	141	66	42	38	51	40	937
TOTALS...	3634	1397	560	1415	1013	511	360	745	461	10096

TABLE XXIX.

SHOWING THE NUMBER OF DEATHS FROM ALL CAUSES IN EACH DISTRICT DURING EACH MONTH OF THE YEAR 1863.

MONTHS.	Port-Louis.	Pamplem.	Riv. du Rempart.	Flacq.	Gd. Port.	Savanne.	Black Riv.	Plaines Wilhems.	Moka.	Total.
January	248	140	57	138	91	46	39	87	49	895
February	331	143	64	125	90	31	46	90	56	976
March	311	179	53	135	122	48	53	89	65	1055
April	271	150	53	132	124	42	46	93	64	975
May	321	162	60	135	91	47	56	102	53	1027
June	205	154	57	142	86	49	50	95	69	907
July...	259	157	73	163	121	37	26	95	47	978
August	274	143	86	152	160	48	33	96	71	1063
September	247	155	76	141	160	50	24	72	81	1006
October	276	129	66	132	92	57	35	65	54	906
November	238	139	64	150	143	53	42	58	64	951
December	269	125	86	111	124	44	38	80	50	927
Total	3250	1776	795	1656	1404	552	488	1022	723	11666

TABLE XXX.

SHOWING THE NUMBER OF DEATHS FROM ALL CAUSES IN EACH DISTRICT DURING EACH MONTH OF THE YEAR 1864.

MONTHS.	Port-Louis.	Pamplem.	Rivière du Rempart.	Flacq.	Gd. Port.	Savanne.	Black Riv.	Plaines Wilhems.	Moka.	Total.
January	251	135	50	127	145	54	38	101	70	971
February	225	165	62	124	146	66	28	109	59	984
March	259	150	54	101	143	50	28	112	62	959
April	223	125	66	110	127	52	26	114	61	904
May...	267	157	47	135	117	50	28	118	60	979
June	264	152	41	134	117	51	30	113	52	954
July...	250	165	54	138	132	50	28	111	62	990
August	261	170	55	132	120	51	22	100	65	976
September	304	161	60	107	112	42	30	115	56	987
October	265	152	65	110	116	54	36	114	70	982
November	307	175	62	111	103	43	36	101	71	1009
December	270	151	75	115	87	50	34	109	63	954
Total	3146	1858	691	1444	1465	613	364	1317	751	11649

TABLE XXXI.

SHOWING THE NUMBER OF DEATHS FROM ALL CAUSES IN EACH DISTRICT DURING EACH MONTH OF THE YEAR 1865.

MONTHS.	Port-Louis.	Pamplem.	Rivière du Rempart.	Flacq.	Gd. Port.	Savanne.	Black Riv.	Plaines Wilhems.	Moka.	Total.
January	289	137	67	112	119	60	32	91	58	965
February	320	143	46	95	92	44	29	113	50	932
March	315	156	56	110	109	58	31	127	79	1041
April	326	131	53	123	96	60	38	100	67	994
May...	325	131	50	121	125	66	37	101	69	1025
June	254	121	37	126	100	77	27	87	65	894
July...	313	129	51	134	129	74	32	84	62	1008
August	335	141	45	143	108	60	44	95	78	1049
September	305	134	39	120	128	79	35	96	64	1000
October	358	138	73	144	131	68	37	101	79	1129
November	308	159	76	157	116	68	35	72	61	1052
December	338	140	84	115	103	76	57	83	57	1053
Total	3786	1660	677	1500	1356	790	434	1150	789	12142

TABLE XXXII.

SHOWING THE NUMBER OF DEATHS FROM ALL CAUSES IN EACH DISTRICT DURING EACH MONTH OF THE YEAR 1866.

MONTHS.	Port Louis.	Pamplemousses.	Rivière du Rempart.	Flacq.	Grand Port.	Savanne.	Black River.	Plaines Wilhems.	Moka.	TOTAL.
January...	319	171	92	155	144	121	41	110	45	1198
February.	278	137	58	167	119	126	51	67	31	1034
March	240	134	86	119	110	112	28	67	34	930
April	276	103	55	118	116	122	39	71	41	941
May	270	151	49	139	142	85	51	70	35	992
June	283	146	61	98	111	85	63	70	51	968
July	303	130	84	129	110	74	65	77	43	1015
August	256	151	99	107	80	97	53	54	47	944
September	231	158	74	101	82	80	50	70	38	884
October...	260	154	83	127	92	80	40	85	58	979
November	281	107	76	91	70	76	53	61	48	863
December	304	146	89	81	102	66	49	54	63	954
	3301	1688	906	1432	1278	1124	583	856	534	11702

TABLE XXXIII.

SHOWING THE TOTAL MORTALITY IN EACH MONTH OF THE FIVE YEARS 1861, 63, 64, 65, 66, THE MONTHLY TOTALS AND MEANS, AND THE MEAN ANNUAL VARIATION.

MONTHS.	1861.	1863.	1864.	1865.	1866.	Totals.	Means.	Variations.
January ...	988	895	971	965	1198	5017	1003.4	+ 49.2
February	753	976	984	932	1034	4679	935.8	— 18.4
March ...	949	1055	959	1041	930	4934	986.8	+ 32.6
April ...	785	975	904	994	941	4599	919.8	— 34.4
May ...	840	1027	979	1025	992	4863	972.6	+ 18.4
June ...	769	907	954	894	968	4492	898.4	— 55.8
July ...	861	978	990	1008	1015	4852	970.4	+ 16.2
August ...	825	1063	976	1049	944	4857	971.4	+ 17.2
September	859	1006	987	1000	884	4736	947.2	— 7.0
October ...	853	906	982	1129	979	4849	969.8	+ 15.6
November	677	951	1009	1052	863	4552	910.4	— 43.8
December	937	927	954	1053	954	4825	965.0	+ 10.8
Totals ...	10,096	11,666	11,649	12,142	11,702	57,255	11,451.0	

Mean Monthly Mortality 954.2

TABLE

SHOWING THE NUMBER OF DEATHS FROM FEVER (F.), THE TOTAL MORTALITY

DISTRICT DURING EACH

Districts.	Port Louis.			Pamplemousses.			Riv. du Rempart.			Flacq.			Grand Port.		
Months.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
January	97	171	2.7	55	104	2.4	14	34	1.6	74	140	2.8	31	83	1.8
February	58	145	2.3	43	81	1.8	22	41	2.0	36	80	1.6	23	63	1.4
March	88	165	2.6	47	84	1.9	16	32	1.5	39	105	2.1	28	75	1.6
April	96	178	2.8	56	98	2.2	15	32	1.5	39	87	1.7	17	64	1.4
May	113	216	3.4	52	87	2.0	20	43	2.1	39	72	1.4	25	60	1.3
June	103	191	3.0	55	97	2.2	23	43	2.1	46	91	1.8	33	65	1.4
July	74	154	2.4	50	82	1.4	12	27	1.3	46	84	1.6	29	70	1.5
August	72	152	2.4	48	87	2.0	18	39	1.9	35	92	1.8	22	67	1.5
September	49	121	1.9	30	72	1.6	17	31	1.5	33	83	1.6	23	59	1.3
October	59	138	2.1	17	59	1.3	6	25	1.2	32	93	1.8	16	48	1.0
November	47	128	2.0	42	76	1.7	19	32	1.5	25	70	1.4	7	56	1.2
December	48	141	2 2	30	78	1.8	13	35	1.7	25	71	1.4	14	51	1.1
Totals...	904	1900	30.2	525	1005	23.3	195	414	20.4	469	1068	21.5	268	761	17.1

XXXIV.

(T.), AND THE DEATH-RATE PER 1000 OF ESTIMATED POPULATION (R.) IN EACH MONTH OF THE YEAR 1870.

Savanne.			Black River.			Plaines Wilhems.			Moka.			Totals.		
F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.	F.	T.	R.
23	40	1.4	17	24	2.0	42	85	2.4	19	40	1.7	372	721	2.2
25	46	1.6	13	25	2.0	32	87	2.4	14	38	1.7	266	606	1.9
32	54	1.9	16	24	2.0	28	93	2.6	11	37	1.7	305	669	2.1
23	64	2.3	17	28	2.3	26	77	2.1	9	30	1.4	298	658	2.0
36	67	2.4	27	37	3.0	36	86	2.4	9	25	1.1	357	693	2.1
53	76	2.7	15	24	2.0	35	84	2.3	11	40	1.7	374	711	2.2
30	64	2.3	13	24	2.0	31	84	2.3	23	37	1.7	308	626	1.6
26	51	1.8	16	23	1.9	30	71	2.0	10	42	1.9	277	624	1.9
20	60	2.1	6	13	1.0	20	61	1.7	6	37	1.7	204	587	1.7
24	51	1.8	6	13	1.0	18	59	1.6	7	35	1.6	185	521	1.6
11	41	1.5	16	23	1.9	20	62	1.7	10	33	1.5	197	521	1.6
19	52	1.8	9	15	1.2	20	61	1.7	8	30	1.4	186	534	1.6
322	666	24.2	171	273	22.3	338	910	25.2	137	424	19.1	3329	7421	23.5

TABLE XXXV

SHOWING THE STRENGTH OF H. M'S TROOPS IN MAURITIUS, ADMISSIONS INTO HOSPITAL, &c., FROM 1823 TO 1867.

Years.	Strength.	Total Admissions into Hospital.	Deaths.	Death-Rates.	Remarks.
1823	1243	1225	34	27·4	
1824	1204	1250	22	81·3	
1825	1145	1513	22	19·2	
1826	1371	2317	21	15·3	
1827	1862	2198	32	17·5	
1828	1729	2403	67	38·7	
1829	1770	2239	59	33.3	
1830	1733	2284	36	20·7	
1831	1875	2777	60	32·0	
1832	1984	2983	62	31·0	
1833	2321	3401	64	27.6	
1834	2312	3116	72	31·1	
1835	2002	2506	68	33·9	
1836	1655	2115	51	30·8	
1837	1634	1896	39	23·8	
1838	1589	1369	75	47·2	Typhoid Fever and Measles.
1839	1540	1260	37	24·0	
1840	1971	1492	49	24·9	
1841	1948	1493	54	27·6	
1842	1917	1250	42	21·9	
1843	1878	1668	58	30·9	
1844	1773	1641	39	22·0	
1845	1749	1547	36	20·6	
1846	1781	1736	35	19·6	
1847	1784	2008	34	19·1	
1848	1914	1844	29	15·1	
1849	1985	1916	42	21·1	Intermittent Fever imported from England.
1850	1858	1819	34	18·3	
1851	1423	1542	30	21·1	
1852	1119	930	20	17·9	
1853	1784	1634	27	15·1	
1854	1685	1975	76	45·1	Choléra.
1855	1789	1855	55	30·7	
1856	1193	1176	31	26·0	
1857	734	944	12	16·3	Int. Fever imported from England and India.
1858	759	1004	21	27·7	
1859	1693	1236	7	5·5	
1860	1886	2112	38	20·1	
1861	1915	1167	22	11·5	
1862	2049	1685	85	41·5	Choléra.
1863	1978	1288	19	9·6	
1864	1789	1290	16	8·9	
1865	1882	1416	13	6.9	
1866	1781	1350	22	12.3	
1867	1324	2889	44	33.2	
Means... ...	1696 ...	1795 ...	40.6	23.6	

Note.—From 1832 to 1835, inclusive, the year commenced on the 1st January, from 1836 to 1859 on the 1st April, and from 1860 to 1867 on the 1st January. The deaths given for 1859 occurred from the 1st April to the 31st December.

TABLE XXXVI.

SHOWING THE DIRECTIONS OF THE WIND, FROM 1861 TO 1880, AS DERIVED FROM OBSERVATIONS MADE FOUR TIMES DAILY. *.

Years.	N to N E.	N E to E.	E to S E.	S E to S.	S to S W.	SW to W.	W to N W	N W to N.	Totals.
1861	45	190	629	203	14	18	61	36	1196
1862	27	89	610	303	11	25	62	49	1176
1863	20	116	597	362	9	19	60	72	1255
1864	13	82	698	337	11	19	56	59	1275
1865	14	83	638	406	17	15	52	52	1277
1866	16	45	705	399	21	17	48	43	1294
1867	14	70	652	448	3	12	102	51	1352
1868	15	82	569	503	18	43	77	56	1363
1869	33	73	612	484	55	8	59	39	1363
1870	33	95	668	440	28	1	59	48	1372
1871	7	78	632	412	29	6	31	8	1203
1872	13	105	626	336	26	8	25	10	1149
1873	33	122	486	324	26	9	20	18	1038
1874	21	102	626	330	8	20	28	31	1166
1875	34	254	915	133	17	10	12	14	1389
1876	26	206	932	80	22	26	13	6	1311
1877	68	260	889	112	14	42	25	48	1458
1878	33	161	920	229	22	28	32	32	1457
1879	29	240	909	122	17	39	17	11	1384
1880	12	257	1069	92	8	14	6	6	1464
Totals.	506	2710	14382	6055	376	379	845	689	25942
Means.	25.3	135.5	719.1	302.7	18.8	18.9	42.2	34.4	1297.6

* The total number of observations in each year (except leap years) was 1460, but the "calms" and "variables" are not included in the Table.

LVII

TABLE XXXVII.

SHOWING THE PERCENTAGES (TO TOTAL STRENGTH) OF ADMISSIONS INTO HOSPITAL FROM ALL CAUSES, CONTINUED FEVER, AND DYSENTERY.

Years.	From all causes.		From continued Fever.		From Dysentery.		Percentages from cont. Fever and Dysentery.
	Admissions.	Percentages.	Admissions.	Percentages.	Admissions.	Percentages.	
1823...	1225	90.8	108	8.7	111	8.9	17.6
1824...	1250	103.8	141	11.7	156	13.0	24.7
1825...	1513	132.1	250	21.9	151	13.2	35.1
1826...	2317	169.0	174	12.7	447	32.6	45.3
1827...	2198	118.0	262	14.1	359	19.3	33.4
1828...	2403	138.9	303	17.5	544	31.5	49.0
1829...	2239	126.4	150	8.5	356	20.1	28.6
1830...	2284	131.8	205	11.8	244	14.1	25.9
1831...	2777	148.1	424	22.6	354	18.9	41.5
1832...	2983	150.4	486	24.5	413	20.8	45.3
1833...	3401	146.5	517	22.3	527	22.7	45.0
1834...	3116	134.8	443	19.1	471	20.4	39.5
1835...	2506	125.1	352	17.6	309	15.4	33.0
1836...	2115	127.8	218	13.2	206	12.4	25.6
1837...	1896	116.0	260	15.9	298	18.2	34.1
1838...	1369	86.1	190	12.0	262	16.5	28.5
1839...	1260	81.8	165	10.7	110	7.1	17.8
1840...	1492	75.7	211	10.7	124	6.3	17.0
1841...	1493	76.6	203	10.4	111	5.7	16.1
1842...	1250	65.2	184	9.6	110	5.7	15.3
1843...	1668	88.8	278	14.8	159	8.5	23.3
1844...	1641	92.6	418	23.6	129	7.3	30.9
1845...	1547	88.4	427	24.4	111	6.3	30.7
1846...	1736	97.5	211	11.8	131	7.3	19.1
1847...	2008	112.5	140	7.8	185	10.4	18.2
1848...	1844	96.3	176	9.2	168	8.8	18.0
1849...	1916	96.5	193	9.7	151	7.6	17.3
1850...	1819	97.9	148	7.9	101	5.4	13.3
1851...	1542	108.4	211	14.8	110	7.7	22.5
1852...	930	83.1	110	9.8	56	5.0	14.8
1853...	1634	91.6	83	4.6	95	5.3	9.9
1854...	1975	117.2	167	9.9	141	8.4	18.3
1855...	1855	103.7	158	8.8	91	5.1	13.9
1856...	1176	98.6	144	12.1	45	3.8	15.9
1857...	944	128.6	142	19.3	50	6.8	26.1
1858...	1004	132.3	105	13.8	61	8.0	21.8
1859...	1236	78.9	65	3.8	81	4.8	8.6
1860...	2112	112.0	234	12.4	188	10.0	22.4
1861...	1167	60.9	40	2.1	153	8.0	10.1
1862...	1685	82.2	94	4.6	73	3.6	8.2
1863...	1288	65.1	89	4.5	96	4.8	9.3
1864...	1290	72.1	64	3.5	82	4.6	8.1
1865...	1416	75.2	136	7.3	127	6.7	14.0
1866...	1350	75.8	142	8.0	108	6.1	14.1
1867...	2889	218.2	204	15.4	119	9.0	24.4
Means.	1794.6	105.8	209.5	12.4	188.3	11.1	23.4

TABLE XXXVIII.

SHOWING THE DEATHS PER 1000 OF THE POPULATION IN TWELVE EUROPEAN STATES FROM 1853 TO 1878.

Years.	England & Wales.	Denmark.	Sweden.	Austria.	Hungary.	Prussia.	German Empire.	Belgium.	The Netherlands.	France.	Spain.	Italy.	Mean Death-Rates of 8 States.	Variation.
1853... ...	22.9	24.3	23.7	35.0	...	29.0	...	22.1	24.5	22.0	...	...	25.4	+ 1.3
1854	23.5	18.5	19.8	37.4	...	27.6	...	22.5	23.9	27.4	...	...	25.1	+ 1.0
1855... ...	22.6	20.1	21.5	46.0	...	30.6	...	24.5	28.1	25.9	...	...	27.4	+ 3.3
1856... ...	20.5	18.9	21.8	31.9	...	26.2	...	21.5	23.4	23.2	...	..	23.4	— 0.7
1857... ...	21.8	21.9	27.6	29.6	...	28.2	...	22.6	27.3	23.7	...	...	25.3	+ 1.2
1858... ...	23.1	23.3	21.7	32.0	...	27.6	...	23.3	27.8	24.0	...	...	25.3	+ 1.2
1859... ...	22.4	20.4	20.1	30.7	...	25.7	...	23.9	31.2	26.9	...	...	25·2	+ 1.1
1860... ...	21.2	20.2	17.6	29.8	...	23.7	...	19.6	24.7	21.4	...	...	22.3	— 1.8
1861... ...	21.6	18.4	18.5	31.4	...	25.3	...	22.2	25.2	23.2	26.3	...	23.2	— 0.9
1862... ...	21.4	18.4	21.4	30.9	...	24.5	...	20.7	23.7	21.7	26.8	...	22.8	— 1.3
1863... ...	23.0	18.3	19.3	31.1	...	26.0	...	22.1	23.2	22.5	28.5	30.8	23.2	— 0.9
1864... ...	23.7	23.3	20.2	30.2	...	26.0	...	23.5	25.1	22.7	30.6	29.7	24.3	+ 0.2
1865... ...	23.2	23.2	19.4	31.0	...	27.2	...	24.5	25.8	24.3	32.8	29.8	24,8	+ 0.7
1866... ...	23.4	20.9	20.0	33.3	38.9	34.0	...	30.3	28.7	23.2	28.0	29.0	26.7	+ 2.6
1867... ...	21.7	20.0	19.6	28.1	33.5	25.6	...	21.6	23.6	22.7	29.1	34.2	22.9	— 1.2
1868... ...	21.9	19.3	21.0	29.3	33.8	27.3	...	21.7	24.8	24.1	32.6	30.5	23.7	— 0.4
1869... ...	22.3	19.1	22.3	28.9	32.0	25.9	...	21.8	23.0	23.5	32.6	27.7	23.3	— 0.8
1870... ...	22.9	19.1	19.8	29.2	32.6	25.9	...	23.3	25.7	28.3	30.1	29.8	24.3	+ 0.2
1871... ...	22.6	19.5	17.2	30.0	39.0	28.4	...	28.5	29.4	34.8	...	30.0	26.3	+ 2.2
1872... ...	21.3	18.3	16.3	32.4	42.3	29.3	29.0	23.2	25.7	22.0	...	30.7	23·6	— 0.5
1873... ...	21.1	18.6	17.2	38.5	65.1	28.0	28.2	21.5	24.0	23.3	...	30.0	24.0	— 0.1
1874... ...	22.3	19.9	20.3	31.3	42.6	25.9	26.7	20.5	22.6	21.4	...	30.3	23.0	— 1.1
1875... ...	22.8	21.0	20.2	29.7	37.2	26.4	27.6	22.7	25.4	23.1	...	30.7	23.9	— 0.2
1876... ...	21.0	19.7	19.5	29.4	35.0	25.4	26.3	21.9	23.3	22.6	...	28.7	22·8	— 1.3
1877... ...	20.4	18.7	18.5	31.1	36.3	25.5	26.6	21.1	22.0	21.6	...	28.1	22.4	— 1.7
1878... ...	21.7	18.5	18.0	31.1	...	25.7	26.2	21.5	22.8	22.6	...	28.8	22.7	— 1.4
Means ...	22.2	20.1	20.1	31.9	39.0	27.0	27.2	22.8	25.2	23.9	29.7	29.9	24.1	

REMARKS.

England : Cholera in 1854.
Denmark : Cholera in 1853 and war in 1850 and 1864.
Sweden : Cholera in 1853, 1857, and 1866 ; small-pox in 1874 ; scarlet fever and diptheria in 1877.
Austria : Cholera in 1873.
Hungary : Cholera in 1866, 1873, and 1874.
Prussia : Cholera in 1866 and war in 1866, 1870, and 1871.
Belgium : Cholera in 1866 and small-pox in 1871.
Netherlands : Cholera in 1859 and 1866, and small-pox in 1871.
France : Cholera in 1865-66 and war in 1870-71.

TABLE XXXIX.

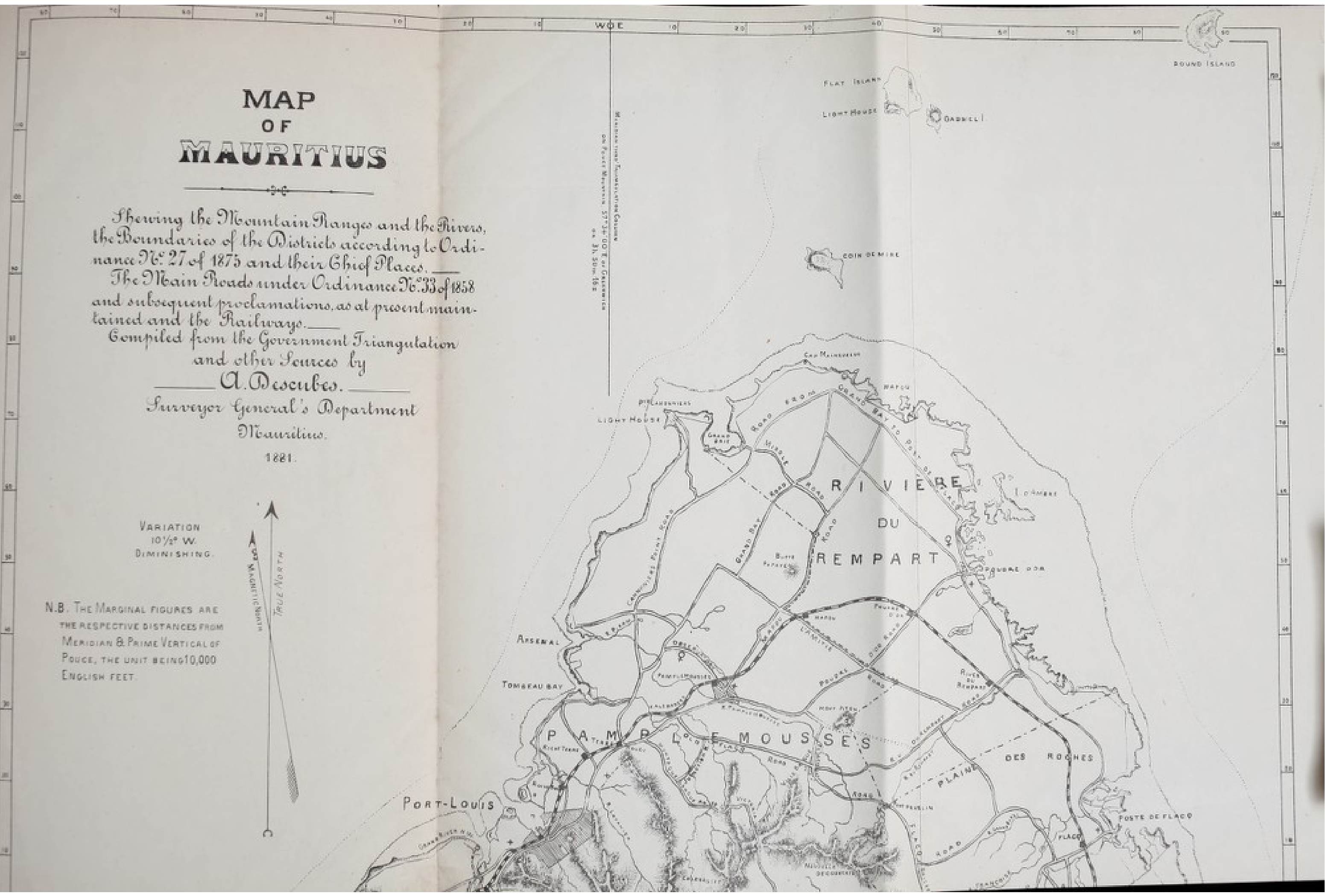
SHOWING THE NUMBER OF DEATHS FROM FEVER IN EACH DISTRICT, IN EACH MONTH OF 1880.

DISTRICTS.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		TOTALS.	
	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.	General Pop.	Indian Pop.
Port Louis	41	35	58	22	48	54	47	54	72	62	60	70	40	58	42	42	47	47	45	46	45	47	41	35	586	572
Pamplemousses	18	39	9	22	16	40	30	56	19	72	22	56	13	41	14	44	18	45	12	41	12	46	14	45	197	547
Rivière du Rempart ...	8	9	2	11	9	18	8	26	6	34	4	28	5	15	5	7	3	10	3	7	1	9	2	12	56	186
Flacq	18	27	18	22	13	41	19	60	28	67	28	37	20	47	16	44	13	41	13	39	14	49	21	42	221	516
Grand Port	16	40	16	27	17	34	26	38	17	57	18	46	17	39	27	50	11	28	20	36	15	37	13	32	213	464
Savanne	10	40	10	56	12	35	9	32	11	52	13	33	12	33	6	35	8	18	8	26	8	24	5	11	112	395
Plaines Wilhems	19	39	12	28	17	54	26	47	12	42	13	30	11	28	16	34	11	22	16	32	10	34	11	33	174	423
Moka	5	10	2	9	4	18	4	23	5	23	5	18	2	12	1	18	4	13	1	10	2	19	2	14	37	187
Black River	8	12	2	14	7	27	14	16	10	27	5	23	4	23	4	19	4	16	2	11	7	17	7	10	74	215
TOTALS...	143	251	129	211	143	321	183	352	180	436	168	341	124	296	131	293	119	240	120	248	114	282	116	234	1670	3505

TABLE XL.

POPULATION OF THE ISLAND OF MAURITIUS ON 3RD APRIL, 1881, DATE OF THE TAKING OF THE 5TH CENSUS.

DISTRICTS.	Indian Population.			General Population.			Total.			Estimated Population on 31st December 1880.
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	
Port Louis	17057	10307	27364	19904	19198	39102	36961	29505	66466	64881
Pamplemousses	16461	10927	27388	5499	4783	10282	21960	15710	37670	44570
Rivière du Rempart	10156	6354	16510	2194	2022	4216	12350	8376	20726	25765
Flacq	27079	17500	44579	5995	5448	11443	33074	22948	56022	59901
Grand Port	24175	15772	39947	6817	6218	13035	30992	21990	52982	53028
Savanne	17253	10716	27969	3433	3045	6478	20686	13761	34447	34524
Black River	6583	4153	10736	2467	2089	4556	9050	6242	15292	12703
Plaines Wilhems	18382	12357	30739	7726	7850	15576	26108	20207	46315	40420
Moka	14165	9549	23714	3139	2915	6054	17304	12464	29768	24196
Shipping belonging to Mauritius	31	...	31	122	6	128	153	6	159	......
Flat, Gabriel and Fouquet Islands	10	6	16	7	4	11	17	10	27	......
Resident Population ...	151352	97641	248993	57303	53578	110881	208655	151219	359874	359988
Military	...	...	...	380	56	436	380	56	436	......
Shipping not belonging to Mauritius. ...	71	...	71	454	12	466	525	12	537	......
Total Population ...	151423	97641	249064	58137	53646	111783	209560	151287	360847	359988


MAP
OF
MAURITIUS
Shewing the Mountain Ranges and the Rivers, the Boundaries of the Districts according to Ordinance No. 27 of 1875 and their Chief Places.
The Main Roads under Ordinance No. 33 of 1858 and subsequent proclamations, as at present maintained and the Railways.
Compiled from the Government Triangulation and other Sources by
A. Descubes.
Surveyor General's Department
Mauritius.
1881.
VARIATION
10½° W.
DIMINISHING.
N.B. THE MARGINAL FIGURES ARE THE RESPECTIVE DISTANCES FROM MERIDIAN & PRIME VERTICAL OF POUCE, THE UNIT BEING 10,000 ENGLISH FEET.
MAGNETIC NORTH
TRUE NORTH
ROUND ISLAND
FLAT ISLAND
LIGHT HOUSE
GABRIEL I.
COIN DE MIRE
CAP MALHEUREUX
GRAND BAY
RIVIERE
DU
REMPART
PAMPLEMOUSSES
PLAINE DES ROCHES
POUDRE D'OR
ARSENAL
TOMBEAU BAY
PORT-LOUIS
POSTE DE FLACQ
FLACQ