

Notes on Indian mosquitoes / by G.M. Giles.

Contributors

Giles, George Michael James, 1853-1916.
Royal College of Surgeons of England

Publication/Creation

London : John Bale, Sons & Danielsson, 1901.

Persistent URL

<https://wellcomecollection.org/works/yqpa4ft9>

Provider

Royal College of Surgeons

License and attribution

This material has been provided by This material has been provided by The Royal College of Surgeons of England. The original may be consulted at The Royal College of Surgeons of England. where the originals may be consulted. Conditions of use: it is possible this item is protected by copyright and/or related rights. You are free to use this item in any way that is permitted by the copyright and related rights legislation that applies to your use. For other uses you need to obtain permission from the rights-holder(s).



Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
<https://wellcomecollection.org>

2



NOTES ON INDIAN MOSQUITOES

BY

LIEUT.-COL. G. M. GILES, M.B., F.R.C.S., I.M.S.

Sanitary Commissioner N.W.P. and Oudh

(Forwarded for publication by F. V. Theobald)

[Reprinted from the "Journal of Tropical Medicine," May 15, 1901]

LONDON

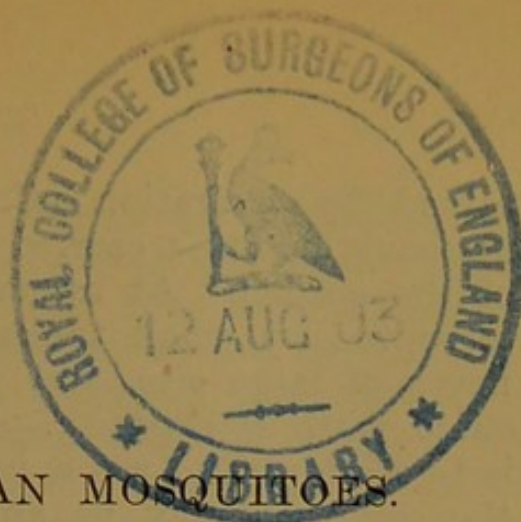
JOHN BALE, SONS & DANIELSSON, Ltd.

OXFORD HOUSE

88-89, GREAT TITCHFIELD STREET, OXFORD STREET, W.

—
1901





NOTES ON INDIAN MOSQUITOES.

By LIEUT.-COL. G. M. GILES, M.B., F.R.C.S., I.M.S.

Sanitary Commissioner, N.W.P. and Oudh.

(Forwarded for publication by F. V. Theobald.)

LANDING in Bombay in the month of March, I found that mosquitoes were not then particularly troublesome there. Still curtains were a necessity at night, and although I could find no *Anopheles*, *Culex tæniatus*,* Meig., and *C. fatigans*, Wied., were pretty common. It was evident that both bred in small domestic collections of water, as the ornamental pond in the Hotel garden contained no larvæ. Leaving Bombay, I arrived in Lucknow on March 19. No rain had fallen for months, and the place appeared as if burnt up after the long drought. Not a single natural collection of water could be seen; all the irregular excavations, so common in India, and which usually retain a little water throughout the year, being absolutely dried up. In spite of this the houses in the Civil lines were simply infested with mosquitoes, which were so numerous as to be a veritable pest, of which every one was complaining, though no one appeared the least disposed to make any effort to destroy them. The reason for this enormous multiplication of mosquitoes was not difficult to discover. In Lucknow, as in the European quarters of most Indian towns, every house has its garden which can only be main-

* *Culex tæniatus*, Wiedemann, is synonymous with *Culex fasciatus* of Fabricius. It comes in my new genus *Stegomyia*.
—F. V. T.

tained by irrigation effected by means of small masonry channels carried from the well to all parts of the garden. At intervals these channels are interrupted by small tanks of cemented brick work, never of large size, and in fact, generally about a cubic yard in capacity. The object of these tanks is to store up the water in convenient places, so that the gardener may be able to dip from them and water his plants without even having to walk more than a few yards. There must be hundreds of these little tanks in the "Civil lines," and without exception they were simply alive with the larvæ and pupæ of *Culex fatigans*, no other species being, as far as my observation went, present at this time of the year. Under these circumstances it is not surprising that the lives of the inhabitants of the bungalows were made a burden to them, and that when I woke up the first morning of my stay, not having been able to find a mosquito net, I counted no less than forty punctures in about a square inch of the skin of my forearm. Now it would be perfectly easy for the good folks of Lucknow to practically rid themselves of the annoyance at this time of the year, for with the exception of these irrigating tanks there was absolutely not a drop of water to be found for a gnat to breed in, and it is obvious that if the inhabitants insisted on the tanks being completely emptied and cleaned out once a week, not a single mosquito could reach maturity; while the mature insects in the bungalows could easily be destroyed by the expenditure of a little trouble, as thorough fumigation with sulphurous acid, used in the same way as for disinfection, would destroy every insect in the house. For this fact I am indebted to Mr. Hankin, the well-known bacteriologist, who discovered the fact in the course of some experiments he was making with the view to utilising sulphur for disinfection of plague-infected dwellings.

The sulphur should be mixed with about one-eighth its weight each of nitre and charcoal, and moulded with gum water into pastilles weighing

about 4 ounces; each of which, when burned, will supply sufficient sulphurous acid to render about 1,000 cubic feet of air lethal. It is almost needless to say that before setting fire to the pastilles all doors and windows should be closed, and the rooms treated exactly in the same way as if one were "fumigating" them for some infection. If, however, people would but insist on all domestic stores of water, such as those irrigation tanks, being emptied weekly throughout the cold season, there would be no need to deal with the adult insects, as in the absence of any breeding places the race would soon die out for want of progeny, and only stray stragglers from the distant bazaars could come to trouble the European community. But this would require co-operation, and to secure this is hard, for it is well nigh impossible to convince the even very well educated "man in the street" that there can be any connection between the prevalence of mosquitoes and the cultivation of his cabbages.

The matter, however, is of far-reaching importance as, in spite of the well-known pictures of the anopheles pool, I find that these tanks are, at the proper season, undoubtedly the favourite breeding places of *Anopheles*.

On moving into my official quarters in the Macchi Bhawan, which form part of the remains of an old fort destroyed after the mutiny, and are placed on a mound in the midst of an arid plain, I found the rooms to be almost free from mosquitoes, although the well-irrigated Husseinabad gardens are within 400 yards of the site. Still a certain number made their way across the intervening space, so that when sleeping in the open one required a mosquito net. By insisting, however, on the chicks (insect-proof screens made of split bamboo) being let down from dawn to 8 a.m., I kept the house comfortably free.

Shelter during the heat of the day is, in fact, a matter of life and death to a mosquito. About the only way to sleep in comfort at this time of the year in Oudh is to have one's bed placed in the open.

My servant one night was careless in the tucking in of the mosquito net, and when I woke in the morning I found I should have done well to have imitated the Irishman of the story and "crept out under the bottom bar," for the net was alive with happy, satiated dames of the gnat community.

My bed, as a matter of fact, had no bottom bar, but doing my best to imitate the astute Hibernian, I crept out with infinite precaution, tucked in the curtains, and gave directions that the bed should be left where it was. The day turned out somewhat cloudy, the temperature inside the net never exceeding 105 degrees F., but by noon every mosquito was not only dead but bone-dry.

Until the middle of April no other species than *C. fatigans* appeared, but towards the end of the month my quarters were suddenly invaded by a swarm of *Anopheles Rossii mihi*. After some search I found their breeding pool some 300 yards off, beside one of the piers of the old bridge across the Goomti, which flows just beneath the house. The pool was but a few yards long by not more than six feet wide, and though it did contain a certain amount of green filamentous vegetation, was extremely foul. Still it is the nearest approach to the "*Anopheles* pool" of the West African Malaria Commission that I have met with inhabited by the larvæ. Typical pools of the sort I have indeed come across by the dozen, but in no case have I met with the larvæ in such pools.

The horizontal posture of the larvæ was however very noticeable, and when placed in a tray under lens, I could also verify their peculiar trick of screwing round their heads so as to look upward.

I bred out adult insects from these larvæ and also confined some females over a dish of water from the pool, but I could not induce them to deposit their eggs; and then a plague scare called me away, and when I returned no *Anopheles* could be found in the house, and the pool (which I had kerosined) contained no larvæ.

In May my office moved to the pleasant hill station of Naini Tal, some 7,000 feet above the sea. When I arrived, mosquitoes were very scarce, but we had an abnormal amount of rain for that season of the year, and soon they began to appear in small numbers. The first species I took is one I had last year received from Bakloh in the Punjab Himalayas, and which I then thought might be identical with *C. albopictus*, Skuse; but about the same time I received a specimen of the latter species from Travancore, and there can be no doubt that they are distinct. The decoration of the thorax closely resembles that of *C. tæniatus* and of *C. notoscriptus*, Skuse, but the position of the tarsal bands distinguishes it from both, and the venation of the wing does not answer to Skuse's description, so I accordingly describe it as *C. pseudotæniatus* sp. n. For some time I could not discover the breeding pool of the local mosquito, but ultimately I found that the larvæ inhabit certain pools in the course of the surface drainage system. Even in moderate rain these pools are mere interruptions in the course of a roaring torrent, and it is difficult to understand how any *Culex* larvæ can maintain itself in such a position; nevertheless there they may be found, even immediately after the heaviest rain.

Taking the larvæ from these pools I bred out two additional new species, *C. pulchriventer* and *C. viridiventer*. The former is a very beautiful and well-defined species, but the latter closely resembles *C. fatigans*, Wied., but is certainly distinct, as it is unlikely that any domestic gnat could maintain itself in such a situation, and it differs radically from *C. fatigans* in habits of life, for both this and *pulchriventer* are purely phytophagous, sylvan species; as, though I liberated a number in my sleeping room, none ever attacked me, and they seemed to die for want of vegetable food. Moreover, except by accident, they never enter houses.

In the fresh insect, however, there is no difficulty in distinguishing the species from each other at a

glance by the form of the light abdominal bands which are distinctly triangular in well-marked specimens of *C. viridiventer*. The most striking point of my observations in the hills is the occurrence of several species hitherto believed to be restricted to Europe. In my "Hand-book of the Gnats" I have already mentioned receiving *C. annulatus*, Schrank, from Bakloh . . . , but on this occasion I also met with Noe's recently but very inadequately described *C. mimeticus*, and also *C. spathipalpis*, Rond, besides a species I took to be *C. pipiens*, L., but which I understand from Mr. Theobald he believes to be distinct. As there is continuous temperate land connection between Europe and the Himalayas, there is nothing astonishing in this, and I look to hearing of the discovery of other European forms in these mountains.

In July, a day or two before returning to the plains, I took in my bungalow a single female of *An. Lindesayii mihi*, but have since met with no other examples, and I have not been able to discover its breeding pools. Probably like *An. Rossii mihi* of the plains, it frequents small domestic collections of water, but in Naini Tal at least it is rare.

In July and August, my duties involved an extensive tour through the province during the rainy season. In the early part of the period it was evident that though *Anopheles* larvæ were common, they had not long been so, as even in places where they were plentiful, I could find no adults. It was not indeed till the end of the month that I began to find them at all commonly in bungalows. The situations, however, in which I found the larvæ entirely upset all the notions I had gathered from recent writings on the subject. I began, of course, by looking for the typical *Anopheles* pool of Ross, but such as I found never held any of the expected larvæ, and the first place I met with them was in the garden of the Meerut Club, in the small irrigation tanks I have already described. Here they were present in enormous numbers, sometimes alone, but

more frequently in company, and apparently on excellent terms with, the larvæ of *C. fatigans*. It was, however, noticeable that while the *Culex* larvæ for the most part remained in the middle of the tanks, those of *Anopheles* generally kept themselves floating with their heads touching its side walls, and so might easily be overlooked. In my subsequent wanderings, I met with *Anopheles* larvæ in a variety of situations, but always these small irrigation tanks were the "surest find," and further I never met with them at any distance from human habitations, so that I am inclined to suspect that females are unable to mature and deposit their eggs until they have had a feed of blood. I have also met with *Anopheles* larvæ in muddy pools of some size in brick fields, in the overflow from stand-posts in large cities supplied with a regular filtered water supply, and even in a very shallow depression in the concrete surface of the platform of a bustling railway junction, also fed by a stand-post. The establishment of the part played by the wastage from municipal water supplies in the propagation of malaria is a point of considerable importance, as it goes far to explain the hitherto inexplicable fact that the introduction of a pure water supply into large towns in the N.W.P. has not, in any instance, been followed by any reduction of the mortality rate. As may be gathered from the foregoing notes, *Anopheles* appears to be capable of breeding in these latitudes during the greater part of the year, but the drying up of all suitable collections of water, and the fierce heat which renders any remaining collections of water luke-warm, brings the propagation of the species, under normal conditions, to a stand-still during the hot weather; but in shade of the narrow streets of an oriental city, with a constant flow of fresh cool water from the hydrant, the conditions of the rains are reproduced, in spite of the fiery heat; and the potentialities of malaria are prolonged for a good four months, with a corresponding enhancement of the malarial death rate that may more than

neutralise the diminished amount of dysentery and other bowel diseases that must, without fail, result from the supply of pure water.

It is useless to seek for any confirmation of this theory in our mortality returns, as these, being unavoidably based entirely on the diagnosis of friends and village policemen, are, though fairly accurate as to total number, quite worthless in differentiating causes of death. One fact, however, they do establish, and that is that in our large towns which have been provided with supplies of pure filtered water, the hot weather, formerly by far the healthiest season of the year, no longer contrasts to the same extent with the autumn in the matter of mortality as heretofore, in cholera-free years; while the difference is as marked as ever in the surrounding country. The remedy obviously lies in good surface drainage, which at present is very defective, even in our largest cities.

The pools which may always be found in road-side ditches are another very favourite breeding-place for *Anopheles*. Some of the collections of water in which I have found them have been absurdly small, and would not suffice to fill a wash-hand basin. Far from being, as we have been led to expect, confined to a few marshy pools of moderate size, they are omnipresent, and seem to be capable of developing in water of very varying degrees of purity. *Anopheles Rossii* is, in fact, what Ficalbi would speak of as a "foveal" and not a "paludal" or even "sub-paludal" species. A consideration of these new facts makes it self-evident that the task of extirpating malaria by the systematic treatment of mosquito breeding-places with larvicides, is by no means as simple as we had hoped it might prove.

As every garden tank and each half-gallon puddle is a possible and probable breeding-place, it is obvious that it would require a small army of conservancy men, and an inquisitorial search of every corner, public and private, to secure the object aimed at. Still it must not be supposed that our

knowledge is valueless and that nothing can be done. In cantonments, and in the European quarters of our municipalities (Civil lines) it would be practicable to enforce the weekly emptying of garden tanks and similar domestic water stores, and in such localities the systematic parafining of ditch and other puddles would not be impracticable. For the individual European, living as he does in widely separated villas, there need be no difficulty in securing a very large degree of protection by a careful search of his compound and its immediate neighbourhood.

Now as to the question of the natural enemies of the larvæ. There is a general consensus of opinion that as a rule fish are inimical to the larvæ, and personally I have never met with fish and the larvæ of *Culicidæ* in company; so that it may be assumed that the majority of fish devour and destroy all that appear. This, however, is certainly not the case with all species of fish, for Captain James, I.M.S., finds them constantly in company in the rice swamps of Southern India. It is not to be expected that all species of fish should have the same tastes as to food, and the question is clearly entirely one of species, and it is quite possible that a good deal might be effected by the introduction of undoubtedly larvivorous species into such situations. I do not suggest this species for the purpose, but as an example I may mention that the ordinary golden carp, so common in ornamental tanks in Indian gardens, are so greedy of mosquito larvæ that they never allow them to survive in their company.

Another inveterate enemy is the larva of the dragon-fly, of which we have a great variety of species in India, all apparently equally destructive to the *Culicidæ*.

It is largely due to the well-nigh universal presence of these larvæ in all marshes and fairly sized collections of water in the open, that mosquito larvæ are seldom or never found in such situations. The presence of certain kinds of water plants is also

inimical, mainly, I am inclined to think, because they hide the water from the female gnat searching for a suitable place in which to deposit her eggs. At any rate I can in no other way account for the curious fact that, in the Benares public gardens where there are some scores of the small irrigation tanks I have already described, *Culex* and *Anopheles* larvæ alone or in company were present in every tank save those that were covered with a peculiar floating water plant looking much like a young lettuce, which is spoken of by the natives as *Jalkumi*.

In the tanks so planted, the water was alive with young leeches and nematodes, but I could not find in any of them a single mosquito larva.

Introduced into a tank already containing mosquito larvæ however, the plants appeared to exercise no hostile influence whatever on their development, and for this reason I conclude that the plants act mechanically in the same way as an artificial cover.

During the rains, *C. fatigans*, Wied., ceases to be the prominent house-gnat that it is in the hot weather; its place being taken by *C. tæniatus*, Meig., *C. albopictus*,† Skuse, and two others hitherto undescribed, species which I have named *C. gubernatoris* and *C. micropterus*; but it was not till late in August that I found *Anopheles* at all common in bungalows.

C. fatigans, Wied., is, I may in conclusion remark a most puzzling species, and I am more and more at a loss to conclude as to what should be regarded as the type.

It would require very large series, coupled with careful examination of larvæ, to come to any definite conclusion in the matter; but I suspect that however close their superficial resemblance, there are really several perfectly distinct species of this type. As to one of these, which I have described as *C. viridiventer*, I have no practical doubt, as it contrasts in habits of food, and in the habitat of its larvæ, in

† This is *Stegomyia scutellaris*, Walker.

every respect with *C. fatigans*, and is a purely Himalayan species. I suspect, too, that a form breeding in large cemented garden tanks in the plains during the rains is also distinct, but I have not yet been able to go sufficiently into the question.

