

## REMARKS ON SOME OLD WORLD GECKOES.

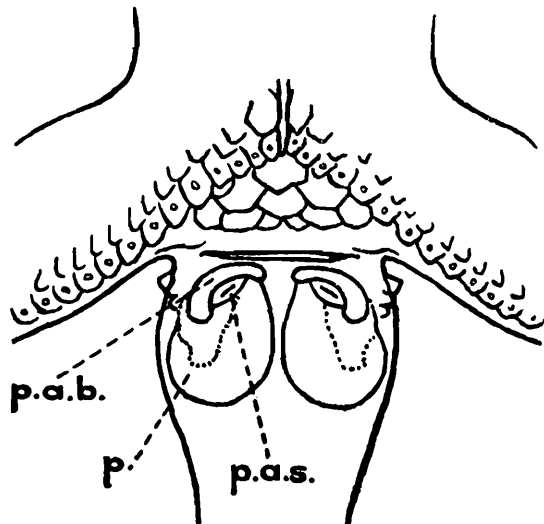
By MALCOLM A. SMITH.

In reviewing the Oriental Gekkonidae for the forthcoming Volume on the Lizards in the Fauna of British India series, it has been found necessary to make certain changes in taxonomy and nomenclature with regard to the Family. To have included all the changes in that Volume would have been out of place, for some of the genera and species concerned do not occur in the area covered by that work. In the present article certain structural characters which concern the family as a whole are considered, the status of four genera and of the Uroplatidae are discussed, and two species from the Indian Empire are described as new. The text-figures are by Miss Joyce Townend.

### *The post-anal bones and sacs.*

These structures, which appear to be peculiar to the Gekkonidae, have so far escaped the notice of anatomists. Noble mentioned the bones briefly in 1921, but I can find nothing in the literature concerning the sacs. Most of the Geckoes, under which I include the Eublepharidae and Uroplatidae, possess them.

They are paired structures, lying one on each side of the base of the tail just behind the vent. The sac is present in both sexes, but the bone only in the male; in those species in which the sac is absent, the bone also is absent. The bone is short, and curved or angular in shape; it lies free just under the skin. It can be easily recognised without dissection, by inserting the point of a needle into the opening of the sac and lifting the bone upwards. The opening of the sac lies within the curve of the bone; it varies from an elongated and conspicuous slit, to a minute aperture hardly visible to the naked eye. Its position with regard to the vent is variable; in some species it is closer to that opening



TEXT-FIG. 1.—*Gymnodactylus pulchellus*. Post-anal bones and sacs. *p.* penis; *p. a. b.* post-anal bone; *p. a. s.* opening of post-anal sac; The outline of the sac itself is shewn as a dotted line.

than in others. The sac itself runs backwards and outwards; it is loosely attached to the surrounding tissues, and in life, in large species, can be partly evaginated. It is larger in the male than in the female.

Mr. M. A. C. Hinton junr. has kindly made microscopic sections of the sac wall for me and glandular cells are certainly present. At the same time I have so far failed to discover any secretion in the sac, although I have examined many individuals both in the living state—in captivity—and preserved. Possibly the secretion is periodic, occurring only during the mating season. The attention of naturalists in India is directed to this point.

The above description of the bones and sacs is as I have found them in all the Oriental Geckoes. Some of the material used has been stained by the Alazarin method, and in that case the whole skeleton could be very completely examined. For the rest I have relied upon dissection and the information gained is therefore not so exact. A complete series of stained specimens may shew that the shape of the post-anal bones is not always as stated, for they are variable, at any rate in Geckoes outside the Oriental Region. The American *Coleonyx variegatus* has two post-anal bones on each side, the outer one projecting through the skin (Noble 1921); the same author states that in the African *Pachydactylus maculatus* "in addition to a broad fenestrated median bone lying transversely across the anterior lip of the cloaca, there is a pair of irregularly shaped bones posterior to either corner of the cloacal slit" I have failed to find this median bone in the one stained specimen of this species in the British Museum collection, and its post-anal bones are angular, as in some of the Oriental Geckoes, and not irregularly shaped as he states.

Post-anal bones and sacs are present in all the Indian and Indo-Chinese Geckoes, except *Pristurus*. They are not present in any member of the genus *Pristurus*. On the other hand they are present in all the species of *Phyllodactylus* in the British Museum collection except *P. riebeckii* from Socotra and *P. elisae* from Persia; they are present in all the Old World species of *Gonatodes* (as Boulenger recognized the genus), but absent in all the New World species.

### Genus *Cnemaspis*.

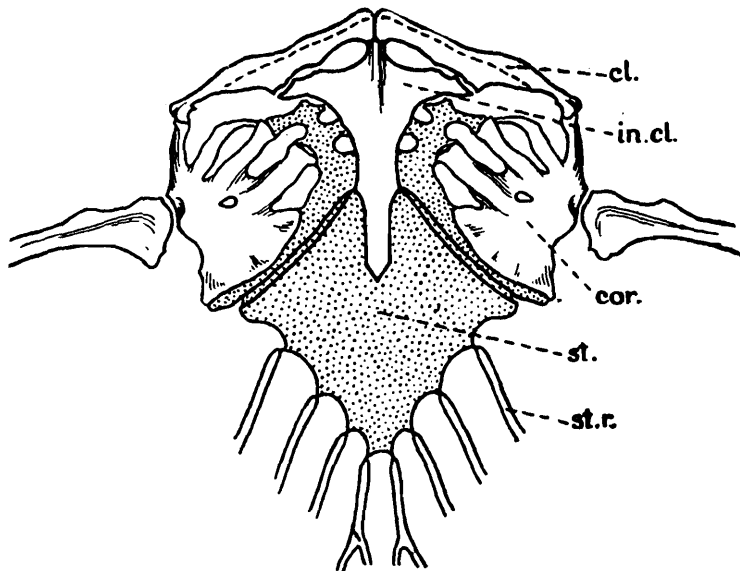
The *Gonatodes* of Boulenger had a wide distribution over the Oriental Region, Africa and tropical America. In external characters all the species agreed well, but as shewn by Noble (1921) there are considerable skeletal differences between the American *Gonatodes* (genotype *albogularis* from the West Indies) and *Gonatodes dickersoni* Schmidt from Africa; he therefore erected a new genus, *Paragonatodes*, for the African species. My examination of the Oriental forms shews that they agree in the majority of their characters with *Paragonatodes*. Noble's examination of the African species (3 in number) was limited to *G. dickersoni*, and I have made a partial examination of *G. africanus*†. Of the Indian species I have examined *G. indicus*\*, *G. mysorensis*\*, *G. ornatus*†, *G. sisparensis*† and *G. beddomei*† (= *marmoratus*); of the Indo-Chinese and Malayan, *G. kendalli*†, *G. nigradius*\*, *G. affinis*†, *G. siamensis*\* and *G. bculengeri*\* (= *Gonatodes glaucus* Smith). Those marked with an

asterisk are stained specimens, those with a cross have had the pectoral girdle only dissected.

The characters stressed by Noble as distinguishing his *Paragonatodes* from the American *Gonatodes*, are as follows:—

<i>Gonatodes</i>	<i>Paragonatodes</i>
1. Clavicle slightly dilated, not perforated.	1. Clavicle slightly dilated, not perforated.
2. Interclavicle cruciform.	2. Interclavicle dagger-shaped.
3. Four sternal ribs.	3. Three sternal ribs.
4. No hypo-ischium.	4. A hypo-ischium.
5. No post-anal bones.	5. Post-anal bones.
6. Two pairs of basi-branchials.	6. One pair of basi-branchials.

As regards 4, 5 and 6 the Oriental forms agree with *Paragonatodes*. They have a well-developed hypo-ischium, post-anal bones and sacs, and a reduced hyoid apparatus, there being only one pair of basi-branchials. Four sternal ribs are present in all the Oriental species, as well as in



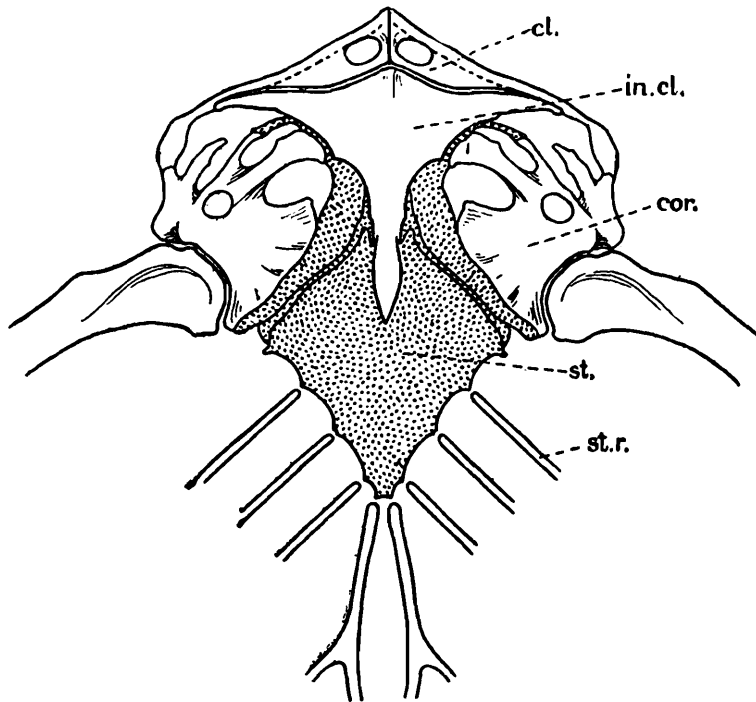
TEXT-FIG. 2.—*Cnemaspis mysorensis*. Sternal apparatus.  
cl. clavicle; in. cl. interclavicle; cor. coracoid; st. sternum; st. r. sternal ribs.

*Gonatodes africanus*. The interclavicle is well developed and cruciform in the Oriental forms, but much reduced and with only very small transverse arms in *africanus*, in which respect it agrees with *dickersoni*. In *africanus* the whole of the sternal apparatus appears to be poorly ossified.

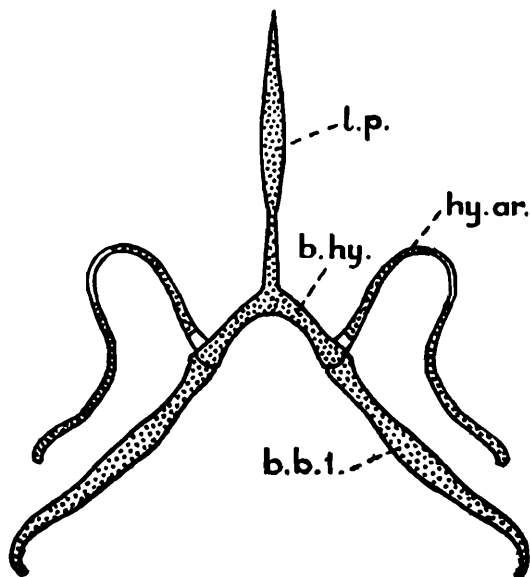
The greatest variation in form is in the clavicle. In the Indian *mysorensis*, *indicus* and *beddomei* it is dilated and thinned but not perforated as figured in *mysorensis* (text-fig. 2); in the Indo-Chinese and Malayan species and in the Indian *ornatus* and *sisparensis* it is dilated, thinned and perforated as figured in *boulengeri* (text-fig. 3). The perforation of the clavicle is but the final stage in the thinning process of the bone, and it may vary in size in different species from a small hole to a comparatively large opening. It cannot therefore be regarded as having any phylogenetic significance.

My observations then confirm Noble's view that the American species of *Gonatodes* are generically distinct from the Oriental. All the Old World species appear to be sufficiently nearly related to one another

to be regarded as congeneric, and for them *Cnemaspis* Strauch 1896, type *boulengeri*, from Pulo Condor off the coast of Cochin-China, is avail-



TEXT-FIG. 3.—*Cnemaspis boulengeri*. *cl.* clavicle; *cor.* coracoid; *in. cl.* interclavicle; *st.* sternum; *st. r.* sternal ribs.



TEXT-FIG. 4.—*Cnemaspis mysorensis*. *b. b. i.* basi-branchial I; *b. hy.* body of hyoid; *hy. ar.* hyoid arch; *l. p.* lingual process.

able. Strauch recognised the affinities of his species with *Gonatodes* but considered that its enlarged post-tibial scales were sufficient to merit generic distinction. I am not of that opinion.

#### Genera *Gehyra* and *Hoplodactylus*.

The actual specimens which Gray had before him when he framed his genus *Gehyra*, type *pacifica*, cannot now be traced and the combination—*Gehyra specifica*—does not occur again in literature. He mentions three specimens, and presumably they belonged to two genera, for in revising his genus in 1842 he made *Gecko oceanicus* Lesson 1830, the type of *Gehyra* and gave the name *pacificus* to a new genus which he called

*Naultinus*. This conclusion was confirmed in 1845 and a specimen of *Gehyra oceanica* (Lesson) is mentioned as being in the British Museum. That specimen also cannot now be traced. Whether he recognized in 1842 that his *Gehyra pacifica* was identical with *Gecko oceanicus* but omitted to include it in the synonymy we do not know, but it is significant that both his *pacifica* and his specimen of *oceanica* are from the same locality, namely "Islands of the Pacific". His original description of the genus "Digiti 5-5, ad basin dilati, serie unica squamarum transversalium integrarum tecti, ad apicem compressi, liberi, omnes (praeter pollices) unguiculati" as well as his confirmation of it in 1842, are quite in agreement with the *Gehyra* of Boulenger or *Peropus* of later authors, and *Gehyra* 1834, type *pacifica* = *oceanica*, therefore, is the correct name for the genus and not *Peropus* Wiegmann which did not appear until 1835. The only point that remains to be considered is the place of the unidentifiable *G. pacifica* in literature. On the argument put forward it would be correct to include it in the synonymy of *oceanica*.

The synonymies of *Gehyra*, *Naultinus* (which Gray also confused with *Hoplodactylus*) and *Hoplodactylus* will now stand as follows:—

#### *Genus Gehyra.*

*Gehyra* (in part) Gray, Proc. Zool. Soc. 1834, p. 100, and Zool Misc. 1842, p. 57 (type *pacifica* = *oceanica*).

#### *Genus Naultinus.*

*Naultinus* (in part) Gray, Zool. Misc. 1842, pp. 58 and 72, and Cat. Liz. Brit. Mus. 1845, p. 169 (type by elimination *elegans*).

#### *Genus Hoplodactylus.*

*Hoplodactylus* Fitzinger, Syst. Rept. 1843, pp. 19 and 100 (type *Platydyctylus duvaucelii* D. & B.).

*Gehyra* 1834 is in part *Gehyra* and in part *Naultinus*, whereas *Naultinus* 1842 is in part *Naultinus* and in part *Hoplodactylus*.

*Hoplodactylus*, as recognized by Boulenger (Cat. Liz. Brit. Mus. I, 1885, p. 171) contained five species. Three of these were said to inhabit New Zealand, one India, and the fifth, namely *H. duvaucelii*, which was stated to have come from Bengal, but which has never since been found in any part of India, now turns out to be very closely allied to, if not a race of, one of the New Zealand forms. I have recently compared a specimen of *H. pacificus* with the types and only known specimens of *duvaucelii* and except for a difference in size, and the number of subdigital lamellae the two are identical. The largest specimen (♀) of *pacificus* in the British Museum collection measures 70 mm. from snout to vent, the largest example of *duvaucelii* 120 mm. There can be little doubt that the types of *duvaucelii* did not come from India, and that some error must have occurred in the labelling of the specimens. This places the genus *Hoplodactylus* in a more satisfactory position, for

the faunas of New Zealand and India have nothing in common with one another. The true *Hoplodactylus* is confined to New Zealand, and the one Indian species, which can be distinguished from it by several small but distinct characters, should be placed in a separate genus. I propose for it *Dravidogecko*, gen. nov., monotype *Gecko annamallensis* Günther. The similarity which the two genera bear to one another in external characters is due no doubt to parallel evolution and not to phylogenetic relationship. The material available does not permit me to examine the internal structure of *Dravidogecko*.

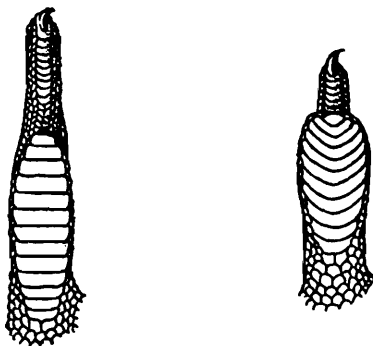
The following characters will serve to distinguish the two :—

Free terminal phalanges rising from the end of the expanded portion of the digit; inner digit with a minute claw, or the claw concealed; male pores in multiple series	<i>Hoplodactylus</i> .
Free terminal phalanges rising from within the expanded portion of the digit; inner digit with distinct claw; male pores in single series	<i>Dravidogecko</i> .

Boulenger's Key for the species of *Hoplodactylus* unfortunately breaks down when a large number of specimens are examined; the four forms however can be readily distinguished from one another if attention is paid to the following characters :—

A. 10 to 14 lamellae (the posterior usually divided) beneath the free terminal phalanges of the outer 4 digits.	
Ten to 12 curved lamellae beneath the dilated portion of the digit	<i>pacificus</i> .
Sixteen to 18 curved lamellae beneath the dilated portion of the digit	<i>duvaucelii</i> .
Lamellae beneath the dilated portion of the digit straight, transverse	<i>granulatus</i> .
B. 4 to 6 lamellae beneath the terminal phalanges of outer 4 digits, which are not more than half the length of the dilated portion.	
Lamellae beneath the dilated portion of the digit curved	<i>maculatus</i> .

Colour pattern and the number of pores in the male vary greatly in different individuals. In two specimens of *maculatus* in the same bottle



TEXT-FIG. 5.—*Hoplodactylus granulatus* and *H. maculatus*. Fourth toes.

in the British Museum collection there are 39 pores in one example, 102 in the other. Lucas and Frost state that *duvaucelii* has no pores, but this is not so.

The synonymy of the species will run as follows :—

1. *Hoplodactylus pacificus*.

*Naultinus pacificus*, Gray, Zool. Misc. 1842, pp. 58 and 72 and in Diffenbach's Travels in New Zealand, 1843, p. 203; *id.*, Cat. Liz. Brit. Mus. 1845, p. 169 (in part).—*Hoplodactylus pacificus*, Boulenger, Cat. Liz. Brit. Mus. I, 1885, p. 173; Lucas and Frost, Tr. N. Zealand Inst., XXIX, 1897, p. 264.

2. *Hoplodactylus duvaucelii*.

*Platydictylus duvaucelii* Dum. and Bib. Erp. Gen. III, 1836, p. 312 (type loc. "Bengal"; Mus. Nat. Hist. Paris).—*Hoplodactylus duvaucelii*, Boulenger, Cat. Liz. Brit. Mus., p. 172.

3. *Hoplodactylus granulatus*.

*Naultinus granulatus* Gray, Cat. Liz. Brit. Mus., 1845, p. 273 (type loc. New Zealand; Brit. Mus.).—*Hoplodactylus granulatus*, Boulenger, Cat. Liz. Brit. Mus., 1885, p. 174; Lucas and Frost, Tr. New Zealand Inst., XXIX, 1897, p. 264.

4. *Hoplodactylus maculatus*.

*Naultinus pacificus* (*N. maculatus*) Gray, Cat. Liz. Brit. Mus., 1845, p. 273 (type loc. New Zealand; Brit. Mus.).—*Hoplodactylus maculatus*, Boulenger, Cat. Liz. Brit. Mus., I, 1885, p. 171; Lucas and Frost, Tr. N. Zealand Inst., XXIX, 1897, p. 264.—*Naultinus pacificus* (*N. brevidactylus*)<sup>1</sup> Gray, l. c. s., p. 273.

The genus is definitely known from New Zealand. The old collections of the British Museum and Paris contain specimens of *H. pacificus* from Tasmania and of *H. maculatus* from Tasmania and the Marquesas Is. As far as I am aware they have not been since met with in those localities.

### Genus **Hemiphyllodactylus**.

Bleeker's *Hemiphyllodactylus*, 1860, appears to have given rise to considerable confusion in the past. Boulenger in his Catalogue, 1885, limited it to a single species (under *Spathoscalabotes*), overlooking the fact that three of the species included by him in that work under *Lepidodactylus*, namely *ceylonensis*, *aurantiacus* and *crepuscularis* had the generic characters of *Hemiphyllodactylus*, the chief of which is the vestigial first digit. This was put right by Stejneger in 1899. Later Boulenger described under *Gehyra*, two species, namely *larutensis*, 1900, and *yunnanensis*, 1903, that again have the digital characters of *Hemiphyllodactylus*. The latter was made by Barbour in 1924 the type of a new genus, namely, *Cainodactylus*. I cannot help thinking that he overlooked *Hemiphyllodactylus* at the time, for I can find nothing in his description, or in the species, the types of which are in the British Museum, to separate it from that genus. *Hemiphyllodactylus* and *Gehyra* are no doubt very closely allied, and both are possibly derived from *Hemidactylus* by gradual reduction of the first digit. Whether their retention as three separate genera represents their true phylogeny is doubtful. *Lepidodactylus* on the other hand appears more closely allied to *Gekko*.

The genus *Hemiphyllodactylus* may be defined as follows :—

Digits free, subcylindrical at the base, the penultimate joint bearing a strong expansion furnished beneath with lamellae, which are more or less divided in two by a median fissure; terminal phalanges of outer four digits short, compressed, clawed, free, rising angularly from within the

<sup>1</sup> These specimens cannot now be traced.

expansion ; inner digit vestigial, without free distal phalanx, sometimes with a minute claw. Dorsal scales small, granular. Pupil vertical. Males with preanal and femoral pores.

Range. Ceylon and southern India ; Indo-China ; the East Indies and Islands of Oceania. It contains the following species :—

1. *Hemiphyllodactylus typus*, Bleeker, 1860.

*Platydactylus crepuscularis* Bavay, 1869.

*Spathodactylus mutilatus* Gunther, 1872.

*Lepidodactylus ceylonensis* Boulenger, 1885.

*Hemiphyllodactylus leucostictus* Stejneger, 1899.

*Hemiphyllodactylus insularis* Taylor, 1918.

*Hemiphyllodactylus margarethae* Brongersma, 1931.

2. *Hemiphyllodactylus yunnanensis*.

*Gehyra yunnanensis* Boulenger, 1903.—*Cainodactylus yunnanensis* Barbour, 1924.

*Hemiphyllodactylus harterti*.

*Lepidodactylus harterti* Werner, Zool. Anz. Leipzig, April, 1900.

*Gehyra larutensis* Boulenger, Ann. Mag. Nat. Hist. August, 1900.

Through the kindness of Dr. Ernst Ahl, Keeper of Reptiles in the Zoological Museum, Berlin, I have recently been able to examine the type and only known specimen of *L. harterti*, and can confirm Boulenger's suspicion (1912) that it is identical with his *larutensis*. The name *harterti* has priority over *larutensis* by four months.

It is satisfactory to find that Dr. L. D. Brongersma (1931), working independently, has reached the same conclusions with regard to *Hemiphyllodactylus typus* as I have.

### The Eublepharidae and Uroplatidae.

It is usual now to regard the Eublepharidae as of polyphyletic origin, as an assemblage of genera that have developed independently, but along similar lines, from the true Geckoes, in different parts of the world. Boulenger separated them from the Gekkonidae for having procoelous vertebrae, co-ossified parietals and moveable eye-lids, but recent work has shewn that there are exceptions to this definition. The American *Sphaerodactylus* is a Geckonid with procoelous vertebrae ; paired parietals have been found in two species of Eublepharid (Noble, 1921). His statement, however, that the Indo-Chinese *Phyllodactylus siamensis* has fused parietals is not borne out by three specimens examined by me in the British Museum collection. The Malayan *Aeluroscalabotes* is a Geckonid with connivent eye-lids, and no doubt other exceptions to those mentioned will be found when the internal structure of more of the Geckoes is known.

The Uroplatidae differ from the true Geckonids and the Eublepharids in having cylindrical clavicles and a reduced interclavicle. The interclavicle however is not more reduced in them than it is in the two African species of *Cnemaspis* previously mentioned, while the difference between a cylindrical clavicle which is larger at its sternal end, and the clavicle



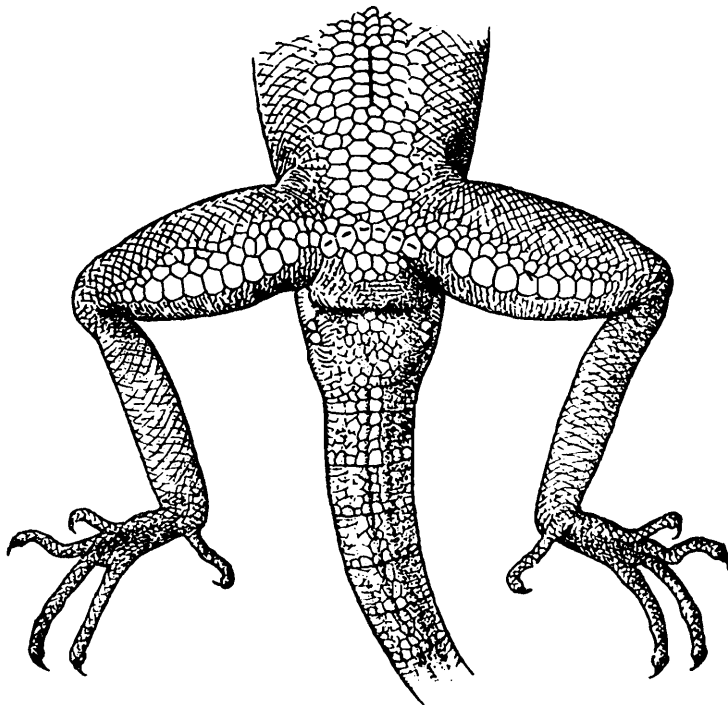
as it is found in some species of *Gonatodes* and *Cnemaspis* is not great. In other respects *Uroplates*, the only genus in the Family, is a typical Geckonid and should be regarded as a member of the Gekkonidae. Mocquard came to this conclusion in 1909 (Nouv. Arch. Mus. Paris). Ángel, on the other hand, has discussed the genus more recently (Mem. Acad. Malg. 1929, fasc. IX) and has regarded the genus as a subfamily of the Gekkonidae.

The following species are described as new to science.

***Agamura femoralis*, sp. nov.**

Head somewhat depressed, about twice as long as broad; snout longer than the distance between the eye and the ear-opening, the diameter of which is less than half that of the eye; eye moderate, with well-developed upper eye-lid. Rostral pentagonal, as broad as high; nostril between the first labial and three rather swollen nasals; 12 upper and 11 lower labials; mental considerably longer than the adjacent labials, pointed behind; a pair of well-developed post-mentals with a smaller pair outside; gular region with small flat granules.

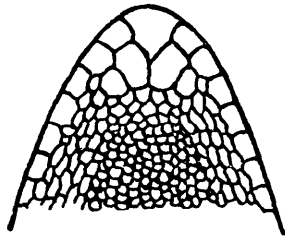
Head covered above with small rounded scales, largest on the snout, intermixed posteriorly with larger tubercles. Body depressed, back with small, rather irregular scales intermixed with numerous larger rounded keeled tubercles; belly with flat, rounded, feebly imbricate scales. Limbs



TEXT-FIG. 6.—*Agamura femoralis*, From the type.

shorter than in *persica*, the hind limb reaching only to the neck; a series of much enlarged scales along the under surface of each thigh. Tail cylindrical, becoming suddenly smaller after the basal part but not so markedly as in *persica*, tapering to a point, segmented, with small scales above, four or five in longitudinal series to each segment, below with larger irregular scales, usually three to each segment. Male with 6

preanal pores in a transverse series and a series of greatly enlarged femoral scales.



TEXT-FIG. 7.—*Agamura femoralis*, Ventral view of the Chin.  $\times 3$ .

Greyish above with indistinct darker cross-bands upon the back and tail ; whitish below.

Head and body 50, tail 55 mm.

The type and only known specimen (B. M. coll. 1912, 3-26-12) was collected by Capt. C. Daukes at Kharan in Baluchistan in 1912. It differs from the only other known species in the genus in having enlarged femoral scales, well-developed postmentals and a pointed tail.

### ***Stenodactylus maynardi*, sp. nov.**

*Stenodactylus orientalis* (not of Blanf.) Alcock and Finn, *J. Asiat. Soc. Bengal*, LXV, 1896, p. 554.

Types male and female (Brit. Mus. 1931, 6-14-1, and Ind. Mus., no. 13944).

Head moderate, depressed ; snout longer than the distance between the eye and the ear-opening, the diameter of which is half that of the eye. Nostril between the rostral, first labial, and three or four smaller shields ; rostral quadrangular ; 13-15 upper and 12-13 lower labials ; mental much larger than the adjacent labials, its curved posterior margin projecting well beyond them ; no post-mentals. Head covered above with small, granular scales, largest upon the snout. Body depressed, the back covered with small granular scales, intermixed with numerous larger keeled tubercles ; belly with small, rounded, keeled scales. Limbs above with subimbricate, keeled scales ; the hinder one reaches to the axilla. Toes long, with well-marked lateral denticulations, the transverse lamellae with several keels. Tail with rows of small, keeled scales. Male with 9 very distinct preanal pores transversely arranged ; female with 9 enlarged pitted scales.

The specimens, which are now somewhat faded, are of a light yellowish-brown colour above with four longitudinal dark brown streaks, the two lateral ones being distinct and unbroken, the two median ones broken up into a series of spots. Dr. Maynard states of their colours in life : “three irregular yellow longitudinal bands, with brownish-black stripes intervening from top of head to tail ; under surface of body and limbs delicate pinkish.”

Head and body, ♂45, ♀50, tail, ♂70, ♀76 mm.

The types and only known specimens were collected by Dr. Maynard in Baluchistan near the Afghan frontier.

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