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THE FAUNA OF A DESERT TRACT IN
SOUTHERN INDIA.

PART I.—BATRACHIANS AND REPTILES. PART II.—INSECTS AND ARACHNIDA.

BY

N. ANNANDALE, D.Sc., C.M.Z.S.

Deputy Superintendent of the Indian Museum.

PART III.—A LIST OF A SMALL COLLECTION OF MAMMALS.

BY

R. C. WROUGHTON, F.E.S.

(WITH THREE PLATES)



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INDEX SLIP.

ZOOLOGY.

ANNANDALE, N.—Notes on the Fauna of a Desert Tract in Southern India. Pt. I.—Batrachians and Reptiles, with remarks on the Reptiles of the Desert Region of the North-West Frontier, with two plates. Calcutta Mem. As. Soc. Beng. Vol. I, No. 10, 1906, p. 183.

Rana greenii, recorded from the mainland of India.

Nicoria tejuja var. *thermophilis*, recorded from the mainland of India, Annandale, N., etc.

Teratolepis scabriceps, sp. nov. Annandale, N., p. 187.

Typhlops bramius var. *arenicola*, var. nov. Annandale, N., Calcutta Mem. As. Soc. Beng. Vol. I, No. 10, 1906, p. 192.

Typhlops limbrickii, sp. nov. Annandale, N., Calcutta Mem. As. Soc. Beng. Vol. I, No. 10, 1906, p. 193.

Typhlops psammophilus, sp. nov. Annandale, N., Calcutta Mem. As. Soc. Beng. Vol. I, No. 10, p. 193.

Naja tripidians var. *aures*, var. nov., Mem. As. Soc. Beng., p. 196.

Dryophis mycterizans var. *anomalus*, var. nov., Mem. As. Soc. Beng., Annandale, N., p. 196.

ANNANDALE, N.—Notes on the Fauna of a Desert Tract in Southern India, Mem. As. Soc. Beng., Pt. II.—Insects and Arachnida. Calcutta Mem. As. Soc. Beng. Vol. I, No. 10, 1906, pp. 203-219.

Cophogryllus arenicola, sp. nov. Annandale, N., Calcutta Mem. As. Soc. Beng. Vol. I, No. 10, 1906, pp. 203-210.

Physothryphus coprolagus, sp. nov. Annandale, N., Calcutta Mem. As. Soc. Beng. Vol. I, No. 10, 1906, p. 214.

Trombidium grandissimum, habits of, Annandale, N., Calcutta Mem. As. Soc. Beng. Vol. I, No. 10, 1906, pp. 216-217.

WROGONTOV, R. C.—Notes on the Fauna of a Desert Tract in Southern India. Part III.—A list of small collection of Mammals from Ramanad. Calcutta Mem. As. Soc. Beng. Vol. I, No. 10, 1906, pp. 221-222.

Notes on the Fauna of a Desert Tract in Southern India. Part I.—Batrachians and Reptiles, with remarks on the Reptiles of the Desert Region of the North-West Frontier.

(With two plates.)

By N. ANNANDALE, D.Sc., C.M.Z.S., *Deputy Superintendent of the Indian Museum.*

[Read December 6th, 1905.]

CONTENTS.

	<i>Page.</i>
Introduction	183
Batrachians from Rámanád	184
Reptiles from Rámanád	185
A list of the Reptiles collected by the Seistan Arbitration Commission 1905)	196
A list of the Reptiles recorded from Rámanád	198
Notes on distribution	199
Notes on colour	201

INTRODUCTION.

Although what may be called the characteristic fauna of Southern India (*i.e.*, that of the "Malabar tract")¹ has been investigated, as regards the vertebrates, in some detail, there are still considerable tracts of country even in this part of the peninsula which remain almost unknown to the zoologist. With the rich jungles of the hills, and the fertile uplands, in their vicinity, it is hardly surprising that Indian naturalists should have neglected the barren coastal plains, which are so unattractive in appearance and offer, comparatively speaking, so poor a harvest to the collector. Indeed, the fact has been almost ignored that these barren tracts are not entirely confined to the coast, but expand inland into what may be called, without exaggeration, miniature deserts. It is with one of these miniature deserts, in which I spent the month of August, 1905, that this communication deals.

The subdivision of Rámanád is at present part of the district of Madura. It has an area of over 2,000 square miles, and extends along the Indian shore of the southern extremity of Palk's Straits and the extreme northern corner of the Gulf of Manaar, including the island of Ráméswarem and extending inland for some little distance on the mainland. Obviously the formation of the country is very recent. The soil throughout the greater part of it is mere sea-sand, which is often impregnated with common salt, and sea shells are abundant at ten miles from the sea. The salt in the soil is said to be extending its range, soaking gradually in a widening circle through the sand, and is thus rendering the absolutely infertile area, which gradually disappears inland towards Madura proper, more extensive. The whole subdivision is absolutely flat. In some places open woods

¹ See Blanford in *Phil. Trans. Roy. Soc. B.* CXCIV, 1901, p. 346.

of the Bábul Thorn (*Acacia arabica* Willd.) cover a considerable area, and there are large groves of Cocanut and Palmyra palms. The sandy wastes, where they are free of salt, bear at intervals scattered bushes of *Cassia auriculata* Linn. (the yellow flowers of which are most conspicuous), and in some places several of the poorer cereals are cultivated when the rains occur. For the greater part of the year, however, ordinary cultivation is impossible, the beds of the few rivers being dry or containing a very slender stream of water in their depths, and all except a few of the deeper tanks and wells being empty. Between October and January the rainfall is sometimes considerable; but at all seasons it is liable to fail. There is, close to the town of Rámanád, a basin about five miles square which after heavy rain becomes a lake, and then the rivers are in flood. Even during my visit in August, a few brief and extremely local thunder-storms occurred, and the air, owing to the proximity of the sea, was often very moist.

My visit to Rámanád was rendered successful largely by the kind offices of the Rev. A. D. Limbrick, of the S.P.G. Mission established in the capital of the subdivision. I am also indebted to the suggestions of Col. A. W. Alcock, F.R.S., at whose recommendations the Trustees of the Indian Museum permitted me to go to Southern India. The nomenclature in this paper is that of Boulenger's volume in the "Fauna of India," except when it is otherwise stated.

BATRACHIA.

RANA CYANOPHLYCTIS.

The specimens observed were all small, the largest male preserved measuring 41 mm. in length. This frog is very common in the little pools which are formed in the sand by every shower of rain, in wells, and at the edge of the larger tanks.

In the evening, after a shower of rain, the males became very noisy. Judging from a few tadpoles and young individuals which were seen in August, and from notes made on *R. limnocharis* and *Rhacophorus leucomystax* in Malaya and *Rana tigrina* in Calcutta, this croaking of the males means the renewal, to some extent, of sexual activity, but is not, unless climatic conditions are favourable, necessarily followed by breeding. After every shower, however, it appears that a few couples, suddenly aroused, in many cases from torpor, are sufficiently vigorous actually to produce young, which may either perish or survive according to circumstances; the true breeding season being apparently in the rains. It seems probable, moreover, that fall of comparatively cold water on their bodies affords sufficient stimulus, in the case of many frogs inhabiting warm countries, to induce a renewal both sudden (and it may be, as far as the offsprings are concerned, inconvenient) of the sexual instinct. Mr. E. J. Bles's observations on the breeding habits of *Xenopus laevis* in captivity¹ give very powerful support to this view.

RANA GREENII.

R. greenii, Boulenger in *Spolia Zeylanica* ii., p. 74.

A single specimen was obtained at Rámanád which I believe to represent this form. It was a female measuring 35 mm. in length. I have gone through the large series in

¹ *Proc. Cambridge Phil. Soc.* XI, p. 220.

the Indian Museum identified as *Rana limnocharis* by Mr. W. L. Sclater¹ and can find no specimen which agrees either with *R. greenii*, *R. brevipalmata*, or with *R. nilgirica*. We are badly off, however, as regards examples of most of the South Indian Batrachians.

BUFO MELANOSTICTUS.

Common at Rámanád and on Ráméswarem, as it is throughout the plains of India, Burma, Ceylon, Siam and Malaya. Immediately after dark numerous individuals may be found hopping slowly along even in the driest localities. The eggs seem to be laid, as a rule, in small pools of rain-water.

In Calcutta, I have on several occasions observed individuals of this Toad seated under lamps attached to the wall of a house, and feeding on the insects which burnt their wings and fell to the ground (cf. *postea*, pp. 186, 209).

REPTILIA.

TESTUDO ELEGANS.

Not uncommon on the sand, both in Ráméswarem and on the mainland. Its food consists largely of the thickened, almost leafless stems of certain desert plants. It is mild in behaviour and soon becomes very tame.

The species reaches at least 18 inches in length of carapace, judging from specimens in the Museum; but all those seen in Rámanád were small.

NICORIA TRIJUGA var. THERMALIS.

This form does not appear to have been recorded previously from the mainland of India, but is by far the commonest Tortoise throughout Rámanád. It appears to be entirely terrestrial in its habits and is found on the sand at considerable distances from water. In captivity it shows no eagerness for vegetable food, but the Tamils say that it feeds on the stems which form a great part of the diet of *Testudo elegans*. Only young specimens were obtained.

HEMIDACTYLUS FRENATUS.

A very common Gecko in houses throughout the whole of Southern India. We have specimens from the Calcutta bazaars in the Museum; but they may have been introduced, as the species is rare in Lower, though abundant in Eastern Bengal.

HEMIDACTYLUS BROOKII.

Equally common with the preceding species in houses in Rámanád and throughout the greater part of India. It occurs in human habitations in Calcutta² but is not here so abundant as *H. flaviviridis*. A pair, however, have taken up their abode for some months

¹ See *List of the Batrachia in the Indian Museum*, 1892.

² I have lately found it (March 1905) abundant under stones on dry soil in jungle on hills near Chakardharpur, Chota Nagpur. (March 8th, 1906.—N. A.)

in a basket of papers, which are very seldom disturbed, on my writing-table in Calcutta. I think they are male and female, but cannot be quite sure on this point. One of them lost its tail by some accident, and the new tail took about a month to grow to its former size.

A habit of this Gecko, and also of *H. flaviviridis*, *H. frenatus* and *Gehyra mutilata*, appears to be little known among herpetologists (although well known to all observant residents in the East) and therefore worthy of record. I mean the habit of frequenting the neighbourhood of artificial light at night and feeding on the insects attracted thereby. I have frequently noticed, both in Calcutta, in Colombo, and in Singapore, that almost every street lamp contains at least one Gecko after the lamp-lighter has gone his round. In Calcutta, if a lamp is fastened to the wall of a house, either inside or out, an individual, or frequently a pair, of *H. flaviviridis* takes up its residence in the immediate vicinity, frequently behind the lamp, and issues out at night to catch prey with the aid of the light. The pair of *H. brookii*, to which I have alluded above, were probably attracted to the basket in which they live, by the fact that a lighted lamp was placed beside it every night, and certainly they benefit by feeding on the insects which burn their wings. Elsewhere I have noted an instance of an insect (the Mantis, *Hierodula modesta*)¹ acting in a similar manner, while attention is drawn above to an identical procedure on the part of a Toad.

The frequency with which the different species of house Geckos are seen in pairs leads me to think that they are monogamous. If I am right, the association is not dissolved at the end of the breeding season in all cases; for even at the beginning of December, when the Lizards are in a semi-torpid condition and only issue from their retreats occasionally, the two individuals, in the case of *H. brookii*, are just as frequently noted together as they were in August. Solitary specimens of *H. flaviviridis*, however, are as common as those which have, apparently, taken a mate.

HEMIDACTYLUS LESCHENAUTII.

This Gecko is abundant in all parts of Rámanád, but not in houses. Its favourite situation is the trunks of Tamarinds and other trees which have a greyish bark. Here its marbled grey back and sides render it most inconspicuous. In Calcutta I have seen it on the walls of out-houses, but never inside a human dwelling. It has been described, however, as a house Lizard, and very possibly is one in some parts of India; for *Gecko verticillatus*, a common house Lizard in many parts of Burma and Siam, does not habitually enter houses in the Siamese Malay States. The latter species is not, however, so admirably concealed by its coloration on the trunks of the Areca and Cocoanut palms it frequents, as *H. leschenaultii* is on stone walls and the bark of certain trees.

HEMIDACTYLUS TRIEDRUS.

Three specimens were obtained; one at Pamban, one at Mandapam, and one at Rámanád. Of the two latter, one was caught in a house and the other in a tent set up in a garden.

¹ *Proc. Zool. Soc.* 1900, p. 852.

In life this lizard has a beautiful but subdued coloration which rapidly disappears after death. The following description was taken from a living specimen: Ventral surface pinkish white; dorsal surface buff with a greenish tinge, with scattered white tubercles; three pale olive-green cross bars, each edged with white; supraocular region leaf-green.

TERATOLEPIS SCABRICEPS, sp. nov.

Diagnosis.

Habit rather stout, limbs short; tail cylindrical, swollen at the base, tapering distally; head large, flat; forehead convex; snout slightly longer than orbit, rounded, blunt. Head, dorsal surface of neck and shoulders covered with small, highly convex, rounded scales, which are smallest on the vertex and largest just above the fore-limbs. Scales on dorsal surface of the trunk not much larger than those on the belly, leaf-shaped, strongly imbricate, keeled or almost smooth. Two pairs of enlarged chin-shields, followed posteriorly by a number of irregular granules, the first pair meeting behind the mental; 7 to 8 upper, 6 to 8 lower labials; nostril between the rostral and several small scales. *Colour* pale grey, with a coarse and irregular reticulation of black and white on the back.

<i>Dimensions</i> ♀	Total length	...	...	75 mm.
	Head	...	...	14 "
	Body	...	...	31 "
	Tail	...	...	30 "
	Fore-limb	...	...	9 "
	Hind Limb	...	...	15 "

Two specimens from Rámanád; one an adult female containing two large eggs, the other half-grown.

The pupil is vertical, as it probably is in *T. fasciata* also. *T. scabriceps* is the second species of the genus to be described. The type form is only known from a few specimens, all of which appear to be in a bad state of preservation, from Central India and Sind. The new species differs from it (1) in its less graceful habit and shorter limbs; (2) in the possession of conical rounded scales on the head and fore-quarters; and (3) in having two pairs of distinctly enlarged chin-shields. Unfortunately the type of *T. fasciata*, the only other specimen of the genus to which I have access, is almost wholly disintegrated; but sufficient remains of the skin on the head and of the limbs to show that these differences are real ones.

Teratolepis and *Calodactylus* (the latter from North Arcot) are the only genera of their family peculiar to the Indian Fauna, both being highly specialized genera.

SITANA PONTICERIANA.

Very common throughout Rámanád, both on the seashore immediately above high tide-mark and inland.

I can bear out the statements of Jerdon and Blanford that this is, under natural

conditions, a ground lizard; but in captivity it is fond of resting on twigs stuck upright in the ground. In the middle of August the breeding season¹ was evidently about to commence. The gular appendage of the male was, in most cases, just assuming its brilliant coloration. In some specimens the anterior margin was bluish-grey, the remainder being dirty white; in others this margin was of a brilliant "Oxford" blue, the breadth of the streak thus formed varying with the degree of development. Within the blue streak scarlet spots were more or less conspicuous, first appearing as of a dirty grey colour. An additional ornamentation was very noticeable in fully developed living specimens, *viz.*, a pearly iridescence on the scales of the throat at the base of the appendage. These brilliant ornaments were quite absent in the females. The appendage is not a pouch and has no connection with the air-passages or the lumen of the gullet. It consists of a deep fold of skin, the cavity of which is filled with connective and muscular tissue, the latter taking the form of a stout band attached above to the base of the tongue and below to the lower extremity of the anterior margin of the appendage. When this muscle is tautened the anterior margin is drawn down into a vertical position, and the appendage, which is otherwise pressed tightly against the throat, is unfolded like a fan. The male, if undisturbed, may be watched standing with the fore-quarters well raised from the ground and the hind-quarters pressed back on the base of the tail (the distal extremity of which is raised in the air), alternately unfolding and folding the appendage. The female or females, to attract which the performance takes place, remain concealed beneath a bush or stone in the neighbourhood. If a male is roughly handled the appendage is likewise unfolded in the excitement of the struggle.

The arched position of the tail, with the base resting on the ground and the tip raised in the air, is very characteristic of this Lizard. When running it occasionally raises its fore-limbs from the ground, and the weight of the body is always supported very largely on the base of the tail. Several other Agamids have been observed to adopt a bipedal mode of locomotion when moving rapidly. The most notable instance is that of the Australian Frill Lizard.² Green has noted the same habit as regards *Otocryptis bivittata*³ in Ceylon, and I have done so as regards *Calotes versicolor*⁴ in Malaya. Mr. L. L. Fermor, of the Geological Survey of India, tells me that he has seen in Kumaon an *Agama* (probably *A. tuberculata*) momentarily assume an almost upright attitude, with the fore-limbs well raised from the ground, when running away.

¹ Living females brought to Calcutta from Rāmanād became distended with eggs in September, in which month one died egg-bound. The eggs were then large, but devoid of an outer covering and amorphous in outline. The distention of the body continued till December. Another specimen then died and was dissected. The oviduct contained eggs with a very tough leathery shell devoid of calcareous matter. They were rounded at either end and measured 10 mm. by 5 mm. In each the embryo, which had already passed through the earlier stages of development, was visible to the naked eye. Other similar eggs were laid about the same time and were buried by the parent in the sand, but soon died, if they were alive when laid, and shrivelled up. Rai R. B. Sanyal, Bahadur, Superintendent of the Calcutta Zoological Gardens, has called my attention to the long period for which house Geckos (? *Hemidactylus flaviviridis*) go with eggs, and is inclined to regard the long retention of the eggs by *S. ponticeriana* in captivity as possibly not abnormal. I lately saw large numbers of this lizard in open jungle in Chota Nagpur. Living among dead leaves or a dry, greyish soil, they were much darker and duller during life than specimens from the sandy wastes of S. India. They were also all very small. (March 8th, 1906.—N.A.)

² Saville Kent in *Nature*, LXVI, p. 630.

³ *Ibid.*, p. 492.

⁴ *Ib id.*, p. 577. Colonel Alcock permits me to say that he has seen *Calotes versicolor* running across his lawn in Calcutta with the fore-limbs raised from the ground.

CALOTES GIGAS.

C. versicolor (partim), *Annandale in Journ. As. Soc. Bengal*, 1905, p. 87.

In spite of what I said in the paper referred to regarding Blyth's *Calotes gigas*, I think that it will be well to regard this form as having conventional specific rank. It is evidently no more than a race (probably local) of *C. versicolor*; but as it does not appear to have been customary to recognize subspecies in the genus, it will be convenient to call it by Blyth's name pure and simple. When I published the note alluded to I had examined a large series of specimens, none of which were in good condition; but the examination of a considerable number of living and freshly-killed examples, both of *C. versicolor* and of *C. gigas*, shows that sufficient attention was not paid to certain characters which are obscure in badly-preserved material and can only be detected in such material when carefully sought for. The only objection to regarding the two forms as distinct species is the difficulty of diagnosing the females, for as regards the males, at any rate when they are adult or at least half grown, there is no such difficulty.

In both sexes the number of scales round the body, their arrangement and general character are practically identical in the two forms; but in almost all cases it is quite easy to separate one from the other on inspection. In *C. gigas* (both sexes) the scales of the body and limbs are distinctly larger, the body being relatively deeper than in *C. versicolor*; those which form the crest differ in outline, their posterior edge in *C. gigas* being more or less sinuous and their anterior edge convex forwards, while in *C. versicolor* both edges are nearly straight; in the former species, too, they are considerably longer than in the latter, while the scales adjacent to them on either side have a more pronounced character, their dorsal extremity being prolonged into a spine continuous with their strong keel. The extent of the crest backwards is also greater in *C. gigas* (both sexes) than in *C. versicolor*, and the cheeks are more swollen. The males of *C. gigas* have one very characteristic feature, which is apparent even in half-grown individuals:—the base of the tail is swollen and its dorsal and lateral surfaces are covered with scales the edges of which are greatly thickened and plicated, the keel also being thickened but barely extending to the edge of the scale posteriorly; while the last three spines of the crest are much thickened laterally. The coloration of the two forms is also slightly different, and *C. gigas* perhaps does not possess the same powers of colour-change as *C. versicolor*. The males of the former are (both in spirit and during life) of a sandy colour, which may deepen into yellow on the swelling at the base of the tail. The base of many of the scales on the back and sides is densely irrorated with chestnut atoms, and there may be dark transverse bars and reticulations on the sides. The greater part of the thigh is frequently black or very dark-brown, and the whole of the hind-quarters is generally darker than the fore-quarters. There are usually two conspicuous black spots on the top of the head just behind the occipital scale, which may be white, and more or less marked dark streaks radiate from the eyes. The female is far more boldly marked. The ground colour of the dorsal surface of the body and limbs is a pale chestnut, on which there is a very bold reticulation of sandy colour. The streaks radiating from the eye are more conspicuous than in the other sex; the two dark spots

behind the occipital scale are edged with white, and there are two or three broad, dark, pale-edged bars across the top of the head in front of this scale, the posterior bar being the most conspicuous. A black spot in front of the shoulder is constant in both sexes.

Boulenger's description of the coloration of *C. versicolor* in the "Fauna of India" is sufficiently exact as regards specimens preserved in spirit. Living specimens, especially females, have sometimes a greenish tinge, while young individuals of both sexes are easily recognized on account of a pale line which runs along each side and is often joined to its pair by dark cross-bars. The markings on the head in females may be similar to, but less conspicuous than, those on that of *C. gigas*. A satisfactory detailed account of the colour of the living *C. versicolor* is, however, rendered impossible by the powers of colour-change the Lizard possesses. As in the true Chameleon, with which this Lizard is frequently confused, these powers are regulated chiefly by psychological stimuli.

As regards actual dimensions, *C. versicolor* does not reach those of *C. gigas*. The following measurements show the bulk attained by well-developed adults of both sexes; they are taken from species which do not seem to be in any way abnormal as regards size. Possibly, however, the females grow larger than they would indicate:—

<i>Dimensions of Calotes gigas.</i>		♂	♀
Total Length	...	460 mm.	...
Head	...	35 "	27 mm
Body	...	95 "	74 "
Tail	...	330 "	injured
Hind Limb	...	95 "	80 "
Fore-limb	...	60 "	50 "
Breadth of Head	...	26 "	18 "

Numerous examples of *C. gigas* were obtained both on Rameswaram Island and on the mainland of Ramanad, and no other form was seen. It is not, however, confined to Southern India. Dr. A. Willey, Director of the Colombo Museum, has kindly sent me specimens from Colombo, where it would appear to be the common form, as it certainly is in the suburbs of Madras. We have specimens in the Museum, which a comparison with fresh ones has enabled me to detect, from Central India, S. Bombay, the North-West Provinces, and Sind; but the few we have from Baluchistan must be referred to *C. versicolor*. Whether the two forms occur together in any one locality I have not been able to ascertain with certainty.

C. gigas, as far as my observations go, is more arboreal, strictly speaking, in its habits than *C. versicolor*, which lives chiefly in bushes and on the ground. All the specimens I saw in Ramanad were on tree-trunks or running from tree to tree. The males crawl slowly up the trunks, nodding their heads to the females, which keep out of sight and are difficult to detect. For this reason, by far the greater number of the specimens brought me were males.

Muhammadans in Ramanad regard *Calotes* with great dislike and kill it whenever they get an opportunity. They say that some Muhammadans were once hiding in a well

and that one of these Lizards betrayed them to their enemies by standing above and nodding its head in their direction.

MABUIA BIBRONII.

This Skink is generally reckoned scarce in collections, but it is extremely abundant, together with *Sitana ponticeriana*, on the sands of Rámanád, especially on the shore at Pamben. It progresses very rapidly, carrying its body low and making as much use in progression of its tail as of its legs. It is one of the few Skinks with which I am acquainted in which the young are not more conspicuously marked than the adults. Small individuals, which may have been recently born or hatched, were common in August and closely resembled the adults. The adult males had a band of reddish brown running along the side which was absent from the females. Males of *Lygosoma sikkimense* obtained from Darjeeling in April had a very similar distinction.

In several examples a third lobule, smaller than either of the two normally present, occurred at the anterior edge of the ear-opening on one side (never on both sides) of the head. Very possibly the function of the unusually long lobules in this species is to prevent grains of sand from coming in contact with the tympanic membrane, which is protected or entirely covered in other sand-loving skinks, notably in those of the genus *Scincus* and *Ophiomorus*.

LYGOSOMA PUNCTATUM.

A single specimen was brought to me in the town of Rámanád.

CHAMÆLEON CALCARATUS.

Common in Rámanád, especially on Tamarind trees.

Under natural conditions the Indian Chameleon does not possess the same powers of colour-change as *Ch. vulgaris*. When undisturbed it is of a bright green colour, with a variable number of large pale-yellow spots and blotches on the sides, the midventral line from the chin to the vent, the soles of the feet, the gape and a line drawn backwards from it along the side of the head, and a horizontal bar behind the axilla being of the latter shade, as well as a suffusion on the sides of the throat immediately behind the head. When the animal is interfered with, the pale spots on the sides disappear and the whole head and body become blotched and marbled with dark green, the body being at the same time distended. In this condition the Chameleon attempts vigorously to bite, and even sits up on its hind legs, clutching at its adversary with its hands and hissing viciously. In captivity it becomes much paler in colour and loses its power of changing to a great extent. Narcotized specimens become almost black, as captive individuals frequently do during cold weather. The pale midventral line, however, never disappears. Young individuals, of four inches long, resemble adults as regards colour.

I am inclined to think that this species moves less deliberately than the North African form, and makes less use of its tail in progression. Although the tail is occasionally twined round a branch, it is just as frequently held coiled in a spiral beside the branch. A large male, obtained at Kilakarai, had lost the greater part of its tail by some accident.

The wound had healed, leaving a distorted stump; but the animal seemed in no way inconvenienced. There were no signs of new growth in the stump.

The natives of different parts of India have many superstitions regarding the Chameleon. The Hindus and Muhammedans of Rámanád regard it as being possessed by an evil spirit, and will not touch it lest the spirit should enter their own bodies. Like most Anglo-Indians they confuse it to some extent with Lizards of the genus *Calotes*, but they regard it as specifically distinct from the Lizards.

TYPHLOPS BRAMINUS var. ARENICOLA, var. nov.

Differs from the typical variety in being slightly stouter, in having a shorter spine at the tip of the tail, and most notably in colour. The ventral surface is white (in spirit) and each scale on the dorsal surface is faintly tinged with buff, those on the head being faintly vermiculated with the same shade. In life the whole animal is of a pale flesh-colour, due to the blood seen through the almost pigmentless integument.

I think I am right in regarding this form as a variety of the common *T. braminus*¹ although it has more the appearance of a specimen of *T. diardi* which has been bleached in spirit by exposure to strong light. It has been, however, a matter of extreme difficulty to detect the limits of the scales on the heads of this and the two other almost colourless forms described, even when various staining agents were used. The present form certainly has, as have also the other two, a completely divided nasal, and the scaling of its head closely resembles that of *T. braminus*. Possibly it should be considered a distinct species; but I do not feel confident on this point. The three specimens obtained have each 20 scales round the body. They are distinguished from *T. accedens* by the greater relative girth.

This form apparently lives in the sandy soil prevalent at Rámanád, but I was not so fortunate as to find an example myself, the examples examined having been procured for me by native boys.

Very little seems to be known regarding the habits of even the common species of *Typhlops*. I have taken specimens of *T. braminus* in leaf mould, in the rotten wood of fallen trees in the jungle, under stones on dry soil in an open wood, and crawling on the floor of a house in Calcutta. One of the attendants at the Indian Museum lately brought me a piece of sugarcane which he had peeled with the intention of chewing it. It must have grown, judging from its girth, at a considerable height above the ground, and it was traversed vertically by the burrow of some caterpillar. The caterpillar had disappeared, but the burrow was occupied by a specimen of the common *Typhlops*. I kept this specimen alive for some days in an insect cage in which some caterpillars had lately pupated, and was surprised to see it swallowing their excreta. It used the spine at the tip of its tail in maintaining a grip of any object round which it coils itself very much in the same way as *T. acutus* uses its beak.²

¹ During the last year specimens of the following species have been brought to the Museum from Calcutta and its neighbourhood:—*T. braminus*, *T. diardi*, *T. porrectus*, and *T. acutus*; the last most frequently. The pigmentation of normal specimens of *T. braminus* from the same locality is somewhat variable, and in var. *arenicola*, judging from an individual taken during the rains at Rámanád by the Rev. A. D. Limbrick, the colour of the dorsal surface may be a more deeply suffused with buff than it is in the types of the variety. (March 8th, 1906—N. A.)

² See *Journ. As. Soc. Bengal*, 1905, p. 209.

TYPHLOPS LIMBRICKII, sp. nov.

Diagnosis—

Habit slender, short, somewhat flattened; head broad, rather large; eyes large but inconspicuous; snout rounded, projecting moderately; tail slightly longer than broad, ending in a point; the diameter of the body contained about 29 times in the length; 18 scales round the body. Rostral about $\frac{2}{3}$ the width of the head, barely reaching the centre of the eyes behind; nostril lateral but almost inferior, between two nasals, the first of which is in contact with the first labial and does not reach the upper surface of the head, the cleft between the two starting from the suture between the first and second labial; the posterior nasal widely separated from its fellow above; a præocular almost as large as the ocular; no subocular; the præocular in contact with the third labial below; (?) five upper labials; the upper head scales scarcely larger than those on the dorsal surface of the body. Head and upper surface of body feebly tinged with buff; tip of tail and the whole ventral surface dirty white (pale flesh-colour in life). Total length of type specimen, 72 mm.

A single specimen from Rámanád. I have much pleasure in associating the species with the name of the Rev. A. D. Limbrick, of Rámanád.

TYPHLOPS PSAMMOPHILUS, sp. nov.

Diagnosis—

Habit slender, elongated, cylindrical; head very small; eyes small but densely pigmented; snout rounded, obtuse, projecting; tail twice as long as broad, ending in a spine; the diameter of the body contained about 78 times in the total length; 20 to 22 scales round the body. Rostral less than a third the width of the head, not reaching the level of the eyes behind; nostril lateral, between two nasals, the cleft proceeding from the first labial and reaching the upper surface of the head, the posterior nasal separated from its fellow above; 4 upper labials; a præocular larger than the ocular, in contact with the anterior nasal; no subocular. Head and tip of tail white; scales on body, above and below, pale grey minutely edged with black, giving the animal a delicately reticulated appearance. Total length, 195 mm.

Three specimens from Rámanád.

ERYX CONICUS.

Gongylophis conicus, *Boulenger, Fauna Ind., Rept.*, p. 247, fig. 75.

An adult female and three young ones, said to have been found with it, were brought me at Rámanád. The young were far more brilliantly coloured than the adult but their markings had the same outlines.

ERYX JOHNII.

This species is evidently more common than the preceding, both on Rámés-warem Island and the mainland. Numerous specimens were brought me at every halting place. Probably both it and *E. conicus* feed on the small rodents (*Mus* and *Gerbillus*) which are abundant in the sand.

The young of *E. johnii* are of a brilliant brick-red colour in life, with black cross bars on the back. The adults differ considerably in this respect, especially as regards the ventral surface, which may be almost white or densely crowded with dark brown atoms. The colour of the dorsal surface only varies in intensity.

Large individuals seem to be liable to a disease of the tail, which is very frequently distorted even under natural conditions; while in captivity it sometimes becomes covered as if with mould.

LYCODON STRIATUS.

A specimen was brought me at Pamben. Its coloration in life was practically identical with that of the example from Ceylon recently described by Green¹; but it is said that in specimens from Malakand the pale markings are bright yellow during life, although they fade rapidly in spirit. A model in the Indian Museum, prepared from a specimen and description furnished by Major Maynard, I.M.S., is coloured in this way.

The snake appears to be rare wherever it is found. Thurston² records the common *Lycodon aulicus* from Ráméswarem, but I did not see a specimen.

ZAMENIS MUCOSUS.

A large specimen was brought me at Rámanád, where I am told it is not uncommon.

The coloration of this individual differed somewhat from that of specimens from the damper parts of India, the dorsal and lateral scales all over the body and tail being golden brown at the base, and the head scales being suffused with the same shade. The whole animal had, therefore, a sandy tinge, which did not, however, appear to be sufficiently developed to be actually protective in function.

DENDROPHIS PICTUS.

Common on Ráméswarem Island and on the mainland. It seems to be more strictly arboreal in Rámanád than it is in the Malay Peninsula, where it is common on bushes a few feet above the ground.

I have lately dissected a considerable number of specimens both from Southern India and from the Andamans, and I find that in two of these specimens (one from each locality) there are only twenty teeth in the maxillary. This observation breaks down the separation between *Dendrophis* and *Dendrelaphis*, but as the species of both genera are easy to distinguish from one another, the matter is not one of importance.

An examination of living and fresh specimens from the Andamans, sent to Calcutta by Major A. R. Anderson, I.M.S., shows that at any rate the majority of examples from these islands belong to a very distinct colour variety, which was accurately described by the late Dr. J. Anderson³ under the varietal name *andamanensis*. Without examination of the scales it would be hard to believe that Major Anderson's specimens from Port Blair and mine from Rámanád belong to the same species. The following is Dr. Anderson's description of the coloration of *D. pictus* var. *andamanensis*:—

¹ *Spolia Zeylanica*, ii, p. 205.

² *Madras Govt. Mus. Bull.*, III, 1895.

³ *Proc. Zool. Soc.* 1871, p. 184.

Grass-green above, each scale with a broad, black margin, and the ventrals with a black margin externally as far as the keel. The black margins of the lateral scales so broad that when the body is at rest they produce an appearance as if a black line ran along the side of the body. A black band the breadth of the loreal through the eye, over the inferior postorbital and upper margins of the last upper labials, to the side of the neck, where it breaks up at intervals of two rows of scales into round, black spots, etc.

The Rámanád specimens differ slightly, chiefly as regards their less vivid colours, from examples from Bengal or the Malay Peninsula, but more nearly resemble the former than the latter. It does not seem worth while to give them a varietal name, but the following description is based upon them :—

Dorsal surface dark bronze ; a pale spot on the centre of the upper surface of the head, a broad mid-dorsal line of pale buff extending from the neck to the tail, on which it gradually becomes indistinct, and a white, lateral line edged above with black ; labials and sides of the neck pale yellowish, with vertical black streaks, the sides of the neck tinged with pale blue ; ventral surface dirty white, more or less distinctly tinged with yellow on the throat, becoming darker posteriorly until, about the centre of the body, it is slate-grey. There is no tinge of green in the coloration. In specimens from Bengal, the pale mid-dorsal line may be obscure or absent and the bronze of the back and sides is not quite so deep or so brown.

TROPIDONOTUS PISCATOR.

Several specimens were brought me at Rámanád which had been taken in holes in the sides of wells. Their coloration is of an indefinite character, the dorsal surface being pale olive-green with numerous small, black spots and streaks arranged irregularly, and the belly uniformly yellowish. The common variety in Calcutta is var. *A.* of Boulenger's "Catalogue," which also occurs abundantly in the Andamans. As regards coloration and appearance generally, the Rámanád's specimens resemble *T. plumbicolor*, but the scaling and proportions of tail and body are those of *T. piscator*.

In Calcutta this is the only snake at all commonly seen in the open, though *Lycodon aulicus* and *Typhlops acutus* are not infrequently found in houses, the former being sometimes mistaken for the Krait. In the evening, numerous specimens of *T. piscator* may be seen swimming on the surface of many tanks, and their evolutions beneath the surface may be watched during the day in any suitable place. Their food consists wholly or chiefly of fish, and they do not as rule molest the large Tank Frogs (*Rana tigrina*) which may sometimes be seen sitting side by side with them on stones in the water. *T. stolatus* is just as common on the banks of the tanks, but it is not so thoroughly at home in the water and usually remains concealed among the herbage on dry land.

DRYOPHIS MYCTERIZANS.

Common throughout Rámanád.

The specimens from Rámanád are normal in every respect, but I take this opportunity to describe what appears to be a new variety from Santragachi on the Bengal-Nagpur Railway, the type having been presented to the Indian Museum by Mr. G. Cummsky.

var. nov. ANOMALUS.

Agrees in coloration, proportions and scaling of the tail and body with the typical variety, from which it only differs in the structure of the integument of the nasal appendage. This is covered above by small scales somewhat larger than those in the same position in *D. pulverulentus*.

I was inclined to regard the specimen as a mere monstrosity until the Zoological Gardens¹ at Alipur received an identical example from Lower Bengal a few weeks ago. The variety can be distinguished readily from *D. pulverulentus* by its characteristic coloration and by the fact that the rostral appendage is shorter than the eye.

NAIA TRIPUDIANS.

Common on Ráméswarem Island and on the mainland. The specimens seen belonged to the *forma typica* of Boulenger's "Catalogue." This is the common form in Madras, var. *C. (fasciatus)* being more abundant in Bengal. In the Malay Peninsula, the latter variety is the least scarce in most parts of the Siamese States, while in Selangor and at Singapore var. *D. (sputatrix)* is the prevalent if not the only form. The yellowish variety without or with very faint markings which is apparently not uncommon in Rhaman² and which appears to be represented by a specimen taken by Flower³ in Perak, seems to be near var. *B. (cæca)* but does not quite agree with any described in the "Catalogue." Should it seem desirable to give it a name, it may be known as var. *aurea*.⁴

ECHIS CARINATUS.

Three very small specimens were brought me at Mandapam. They agree in every respect with those from Northern India. The species appears to be generally scarce in Rámanád, but is said by native boys to be abundant in certain restricted localities.

REPTILES COLLECTED BY THE SEISTAN ARBITRATION COMMISSION.

In order to compare the herpetology of Rámanád with that of an inland desert tract at the other extremity of India, I give below a list of the Reptiles obtained by the recent Seistan Arbitration Commission under Sir A. H. McMahon. Unfortunately a large number of the labels attached to the specimens have become illegible in spirit, but all those which I have been able to read, indicate localities on one side or the other of, but always in close proximity to, the Perso-Baluch frontier. A single specimen of *Ophiomorus tridactylus* appears to be actually from Persian Seistan, but even this is not quite clear. In any case it is improbable that there is any great difference between the herpetological fauna of Persian Seistan and that of the north-western part of Baluchistan, which

¹ Rai R. B. Sainyal, Bahadur, tells me that in his long experience at the Gardens he has frequently noted this variety among specimens of *D. mycterisans* from the Midnapur district of Bengal. (March 8th, 1906.—N. A.)

² Laidlaw, in *Proc. Zool. Soc.*, 1901 (2), p. 580; Annandale, *Fasc. Malay. Zool.* 1, p. 168 (note).

³ Flower, in *Proc. Zool. Soc.*, 1899, p. 691.

⁴ Since this was written an elaborate analysis of the distribution of different varieties of the Cobra in India has been published by Col. Bannerman (*Journ. Bombay Nat. Hist. Soc.* XVI, pp. 638-643).

belongs zoologically, as is shown by the occurrence of such forms as *Eryx jaculus*, to Persia rather than to India. Alcock and Finn¹ have published an account of the Reptiles obtained in 1896 by the Afghan-Baluch Boundary Commission which probably gives a truer idea of the same fauna, and I therefore give a list from their paper of the species they enumerate and describe.

I. REPTILES COLLECTED BY THE SEISTAN COMMISSION (1903-5).

Lizards—

<i>Teratoscincus scincus</i> §	(one specimen).
<i>Agamura persica</i> §	(two specimens).
<i>Agama isolepis</i> §	(three specimens).
<i>Phrynocephalus maculatus</i> §	(one specimen).
<i>Varanus griseus</i> §	(five specimens).
<i>Eremias velox</i> §	(seven specimens).
<i>Ophiomorus tridactylus</i> §	(five specimens).

Snakes—

<i>Eryx jaculus</i>	(five specimens).
<i>Lycodon striatus</i> *	(one specimen).
<i>Zamenis diadema</i> §	(two specimens).
„ <i>karelinii</i> §	(ten specimens).
<i>Taphrometopum lineolatum</i> §	(eight specimens).
<i>Dipsadomorphus trigonatus</i> }	(seven specimens).
var., <i>melanocephalus</i> {	
<i>Echis carinatus</i> § *	(seventeen specimens).

Also several specimens in a bad state of preservation.

2. REPTILES COLLECTED BY THE AFGHAN-BALUCH EXPEDITION (1896).

Lizards—

<i>Teratoscincus scincus</i> . §
<i>Ceramodactylus affinis</i> .
<i>Stenodactylus orientalis</i> .
<i>Gymnodactylus</i> sp. (<i>prox.</i> <i>kachensis</i>).
<i>Agamura cruralis</i> .
„ <i>persica</i> . §
<i>Agama isolepis</i> . §
„ <i>nupta</i> .
<i>Phrynocephalus olivieri</i> .
„ <i>ornatus</i> .

¹ *Journ. As. Soc. Bengal*, (2), 1896, pp. 530-566.

Phrynocephalus maculatus. §
 „ euptilopus.
 „ luteoguttatus.
 Uromastix asmussii.
 Varanus griseus. §
 Acanthodactylus cantoris.
 Eremias guttulata.
 „ velox. §
 Scaptira scripta.
 „ aporosceles.
 Ablepharus brandtii.
 Ophiomorus tridactylus. §

Snakes—

Glauconia blanfordii.
 Lytorhynchus ridgewayi.
 „ maynardi.
 Zamenis diadema. §
 „ karelinii. §
 „ rhodorachis.
 Taphrometopum lineolatum. §
 Eristocophis macmahonii.
 Echis carinatus. * §

The following is a list of the Reptiles recorded from Rámanád. Those whose names are enclosed in square brackets are noted by Thurston (*op. cit.*), the remainder were collected or examined by myself, specimens of all but *Naia tripudians* having been preserved :—

3. REPTILES RECORDED FROM RÁMANÁD.

Tortoises—

Testudo elegans.
 Nicoria trijuga *var.* thermalis.

Lizards—

Hemidactylus frenatus.
 „ brookii.
 Hemidactylus leschenaultii.
 „ triedrus.
 Teratolepis scabriceps.
 Sitana ponticeriana.
 Calotes gigas.
 Mabuia bibronii.
 Lygosoma punctatum.

Chameleon—

Chamæleon calcaratus.

Snakes—

Typhlops braminus var. *arenicola*.
 „ *limbrickii*.
 „ *psammophilus*.
Eryx johnii.
 „ *conicus*.
 [*Lycodon aulicus*.]
 „ *striatus*.*
Zamenis mucosus.
Dendrophis pictus.
Tropidonotus piscator.
 [„ *stolatus*.]
Dryophis myterizans.
Naia tripudians.
Echis carinatus.*

The names of species which occur in either of lists 1 or 2 and also in list 3 are marked with a *; of those which occur in both 1 and 2 with a §; and of those which are confined to 2, with a ||.

Of the 14 species and 13 genera included in the first list 3 species and 2 genera are not included in the second, while of the 31 species and 24 genera in the second, 20 species and 10 genera are not included in the first. We may, however, regard these two lists as complementary to one another. Of the 26 species and 18 genera in the third list, 2 species and 4 genera are common to it and to one or both of the first two.

NOTES ON DISTRIBUTION.

On the whole, the inclusion of such forms as *Echis carinatus*, *Eryx conicus*, and *Eryx johnii* in the fauna of Rámanád suggests that this fauna is a desert fauna of wide distribution in India. The most superficial examination, however, of the lists given on the preceding pages will show that there is a very great difference between the fauna of the deserts of the extreme north-western (political) border of India and that of the desert tracts in the south-eastern corner of the Peninsular Area. As Blanford¹ has pointed out, a great part of Baluchistan belongs practically to the Palæarctic Region, and this observation is well borne out by the collections recently made on the northern border of that country. We may note in passing the comparatively large number of Lacertidæ in the two first lists given above, or at any rate in the second list, which is much more nearly complete than the first. There are no members of this family in my Rámanád collection, and it is doubtful whether any exist in the area it represents. In the Afghan-Baluch list, on the other hand, no less than five species, representing three genera, are recorded. A similar difference may be noted as regards the genera of the Agamids included in the

¹ *Phil. Trans. Roy. Soc. B.* CXCIV, 1901, p. 337, etc.

two faunas. Those from the North-West Frontier belong to the genera *Agama*, *Phrynocephalus* and *Uromastix*, all of which are typically Palæarctic and Ethiopian; while those from Rámanád represent *Calotes* and *Sitana*, the first of which is confined to the Oriental Region, while the second is peculiar to the Indian Peninsula, in which it is represented by a single species. Further, the genus *Lytrohynchus* is essentially a northern genus, while the species of *Eryx* which occurs on the North-West Frontier is not that of Peninsular India but ranges from the north of Baluchistan to South-Eastern Europe and North Africa.

Of the species which occur on the Frontier and also in Rámanád, *Echis carinatus* is found in "desert or sandy districts of Africa north of the equator; Southern Asia, from Transcaspia to India," but apparently not east of Bengal; while *Lycodon striatus* has only been recorded from Transcaspia, India and Ceylon. As the latter snake is more abundant in the northern parts of India than in the southern, and more frequently found in barren localities than in places with a luxuriant vegetation, we may probably regard both it and *Echis carinatus* as originally northern and desert forms which have been able, owing to some peculiarity of constitution, to survive in southern, and, in the case of *L. striatus*, in rather damp localities, to which individuals have at some period made their way.

Regarding the species in the Rámanád fauna which are not represented even by near allies in that of the North-West Frontier, the majority of them are true Oriental forms widely spread in their own region. Such are *Zamenis mucosus*, which occurs throughout Peninsular India, Ceylon, Burma, in Afghanistan, S. China, Siam, Malaya and Java; *Dendrophis pictus*, a common Indo-Malayan and Ceylonese species; *Tropidonotus piscator*, with a range somewhat similar to that of *D. pictus*; *Naia tripudians*, which is found all over the Indo-Malayan countries and extends its range northwards into Persia, Afghanistan and Turkestan; to a less extent, *Dryophis mycterizans*, occurring throughout the greater part of India, Burma, and Ceylon, and in Siam; and also *Hemidactylus leschenaultii*, known from India, Ceylon, and Malaya.

Leaving out of consideration two other species of *Hemidactylus*, which, being house Lizards, have an extremely wide adventitious distribution, there remains an element confined to Peninsular India and Ceylon, and this may be further subdivided. In the first place we have forms which occur practically all over the Peninsula. Of these the most noteworthy are *Testudo elegans*, *Sitana ponticeriana* and *Chameleon calcaratus*. These three reptiles occur almost everywhere in Peninsular India except in the lower Ganges plain and on the slopes of the Himalayas. The Indian Chameleon is found on the west coast of the peninsula as far north as Sind; on the east coast it probably does not range much to the north of the extreme south of Lower Bengal, but it is said to be common in Bihar and is certainly abundant in Orissa, in the south of the peninsula and in Ceylon. Probably the climate of Lower Bengal proper is too damp for the three species last mentioned, two of which enjoy a sandy soil, while the Chameleon appears to avoid jungles which are very dense. So far as it is possible to say, what is true of this species is also true of *Calotes gigas*, which may be a race of *Calotes versicolor* in some way adapted for survival in places where vegetation is rather scanty, for even in Colombo, which always strikes the traveller as being so

peculiarly tropical as regards its vegetation, a very great proportion of the flora is not indigenous and the soil is naturally anything but fertile.

Secondly, as regards the peninsular element in the fauna of Rámanád, there are two reptiles which are peculiar to Central and Southern India and to the less densely wooded districts of Ceylon. These are *Hemidactylus triedrus* and *Mabuia bibronii*, while the Tortoise *Nicoria trijuga* var. *thermalis* is probably confined to Ceylon and the immediately adjacent part of the mainland of India, as may also be the case with the Frog *Rana greenii*.

Lastly, there are four Reptiles which have not hitherto been described. One of these, *Teratolepis scabriceps*, belongs to a genus hitherto only known from Central India and Sind, while the others are forms of a genus occurring in Southern Europe, all over Africa, Southern Asia, and tropical America, and throughout the greater part of Australasia. As these three forms all exhibit a very obvious sign of modification in connection with a desert life, and as few resembling them in this respect have been taken elsewhere in India, it is possible that they may have originated in Rámanád.

To sum up, (1) the Reptiles of Rámanád represent, in the main, a fauna widely spread in the Oriental Region and capable of existence under various conditions of life; (2) some of the species are confined to Peninsular India, and (3) a few to the Deccan, Southern India, and Ceylon (the last two categories consisting chiefly of forms which avoid luxuriant vegetation); (4) several may be of local origin; and (5) one or two have probably extended their range at some period through the waste places of Peninsular India from the north. There is no relationship between the Reptiles of Rámanád and those of the Malabar coast and hills, and such relations as do exist between the former and the Reptiles of Malaya are of a most general character.

NOTES ON COLOUR.

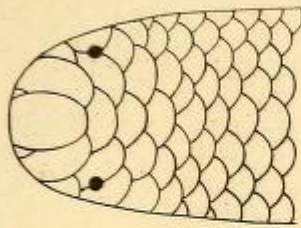
As regards coloration, the most remarkable forms obtained from Rámanád are the three representatives of the genus *Typhlops*, all of which were notable for the small amount of pigment present in their skin. Comparatively few species of their family are known from desert localities in Asia, but of these, several (notably *T. socotranus*) are paler than the majority of their relatives; while some of the Glauconiidæ, a family of similar habits and general appearance, are also pale in dry and sandy areas, as, for example, in parts of Baluchistan and Central America (*Glauconia blanfordii* and *G. myopica*). At first sight it is difficult to distinguish between well-preserved specimens of *G. blanfordii* and of *T. braminus* var. *arenicola*, and I think that there can be no doubt that this is a case of convergence, or of like conditions producing a like modification in species structurally different from one another. Similarly we find that the variety of the common Indian Rat Snake (*Zamenis mucosus*) from Rámanád is paler in colour than that from less sandy parts of India, while *Calotes gigas* and *Sitana ponticerriana*, in spite of markings which become conspicuous in certain situations, have also a general sandy look and are admirably concealed among the shadows cast by scanty vegetation upon sand, the same being true to a lesser extent of *Testudo elegans* and of the typical form of the Cobra, which is generally abundant in the sandy districts of India.

The question at once arises, "How does the sandy coloration of desert animals, which is so well known in most sandy tracts, come about?" These Rámanád forms, occurring in a small and probably very recent desert not separated by any great natural barrier from fertile districts, are of considerable interest as regards this question. The first point that becomes evident on a critical examination of them is that their pale (or paler than ordinary) coloration is not essentially protective in all cases. *Sitana ponticeriana*, *Calotes gigas*, and the typical form of the Indian Cobra, are undoubtedly concealed by their coloration in such localities; but the yellow Cobra of the dense Malayan forests, to which I have referred above, is much more sandy than any of these, while the Rámanád Typhlopidae and the Rat Snake from the same locality, though possibly rather less conspicuous than if they were darker, are by no means identical with sand in colour, but only have a vague approximation to it. This is especially true in the case of the *T. limbrickii* and the local variety of *Typhlops braminus*, which are distinctly flesh-coloured in life, and of *T. psammophilus*, which, judging from the intense pigmentation of its eyes, may be endowed with some powers of vision and therefore may exist under conditions which would expose it more directly to the effects of light. It is curious that the snakes most highly modified as regards colour in this locality are those which would seem to be the least often exposed directly to light, as burrowers. It is well known, however, that the hair of many tropical mammals, which live more or less in the shade, takes on a reddish or yellowish tinge owing to exposure. I may instance the black-backed variety of the squirrel *Ratufa bicolor*, the back of which, in specimens which have not recently cast their coat, becomes distinctly reddish. We know, moreover, that, even in temperate localities, some slight change may substitute yellow pigment for black in the feathers of birds—a phenomena which occurs not infrequently in the Puffin (*Fratercula arctica*) of Iceland, where individuals with the back mottled with white and yellow, instead of being black, are sometimes produced. It would, therefore, appear possible that even indirect exposure to the steady glare of light that occurs in tropical and subtropical deserts may produce an extreme degree of yellowing in delicate organisms. The transmission of the paler type of coloration thus brought about would not necessarily postulate the transmission of acquired characters; for the light might well effect the embryo in the egg or in the body of the mother, the decrease in intensity of pigmentation of the adult giving, in the latter case, a readier access for the light to the foetus. Indeed, it is possible that the light might even affect the generative organs of the parents to such an extent that they produced, under all conditions, paler offspring, which were not able to transmit to the third generation the power of producing pigment of great intensity. Such considerations must be largely speculative, until we are in a position to state definitely not only what changes are produced in the coloration of tropical animals, directly or indirectly, by environment, but also what is the structural difference between different animal pigments.

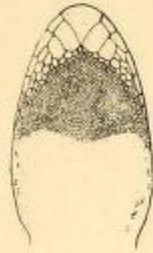
The Reptiles of Rámanád are, for the most part, forms which are sufficiently generalized in coloration, as in structure, to survive in a considerable variety of environments, without dying out individually, or perishing as species by evolution in some new direction; but a few of them exhibit very obvious modifications, probably due directly to the effect of change of environment upon the breed, possibly even upon the individual.

EXPLANATION OF PLATE IX.

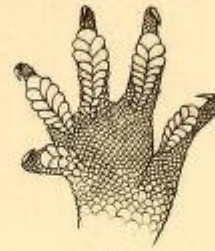
Fig. 1	<i>Teratolepis scabriceps</i>	...	...	... (slightly enlarged).
„ 1a	Chin	...	...	... (enlarged).
„ 1b	Hind foot	...	...	... (enlarged).
„ 1c	Fore foot	...	...	... (enlarged).
„ 2	<i>Calotes gigas</i> , Base of tail...	...	...	... (nat. size).
„ 2a	Portion of crest	...	...	... (× 2).
„ 2b	Scales, on base of tail	...	...	... (enlarged).
„ 2c	Ordinary tail scales...	...	...	... (enlarged).
Figs. 3, 3a	<i>Typhlops limbrickii</i>	...	...	... (enlarged).
„ 4, 4a	„ <i>psammophilus</i>	...	...	... (enlarged).



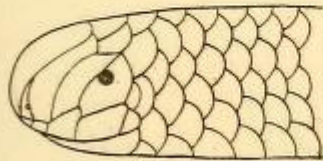
3.



1 a.



1 b.



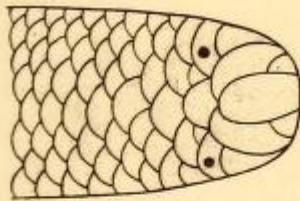
3 a.



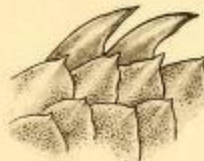
1



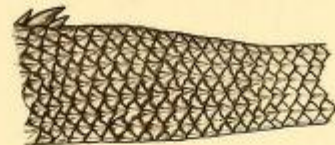
1 c.



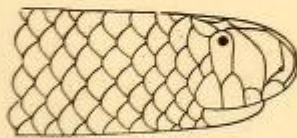
4



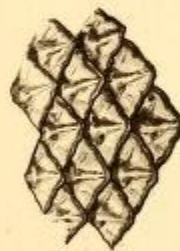
2 a.



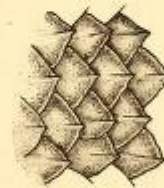
2.



4 a.



2 b.



2 c.

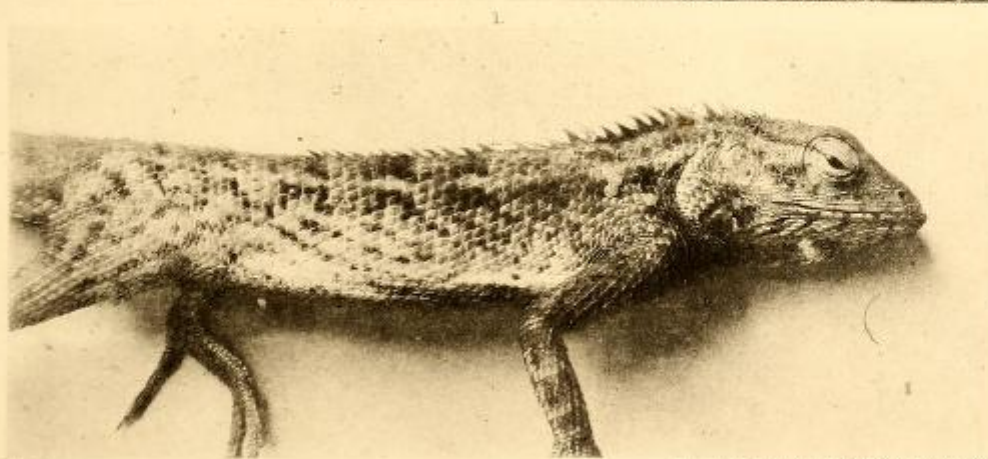
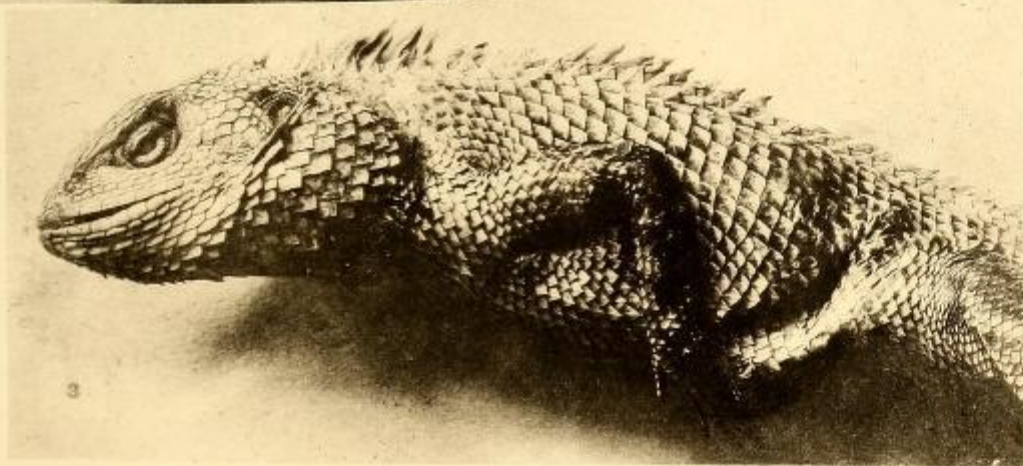
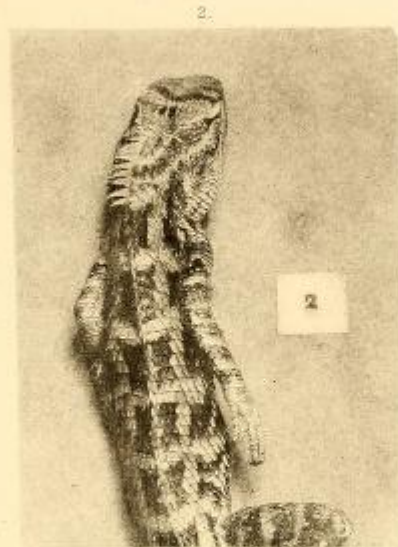
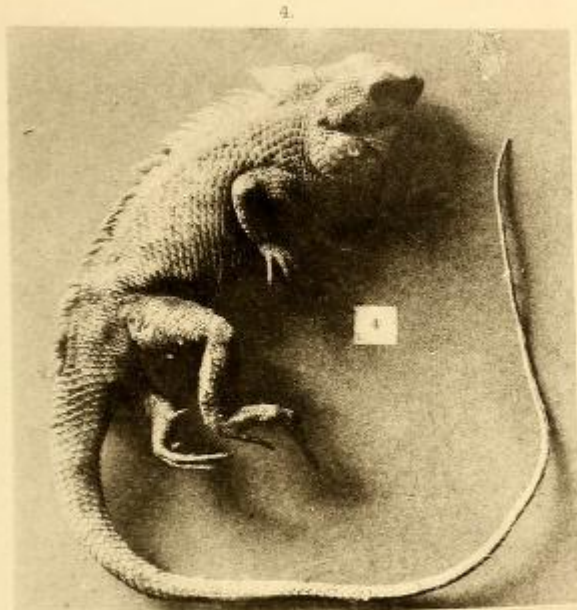
Photographs.

Survey of India Offices, Calcutta, December 1905.

REPTILES OF RĀMANĀD.

EXPLANATION OF PLATE X.

- | | | | | |
|--------|--|-----|-----|----------------------|
| Fig. 1 | <i>Calotes versicolor</i> , adult male | ... | ... | (slightly enlarged) |
| " 2 | <i>Calotes gigas</i> , female | ... | ... | (reduced). |
| " 3 | " adult male | ... | ... | (slightly enlarged). |
| " 4 | " " | ... | ... | (reduced). |



Photographie.

Survey of India Offices, Calcutta, February 1906

CALOTES GIGAS AND CALOTES VERSICOLOR