

## **The venomous snakes of India / J. Fayrer.**

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## THE VENOMOUS SNAKES OF INDIA.

IN a previous article an account was given of the carnivora and other wild beasts which are destructive to life in British India; of the mortality caused by them in those provinces which have furnished statistical records of the death-rates, of the rewards paid by Government for the destruction of the noxious creatures, and of the numbers destroyed, with a brief notice of the measures in force for abating the evil.

It was shown that the average loss of life caused by wild animals and venomous snakes combined has for eight years been at the rate of 22,620 human beings and 53,277 head of cattle annually, and that it has continued at about the same rate, with slight fluctuations, up to the present date, notwithstanding such measures as may have been resorted to for its prevention. It was also shown that of these deaths those of 2,740 human beings and 51,180 head of cattle and other domestic animals were due to wild animals alone, whilst the much larger number of 19,880 deaths of human beings, and the smaller of 2,100 of cattle were ascribed to venomous snakes of different kinds. The smallest numbers killed by wild beasts and snakes combined, recorded in the eight years cited, were in 1881, when 21,427 human beings and 43,669 cattle were killed; the largest figures were in 1886, when 24,841 men, and in 1887, when 63,737 cattle were killed.

In this paper I propose to describe the reptiles which cause these deaths, to give some account of the circumstances under which they exert their lethal power, to notice the measures in operation for preventing the evil, and to make a brief reference to the nature and physiological action of the virus which is so fatal.

The provinces referred to represent, roughly, about five-eighths of the peninsula, and the population about 199,000,000, or seven-ninths of a total population of 256,000,000; both are the same as those referred to in the former paper. The thirteen groups of native states forming Feudatory India, with the French and Portuguese possessions, having a population of 57,000,000, are excluded from the above calculations.

In describing the venomous snakes of India I shall dwell at any length on those only which are most destructive to life, *e.g.* the Naja or Cobra, the Ophiophagus or Hamadryad, the Bungarus or Krait, the



Daboia or Russell's viper, and the *Echis carinata* or Kuppur. The crotaline snakes, though all poisonous, are comparatively innocuous, as far as human life is concerned. Some notice will also be taken of the hydrophidæ or sea snakes which, though, exceedingly poisonous, are not very destructive to human life.

I regret that I am unable to assign to each species its individual share in the death-rate, as no reliable returns of this particular form of detail are available. The deaths, whatever their numbers may be, are recorded under the general head of 'poisonous snakes.'

India is richly supplied with both venomous and innocuous snakes; with the latter we are not here concerned.

The order Ophidia has two principal subdivisions, the colubriform and the viperiform. The first is divided into the venomous and innocuous. The second or viperiform are all venomous. Both the colubrine and viperiform are numerous in India; the colubriform by five genera of elapidæ and four of hydrophidæ, the viperiform by two genera of viperidæ and four of crotalidæ, making a total of fifteen poisonous genera, comprising a large number of species and varieties. But large as the number is, it is small compared with the innocent genera and species contained in about seventeen families of innocent colubriform snakes inhabiting the same country.

Snakes are pretty generally distributed over the globe wherever climate and other physical conditions are favourable to their existence, but tropical countries are most richly supplied, and in the hottest regions the most venomous are found. In our own islands, the common adder is the only venomous snake, and its power is feeble compared with that of the snakes of India, the West Indies, Tropical America, Africa, and Australia, where the largest and most deadly forms are found in great variety. The most widely distributed venomous snakes are the viperiform; America and Africa abound in them, the crotalidæ being most numerous in the former, the true vipers in the latter, whilst in Asia the poisonous colubrine snakes are most numerous and are represented by the *Najas*, *Bungarus*, *Callophis*, and the hydrophidæ. The true vipers, on the other hand, are represented by *Daboia* and *Echis*, whilst the crotalidæ or pit vipers are represented by *Trimeresurus*, *Hypnale*, *Halys*; Australia has its peculiar forms of both colubriform and viperiform genera.

The general characters of Ophidia are well known, and therefore need only a few remarks on the distinctive characters of the venomous, as contrasted with the innocent forms, with a brief notice of the apparatus by which the virus is secreted, and of the fangs by which it is inoculated.

Snakes are oviparous or ovoviviparous; the colubrine snakes for the most part belong to the first class,—the cobra, for example, lays eggs; there are exceptions, however, such as hydrophidæ and homolop-



sidæ, which bring forth their young alive. The viperine—*e.g.* the daboia, the adder, the rattle-snake—are viviparous. There are exceptions, as some *Trimeresuri* are oviparous, it is said, but there is no great physiological distinction after all, the question being whether the eggs are hatched before or after leaving the oviduct. The progeny is numerous; the cobra lays twenty to thirty white, leathery eggs, which are hatched in some warm place by the natural heat. The viper is equally prolific. Some oviparous snakes are said to incubate; the cobra probably watches its eggs; the python is said to have been observed to coil itself round its eggs until hatched. Young vipers emerge from the oviduct alive, the process being expedited by the mother exposing herself in a warm, sunny place. The female of all snakes is said to be larger than the male. There may be differences in colour and slight variations in form, but no other prominent external characters distinguish the sexes.

Snakes hybernate in cold climates; returning warmth rouses them into activity. I have seen a python in the north-west of India, quite torpid in the early morning in the cold weather, roused to activity by the heat of the sun's rays. Snakes are carnivorous, and generally eat living creatures, but some will swallow eggs—the cobra sometimes robs the hen-roost—insects, molluscs, and even, it is said, vegetable matter; they prefer living prey, and some are cannibals—the ophiophagus and callophis, especially, live on snakes. In captivity they will, it is said, drink milk; needless to add that the bucolic tradition of robbing the cow is a myth.

Snakes differ in their habits and modes of life, and are grouped accordingly. Tree and grass snakes live in the trees, bushes, and grass, and are often coloured like the vegetation they frequent. When slender and active they are called whip snakes; innocent and poisonous forms are found among them. Ground snakes are found in all three sub-orders; they generally live above ground, and the great proportion of snakes, whether innocent or venomous, belong to this group.

Burrowing snakes live much underground, have a rigid, cylindrical body, short tail, narrow mouth, small teeth, and are all innocent.

There are fresh- and salt-water snakes. The salt-water snakes are peculiarly adapted for an aquatic life, and are all venomous; the fresh-water snakes have not the same characters as the hydrophidæ, or salt-water snakes, and are innocent—a curious fact! The hydrophidæ are viviparous.

It may be well here to say a few words on the structure of the jaws, teeth, and poison apparatus of the venomous snakes. The cranium is made up of a number of bones modified in accordance with the general structure and habits of the creature. It is only necessary to refer to these as far as concerns the mode in which the prey is seized and swallowed, and the poisonous wound inflicted. Deglutition is effected in a peculiar way: the prey being seized, the



mouth gapes laterally and vertically; each side of the jaws, having independent motion, is called separately into action, and the object grasped is slowly but surely drawn in; the sharp and recurved teeth hold it firmly as each side of the jaw alternately advances or relaxes its grasp; the prey is thus gradually but inevitably engulfed, the mouth and passages distending to an extraordinary degree. This is effected by the method in which the mandibles, maxillæ, and tympanic bones are articulated; the latter are long and slender, loosely articulated with the mastoid bones of the skull. At their distal extremities they articulate in a similar manner with the mandibles; these, again, are united in front by an elastic ligament. This allows of great stretching in all directions, enabling the snake to swallow an object much larger than itself in diameter.

The mandibles are closely set with sharp recurved teeth; the upper jaws, composed of the maxillary pterygoid and palatine bones, have also teeth. These with the premaxillary bones make up the maxillary arch.

The maxillary bones are characteristic in the venomous snakes, being much shorter and provided with fewer teeth than in the innocent snakes. In the latter they are elongated slips of bone set with small recurved teeth. In the poisonous colubrine snakes they are less elongated and have a fixed, large, tubular poison fang, several loose reserve fangs, and one, two, or more fixed smaller teeth which are not tubular and not directly connected with the poison apparatus. In the viperidæ the maxillary bone is a short triangular movable wedge furnished with one long tubular poison fang lying hidden in the mucous sheath. The movements of the poison fang as seen in the viperidæ are due to the rotation of the maxillary bone on its articulation with the skull, not to the mobility of the fang itself, the active poison fang in all snakes being firmly fixed in the maxillary bone. This mobility of the maxillary bone is very great in vipers, *e.g.* *daboia*, *crotalus* and *pelias*, whilst it is very slight in the poisonous colubrines.

The mechanism by which the fangs of a viper are reclined or erected is most curious and beautiful. When erected, the maxillary bone, into which the fang is inserted, is pushed forward by the external pterygoid bone, which is drawn forward by the action of the prespheno-ptyergoid muscle. The muscular arrangement for opening and closing the mouth and at the same time compressing the poison gland, thereby injecting the venom through the tubular fang, is beautifully adapted to the purpose to be fulfilled.

It must suffice to mention the principal muscles. The temporals, masseters, and pterygoids are mainly concerned in closing the jaws and in compressing the poison gland; the prespheno-ptyergoid erect the fang. There are other muscles which move the jaws, or help to steady the erect fang when in the act of biting, but these



need not be described. The poison glands are situated between the orbit and the tympanic bone. They are oval bodies, composed of lobes and lobules, which, having secreted the virus from the blood, which is abundantly supplied to the gland, force it through a duct which leads to and opens by a papilla into a capsule of mucous membrane, whence it finds its way into a triangular opening at the base of the fang, with which the papillary end of the duct is brought into close apposition, and thence it finds its way along a canal (to be described presently) into the wound. The poison glands are of various forms and sizes. In some snakes, as callophis, they are much elongated; in the cobra they are of the size and something of the shape of an almond. They are inclosed and fixed *in situ* by a fibrous capsule which is connected with a tendon, and are covered by the muscular fibres which compress them when the mouth is closed. The virus is a transparent, slightly viscid fluid, faintly acid in reaction, having something of the appearance of glycerine, of a faint yellow or straw colour—in the ophiophagus of a yellow colour—when dried, it forms a semi-crystalline substance, like gum Arabic. It is secreted in considerable quantities; and if a fresh, vigorous snake be made to bite a leaf stretched across a teaspoon—or, as the natives of India do it, with a mussel-shell—several drops may be obtained. It is exhausted when the snake has bitten frequently, but is rapidly reformed; in the interval the reptile is comparatively harmless, but soon becomes dangerous again. It has been shown that a vigorous cobra can kill several creatures before its bite becomes impotent, but the immunity is of short duration, the virus being rapidly re-secreted. Removal of the fangs has the effect of rendering the snake temporarily harmless; but, as the reserve fangs (unless, indeed, they have all been removed) replace those which have been taken away, the snake soon becomes dangerous again, as has been proved by more than one fatal accident to the snake-charmers and others.

Some animals, especially the pig and the mongoose, are supposed to have immunity from snake-bite: fat sometimes protects the former, and the latter is so wiry and active that he frequently escapes with only a scratch; but, if either of them be fairly bitten in a vascular part, he succumbs like any other animal.

The chemistry of snake-poison has been made the subject of inquiry by Fontana, Prince L. Bonaparte, Armstrong, Gautier, and others, and recently by Drs. Weir Mitchell, and Reichert of the United States, the results of whose investigations were published in 1886. Gautier thought he had discovered a ptomaine in the venom of cobra, but they have been quite unable to verify this statement. They maintain that there are three distinct bodies in the venom: one is apparently harmless, while of the other two, which are proteids, one belongs to the globulins, the other to the peptones. The globulins, again, are of different kinds, and the investigators are of opinion



that explanation of the difference of the physiological effects produced by different species of snakes may be afforded by the proportion of globulins to peptones, and of the various kinds of globulin to one another. For instance, the poison of *Naja* does not destroy the coagulability of the blood; it contains only 1.75 per cent. of globulins, peptone being the material which represents the poisoning capacity; the viperine poisons produce complete fluidity, and the venom of *crotalus* contains 24.6 per cent. of globulins. Other experiments with the globulin and peptone parts of the venom have given like results.

Heat has very little effect on the toxicity of cobra poison, unless its application be very prolonged; but in other species heating the venom beyond a certain point, varying for different venoms, lessens its poisonous power.

From other experiments of Drs. Weir Mitchell, Reichert, and others it appears that ferric chloride, bromine, iodine, and other reagents destroy crotaline venom; permanganate of potassium has great power to destroy cobra venom.

The activity of snake virus differs not only in character and intensity in different genera and species, but in the same individual under varying conditions of temperature, climate, health, and state of vigour or exhaustion. It is a most virulent poison, and may neither be sucked from a bite nor swallowed with impunity. It acts most rapidly on warm-blooded, but is also deadly to cold-blooded, creatures, and to the lowest forms of invertebrate life. Strange to say, a snake cannot poison itself, or one of its own species, scarcely its own congeners, and only slightly any other genus of venomous snake; but it kills innocent snakes quickly.

Snake-poison kills by extinguishing in some way the source of nerve energy. It is also a blood poison and irritant, and causes great local disturbance as well as blood change. If it enter by a large vein, life may be destroyed in a few seconds. The chief effect is on the respiratory apparatus, and death occurs by asphyxia; but general paralysis is also a result. These are the primary symptoms; the secondary symptoms are such as result from blood-poisoning; they manifest themselves in various ways, and have to be treated on ordinary medical principles.

The phenomena of poisoning vary according to the nature of the snake and the individual peculiarities of the creature injured, the chief difference being observed in viperine as contrasted with colubrine poison. The latter is a nerve poison of great deadliness, but as a blood poison its results are less marked. Viperine poison, on the other hand, is a more potent blood poison. Dr. Wall has made investigations on this subject and his conclusions verify those recorded in the *Thanatophidia*. Cobra poison produces general paralysis, but shows a preference for certain nerve centres; respiration is quickly



extinguished after paralysis shows itself, and death is attended with convulsions. Daboia (*i.e.* viperine) poison causes early convulsions, paralysis is general, and respiration is much more quickened than by cobra poison, but lasts longer. Daboia poison causes more local mischief, destroys to a far greater extent the coagulability of the blood, causes hæmorrhages, but less salivation, whilst in cobra poison the latter is profuse, and the other symptoms are less prominent.

The local effects of the poison are partial paralysis of the bitten part, pain, swelling, hæmorrhage, and inflammation. The general symptoms are depression, faintness, cold sweats, nausea, vomiting, exhaustion, lethargy, unconsciousness.

Sixty-five cases of snake-bite are recorded in the *Thanatophidia of India*, and from them it appears that the most fatal periods are between two and three hours, and more than twenty-five per cent. of the total deaths take place between one and three hours after the infliction of the bite.

Out of the fifty-four cases where the exact spot is stated, 94.54 per cent. of the wounds were in extremities; this is a matter of interest, as success depends on preventing access to the circulation and in the facility of removing the injured part.

Snake-poisoning in this country, by the adder, is of the viperine character; and though its immediate effects as a nerve poison are feeble, yet the effects on the blood and locally on the tissues may be productive of serious, if not dangerous, symptoms.

As to reputed antidotes, almost every known drug, and many other things besides, have been tried. Fontana, writing in 1782 on spirits of hartshorn, which was considered in his time to be an antidote, maintains that the few cases cited are not enough to establish it as a specific, and points out that remedies are frequently considered to be effectual because recovery has followed their application, while the fact that it is necessary to establish is that the patient would have died without the application. It is impossible to enumerate all the remedies that have been reported beneficial; but amongst those that have had the greatest repute may be mentioned arsenic, ammonia (given as an internal remedy and injected under the skin), alcohol, quinine, strychnine, acids, besides snake poison, snake bile, and the snake-stones so much relied on in India. These are said to attach themselves closely to the bitten part; the blood that oozes out is rapidly imbibed by the so-called stone; and when it drops off the bitten person is said to be out of danger. Faraday expressed his belief that these are pieces of charred bone which have been filled with blood and then charred again. There may be a fragment of truth in the supposition that they are of use, because, in absorbing the blood, they must also absorb some of the poison, though so little that, in the case of a severe bite from a deadly snake, their efficacy must be a mere delusion.



The result of experience is that, so far, no physiological antidote to snake virus is known, and that, when the full effect on the respiratory centres is produced, remedies are of little, if any, avail; albeit, when the poison has entered in smaller quantities, medical treatment may be of service on general principles. In the treatment of snake-bite, the object is to prevent the entry of the poison into the system, and this may be done by applying a tight ligature above the injured part. The next step is, if possible, to remove or destroy the poison in the wound, by excision or by burning, and the application of potassium permanganate. The subsequent treatment is conducted on ordinary medical principles, of which further details would be out of place here.

A few words on the dentition of the snake.

In the innocuous snakes, the small, sharp, recurved teeth are arranged in four rows, an outer or maxillary and an inner or palatine. They are all tolerably equal in size, and not canalised. In the venomous snakes there are one, two, or three, seldom more, set in the movable maxillary bone; the anterior of these is the poison fang. In the viper it is the only fixed tooth attached to this bone, whilst in the poisonous colubrines—cobra to wit—there may be two or three smaller teeth implanted in the maxillary bone behind the fang, which is less movable than in vipers; and in all venomous snakes there are a number of reserve fangs of different sizes lying loose in the mucous capsule, which are ready to take the place of the principal fang, should it be lost.

The bite of a venomous snake may thus be distinguished from that of an innocent one by two punctures at a certain distance apart, and by the absence of smaller punctures. The fangs are shed at intervals, and, to supply the loss, the reserve teeth are provided. These lie in the capsule of mucous membrane which ensheathes the fang. These fangs are erroneously described as being perforated. The fact is, the tooth during development is folded on itself, so as to form a tube. In the vipers the fusion of the involuted edges is so perfect as to form a perfect tube, with a triangular opening at the base and another near the apex of the fang. It is somewhat less perfect in the cobra, whilst in some sea snakes it remains an open groove. It is along this channel that the poison passes into the wound; and when the fang is deeply imbedded, the quantity of virus injected is considerable, and its effects are rapidly manifested. But if the snake merely strike, and wound or scratch without imbedding the fang, the severe symptoms of poisoning do not necessarily follow. Such is the explanation of some snake-bites from which no serious evil has resulted, or where the bitten person is supposed to have been preserved by an antidote. In other similar escapes, it may have been that the snake was exhausted by previous biting.

I must now give an account of the principal forms of venomous



snakes found in India. The Elapidæ are subdivided into najadæ, or hooded snakes, and the elapidæ proper, which are not hooded. Najadæ have only two genera, *Naja* and *Ophiophagus*. Elapidæ have three Indian genera—*Bungarus*, *Xenurelaps*, *Callophis*.

The najadæ comprise the several varieties of cobra, which are all of one species, though differing considerably in external appearance.

The Cobra di Capello, *Naja tripudians*, has numerous synonyms in different parts of India. It is sometimes called the spectacled or hooded snake; some are marked with a figure like spectacles; others have a single ocellus on the hood; some have no mark. The former are called by the natives of Bengal 'gokurrah,' the latter 'keautiah;' but they have other vernacular synonyms in different regions. A common general native term is Kala Nag or Kala Samp. There are many varieties, both as to pattern on the hood and general colouration, and they are considered by natives as being of different degrees of activity or deadliness; but the probability is that in these respects they are all much the same, any difference being due to temporary or individual causes.

The cobras are all hooded snakes—that is, the neck dilates into an oval disc, caused by the expansion of a certain number of elongated ribs. The body and tail are relatively of moderate length, seldom together exceeding five or six feet, more frequently three or four feet. The scales are smooth and imbricated; there is no loreal shield, the nostrils are lateral, and the pupil of the eye is round. The head is short and not very distinctly separate from the neck; the fangs are of moderate size and but slightly movable; there are one or two small teeth behind them in the maxillary bone.

The cobra is a nocturnal snake—at least it is most active in the night, though often seen moving about in the day. It is oviparous; the eggs, eighteen to twenty-five in number, are obovate, about the size of those of a pigeon; the shell is white, tough, and leathery. They feed on small animals, birds' eggs, frogs, fish, even insects. They occasionally rob hen-roosts and swallow the eggs whole, and prefer to take their food at dusk or during the night. They are said to drink much water; but it is certain that they will live weeks, even months, in captivity, without touching food or water. They go into water readily and swim well, but are essentially terrestrial snakes. They can climb, and occasionally ascend trees in search of food. Cobras are not infrequently found in the roofs of huts, holes in walls, old ruins, fowl-houses, and among stacks of wood, cellars, old brick-kilns, old masonry of brick and stone, or mud among the grass or low jungle; such are the common resorts, and during the rains or inundations they collect in such places of refuge, where they are frequently disturbed by men who, stepping on or unintentionally disturbing them, mostly at night, receive their death-wound.

The cobra sheds the epidermis with the outer layer of the cornea



frequently, perhaps ten or twelve times a year; the fangs also are shed. The entire slough is often found marked by a single rent, through which the creature has emerged, brightly coloured and glistening in its new epidermis. It aids the process of exfoliation by friction against some hard substance, such as the branches of a tree, a stone, or the like. The cast-off epidermis is often found in fragments.

The cobra is found all over Hindustan, up to a height of 8,000 feet in the Himalayas and other mountain ranges. Hodgson says he never saw it in the Nepaul Valley, but I suspect it is there nevertheless. It is equally dreaded and fatal wherever met with; fortunately, it is not naturally aggressive, and seldom exercises its dangerous power unless provoked or in self-defence, at which times its aspect is most alarming. Raising the anterior third or more of its body, and expanding its hood, with a loud hissing it draws back its head prepared to strike, and, when it does so, darts its head forwards and either scratches, seizes, or imbeds its fangs in the object of attack. If the grasp be complete and the fangs of a vigorous and unexhausted snake be imbedded in the flesh, the most dangerous and often fatal effects result; but if the fangs only inflict a scratch, or if the snake be weak or exhausted, the same great danger is not incurred. When the bite is inflicted by a vigorous snake it soon proves fatal; if the poison enter a large vein and thence be quickly carried into the circulation, death is very rapid—indeed, almost immediate. Men have been known to perish from a cobra bite within half an hour. The largest and strongest as well as the smallest and weakest creatures succumb. Fortunately, all who are bitten do not die. In the first place, some human beings as well as lower animals have greater tolerance than others of this as of other poisons—a result, doubtless, of idiosyncrasy or varying degrees of nervous energy, which enables one to resist that to which another would succumb. Is it possible that a degree of tolerance might be acquired—as in the case of King Mithridates, who fed on poisons till they nourished him—by which perhaps immunity might be gained? I believe some investigations on this subject were made by Mr. Stradling, but I do not know with what result.

In the second place, a wound may have been inflicted and yet but little of the poison inoculated; or, in the third place, the snake may be weak or sickly, and not secreting the most virulent form of poison;<sup>1</sup> or it may have been exhausted by recent biting, and thus have become temporarily deprived of the power of inflicting a deadly though still a poisoned wound. But when a cobra in the full possession of his powers bites, and injects the poison into man or beast, it is almost surely fatal, and all the remedies vaunted as infallible antidotes are futile. In bites that are less severe, medical aid may be of

<sup>1</sup> I had a cobra in Calcutta which was very vigorous and aggressive, but its virus seemed to be quite harmless.



service, and life may be preserved by simple measures ; but this is a very different matter from that of the so-called antidotes, all of which, after long, carefully conducted, and often repeated experiments, have been found utterly useless. How far remedies may be of avail has been briefly noticed.

Cobras are frequently exhibited by the so-called snake-charmers. Their graceful and imposing attitudes, with raised heads and distended necks, as they sway from side to side, watching the movements of their keeper, and frequently striking at him with their heads, and the ease with which they are handled and made to perform, make them favourites with this class and with the people generally. I may here remark that the cobra depicted in Hindoo legends or old paintings is the gokurrah, or spectacled snake. Though generally, when kept for the purpose of exhibition, they are deprived of their fangs (which is done by roughly cutting them out with a coarse knife), the snake-catchers handle them fearlessly when armed. These men know the habits of the creature thoroughly, and are so well acquainted with the extent to which they can move and strike, that they take them up without fear, though with great caution, always grasping them tightly just below the head with one hand, and holding the tail with the other. To obviate any risk or needless trouble, they deprive them of their fangs by breaking or cutting them off at the roots, and thus rendering the snake temporarily harmless. They are aware that a new fang is soon produced, and to prevent this they sometimes destroy and remove the capsule and reserve fangs, thus rendering the snake permanently harmless. Neglect of these precautions has often resulted in dangerous accidents. The sole secret of these men lies in their dexterity and fearlessness, engendered by habit. Their *muntras* or charms, their antidotes, and the pipes or tubris with which they pretend to charm 'never so wisely' are as devoid of all real efficacy or power over the snake as are the snake-stones, roots, and other nostrums over its poison. They know as well that their dexterity in avoiding the snake's fangs is their real security against being bitten, as that, if they are bitten, the only way of escaping death is at once to prevent the entry of the poison into the circulation by placing a ligature tightly round the trunk above the bitten part, and the application of the knife, hot iron, or live coal to destroy it in the wound.

The snake-charmers, so called, prefer the cobra, but also occasionally exhibit the ophiophagus—which, like the cobra, raises the anterior part of its body and dilates the hood when excited—the bungarus, the daboia, and also some of the innocent snakes, such as chrysopelea, passerita, ptyas, and erix, which are remarkable for the beauty of their colours and activity or their peculiarity of form. These exhibitions are always accompanied by the music of the tubri, or pipe—the cobras raising their heads and moving slowly and grace-



fully from side to side, following the movements of the snake-man. These movements, it is to be observed, are confined to the elapidæ. The cobra is an object of veneration and superstitious awe to the Hindoos, in whose mythology it takes a prominent place. In a religion that deprecates the wrath of a cruel and relentless power by propitiating the deity in whom that power is vested, it is natural that the type of evil, as represented in this reptile, should be regarded with peculiar deference. Many Hindoos object to destroy the cobra if they find it in houses, as sometimes happens; when one has taken up its abode in a hole in the wall, it is fed, protected, and conciliated, as to provoke or injure it were to invoke misfortune on the house and family. Should fear, or perhaps the death of some inmate, prove stronger than superstition, it may be caught, tenderly handled, and deported in an earthen jar to some field, where it is released and allowed to escape. But this feeling, happily, is not universal, and the cobra has many enemies, which limit its increase. Besides by its natural foes, such as the mongoose (*Herpestes*), pigs, rapacious birds, and other creatures, numbers are destroyed by low-caste people for the sake of reward. But still the loss of human life from their bites is very great, and calls for more effective measures by which it may be mitigated.

The *Ophiophagus elaps* (Hamadryad, Sunkorchor) is one of the largest venomous snakes. It attains a length of twelve to fourteen feet, is very powerful and active, and is said to be aggressive; it is hooded like the cobra, and resembles it in general configuration and character. The colour varies according to age and locality; the adult is some shade of olive green or brown; the shields of the head, the scales of the neck, hinder part of body and tail, are edged with black; the body and hood are marked with black oblique bands, like the chevrons on a sergeant's sleeve. Apparently there are several varieties with modifications of colouration, but the general characters are essentially the same. The young, however, differ considerably from the old, and might be mistaken for another genus; they are black, with numerous white, equidistant, narrow cross-bands. The shields surrounding the occipital are large, and give a distinctive character to the adult snake. This snake, though widely distributed, is not anywhere common, and probably does not destroy many human lives; but it is very deadly, and its gold-coloured virus seems to have similar effects to that of the cobra. I had several specimens in Calcutta, one of nearly twelve feet in length, but it has been seen of a greater length. It is apparently not found in the North-West or Central India, but in Bengal, Burmah, Assam, Orissa, Southern India, and the Sunderbunds. One was killed in the Botanic Gardens of Calcutta of  $8\frac{1}{2}$  feet long. The ophiophagus, like many other snakes, takes to the water readily. A friend informed me that he shot one in the river near Terryah Ghat, at the foot of the Khasyah Hills. He was going slowly up the stream in a boat, when



he met it coming towards him with its head raised several inches out of the water. This individual was above nine feet in length.

The Rev. Dr. Mason, in his work on Burmah, gives the following account of the ophiophagus:—

The natives describe a venomous serpent which grows to be ten or twelve feet long, with a short blunt head, a dilatable neck, thick trunk, and short tail; it is of a darker colour than the cobra, or nearly black. I have never seen it, but the description accords so well with the generic character of *Hamadryas*, that it must be a species of that genus.

‘The *Hamadryas*,’ says Dr. Cantor, ‘is very fierce, and is always ready not only to attack, but to pursue when opposed.’

This, too, is a conspicuous trait in our Tenasserim serpent. An intelligent Burman told me that a friend of his one day stumbled upon a nest of these serpents and immediately retreated, but the old female gave chase. The man fled with all speed, and terror added wings to his flight, till, reaching a small river, he plunged in, hoping he had thus escaped his enemy; but, on reaching the opposite bank, up reared the furious *Hamadryad* ready to bury his fangs in his trembling body. In utter despair he bethought himself of his turban, and in a moment dashed it on the serpent, which darted at it like lightning, and for some moments wreaked its vengeance in furious bites, after which it returned quietly to its former haunts.

Karens from Pegu describe a species of *Hamadryad* with black and white transverse bands. It is often seen twelve feet long by a foot in circumference, and one of my informants tells me he has seen them three fathoms long and proportionately large.

The Bengalee name is *Sunkerchor*. It is found in the forest and grass jungle. It is said to live in hollow trees, and to climb them readily, being frequently found resting in the branches. As its name implies, it feeds on other snakes, though probably, when its favourite food is not forthcoming, it is contented with birds, small mammals, frogs, fish.

It resembles the cobra, except that it is longer in proportion to its size, and its hood is relatively smaller; it is even more graceful in its movements and turns more rapidly; it is occasionally seen with the snake-charmers, who prize it highly as a show, but they say it is very dangerous to catch and difficult to handle before its fangs are removed. A fine specimen of the ophiophagus of about nine or ten feet in length lived for some ten years in the Zoological Society’s Gardens, Regent’s Park, and died a year or two ago; it consumed numbers of the common English snakes, and, I believe, would eat nothing else. It seemed a quiet, unaggressive creature until roused, when it would raise its head, dilate its hood, and strike at any object brought near it. I have had several living specimens when in India, and never saw anything to suggest the idea that they were fiercer or more aggressive than the cobra; on the contrary, they seemed, if anything, less irascible and disposed to strike. The poison is as active and very similar in its effects to that of the cobra. I have no means of ascertaining the extent of injury to human life done by this snake. There can be no doubt that its bite is most fatal; but, from its com-



parative rarity and the remoteness of its haunts, it seems probable that human beings seldom fall victims. I may note here that the largest living specimen I ever possessed was nearly twelve feet in length; it came from Burmah and was of the dusky variety.

Bungarus.—In this genus there are two Indian species; both are common, but the *Bungarus cæruleus*, or krait, is probably, next to the cobra, the most destructive snake to human life. The other species, *B. fasciatus*, sankni or raj-samp, is probably equally poisonous; but it is not so much brought in contact with men, and therefore occupies an inferior position to *cæruleus* as a destroyer of human life.

The krait is of a dark, almost steel-blue black to a chocolate brown, with narrow white cross streaks, rings, or bars of white; the ventral surface is of a dark livid colour, or of a white or yellow tinge; but there are varieties in the form of colouration. This species is common all over India. The fangs are smaller than those of the cobra, and its poison is not so rapid in its action; but it is very dangerous and destructive. It is found in the fields, in grassy plains, rice ghats, low scrubby jungle, and among *débris* of wood and buildings. It insinuates itself into houses, into the bath-rooms, verandahs, on the ledges of doors, jhilmils, book-cases, cupboards; it is in such situations that it not unfrequently causes fatal accidents.

I remember an instance where, after a night's journey in a palanquin, a lady, in taking out her things, found a krait coiled up under her pillow; it had been her travelling companion all night. It is sometimes mistaken for *Lycodon aulicus*, an innocent snake which it much resembles; but the least examination detects the difference. The krait grows to the length of nearly four feet. There was one in the Indian Museum of  $47\frac{3}{4}$  inches, but it is usually much smaller. The scales along the dorsal region are hexagonal and very characteristic.

*B. fasciatus* (Raj-samp or Sankni).—Bites from this snake are comparatively rare, but are very dangerous when they occur; it is larger than *cæruleus* and is beautifully marked with rings of yellow on a dark steel-blue ground. The metallic lustre of the skin is very beautiful; its body is of a triangular shape, and it has the characteristic hexagonal scales along the dorsal ridge.

I killed one in Rangoon of over five feet in length. It is tolerably common in Bengal, Burmah, and Southern India, and is known in the North-West. Its bite is very fatal, like that of the krait; but, as men are not so much exposed to it, it is not so destructive as that snake. It is found in the open country, in grass, low jungle, and in the fields, in holes in the ground, sometimes deep down among the roots of trees. It is not often found in inhabited places, but does sometimes find its way into a native hut, as in the case of the one killed in Rangoon, where it disturbed a hutful of coolies during the Burmese war. It feeds, like the krait, on small animals, mice, birds, frogs, lizards—probably on small snakes and even insects. It is not very aggressive, and tries to escape when discovered; but, when



attacked, retaliates fiercely. It lies coiled up, and, when disturbed, jerks itself out like a spring, but does not extend its whole length of body.

Xenurelaps.—There is only one species of this genus, which is exceedingly rare, and is closely allied to Bungarus. As it does not contribute to the death-rate, I pass it with this brief notice.

Callophis.—This genus has several species in different parts of India, which are all more or less brilliantly coloured. They are not aggressive, and bite reluctantly. The poison is fatal to small animals, but there is no reason to suppose they destroy human beings; so it is not necessary to do more than enumerate them as *Callophis intestinalis*, *C. maclellandi*, *C. anularis*, *C. trimaculatus*, *C. nigrescens*, *C. cerasinus*.

The viperiform sub-order has two families—Viperidæ or Vipers, and Crotalidæ or Pit Vipers. These are represented in India—the former by two genera, *Daboia* and *Echis*, each of which has one Indian species, viz., *Daboia russelli*, or Tie Polonga, Uloo-bora, Sea-Chunder, Jessur, and other local synonyms, and *Echis carinata*, or Kuppur, Afæ, and other synonyms: both very dangerous snakes.

The latter has several genera: *Trimeresurus*, with seven species; *Peltopelorus*, one species; *Halys*, two species; *Hypnale*, one species. These snakes are all venomous, but few deaths are attributed to their bite.

The *Daboia* (*Daboia russelli*), sometimes called cobra-monil and chain viper, is a very beautiful snake; it is of a light chocolate colour, with three series of large black, white-edged rings; a yellow line is on each side of the upper surface of the head, these lines converging on the snout; rectal and labial shields yellow, with brown margin, a triangular, brown, black-edged spot behind the eye; ventral surface yellowish, or marbled with more or less numerous semicircular brown spots on the hinder margin of the ventral shields.

It attains a considerable size—forty to fifty inches. I had one which was forty-four inches in length, and four and a half in circumference. It is common in Bengal, the south of India, Ceylon, and Burmah, and probably may be found all over the plains, and on the hills up to 6,000 feet in Cashmir; but its usual habitat is lower. I am not sure about it in Central India, the North-West Provinces, and Punjab; but, if there, it is less common than further south.

Dr. Russell says it is doubtful whether it is not as venomous as the cobra. My experience inclines me to so nearly agree with Dr. Russell as, at all events, to place it next the cobra. Fowls bitten by it sometimes expire in less than a minute. The effect of the poison is different to that of the colubrine snakes; it causes complete fluidity of the blood, and other conditions already referred to. It is nocturnal in its habits, is sluggish, and does not readily strike unless irritated, when it bites with great fury; it hisses fiercely and strikes with great vigour. Its long movable fangs are very prominent objects,



and with them it is capable of inflicting deep as well as poisoned wounds. Its loud hissing, when disturbed, is calculated to warn those who approach it. It does not appear to cause many human deaths, but it may be that its misdeeds are sometimes ascribed to the cobra. The official returns ascribe many deaths to snakes unknown; were the real culprit detected, it is probable that the daboia would figure more prominently than he does at present. It is a hardy reptile. I had one, forty-four inches in length, which obstinately refused food or water for a whole year, and was vigorous and venomous to the last, when it died suddenly. The daboia is said—and one can well believe it—to kill cattle frequently when grazing, by biting them about the nose or mouth. In proof of its sometimes sluggish nature, there is a well-authenticated case of a young person who picking one up, and, mistaking it for an innocent snake, carried it home; its true character was discovered when it bit a dog or some other animal. It had not attempted to injure the person who carried it.

Echis.—There is only one Indian species, *Echis carinata* (Kuppur, Afæ). This snake is much smaller than the daboia, and grows to the length of twenty inches or more; it is terrestrial and viviparous. I have never seen it in Bengal, but it is common in the North-West Provinces, Punjab, Central Provinces, Scinde, and generally in the south of India, in the Annamally Hills, in the Carnatic, and in the vicinity of Madras. It is of a brownish-grey colour, with a series of quadrangular or sub-ovate whitish spots edged with dark brown; a semicircular band on each side of the dorsal spots enclosing a round dark-brown lateral spot; a pair of oblong, brown, black-edged spots on the centre of the head converging anteriorly; a brownish spot below, and an oblique hood-streak behind the eye; ventral surface whitish, with brown specks. The head presents the appearance of being marked by a cross. The scales are keeled; those on the lateral series have their tips directed downwards obliquely; it is the friction of these against each other that gives it the power of making a peculiar rustling sound. The echis is a very fierce and vicious viper; it throws itself into an attitude of defence and offence, coiled up like a spring, and rustling its carinated scales as it moves one fold of the body against another. It is aggressive, and does not wait to be attacked before darting its head and body out at its enemy, the mouth wide open, and the long fangs vibrating, presenting a most menacing appearance. It is very poisonous; the virus is very active, and of the same character as that of daboia. There can be little doubt that it destroys many human lives, as men are much more exposed to contact with it than with the daboia, because it is of so fierce and aggressive a nature. It is said to live largely on the Scolopendridæ, but probably it preys also on small mammals, frogs, and small birds. For reasons previously given, I am unable to say to what extent it is destructive to human beings; but, from the circumstances under which it exists, there is



little doubt that in some parts of India it is chargeable with a considerable number of deaths.

The Crotalidæ or pit vipers have several genera in India. They are less dangerous than their American congeners, but are all poisonous. They are remarkable for the pit or depression between the eye and nostril in the loreal region; the triangular broad head, and short thick body.

The Halys is the only Indian genus or species with any vestige of the caudal appendage, which has given the name of rattlesnake to certain American Crotalidæ, and in this species it is reduced to a horny spine at the end of the tail.

Many of the Indian Crotalidæ are arboreal snakes, and in colour resemble the foliage and branches of the trees in which they live.

There are several genera: Trimeresurus: *T. gramineus*, *T. erythrurus*, *T. carinatus*, *T. anamallensis*, *T. monticola*, *T. strigatus*, *T. macrosquamatus*. Peltopelorus: *P. macrolepis*. Halys: *H. himalayanus*, *H. elliotti*. Hypnale: *H. nepa* (or Carawilla).

Cantor says of Trimeresurus: 'Although the genus has venomous organs as highly developed as Crotalus or Viper, the effects produced by wounds of this species at least appear to be less dangerous than might be supposed.' Hodgson saw a man who was bitten by one suffer severely from pain and swelling, but he never heard of a fatal case. All who have had any experience say the same—the symptoms are severe pain and swelling of the bitten part, with nausea, sickness, depression, fever, and even sloughing of the bite, after which recovery is rapid. The effects, in short, are not unlike those produced by an adder. It is needless to discuss this any further, for all the genera and species seem to be about the same in this respect. The *Hypnale nepa*, or Carawilla, of South India is reported to be very dangerous, and is dreaded; but its bite, if ever fatal, is exceptionally so to man. It is possible that a few of the deaths may be due to these creatures, but they can be but very few.

It remains now only to make a brief reference to the pelagic colubrine snakes, or hydrophidæ. The members of this family may be recognised at once by the peculiarities of their conformation, which is adapted for an aquatic life. They are all, so far as is known, venomous, and inhabit the sea—the salt-water estuaries and tidal streams. They have a very wide range of distribution in the Indian and Pacific Oceans.

They have a great variety of form, but the transitions are very gradual; some attain a considerable length—I am not able to say how large, but have not seen one of more than five feet; no doubt they often exceed this. They are very poisonous, and, though accidents are rare, yet I have the records of cases where their bite proved fatal, as in the case of a sailor of H.M.S. 'Algerine' at Madras; in another of a sea captain at a port in Burmah; another of a fisherman



bitten in the Salt Lake near Calcutta—all fatal. The fishermen and sailors on the coasts know their dangerous properties and avoid them.

The hydrophidæ have smaller heads, jaws, and fangs than the land snakes; the fangs have open grooves in some, but not all. The virus is very active, and appears to operate as speedily and certainly as that of the land snakes. They have an elongated body like the land snakes; in some instances it is short and thick; in others it is very thick towards the tail, and most disproportionately elongated and attenuated in the neck, whilst the head is very minute. The colouration is varied, often brilliant and beautiful. The hinder part of the body and tail is flattened and compressed vertically, almost like the fin or tail of a fish, and it answers the same purpose, for with it they swim with ease and rapidity. They live, with rare exceptions, in the sea or tidal water; when thrown on the land by the surf, as they frequently are, at Poorie and other places along the coast, they are helpless and almost blind. Their food is fish and small aquatic creatures which they pursue and overtake in the sea. There are certain parts of the Bay of Bengal where they are seen in great numbers, and their movements in the blue water are agile and beautiful. There are four genera of the family in the Indian seas: *Platurus*, *Enhydrina*, *Pelamis*, *Hydrophis*. *Platurus* has two species, *P. scutatus* and *P. fischeri* (Bay of Bengal, tidal streams near Calcutta). This genus has several characters of the land snakes, *e.g.* well-marked ventral shields; body sub-cylindrical and not compressed like the *hydrophis*; colour is black, tinged with yellow.

*Enhydrina* has only one species—*Enhydrina bengalensis* (Valakadyen); it is very poisonous, body compressed, belly carinate, tail flat and compressed, almost like a fish's fin; colour bluish-grey, with dark bands of the same, though deeper colour; no ventral shields. *Pelamis* has only one species—*P. bicolor*.—one of the most curious sea snakes in the Bay of Bengal; no ventral shields; body flattened, yellow sides and belly, back black; it is called kullundur and is very poisonous. The species of *hydrophis* are numerous; in the Indian Seas about thirty have been described, and there are probably others. They present a considerable variety of form and colouration; some have elongated necks and small heads, the posterior part of the body being larger than the anterior; others have not this characteristic; but they have all a strong family likeness, and may be recognised at once by their compressed bodies, finlike tails, and the general absence of well-marked ventral scutæ. Their colouring is also remarkable, green, yellow, black, in bands or rings, being a common pattern. They are all poisonous, and, in a few experimented with, the virus was most deadly. The fangs are small and in some partially grooved. They are entirely pelagic, though they enter the tidal rivers, and, when thrown on shore, are helpless. They are delicate, and seldom live long in captivity. A *H. coronata* sent to me from



one of the tidal streams near Calcutta lived some days in a large tub of salt water, which was frequently changed; it proved its venomous character by biting and rapidly killing a fowl. This snake had a very small head and slender neck, which was more than one-third of the creature's entire length. It was of yellowish olive ground-colour, with about fifty blackish rings, which were broader than the interspaces. Head and ventral side of the neck black, the former with a yellow horseshoe-shaped mark across the frontal and nasal shields; tail had ten or twelve back cross-bars; ventral shields distinct, being rather larger than the ordinary scales.

Space does not admit of more detailed description of the other species. This one may be taken as a type of all. It is impossible to mistake them, and they are all, as far as known, poisonous. They cause occasional accidents to swimmers or to fishermen, or others who handle them when taken out of nets, or picked up on the shore; but they certainly do not contribute to any extent to the death-rate of either men or domestic animals. It is difficult to conceive of what use the poison can be to them.

The mortality from snake-bite is very great. The average loss of life during the last eight years has been 19,880 human beings, and 2,100 head of cattle yearly. I regret that I am unable to state how many of these deaths are to be ascribed to the cobra, or each particular snake, as I have been unable to obtain any reliable returns which entered into this special detail. But when conducting an investigation into this subject in India some years ago, I was then able to make out that of 11,416 deaths of human beings in 1869, out of a population of 120,914,283, 2,690 were assigned to cobras, 359 to kraits, the balance being caused by snakes unnamed. This return is of little value, but it indicates what is well known, that the cobra is by far the most destructive of the venomous snakes of India. Mr. V. Richards, who has investigated the subject closely, says the cobra causes nine-tenths of the human deaths. The snakes which are most destructive to life are probably in the following order: The cobra, *Naja tripudians*; the krait, *Bungarus cœruleus*; the kuppur, *Echis carinata*; Russell's viper, *Daboia russelli*; the hamadryas, *Ophiophagus elaps*; the Raj-samp, *Bungarus fasciatus*. The hydrophidæ are probably not less dangerous, but they are comparatively rare, and seldom brought in contact with human beings, and thus do not contribute so largely to the death-rate.

The number of snakes destroyed, in 1887, amounted to 562,221, for which rewards amounting to Rs. 37,912 were paid. The table shows in detail the number of human beings and cattle killed by all poisonous snakes together, the number of snakes killed, and the amounts paid for their destruction each year from 1880 to 1887 inclusive. Appended also is a short statement showing the deaths from snake-bites in different parts of India during the year 1887,



the latest reports we possess; with a late resolution in the Home Department, which shows how far the Government of India is interesting itself in this question.

*Destruction of life in India by snakes from 1880 to 1887.*

	1880	1881	1882	1883	1884	1885	1886	1887
Number of people killed . . .	19,150	18,670	19,519	20,067	19,629	20,142	22,134	19,740
Number of cattle killed . . .	2,536	2,029	2,167	1,644	1,728	1,483	2,514	2,716
Number of snakes killed . . .	212,776	264,968	322,401	412,782	380,981	420,044	417,596	562,321
Amount of rewards paid . . .	Rs. 11,664	Rs. 11,996	Rs. 11,873	Rs. 22,353	Rs. 28,551	Rs. 25,213	Rs. 25,361	Rs. 37,912

DEATHS FROM SNAKE-BITE IN 1887.

In *Madras*, 1,263 people were killed and 1,070 cattle; 302 snakes were destroyed, and no rewards paid.

In *Bombay*, 1,168 people were killed and 48 cattle; 311,476 snakes were destroyed, and Rs. 6,269 paid in rewards.

In *Bengal*, 9,131 people were killed and 509 cattle; 35,054 snakes were destroyed, and Rs. 4,433 paid in rewards.

In the *N.W. Provinces and Oude*, 5,765 people were killed and 216 cattle; 25,864 snakes were destroyed, and Rs. 3,140 paid in rewards.

In the *Punjab*, 843 people were killed and 77 cattle; 177,080 snakes were destroyed, and Rs. 22,826 paid in rewards.

In the *Central Provinces*, 928 people were killed and 44 cattle; 2,065 snakes were destroyed, and Rs. 844 paid in rewards.

In *Burmah*, 213 people were killed and 428 cattle; 8,431 snakes were destroyed, and no rewards paid.

In *Assam*, 198 persons were killed and 190 cattle; 269 snakes were destroyed, and Rs. 15 paid in rewards.

In *Coorg*, 1 person was killed and no cattle; 48 snakes were destroyed, and Rs. 8 paid in rewards.

In the *Hyderabad Assigned Districts*, 182 people were killed and 134 cattle; 697 snakes were destroyed, and Rs. 140 paid in rewards.

In *Ajmere and Merwara*, 47 persons were killed and no cattle; 575 snakes were destroyed, and no rewards paid.

In *Bangalore*, 2 people were killed and no cattle; 660 snakes were destroyed, and Rs. 236 paid in rewards.

*Extracts from Home Department Resolution for 1886, referring to Venomous Snakes.*

The number of deaths from snake-bite rose from 20,142 in 1885 to 22,134 in 1886.

Of the total mortality by wild animals and snakes, no fewer than 18,805 cases occurred in the Lower Provinces of Bengal and in the N.W. Provinces and Oude, and of this number 16,926 deaths were caused by snakes alone. . . .



The mortality in the several provinces does not vary much when compared with the figures of the preceding year, except in the N.W. Provinces and Oude, where there was an increase in deaths from snake-bite of 1,499, which chiefly accounts for the somewhat large increase in the total mortality of the year. . . .

There was a falling-off in the number of snakes killed from 420,044 to 417,596. As in previous years, the provinces in which snakes were largely destroyed are Bombay, Bengal, the N.W. Provinces and Oude, and the Punjab. The decline is due to a large decrease<sup>2</sup> in the number of snakes destroyed during the year in Bengal, the cause assigned being the same as that alleged for the falling-off in the number of wild animals killed, namely, the small amount available for the payment of rewards. This matter is also being inquired into by the Local Government. In the Hyderabad Assigned Districts, the system of granting rewards for the destruction of snakes, which was in force only in municipal towns, has been extended to towns with dispensaries, and rewards are now paid on the authority of certificates granted by hospital assistants—a measure which the Resident believes will act as an inducement towards the destruction of snakes.

As regards the measures to be adopted for reducing the annual loss of life by snake-bite, I stated my views in 1872, and they are much the same now as they were then. The chief points are, to make known the appearance and habits of the poisonous snakes, and to institute proper rewards for their destruction. With a plain description and a faithful representation in colour of each species, such as is given in the *Thanatophidia of India*, the people can be made acquainted with the characters that distinguish the venomous from the harmless snakes, and thus learn to avoid or to destroy them. A rate of rewards varying from 8 annas to 2 annas, according to the species, was and is again suggested. From the last reports published it appears that rewards, when offered at all, are too small; while some local authorities consider the plan of rewards to be altogether futile, some hold that it conduces to the breeding of serpents and their increase rather than diminution. The subject has often received the careful consideration of the Indian Government, and a variety of measures have been resorted to with a certain amount of success; but it is to be feared that, until a well-organised system be adopted and carried out on the lines suggested, the evil will not be fairly grappled with and overcome.

Something has been, but still more might be, done. There should be more concentration and organisation; regulations should be laid down and uniformly enforced throughout the whole of India; whilst every encouragement should be afforded to those to whom is entrusted the duty of dealing with an evil which is, to a certain extent, removable, whilst a higher scale of rewards should be offered for the destruction of the snakes. Until some such measures are generally and systematically resorted to, there will be no material diminution in the loss of human life from snake-bite, which cannot now be rated at much under 20,000 annually.

J. FAYRER.

<sup>2</sup> 1885 : 53,995. 1886 : 31,204.



