

THE AMPHIBIANS AND REPTILES OBTAINED BY MR. RONALD KAULBACK IN UPPER BURMA.

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[From the Department of Zoology, British Museum (Nat. Hist.), London.]

(Plate VIII.)

The British Museum is indebted to Mr. Ronald Kaulback for a valuable collection of amphibians and reptiles obtained by him in the extreme north of Burma during the years 1937, 1938 and 1939. It makes a valuable addition to our knowledge of the herpetology of that region, which is of particular interest as being the meeting place of the fauna of Indo-China with that of the Eastern Himalayas and China. The country explored by him, mainly for geographical reasons, lies on the borders of Tibet and China, to the north of the tribal area generally known as The Triangle. It is typical of much of the country of the Trans-Himalayan region and consists mainly of densely wooded precipitous hills intersected by deep well-watered ravines. The rainfall during the wet monsoon is heavy, varying from 200 to 220 inches annually. In the valleys the conditions during the hot weather may be almost tropical, but the precipitous hills make it possible to rise to cooler temperatures almost in a few hours.

The collection consists of 630 specimens, of which there are 25 species of amphibians, 15 of lizards and 42 of snakes. Of these, 5 frogs, 2 lizards and 1 snake appear to be new to science.

Of the 82 species enumerated, 14 are widely distributed throughout the Oriental Region, and 29 widely distributed over the Indo-Chinese subregion; 20 belong to the Eastern Himalayas, 8 are Chinese and 11 are so far peculiar to Upper Burma.

Of the 32 genera included we find that 21 are widely distributed over the Oriental Region, some of them worldwide, 6 belong to Indo-China extending into the Malayan subregion, 3 are Trans-Himalayan and 2 Chinese. One genus, namely *Ophisaurus*, is Irano-Turanian.

Mr. Kaulback's notes upon habits, habitats and the colouration of the living specimens are incorporated in the text.

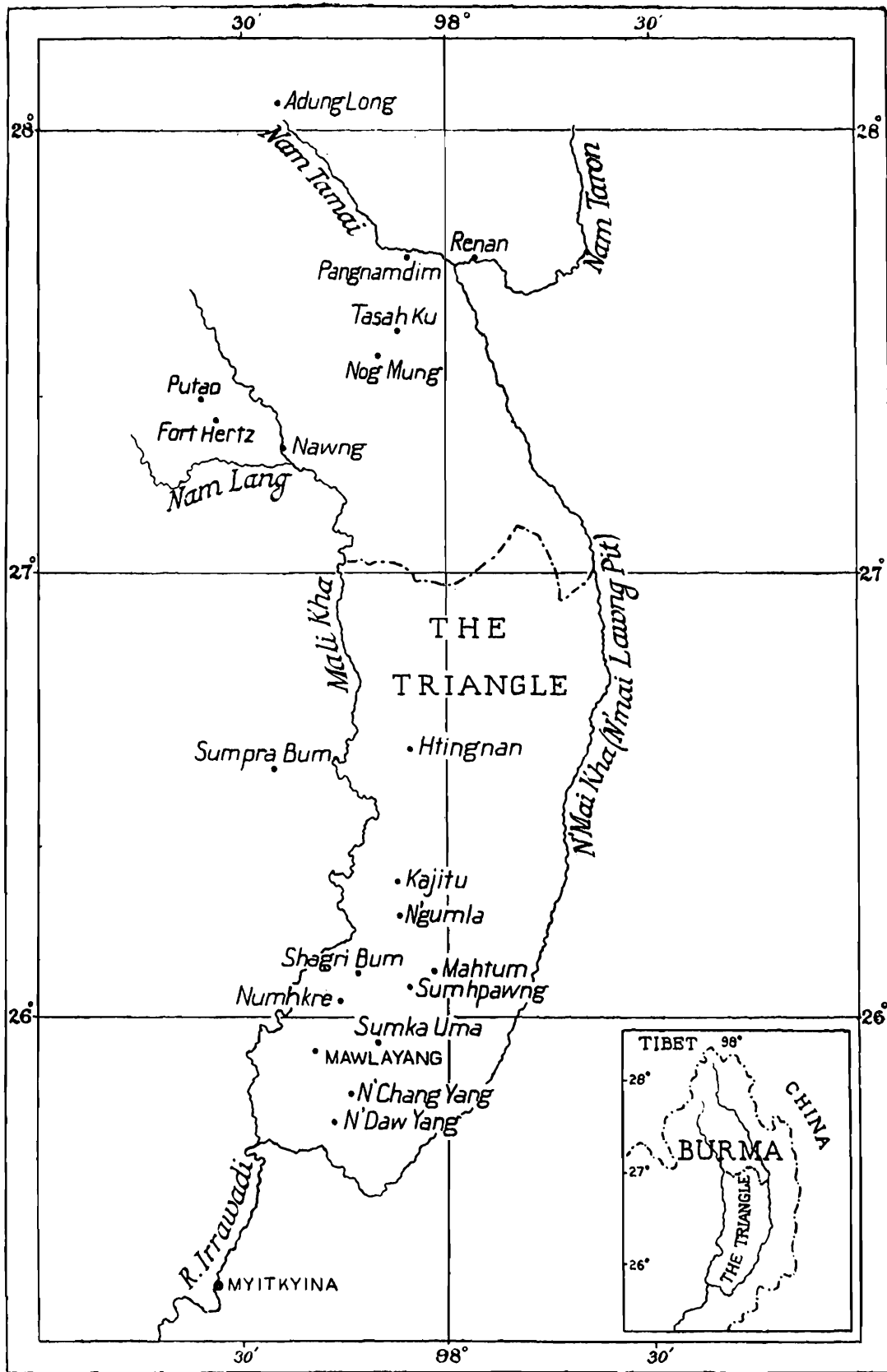
In the arrangement of the Snakes I have followed my Volume in the *Fauna of British India Series*, now in the press.

The types of all the new species are in the British Museum.

I am indebted to Dr. Bains Prashad, Director, Zoological Survey of India, for the loan of some rare material for comparison.

The latitudes and longitudes of various localities mentioned in the paper are given in the following table; those marked with an asterisk

are shown in the map. The entire area explored by Mr. Kaulback lies roughly between latitudes $25^{\circ} 43' - 28^{\circ} 04' N.$ and longitudes $97^{\circ} 22' - 98^{\circ} 18' E.$



Map of the area in which collections were made.

The Triangle is a tribal area bounded on the West by the Mali Kha (-Mali Hka), and on the East by the N'Mai Kha (-N'Mai Hka), Rivers. Northwards it extends to Lat. $27^{\circ} N.$ as indicated by the dotted line.

Names of localities.	Latitude.		Longitude.	
	° N.	'	° E.	'
*Adung Long	28	04	97	43
Ahke	26	56	98	12
Aliwang, Taron Valley	27	42	98	08
Dadung, Taron Valley	27	40	98	18
Dinghputyang	25	58	97	53
Goletu	27	37	97	54
Goletutap	27	37	97	54
Hkandau	26	01	97	52
Hkawng Ga	25	58	98	00
Hkrang Hka	26	34	97	58
Hkunlum	26	53	98	11
*Htingnan	26	36	97	52
Htingraw Ga	26	04	97	59
Htisyengyang	26	51	98	04
*Kajitu	26	18	97	50
Labu Ga	25	46	97	40
Lunghkang Ga	26	36	97	48
*Mahtum	26	06	97	58
Mashaw Tingsa	26	46	97	58
Matsatap	27	30	97	50
*Mawlayang	25	54	97	40
Mawndam, Taron Valley	27	45	98	18
Mungdung, Nam Tamai Valley	27	42	98	00
Naurayang Ga	26	48	98	03
*Nawng	27	15	97	45
*N'Chang Yang	25	50	97	48
*N'Daw Yang	25	46	97	32
*N'Gumla	26	12	97	49
Ningma, Mali Hka Valley	26	33	97	42
*Nog Mung	27	30	97	50
*Numhkre	26	01	97	42

Names of localities.	Latitude.		Longitude.	
	° N. ,		° E. ,	
Paira Ga	26	43	98	04
Pali Bum	25	43	97	38
*Pangnamdim, Nam Tamai Valley	27	42	97	54
Patsarlamdam, Taron Valley	27	38	98	10
*Putao	27	20	97	22
Ratnamhti	27	25	97	47
*Renan, Taron Valley	27	41	98	03
Samatu	26	00	97	40
*Shagri Bum	26	06	97	45
Shenjung, Taron Valley	27	58	98	18
Sherawthu, Taron Valley	27	50	98	18
Sinan Hka	26	26	97	35
*Sumhpawng	26	04	97	52
*Sumka Uma	25	57	97	49
*Sumpra Bum	26	35	97	42
Tara Hka	26	09	97	52
*Tasah Ku	27	35	97	52
Uyawm Uka	26	00	97	59
Wadan	26	47	98	04

AMPHIBIANS.

APODA.

Ichthyophis glutinosus (Linn.).

1 ♀. Sumpra Bum.

Caught on August 10th ; contained 12 eggs.

PELOBATIDAE.

Megophrys hasselti (Tschudi).1908. *Megalophrys hasseltii*, Boulenger, *Proc. Zool. Soc. London*, p. 425, pl. xxv, fig. 3.

1 ♀. Pangnamdim.

Tips of fingers and toes white in life ; it contained ripe ova.

Megophrys major Boulenger.

1908. *Megalophrys major*, Boulenger, *Proc. Zool. Soc. London*, p. 416, pl. xxiii.

2 ♂♂, 6 ♀♀. Sumka Uma, Pangnamdim.

The males have a large subgular vocal sac extending on to the front of the chest. The openings in the mouth are on either side, just in front of the angle of the jaw. The inner two fingers have a pad of dark brown, rugose skin. The males, as shown by Boulenger, are smaller than the females.

Megophrys feae Boulenger.

1908. *Megalophrys feae*, Boulenger, *Proc. Zool. Soc. London*, p. 428.

4 ♂♂, 1 ♀, 1 juv. Ahke, Mahtum, Pangnamdim.

Males with internal vocal sacs opening on each side of the mouth near the angle of the jaw. I cannot discover any other external secondary character by which to distinguish them from the females.

The largest male measures 120, from snout to vent, the largest female 115 mm.

“This frog had a piercing cry, not unlike a small Klaxon (horn). For each performance it filled its lungs in three distinct breaths, opened its mouth, paused a little, and then gave vent to a continuous harsh screeching until its wind had gone.”

BUFONIDAE.

Bufo melanostictus Schneid.

13 specimens. Various localities in The Triangle, as far north as Htingnan (26° 36' N.).

Bufo stuarti Smith.

1929. *Bufo stuarti*, Smith, *Rec. Ind. Mus.* XXXI, p. 78, text-fig. 1.

1935. *Bufo stuarti*, Smith, *ibid.* XXXVII, p. 238.

1 ♂, 2 ♀♀. Pangnamdim, Mashaw Tingsa.

The male was bright yellow in life; it is now uniform pale greyish in colour. The 1st finger has an inconspicuous pad composed of minute rounded granules. One female is light brown with conspicuous, regular markings of dark brown upon the back, the limbs with dark bars; the other, with ripe ova, measures 100 mm. from snout to vent, and is uniform dark brown in colour.

RANIDAE.

Rana tigrina tigrina Daudin.

1920. *Rana tigrina* forma *typica*, Boulenger, *Rec. Ind. Mus.* XX, p. 17.

2 ♂♂, 4 ♀♀. Samatu, N'Chang Yang.

The specimens belong very clearly to the typical form with pointed snout, prominent longitudinal glandular folds and tibio-tarsal articulation reaching to beyond the eye. They are identical with specimens from Nepal in the British Museum.

Rana limnocharis Wiegman.

1920. *Rana limnocharis* forma *typica*, Boulenger, *Rec. Ind. Mus.* XX, p. 28.

47 specimens. Various localities in The Triangle as far north as Mashaw Tingsa (26° 46' N.).

Rana hascheana (Stoliczka).

1929. *Rana hascheana*, Smith, *Rec. Ind. Mus.* XXXI, p. 77.

1 ♂. Lunghkang Ga.

Rana kuhli Dum. & Bibr.

1920. *Rana kuhli*, Boulenger, *Rec. Ind. Mus.* XX, p. 62.

3 ♂♂, 9 ♀♀, 4 juvs. N'Gumla, Htisyengyang, Mashaw Tingsa.

All the males are larger than the females. The largest male measures 72 mm. from snout to vent, the largest female 63 mm. In the male the head is broader than long, and as broad as, or broader than, the body; in the female it is longer than broad. The tympanum is hidden in the males, visible but indistinct in the females. The toes are webbed to the discs, the webs being strongly emarginate.

The present localities mark a considerable extension northwards for this species; it has not been recorded before in Burma.

Rana feae Boulenger.

1887. *Rana feae*, Boulenger, *Ann. Mus. Civ. Genova* (2) V, p. 418, pl. iii.

1920. *Rana feae*, Boulenger, *Rec. Ind. Mus.* XX, p. 68.

3 adult ♀♀, 1 juv. Pangnamdim.

I identify them as *Rana feae* although they do not agree entirely with the description. The vomerine teeth in two specimens are in small, rounded, scarcely oblique groups; in the third they are distinctly oblique; the tympanum is distinct in one specimen and in the juvenile, and $\frac{1}{3}$ the diameter of the eye; in the other two it is hidden; the first finger is not quite as long as the second. There is no ocellus in the groin. The largest specimen measures 90 mm. from snout to vent.

I have examined the specimen from Yunnan, in the Indian Museum; it is a male, with nuptial spines upon the 1st finger, but none upon the chest. The type is in Genoa.

Rana taipehensis van Denburgh.

1931. *Rana taipehensis*, Pope, *Bull. Amer. Mus. Nat. Hist.* LXI, p. 539.

1923. *Rana taipehensis*, Smith, *Journ. Nat. Hist. Soc. Siam* VI, 1923, p. 205, text-fig. 4 (figure of the foot).

1 ♂. N'Chang Yang.

To this species I provisionally refer one specimen, 32 mm. from snout to vent. It has an unusually large tympanum, distinctly larger than the eye, and there is no external metatarsal tubercle. In all the material of *taipehensis* in the British Museum from Formosa, Canton, Hainan, Tongking and Annam there is a very distinct tubercle.

Rana jerboa Günther.1920. *Rana jerboa*, Boulenger, *Rec. Ind. Mus.* XX, p. 196.

2 ♀♀. Htingnan, Tara Hka.

Rana jerboa is known from Malaysia, the Kareni Hills in Burma, and the extreme north of Siam. In the character of the skin, which is granulate, of the dorso-lateral fold, which is broad and indistinct, and in colouration, these two specimens agree better with individuals from Borneo than they do with those from Siam.

Rana gerbillus Annandale.1912. *Rana gerbillus*, Annandale, *Rec. Ind. Mus.* VIII, p. 10, pl. ii, fig. 1.1920. *Rana gerbillus*, Boulenger, *Rec. Ind. Mus.* XX, p. 207.

4 ♂♂, 4 ♀♀. Pangnamdim.

These specimens agree well on the whole with Boulenger's description which was drawn up from the type and two other specimens. I have examined them all; there are some differences but they appear to be individual rather than specific. The toes are fully webbed, the discs of the 3rd and 5th being involved in the web. Boulenger's statement that the toes are "nearly completely webbed" does not appear to be correct.

The back is smooth or obscurely granulate, the males having in addition numerous minute white tubercles; the glandular dorso-lateral fold is moderately broad, and not very distinct. In the type it consists of a series of disconnected warts rather than in a continuous fold. The males have external vocal sacs on either side of the jaw, and grey velvety pads upon the first finger.

Colour.—Greyish or greyish brown above; lips white, with small black spots; a dark brown stripe along the side of the head, including the tympanum; lower parts whitish, the throat, and sometimes the belly, speckled with black; thighs marbled behind with dark brown and yellow.

The largest male measures 50 mm. snout to vent, the largest female 68 mm.

Two specimens (No. 79 and 80) were caught in *copula*.

A common frog at Pangnamdim.

Rana andersoni Boulenger.1920. *Rana andersonii*, Boulenger, *Rec. Ind. Mus.* XX, p. 174.1931. *Rana andersonii*, Pope, *Amer. Mus. Nat. Hist.* LXI, p. 550.

2 ♂♂, 2 ♀♀, 1 juv. Pangnamdim.

Pope has discussed the sexual differences in this species, and Mr. Kaulback's specimens confirm his remarks. The males are 60 and 61 mm. from snout to vent, the females 90 and 94 mm. The tympanum of the male, in proportion to his size, is considerably larger than that of the female. The only important point of difference is with regard to the vocal sacs. Boulenger's statement that the male has an internal vocal sac is correct for the specimens examined by him. Pope states that he finds "a poorly developed one" In Mr. Kaulback's two males there are well-developed sacs appearing as modified patches of

skin at the angles of the jaws. The differences, however, may be due to the different times of the year in which the males were caught.

Rana afghana (Günther).

1920. *Rana latopalmata*, Boulenger, *Rec. Ind. Mus.* XX, p. 217.

1 ♀. N'Chang Yang.

Rana kaulbacki, sp. nov.

(Plate VIII, fig. 1.)

2 ♂♂. Pangnamdim.

Type, and paratype *Brit. Mus.*, 1940. 6. 1. 1-2.

Vomerine teeth in oblique groups, commencing on a level with the choanae, and extending posteriorly behind them, equidistant from the choanae and from each other; head a little broader than long, much depressed. Snout rounded, projecting slightly beyond the mouth, a little longer than the eye; canthus rostralis obtuse; loreal region oblique, feebly concave; nostrils equidistant from the eye and the end of the snout; distance between the nostrils greater than the inter-orbital width, which is a little greater than that of the upper eye-lid; tympanum feebly distinct, $\frac{1}{3}$ the diameter of the eye, $1\frac{1}{2}$ times its distance from the latter. Fingers very long, with very large discs, which are broader than long; first finger shorter than second, the tip merely swollen; third finger twice as long as the snout; subarticular tubercles well-developed.

Hind-limbs long, the tibio-tarsal articulation reaching beyond the tip of the snout; heels strongly overlapping when the legs are folded at right angles to the body; tibia a little longer than the foot, $1\frac{3}{5}$ times in the distance between the snout and the vent; discs of the toes smaller than those of the fingers, completely webbed, the web feebly emarginate and involving the bases of all the discs; outer metatarsals separated to the base; subarticular tubercles moderate; inner metatarsal tubercle oval, flat, $\frac{2}{5}$ the length of the inner toe; no outer tubercle.

Skin smooth; a narrow glandular fold above the tympanum; belly smooth; hinder part of thighs coarsely granulate.

No vocal sacs; a thick, grey, velvety pad on the inner side of the first finger.

Bluish above, green in life, with black spots and marblings; limbs with numerous black cross-bars; belly greyish; hinder parts of thighs yellowish.

From snout to vent 70 mm.

The paratype, also a male, does not differ from the description; it measures 72 mm. in length.

Rana kaulbacki is closely related to *Rana formosa* from the Eastern Himalayas and Khasi Hills. It differs in the absence of vocal sacs and in the character of the glandular fold above the tympanum. In *Rana kaulbacki* this is a thin, narrow strip; in *formosa* it is a thick, prominent, parotoid-like swelling, extending to beyond the angle of the mouth, and succeeded by two or three prominent glandules (Pl. VIII, fig. 1).

Rhacophorus mutus, sp. nov.

12 ♂♂, 18 ♀♀. Htingnan, Sumpra Bum, Kajitu, N'Gumla, N'Chang Yang.

Types ♂ and ♀, Brit. Mus. 1940. 6. 1. 3-4, type loc. N'Chang Yang.

I can discover no morphological character by which to distinguish this tree-frog from the common and widely distributed *Rhacophorus leucomystax*, except that the male is without vocal sacs. Specimens of *Rh. leucomystax* from the surrounding regions, namely Darjeeling, Siam, Tongking, Hainan and Canton, have distinct internal vocal sacs, showing as two slit-like or rounded openings on each side of the floor of the mouth, just in front of the angle of the jaw.

The types are uniform greyish in colour above, whitish below, the throat of the male heavily speckled with dark grey; hinder parts of thighs marbled with black and yellow.

Paratypes, from the above mentioned localities. They are light or dark grey in colour above, many of them with 4 longitudinal dark lines (as in *Rh. leucomystax*, colour var. *quadrilineata*); some have small black spots scattered upon the back.

Rhacophorus verrucosus Boulenger.

1893. *Rhacophorus verrucosus*, Boulenger, *Ann. Mus. Civ. Genova* (2) XII, p. 337, pl. x, fig. 2.

3 ♀♀. Htingnan, Mashaw Tingsa.

All the specimens have ripe, unpigmented ova. This frog, originally described from the Karin Hills in Burma, has since been found in S. Annam and Tongking.

Rhacophorus turpes, sp. nov.

(Plate VIII, fig. 2.)

9 ♂♂, 4 ♀♀. Htingnan.

Types, ♂ and ♀, Brit. Mus. 1940. 6. 1. 29-30.

Vomerine teeth in oblique series between the choanae, which are very large, nearer to the choanae than to each other. Head as broad as long, much depressed. Snout more or less truncate anteriorly, a little longer than the eye; canthus rostralis distinct; loreal region oblique, feebly concave; nostril much nearer the end of the snout than the eye; distance between the nostrils less than the interorbital width, which is twice that of the upper eye-lid; tympanum distinct, 1/3 the diameter of the eye, half its distance from it. Fingers half webbed, their discs smaller than the tympanum; toes fully webbed, their discs smaller than those of the fingers; an inner metatarsal tubercle, no outer; the tibio-tarsal articulation reaches to the eye; subarticular tubercles of fingers and toes well developed.

Skin smooth above, strongly granulate upon the belly and the anal region; above the vent they form a more or less distinct horizontal fold; a few enlarged tubercles upon the hinder part of the belly, and a series of them (4 to 7 in number) along the underside of each thigh; a well-developed pointed, dermal projection on the heel; a glandular fold above the tympanum. Male without vocal sacs.

Pale pinkish-brown above, the male with small black spots, the female with an indistinct dark patch filling up most of the central part of the back; limbs with dark bars; underparts yellowish-white, that of the male powdered with grey.

Female with very large, unpigmented ova, the vitelline sphere measuring $3\frac{1}{2}$ mm. in diameter.

From snout to vent, ♂ 32, ♀ 38 mm.

The paratypes, 8 ♂♂ and 3 ♀♀, do not differ markedly in morphological characters from the types. The tubercles upon the thighs are present in all of them, but their serial character may be obscured by additional tubercles.

Their colouration is variable, but consists mainly in variations of the colour pattern already given. The dark mark upon the back may be broken up into spots.

In form and general colouration *Rhacophorus turpes* is like the Sumatran *Rh. phyllopygus*, from which, however, it differs in a number of characters.

Rhacophorus bimaculatus Boulenger.

1912. *Rhacophorus bimaculatus*, Boulenger, *Fauna Malay Pen.*, p. 250.

1 juv. Pangnamdim.

The specimen agrees well with material from the Khasi Hills, in the British Museum, except that the large spots upon the flanks are absent.

Rhacophorus taronensis, sp. nov.

(Plate VIII, fig. 3.)

1 ♀. Patsarlamdam.

Type, Brit. Mus. 1940. 6. 1. 39.

Vomerine teeth in strong, almost transverse, groups, commencing at the inner margin of the choanae. Head broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, shorter than the eye; canthus rostralis distinct; loreal region oblique, feebly concave; nostril a little nearer the tip of the snout than the eye, nearly as broad as the interorbital space, broader than the upper eyelid; tympanum very distinct, $\frac{4}{5}$ the diameter of the eye, close to it.

Outer three fingers with very large discs, which are as broad as long and as large as the tympanum; more than half webbed, the membrane reaching the disc of the 4th finger and that of the 2nd on the outer side (Pl. VIII, fig. 3); toes fully webbed, their discs smaller than those of the fingers; the tibio-tarsal articulation reaches to between the eye and the tip of the snout; subarticular tubercles of both fingers and toes strongly developed; a short oval inner metatarsal tubercle; no outer.

Skin smooth above, that of the belly and hinder part of the thighs coarsely granulate. A dermal fringe, feebly distinct, on the outer side of the fore-arm, tarsus and foot.

Bluish above, green in life, with small black spots; lower parts whitish, thickly speckled with dark grey; hinder part of thighs black with white spots.

From snout to vent 78 mm.

Rh. taronensis is related to *Rh. bimaculatus*; it differs in the less extensive web to the fingers, the absence of a dermal projection on the heel and very distinctly in colouration.

Rhacophorus maximus Günther.

1890. *Rhacophorus maximus*, Boulenger, *Fauna Brit. Ind.*, p. 472.

1 ♂, 2 ♀♀. Htingnan, Kajitu.

Philautus tytthus, sp. nov.

2 ♀♀. Htingnan.

Type, Brit. Mus. 1940. 6. 1. 40.

Head as long as broad, depressed; snout rounded, a little longer than the eye; nostril nearer the tip of the snout than the eye; distance between the nostrils less than the interorbital width which is greater than that of the upper eye-lid; tympanum feebly distinct, $\frac{1}{3}$ the diameter of the eye. Fingers not webbed, their discs about as large as the tympanum; toes $\frac{3}{4}$ webbed, their discs a little smaller than those of the fingers; inner metatarsal tubercle distinct, no outer; the tibio-tarsal articulation reaches to between the eye and the tip of the snout.

Skin smooth above, with scattered tubercles; flanks more thickly studded with tubercles; belly and anal region strongly granulate.

Dark greyish on the back; with a large indistinct blackish X-shaped mark; flanks outside the mark whitish, speckled with grey; lower parts black, thickly spotted with white; thighs black, with large white spots; tibia and forelimb with black bars; a dark stripe from the eye to the angle of the mouth; a large white spot in the groin.

From snout to vent 21 mm.

Paratype, Brit. Mus. 1940. 6. 1. 41, has the back outside the X mark entirely grey.

Near *Ph. carinensis* from which it differs in the shape of the head, the less extensive web to the toes and markedly in colouration.

To this species I provisionally refer a specimen obtained in the Hkamti Plain, Burma-Tibet frontier, by Capt. Kingdon-Ward (Brit. Mus. 1932. 6. 8. 4-5).

MICROHYLIDAE.

Microhyla ornata (Dum. & Bibr.).

1934. *Microhyla ornata*, Parker, *Monogr. Microhylidae*, p. 139.

10 ♂♂. Samatu, N'Chang Yang.

All the specimens are males with black-pigmented throats.

LIZARDS:

GECKONIDAE.

Gymnodactylus khasiensis tamaiensis, subsp. nov.

1935. *Gymnodactylus khasiensis*, Smith, *Fauna Brit. Ind.* II, p. 53.

1 ♂. Pangnamdim, Nam Tamai Valley.

Type, Brit. Mus. 1940. 6. 1. 42.

Like *Gymnodactylus khasiensis* from the Eastern Himalayas and Upper Burma in all respects, differing only in the arrangement and number of the preanal and femoral pores. These extend in a continuous series, in front of the vent and along the thigh, 20 or 21 in number on each side.

Head and body 90, tail 105 mm.

The specimen was caught on a tree some 6 feet from the ground.

Hemidactylus garnoti Dum. & Bibr.

1935. *Hemidactylus garnoti*, Smith, *Fauna Brit. Ind.* II, p. 100.

6 ♀♀. Mahtum, N'Chang Yang, Ningma.

I have nothing to add to the description given in the *Fauna*. It is remarkable that no males of this species have yet been obtained.

AGAMIDAE.

Draco maculatus (Gray).

1935. *Draco maculatus*, Smith, *Fauna Brit. Ind.* II, p. 138, text-fig. 42.

Draco norvilli Alcock.

1935. *Draco norvilli*, Smith, *Fauna Brit. Ind.* II, p. 142.

2 ♂♂. Sumka Uma.

Inside of wattles and transverse bands on the patagia deep tomato red; gular appendage whitish or yellowish, belly and under-surface of patagia pale greenish; tail with dark brown bands. In colouration it agrees excellently with Alcock's sketch in the original description.

Ptyctolaemus gularis (Peters).

1935. *Ptyctolaemus gularis*, Smith, *Fauna Brit. Ind.* II, p. 149.

16 ♂♂, 15 ♀♀. Common everywhere throughout The Triangle as far north as Pangnamdim.

Pale greenish-brown or olivaceous above, pale fawn below; gular pouch green or yellow, the folds (in the male) very dark blue. Most of the specimens were caught on trees and bushes. Except for the character of the throat, I can find nothing by which to distinguish the sexes. Many of the specimens show enlarged conical tubercles upon the sides of the neck; others have a more or less complete series of enlarged scales on either side of the body parallel with the vertebral scales. One female caught on July 16th contained 5 eggs. The largest specimen, a male, measures 85 mm. from snout to vent, tail 200 mm.

Goniocephalus armatus crucigerus (Boulenger).

1935. *Goniocephalus armatus crucigerus*, Smith, *Fauna Brit. Ind.* II, p. 160.

4 ♂♂, 4 ♀♀, 2 juvs. Various localities in The Triangle as far north as Htingnan.

The Triangle extends the range of this form considerably to the north. I do not know of any previous records north of Lat. 18° in Siam. Most of the specimens were caught in trees or bushes. The colours in life

are very variable, the pale markings on the body and limbs ranging through yellow and white to blue or green ; the enlarged scales and the spines upon the head and dorsal crest are always blue or green.

Two females caught in August and September contained 16 and 20 eggs respectively, the eggs being equally developed in both oviducts.

Japalura kaulbacki Smith.

(Plate VIII, fig. 4.)

1937. *Japalura kaulbacki*, Smith, *Journ. Bombay Nat. Hist. Soc.* XXXIX, p. 755.

1 ♂, 7 ♀♀. Pangnamdim, Ahke.

The original description, based on a single specimen, can now be amplified. The large scales on the lower jaw and cheek extend to the level of the tympanum and are sharply defined from those on the temporal region (Pl. VIII, fig. 4). The tail of the male is distinctly swollen, and is covered with enlarged thickened scales.

The male has a small gular pouch covered with small scales ; in the female this is represented by a longitudinal fold of skin.

Both the male and the females are presumably fully grown. They measure, head and body 100, tail 195 mm. for both sexes.

Colour in life. Male.—Upper surface of head, body and limbs brown, with indistinct green transverse bars ; chin bright yellow ; gular pouch pale blue in front, scarlet behind ; belly and under-surfaces of limbs bluish-green.

Females.—Greenish above with darker markings and cross-bars ; lips and throat yellowish.

Japalura sagittifera, sp. nov.

6 ♂♂, 6 ♀♀. Pangnamdim, Dadung.

Types, ♂ and ♀, Brit. Mus. 1940. 6. 1. 43-44.

Body not depressed, tympanum concealed ; head one and a half times longer than broad ; top of head with large, unequal, keeled scales ; occiput with spinose tubercles ; a series of 3 or 4 enlarged scales behind the eye ; dorsal scales unequal, imbricate, the upper rows pointing backwards and upwards, the lower straight backwards, or backwards and downwards, with much larger, strongly keeled ones arranged in 5 chevron-shaped series upon the back and base of the tail ; ventral scales as large as, or larger than, the largest dorsals, smooth or obtusely keeled ; gular scales smaller than the ventrals ; a small gular sac, distinct in life, the scales covering it not markedly smaller than the surrounding ones ; no transverse gular fold ; a slight fold in front of the shoulder in the male, absent in the female ; no nuchal crest ; dorsal crest a serrated ridge. Limbs slender, 4th toe longer than 3rd ; the hindlimb reaches to beyond the snout in the male, to the nostril in the female. Tail compressed at the base, covered with keeled scales, those below of uniform size, about as large as the ventrals.

The degree of development of the chevron-shaped series of scales is variable. In one female they are poorly developed ; in another female and in a male they are entirely absent,

Colour.—Male blue above, whitish below, speckled with black; a dark brown longitudinal stripe on the neck; another from the eye to the angle of the mouth, bordered in front with white; tail greyish. Female dark brown above, the enlarged scales blue; lower parts as in the male.

Mr. Kaulback's sketches show the blue of the male as bright green in life, with a scarlet spot on the throat in the position of the gular pouch; in the female the blue scales are green. In one female (chevrons absent) the whole of the back is light brown; the flanks are green, the two colours being sharply defined.

♂, head and body, 50, tail 115; ♀, head and body, 60, tail 120 mm.

The paratypes do not differ from the types, except as already mentioned.

Japalura sagittifera is related to *J. andersoniana* from Assam. It differs in a broader and shorter head, in the larger gular scales and in the absence of any nuchal crest. It bears also a close resemblance to *J. tricarinata* in which species the tympanum is always naked.

Calotes versicolor (Daudin).

1935. *Calotes versicolor*, Smith, *Fauna Brit. Ind.* II, p. 189.

3 ♂♂, 4 ♀♀. Sumpra Bum, N'Chang Yang.

Calotes jerdoni Günther.

1935. *Calotes jerdoni*, Smith, *Fauna Brit. Ind.* II, p. 194.

13 ♀♀. Many localities in The Triangle.

Two specimens caught on February 16th were uniform dark crimson in colour, except for the scales on the chin and throat which were half green and half crimson. After death the colour changed rapidly to green on the upper parts, yellowish green below; lips brown, the fold in front of the shoulder brown, the spots on the elbows, knees and ankles yellow. Two others were light olive green when caught, and changed rapidly to dark red and then back again to green; the spots on the elbows, knees and ankles were white. Most of the specimens were caught upon low bushes.

A female caught on June 28th contained 7 eggs.

An examination of Mr. Kaulback's material shows that the differential characters by which *jerdoni* is separated from *maria*, namely the spinous ridges above the tympanum, the character of the gular scales and the number of scales round the body, cannot be relied upon. There is, in fact, little by which to distinguish the two, except the fold in front of the shoulder. This is always quite distinct in *jerdoni*, but in some specimens of *maria* I find it indicated. The characteristic spots on the elbows, knees and ankles are present in both. *C. maria* has so far been found only in the Khasi Hills, where *jerdoni* is also said to have been obtained. I am not quite satisfied, however, that the material of *jerdoni* in the British Museum really came from the Khasi Hills. Further investigation may show that the two should be united specifically, *maria*, the western form, being confined to Assam, and *jerdoni*, the eastern form, to Burma,

SCINCIDAE.

Lygosoma indicum Gray.

1935. *Lygosoma indicum*, Smith, *Fauna Brit. Ind.* II, p. 281.

10 specimens. Pangnamdim, Htingnan, Ningma, Htisyengyang, Ahke.

Lygosoma maculatum (Blyth).

1935. *Lygosoma maculatum*, Smith, *Fauna Brit. Ind.* II, p. 285.

2 specimens. Htisyengyang, Htingnan.

Tropidophorus berdmorei (Blyth).

1935. *Tropidophorus berdmorei*, Smith, *Fauna Brit. Ind.* II, p. 325.

1 specimen. Mahtum.

34 smooth scales round the body. The light transverse markings on the back are pale orange in life ; the belly and undersurface of the tail bright orange.

Not previously found in Burma north of Bhamo.

ANGUIDAE.

Ophisaurus gracilis (Gray).

1935. *Ophisaurus gracilis*, Smith, *Fauna Brit. Ind.* II, p. 393.

7 specimens. Matsatap, Goletutap, Hkunlum, Kajitu, N'Gumla. Underparts bright yellow in life.

VARANIDAE.

Varanus salvator (Laurenti).

1935. *Varanus salvator*, Smith, *Fauna Brit. Ind.* II, p. 406.

3 juvenile specimens. N'Chang Yang, Sumpra Bum.

The smallest of the three specimens, 130 mm. from snout to vent, has a series of bright yellow, narrow transverse stripes upon the back and base of the tail, alternating with other, less distinct ones, which are pale grey in colour.

SNAKES.

TYPHLOPIDAE.

Typhlops diardi diardi Schlegel.

6 ex., Sumpra Bum, Htingnan, N'Gumla, Pali Bum, N'Chang Yang. Scales in 26 or 28 rows at mid-body.

Four of the six specimens were caught on jungle paths after heavy rain.

DIPSADIDAE.

Pareas macularius Theobald.

1 ♂, 5 ♀♀. Htingnan, Numhkre.

♂. V 153, C. 48; ♀♀ V 159-165, C. 42-45.

The stomachs of two individuals contained slugs.

Pareas hamptoni (Boulenger).

3 ♀♀. Pangnamdim, Paira Ga.

V 181-194; C. 73-87.

In disposition they were quiet and inoffensive. Ventrals yellowish in life.

COLUBRIDAE.

Elaphe prasina (Blyth).

1 ♂, 4 ♀♀. Sumpra Bum, Htingnan, Mahtum.

♂, Scale-rows 19/19/17; V 199; C. 102; ♀♀, Scale-rows 19/19/15, except one which has 17/17/13; V 199-209; C. 98-107. One example has the prefrontals united.

Three of the specimens were caught among bamboos, two coiled up inside the nodes. In disposition they varied; one was fierce and bit repeatedly when caught, another was gentle.

Elaphe taeniura Cope.

5 ♂♂, 6 ♀♀. 4 males and 5 females from Pangnamdim and Htingnan have a scale formula of 23/23/17; V 255-263; C. 96-102 (three with tails incomplete not included). One male from Sumpawng Mada has a formula of 19/19/17; V 231; C. 94. One female from N'Chang Yang has 19/19/17; V 249; C. 88.

One specimen was caught in the roof of a hut, another in a bamboo clump, the remainder in rice fields. One caught on July 23rd, contained 11 eggs. In disposition they varied. Some were fierce and bit repeatedly when handled, others were docile.

Elaphe cantoris (Boulenger).

2 ♂♂, 2 ♀♀. Pangnamdim. V. 226-235; C. 79-83+.

The largest specimen, a male, is considerably bigger than any previously recorded; it measures 1960 mm. in total length, tail 335, not quite complete.

All were caught in thick jungle; in disposition they were docile. One caught on July 28th contained 10 eggs.

Elaphe porphyracea porphyracea (Cantor).

2 ♂♂, 4 ♀♀. Pangnamdim, Tasah Ku, Htingnan, Mahtum.

V 207-214; C. 61-68.

Quiet and inoffensive in disposition, making no attempt to bite when handled.

Elaphe leonardi leonardi Wall.

1 ♂. Patsarlamdam. V. 221 ; C. 58+.

Grey above with black markings, some of the scales tinged with red ; ocellar centres grey ; ventrals yellow with black markings. In disposition quiet and easy to handle.

Elaphe mandarina (Cantor).

2 ♂♂, 3 ♀♀. Pangnamdim, Ahke.

V. 225-236 ; C. 70-79. Scale-rows 23 or 21 at mid-body ; loreal absent in all ; dorsal spots 28 to 30 in number on the body.

Caught in rice fields ; quiet and docile in disposition.

Ptyas korros (Schlegel).

2 ♂♂, 2 ♀♀. Mahtum, Ningma, Htingnan.

V. 180-184 ; C. 132-138.

One example was shot with an arrow while swimming across a stream.

Zaocys nigromarginatus (Blyth).

2 ♂♂, 3 ♀♀. Pangnamdim.

Scale-rows 14 or 16 at mid-body. V 201-206 ; C. 126-133.

A common snake at Pangnamdim. An excellent climber, often seen in trees and bushes. Four females caught in July contained 8, 8, 8, and 9 eggs respectively. Development had commenced, the embryos measuring between 12 and 24 mm. in length. A hatchling in life was coloured as follows :—top of head dark green, the scales edged with black ; supralabials yellow ; throat bluish-white ; lower parts greenish-white.

Liopeltis frenatus (Günther).

10 ♂♂, 12 ♀♀. Htingnan. V. 157-169 ; C. 87-100.

A common snake in the neighbourhood. Many of the specimens were caught inside bamboos ; in disposition they were very gentle. Three juveniles, with the egg shells from which they had emerged, were brought in on Jan. 28th, 1939. They measured 183-195 mm. in length, tail 50-54 mm.

Oligodon cinereus Günther.

(*Oligodon violaceus*, auct.)

1 ♂. Sinan Hka. V. 174 ; C. 36 ; 7 supralabials ; a subocular ; T. 1+2. The colouration is that of var. III of my Volume.

Oligodon catenata Blyth.

(*Oligodon herberti*, auct.)

7 ♂♂, 3 ♀♀. Pangnamdim, Matsatap.

Males, V. 190-196 ; C. 38-43 ; females, V. 205-209 ; C. 37-39. One example has a loreal on the right side, another a loreal on both sides.

The largest specimen, a female, measures 580 mm. in total length, tail incomplete. One caught in July contained 3 eggs. Belly bright red in life.

All the specimens were caught in thick undergrowth. In disposition they were quiet and inoffensive.

Oligodon dorsalis (Gray).

1 ♂. N'Chang Yang. V 175 ; C. 40.

Ahaetulla cyanochloris (Wall).

2 ♂♂, 3 ♀♀. N'Chang Yang, Htingnan.

Males, V 180-189 ; C. 149 ; females, V 196-211 ; C. 135-141. There is considerable variation in the breadth of the vertebral scales, but they are always broader than those of scale-row I. One example has a well defined black flank stripe ; in the others it is absent. In two examples the pale green of the belly is clearly marked off from the bronze colour of the back ; in two others the belly is dark green and there is no line of demarcation. All were caught in low bushes or in bamboo clumps.

Chrysopelea ornata Shaw.

1 ♀ ; Mahtum. V 217 ; C. 107+.

The black dorsal cross-bars are very distinctly marked, as in specimens from Tongking.

Dinodon flavozonatum Pope.

3 ♂♂, 2 ♀♀. Pangnamdim, Mungdung, Renan. V 225-233 ; C. 87-89.

A fierce snake, biting viciously and holding on when handled. Cross-bars and underparts yellow in life. Not previously recorded west of Tongking.

Sibynophis collaris (Gray).

1 ♂, 7 ♀♀. Hkrang Hka, N'Gumla, Mawlayang, N'Chang Yang, Aliwang, Htingnan, Wadan.

V 173-181 ; C. ♂ 121, ♀♀ 98-112.

All the specimens were found in heavy jungle undergrowth. In disposition they were timid and inoffensive. One individual caught in June contained 6 eggs.

Natrix nuchalis (Boulenger).

1 ♂, 3 ♀♀, 10 juv. Pangnamdim, Ahke. V 156-160 ; C. 48-65.

Lips and underparts of some individuals pinkish in life. A shy, inoffensive snake.

Natrix venningi taronensis, subsp. nov.

5 ♂♂, 5 ♀♀. Pangnamdim and Aliwang in the valley of the Taron.

Type.—♂, Brit. Mus. 1940, 6. 1. 93, from Pangnamdim, V. 175 ; C. 94.

Differs from the typical form in having fewer caudal shields, 92-106 ; Ventrals 166-176. Dark greyish brown above, with an indistinct chequering of small squarish black spots ; lower parts mottled with black and yellow anteriorly, entirely black posteriorly.

The typical form occurs further south in Upper Burma and has a caudal count of 117-140.

Most of the specimens were caught in small mountain streams. One was eating a frog, another had eaten tadpoles. In disposition they were quiet and inoffensive.

Natrix parallela (Boulenger).

1 ♀. Pangnamdim. V. 170 ; C. 85.

Lower parts yellowish anteriorly, pinkish posteriorly.

Natrix khasiensis (Boulenger).

2 ♂♂, 1 ♀. Nawng Khai, Sumka Uma, Mahtum. V. 144-148 ; C. 95-97+.

Lower parts pale coral red in life.

The stomach of one individual contained insect remains.

Natrix piscator piscator (Schneider).

3 ♂♂, 3 ♀♀, 6 juv. N'Chang Yang.

V. 135-150 ; C. 83-92.

All the specimens in which the chequered pattern is discernible belong to the Indian form, and not to the Indo-Chinese.

Natrix percarinata (Boulenger).

1 ♀. Sumpra Bum. V 152 ; C. 70.

Caught on the banks of a stream.

Natrix himalayana (Günther).

4 ♂♂, 4 ♀♀, 2 juv. Pangnamdim, Htingnan, N'Chang Yang, Dingh-putyang, Mahtum.

V. 169-178 ; C. 85-92.

Two specimens were caught *in copula* on July 24th. Another caught on July 7th contained 7 eggs.

Natrix subminiata helleri Schmidt.

1 ♂, 8 ♀♀. Putao, Htingnan, N'Chang Yang, Sumka Uma, Mahtum, Kajitu.

V 164-172 ; C. 81-91.

Three juveniles have the colouration of the typical form which inhabits the southern half of Indo-China. One female, caught on Jan. 10th, contained 11 eggs. A vicious snake, biting fiercely when provoked. When pursued they would sometimes turn at bay and attack with open mouth.

Pseudoxenodon macrops (Blyth).

6 ♂♂, 4 ♀♀. Pangnamdim, Mawndam, Sherawthu, Shenjung, Ratnamhti, Numhkre, Tara Hka.

V. 164-178 ; C. 62-74.

All the specimens were caught between Aug. 25th and Oct. 8th. Of the six males, four have strongly developed "knobbed" keels on the scales of the ischiadic region ; one is only half-grown. The other two, one adult, the other a juvenile, show no trace of "knobs"

Plagiopholis nuchalis (Boulenger).

1 ♂, 2 ♀♀. Dinghputyang, Mahtum. V 132-142 ; C. 23-27.

Lower parts pinkish in life. Quiet and inoffensive in disposition.

Blythia reticulata (Blyth).

2 ♂♂, 2 ♀♀. Htingnan, Sumpra Bum. V 131-135 ; C. 17-22+.

Found under logs and decaying vegetation. Quiet and gentle in disposition.

Boiga quincunciata Wall.

1 ♂, 1 ♀. Htingnan. V 247-253 ; C. 124-125.

Two specimens of this very beautiful snake, hitherto known only from three specimens. Both were found inside bamboos. They were sluggish in disposition, and did not resent being handled, perhaps owing to the cold as they were caught early in February.

Psammodynastes pulverulentus (Boie).

10 ♂♂, 3 ♀♀. Htingnan, Tasah Ku, Shagri Bum, Sumka Uma, Dinghputyang, Hkandau, Sumhpawng Mada, Mahtum.

V 165-176 ; C. 56-69.

Most of the specimens were caught in heavy jungle undergrowth.

Dryophis prasinus Boie.

6 ♂♂, 3 ♀♀. Sumpra Bum, Htingnan, N'Daw Yang, Sumka Uma, Uyawm Uka, Hkawng Ga.

V 196-206 ; C. 159-187.

"One caught on June 10th contained 7 eggs with transparent shells through which the embryos could clearly be seen moving. Average size of eggs 35 × 15 mm. ; length of embryo about 25 mm."

ELAPIDAE.

Bungarus bungaroides (Cantor).

1 ♂, 1 ♀. Matsatap, Ahke. V. 229-230 ; C. 43-46.

The larger of the two specimens, a male, measures 1400 mm. in total length, tail 160 mm.

***Naja naja kaouthia* Lesson.**

2 ♂♂, 2 ♀♀. Sumhpawng Mada, Mahtum, Kajitu, Sumpra Bum.

Scale formulae : ♂ 31/21/15 ; V 188 ; C. 55 ; ♂ 25/21/15 ; V 187 ; C. 53 ; ♀ 27/21/15 ; V 189 ; C. 54 ; ♀ 25/21/15 ; V. 191 ; C. 55+.

One example had eaten a bird, another a skink. The "monocle" on the hood is well marked in three individuals. The other, fully grown, is uniform brown in colour above without any markings.

***Naja hannah* Cantor.**

1 ♂. Sumpra Bum. V. 243 ; C. 88.

VIPERIDAE.

***Trimeresurus mucrosquamatus* (Cantor).**

1 ♂, 5 ♀♀. Pangnamdim. V. 203-214 ; C. 79-88.

All the specimens were caught in heavy jungle undergrowth. In disposition they were sluggish, and made but little attempt to escape when caught.

***Trimeresurus monticola* Günther.**

4 ♂♂, 4 ♀♀. Pangnamdim, Adung Long, Naurayang Ga.

Males, V. 137-161 ; C. 54-59. Females, V 137-170 ; C. 47-48.

Subcaudals paired or single. One example from Adung Long is uniform yellowish below.

Five examples had eaten small mammals (rats or mice, not yet identified).

***Trimeresurus jerdoni* Günther.**

3 ♂♂, 3 ♀♀. Pangnamdim, Mungdung, Renan, Patsarlamdam, Ahke.

V. 182-188 ; C. ♂ 67-78, ♀ 64-65.

***Trimeresurus kaulbacki*, sp. nov.**

(Plate VIII, fig. 5.)

Types ♂ and ♀, Brit. Mus. 1940. 6.1.51-52.

Snout three times as long as the diameter of the eye ; upper head scales rather small, unequal, smooth, scarcely imbricate, those on the snout larger than those on the crown of the head ; supraoculars large, entire, 8-10 scales in a line between them ; internasals large, broader than long, in contact with one another, or separated by 1 or 2 scales ; 2 enlarged scales in a line between the internasals and supraoculars ; 8 supralabials, first entirely separated from the nasal, second forming the anterior border of the loreal pit, third largest ; anterior genials very large, followed by 5 or 6 pairs of smaller scales, the two series separated from one another by a deep mental groove ; no series of scales between the labials and the subocular ; temporal scales smooth, the series just above the labials being much larger than the others.

Scales in 25/25/19 or 17 rows, strongly keeled, except the outer one or two rows. V. ♂ 205, ♀ 204, C. ♂ 75+, ♀ 70, some of the anterior ones being single.

Hemipenis extending to the 14th caudal plate, forked opposite the 10th ; the distal half is calyculate, the proximal spinous, the spines in the area remote from the sulcus being much larger than those adjacent to it. Olive green above, with a series of dark, diamond-shaped or angular vertebral spots, which may be united to one another and form a zig-zag band ; sides with much smaller and less distinct spots, corresponding in position with the vertebral ones each vertebral spot covers from 12 to 20 scales, which are green at the centres and black at the edges ; lower parts grey, with large, squarish or semi-lunar yellow spots ; throat and anterior part of the body mostly whitish ; top of the head black with yellow longitudinal lines, one extending from the tip of the snout to between the eyes where it divides, the arms diverging and extending backwards to connect above the angle of the mouth with a line which passes backwards from the eye ; nape with 2 parallel longitudinal lines ; upper lip uniform yellow.

Total length ♂ 1340, tail 225 mm. ; ♀ 1390, tail 230 mm.

Paratypes :—10 more adults, all females, all from the type locality, agree closely with the above description. Some individuals have a complete series of small scales between the subocular and labials. V 204-212 ; C. 66-76.

36 juveniles, hatched out from three batches of eggs, differ slightly in colouration but not in morphological characters from the adults. They are pale greyish (light brown in life) above, and have the dark (reddish brown in life) dorsal markings edged with white ; lower parts black and white, the two colours in almost equal proportions ; lips and the whole of the lower jaw white (pink in life) with large black spots symmetrically arranged.

Trimeresurus kaulbacki is most nearly related to *T. jerdoni* to which it bears a strong resemblance. It differs in the longer and narrower head, in the greater number of scales round the body, the greater number of ventrals and in colouration. The head markings, although of the same pattern, are more clearly defined, as also are the dorsal spots.

T. jerdoni further is known to be viviparous whereas *T. kaulbacki* is oviparous.

Mr. Kaulback obtained three females on guard over their eggs. They were found in holes in the ground. With one mother were 6 eggs, with another 16, in two batches of 8 each, and with the third 32, in three batches of 12, 12 and 8. The embryos of the third " nest " were all fully developed and began to emerge from their envelopes on the same day. There is no reason to think, therefore, that they were the product of three different mothers. When born they averaged 260-270 mm. in length.

***Trimeresurus albolabris* Gray.**

8 ♂♂, 8 ♀♀. Nog Mung, Htingnan, Mashaw Tingsa, Labu Ga, N'Chang Yang, Sumka Uma, Mahtum, Sumpra Bum.

Males V 159-166 ; C. 66-73. Females V 163-169 ; C. 53-60.

***Trimeresurus stejnegeri* Schmidt.**

2 ♀♀. Ratnamhti. Scale formula 17/17/13 ; V 146-149 ; C. 59-60.

These specimens are provisionally referred to *T. stejnegeri*, although normally that species has 19 scales at mid-body.