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A REVIEW OF THE ELAPID GENUS *ULTROCALAMUS* OF NEW GUINEA

BY CHARLES M. BOGERT AND BESSIE L. MATALAS

The genus *Utrocalamus* was proposed by Sternfeld in 1913, with two forms recognized. The species *preussi* was designated type of the genus, and an additional name, *bürgersi*, was proposed on the basis of a poorly preserved specimen from "Deutsch-Neuguinea." Since 1913 a third "species," *latisquamatus*, has been described by Schüz, and at least 18 additional specimens assigned to *preussi* have been partially described or mentioned in print.

This review is prompted by the acquisition of six additional specimens secured by the Archbold Expeditions for the biological exploration of New Guinea. The expedition of 1936-1937, an account of which is provided by Rand and Brass (1940), obtained two specimens south of the main divide, near Palmer Junction on the upper Fly River, and four specimens on the Idenburg River were secured by the expedition of 1938-1939 (summarized by Archbold, Rand, and Brass in 1942). A survey of the literature reveals that all specimens hitherto reported were taken on the northern slope of the island (see map, fig. 7). Thus the two specimens from the Fly River extend the known range of the genus, and, moreover, they appear to represent an undescribed form. Before comparisons can be made, however, it becomes necessary for us to evaluate the variations in *preussi*, with which we synonymize both *bürgersi* and *latisquamatus* for reasons explained below. Because we believe the specimens taken on the southern drainage represent a new subspecies the name of the type species becomes a trinomial.

Utrocalamus preussi preussi Sternfeld

Utrocalamus preussi STERNFELD, 1913, p. 388, figs. 1-2 (Seleo Island, near Berlinhafen, type locality); STERNFELD, 1914, p. 38, figs. 31-32 (description of specimen reported in 1913 repeated); DE ROOIJ, 1917, p. 258, figs. 99-102 (Sermowai River, Humboldt Bay; Njao on Tjano River); DE ROOIJ, 1919, p. 93, figs. 7-10 (upper Sermowai River, lower Sermowai River; Njao on the Tjano River; and Hollandia. Except for the latter locality, de Rooij's 1917 records are evidently repeated here); DE JONG, 1927, p. 306 (Etik, Biri River; Arso, Prauwenbivak; Pionierbivak); SCHÜZ, 1929, p. 15 (Teiau River, Toricelli Mountains); DE JONG, 1930, p. 407 (Mamberamo River at 50 meters; Albatrosbivak on the Mamberamo River).

Utrocalamus bürgersi STERNFELD, 1913, p. 388 ("Deutsch-Neuguinea," type locality).

Utrocalamus latisquamatus SCHÜZ, 1929, p. 15 (Garub or Garup River, Toricelli Mountains, type locality).

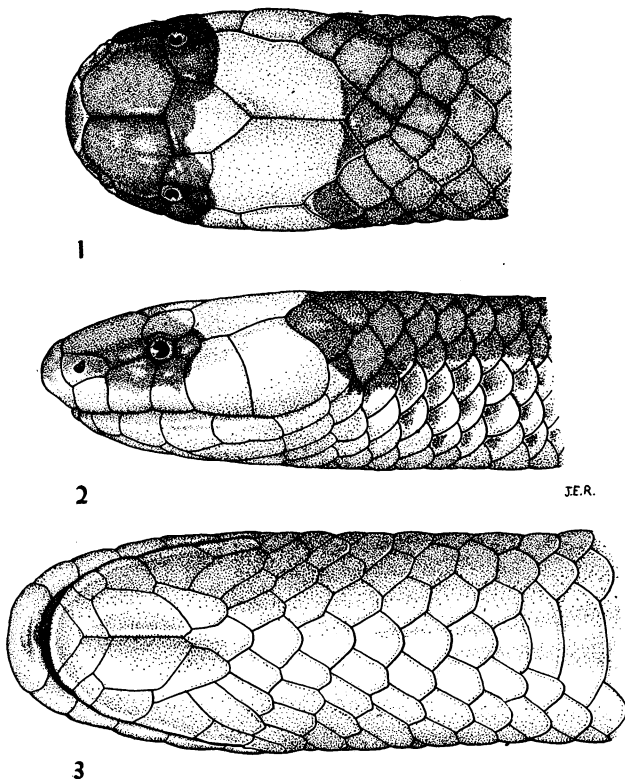
MATERIAL EXAMINED: Four specimens from 4 kilometers southwest of Bernhard Camp, Idenburg River, at an elevation of 850 meters, in Netherlands New Guinea (A.M.N.H. Nos. 62469-62472), collected by William B. Richardson while he was attached to the Indisch-Amerikaanische Expeditie of 1938 and 1939.

LEPIDOSIS: Dorsal scale row formula 13-13-13 on three males but alternating between 13 and 15 on the single female because the vertebral row or the sixth row repeatedly merge and then separate from the contiguous rows. Ventrals 292, 295, 298 (males), 331 (female); anal plate single; caudals 46, 47, 54 (males), 20 (female). Supralabials uniformly five, with the second and third reaching the eye, and with the fifth widely separated from the postocular (see fig. 2), except on A.M.N.H. No. 62472 where the anterior

corner reaches the postocular. Infralabials six throughout the series, with the first three in contact with the anterior chin shields. Nasal entire, in contact with the first and second labials. Postocular present on both sides of all specimens. Ratios of width to length in the dorsal head scales are as follows: prefrontal .86 to 1.9, frontal .61 to .81, supraocular .77 to 1.1, parietal .53 to .63.

respectively, with the organ as well as the sulcus bifurcating in the region of the fifteenth caudal. Basal portion with spines arranged in longitudinal rows terminating in spinules. Distal lobes with papillae arranged in diagonal rows comprising seven chevrons.

DIMENSIONS: Males 500, 505, and 563 mm. in length, with the tails respectively 64, 57, and 64 mm. Female 414 mm.,



Ulrocalamus p. preussi

Figs. 1-3. Dorsal, lateral, and ventral views of the head of *Ulrocalamus p. preussi*, A.M.N.H. No. 62470 (male, $\times 5$).

DENTITION: Maxillary teeth II + 4; palatine teeth 6, pterygoid teeth 16; dentary 12. Grooves are present on all maxillary teeth, including the tubular fangs. Functional fang 0.8 mm. from entrance lumen to tip on a specimen 505 mm. in total length.

HEMIPENES: On the three males the organ (*in situ*) extends to the nineteenth, seventeenth, and seventeenth caudals,

tail 17 mm. Ratios of tail to total length .11 to .13 in males, .04 in the female.

COLORATION: Dark brown above, the two outer scale rows lighter, with a dark spot in the center of each scale. Underside dirty white with a brown bar on each ventral and each caudal, except on A.M. N.H. No. 62470 on which bars are absent from many ventrals. A cream-colored band is present in the parietal region, ex-

tending onto the labials as depicted in figures 1 and 2. The tail terminates in a cream-colored, blunt scale.

SEXUAL DIMORPHISM: It will be noted above that in proportion to the total length the tails of males are approximately three times as long as those of the female. Similarly, the female possesses fewer than half as many caudals and more than 30 additional ventral scales. Two males possess whitish supracloacal tubercles, but these are absent from the largest male as well as from the female. Despite their absence from the largest male, they presumably represent male secondary sex characters.

REMARKS: Heretofore the sex of the few specimens described in the literature has not been mentioned, although de Rooij (1917) evidently had both sexes represented as indicated by the extremes in ventral and caudal counts which she lists as 300 to 328, and 16 to 48, respectively. The counts for seven specimens listed by de Jong (1927) indicate that all specimens but one with 283 ventrals in his series were females. Similarly the types of *preussi* and *latisquamatus* evidently were females, indicating a range in ventral counts of 307 to 331 for females and from 283 (*vide* de Jong, 1917) to 300 for males, assuming that de Rooij's minimum count represents a male. Caudals vary from 16 to 29 in females, if the minimum count reported by de Rooij is correct, and from 37 to 54 in males. Owing to the blunt termination on the tail of all specimens, it is almost impossible to determine whether portions of the tail may not have been lost in some specimens.

The presence of both 15 and 13 scale rows on the female described above throws considerable doubt on the validity of 15 scale rows as a diagnostic character for *bürgersi* and *latisquamatus*. Neither can much value be attributed to the absence of a postocular, because one specimen of the form reported below lacks this shield on one side. Four supralabials quite possibly represent an abnormality resulting from the fusion of two labials. Schüz (1929) presumes that differences in the proportions of the head shields are of diagnostic significance, but had he bothered

to convert his measurements to ratios he himself would not have discovered any impressive difference. Ratios for various head shields are presented above in order to indicate the amount of variation present on our small series. Moreover, the presence of *preussi* in the Toricelli Mountains, as reported by Schüz, would indicate that two closely related "species" occur side by side. Because the characters assumed to be diagnostic for *latisquamatus* and *bürgersi* may well represent mere abnormalities, we conclude that specimens rather than species were defined, and that the names are synonyms of *preussi*.

On the other hand the two specimens taken by the Archbold Expedition of 1936-1937 differ in several respects from specimens hitherto described, particularly when the difference between the sexes in *U. p. preussi* is taken into account. The most obvious character which serves to distinguish the specimens secured south of the main divide is a much narrower, more irregular band across the parietal region. Accordingly we propose to call the population represented by these two specimens

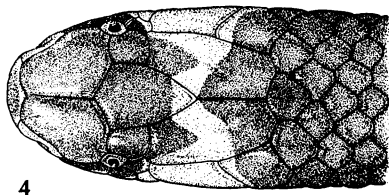
***Ultrocalamus preussi angusticinctus*,**
new subspecies

TYPE: A male specimen, A.M.N.H. No. 57512, taken on the upper Fly River, 5 miles below Palmer Junction in the Western Division of Papua, by Richard Archbold, Austin L. Rand, and G. H. H. Tate in May, 1936.

DIAGNOSIS: Closely related to *U. p. preussi* from which it differs in possessing more ventral scales, and a relatively shorter tail (in males and presumptively in females as well), a narrower parietal band, and in having the fifth supralabial in broad contact with the postocular when this scale is present.

DESCRIPTION OF THE TYPE: Dorsal scale row formula 13-13-13. Ventrals 312; anal plate single; caudals 43. Cephalic plates as depicted in figures 4 to 6, with no preocular and postoculars 1-1. Supralabials 5-5, with the first reaching the nasal, the second touching both the nasal and the eye, and with the third, fourth, and

fifth all in contact with the postocular. Infralabials 6-6, the first pair meeting on the midline behind a normal mental. Two pairs of chin shields approximately of equal length, the posterior pair completely separated by a single scale that extends forward to separate the posterior ends of the first pair. Ratios of width to length for the head shields are: prefrontal .86, frontal .65, supraocular .82, parietal .57.

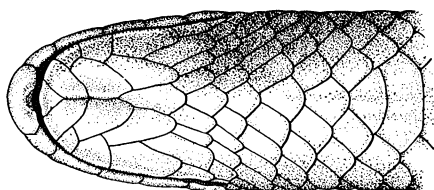


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Ultracalamus p. angusticinctus

Figs. 4-6. Dorsal, lateral, and ventral views of the head of *Ultracalamus p. angusticinctus*, A.M.N.H. No. 57512 (male, type, $\times 5$).

DENTITION: Only the maxilla was examined. It contained two fangs followed by four solid grooved teeth, decreasing in size from front to back (see fig. 8), all of them with grooves. The fang is 0.6 mm. from entrance lumen to tip.

HEMIPENIS: As dissected *in situ* the

organ extends to the fifteenth caudal, bifurcating at the thirteenth, with the sulcus spermaticus dividing at the twelfth caudal. Basal portion with thickly set spinules in longitudinal rows. Distal lobes with papillae tipped with spinules arranged in diagonal rows comprising seven chevrons.

DIMENSIONS: Length over all 477 mm., the tail (42 mm.) 8.8 per cent of the total length.

COLORATION: Dark brown above, the two outer scale rows with light margins on the scales. Underside dirty white, with a brown bar on most of the ventral scutes but absent on those of the anal region as well as on the neck. Tail terminating in a cream-colored, blunt scale.

PARATYPE: A male taken in the same locality and in the same month as the type is virtually identical in most characters. It differs from the type in lacking a postocular on the right side so that the fifth labial is in contact anteriorly with the third and fourth labials, as well as with the supraocular. On the left side of the head the fifth labial reaches a small postocular. There are 319 ventrals and 42 caudals. Ratios of the width to length of the prefrontal 1.0, of the frontal .60, of the supraocular 1.0, of the parietal .58.

DIFFERENCES BETWEEN THE SUBSPECIES

The differences between *angusticinctus* and the typical form are summarized on page 5:

The data in the tabulation include those derived from the material at hand as well as those taken from the literature for *U. p. preussi*. Ventral counts listed by various authors who have not given the sex of their specimens have been placed as males or females on the basis of the data derived from our specimens where the sex is known. We have assumed that the minimum and maximum ventral counts given by de Rooij (1917) represent male and female, respectively, whereas the reverse was assumed to be true of the caudal counts. Judging by our data, all the counts listed by de Jong (1930) are those of females.

De Rooij states that the yellowish

	<i>U. p. preussi</i>	<i>U. p. angusticinctus</i>
1. Ventrals:		
Males.....	293.5 (283-300)	315.5 (312-319)
Females.....	319.0 (307-330)
2. Ratio, width of nuchal band to parietal suture length.....	.72 (.41-1.1)	1.9 (1.6-2.1)
3. Ratio, tail to total length:		
Males.....	.13 (.12-.15)	.09 (.08-.09)
Females.....	.05 (.04-.06)
4. Fifth labial.....	Excluded from postocular or in narrow contact	In broad contact with postocular, or supraocular

band across the parietals disappears with age, although there is no evidence of this in our material. However, the maximum length (720 mm.) which she reports exceeds our largest specimen by 210 mm.

Whereas some of the differences indicated in the table are dichotomous, it is a reasonable assumption that specimens intermediate in some characters will be found, or that only mean differences will prove to exist when large series become

available from both slopes of the Snow Mountains. Evidently this range of mountains (see map, fig. 7) serves as an isolating barrier, although it is conceivable that intermediate or intergrading populations will be found at the west end of the island where the Snow Mountains terminate. Consequently we prefer to use the trinomial for *angusticinctus*, with the belief that it conveys suitable implications concerning relationships.

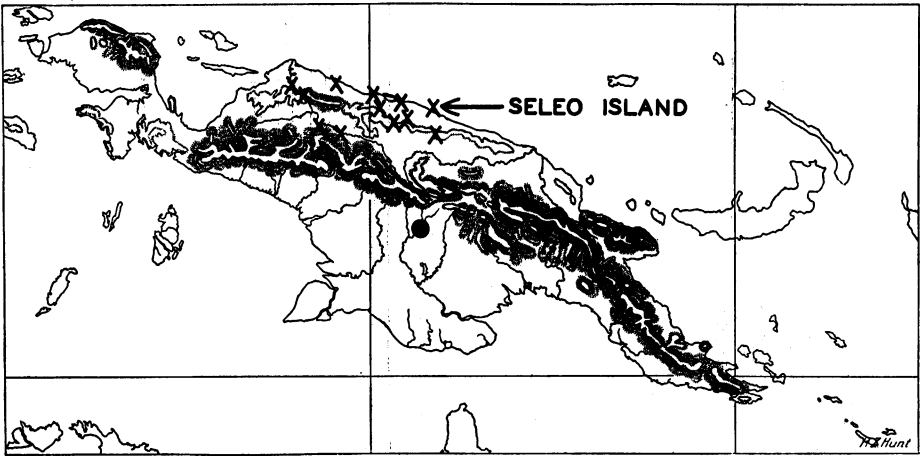


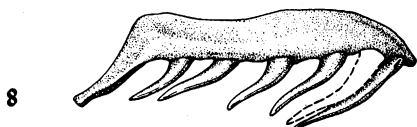
Fig. 7. Map of New Guinea, showing locality records for *Ultracalamus*. *U. p. preussi*, X. *U. p. angusticinctus*, ●.

GENERIC AFFINITIES

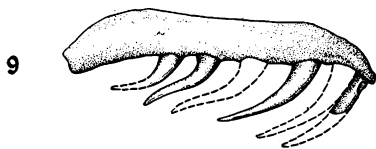
Ultracalamus evidently is closely related to *Toxicocalamus*, *Apistocalamus*, and *Pseudapistocalamus*, all of New Guinea, as well as to *Ogmodon* of the Fiji Islands. In fact, it is doubtful whether those in New Guinea cannot all be assigned to a single

genus. Boulenger in his "Catalogue of snakes" seems to have considered any modification of the head shields to be of generic importance, and his example has been followed by many other taxonomists. Because the Elapidae apparently are an

ancient, relatively conservative group it is perhaps reasonable to expect it to include a fair number of monotypic genera. On the other hand, the generic category has been widely used as a means of indicating differences, whereas it was Linneaus' intention that it be used to indicate similarities. Differences are properly indicated by assigning closely related but non-interbreeding populations to separate species comprising a genus.



Ultrocalamus p. angusticinctus



Pseudapistocalamus nymani



Toxicocalamus stanleyanus

Figs. 8-10. Lateral views of the right maxillae of *Ultrocalamus p. angusticinctus*, A.M.N.H. No. 57512, type, *Pseudapistocalamus nymani*, A.M.N.H. No. 59067, and *Toxicocalamus stanleyanus*, A.M.N.H. No. 59063 (all $\times 15$).

It may be observed that the pattern and coloration are similar on all five genera mentioned above. Moreover, there are no striking differences in dentition, whereas these five genera are unique among the Elapidae in lacking a diastema behind the fangs (figs. 8 to 10). The solid maxillary teeth vary in number from three, reported for *Apistocalamus*, to six in *Ogmodon*. Four are present in *Pseudapistocalamus*,

and the same number are reported for *Toxicocalamus*, although five are present in the single specimen available of *T. stanleyanus* (A.M.N.H. No. 59063, from Mafulu, Central Division, British Papua).

Thus the total number of maxillary teeth varies from five to eight, with all intermediate stages represented. In a similar fashion the number of scale rows has been reduced in some forms, with 17 in *Ogmodon*, 17 or 15 in *Toxicocalamus*, 15 in *Apistocalamus* and *Pseudapistocalamus*, and 15 or 13 in *Ultrocalamus*. Nasal plates have become divided or coalesced in various forms, and the anal plate has been similarly affected. The temporal shields have been reduced in *Ogmodon*, and in *Ultrocalamus* they are completely lacking, along with the internasals and the preocular. Snakes referred to *Apistocalamus* reputedly possess vertically elliptical pupils, but this is perhaps open to question owing to the difficulties encountered in the determination of pupil shapes in preserved specimens.

No serious doubt can exist concerning the affinities of these snakes. They must have descended from a single ancestral population, and some features of their anatomy suggest that it may have been from a relatively primitive elapid stock (Bogert, 1943, p. 297). Evolution has proceeded along various lines with one structure being lost in one species and retained in another. Whether the burrowing habits, which presumably characterize all these snakes, have in some manner brought about the reductions in scalation or not we can only speculate. However, if the ancestral stock had adopted subterranean habits while imperfectly adapted for this mode of existence, a premium may have been placed on a slender habitus. Assuming that selective forces were involved, it is probable that the loss of one scale or another was purely incidental to the attainment of a slender body. Hence the coalescence of contiguous scales or scale rows, or the loss of individual scales, may have been purely a matter of random selection. Genetic isolation of five strains is indicated, and, in general, specialization seems to be most advanced in *Ultrocalamus*

which has lost the internasals, as well as the temporals, while the nasals and the anal plates have become fused. But various stages in these reductions are indicated in other strains that we now recognize as "genera." It is doubtful whether each of these groups will not prove to be monotypic when enough material is available to evaluate the supposed differences that have been pointed out. Usually diagnoses were prepared upon the basis of fewer than a half dozen specimens, with no mention of sexual dimorphism. No striking differences, for example, are apparent when the characters of the five nominal

species of *Apistocalamus* are plotted, and it is questionable whether even five valid subspecies are represented.

Additional material may become available as the result of the current occupation of New Guinea by American armed forces which include several naturalists. While pointing out the desirability of assembling these several related species in one genus, more extended studies are desirable before the precise taxonomic status of the various forms can be ascertained. Hence we retain the various generic names pending further study.

MAXILLARY DENTITION IN PRIMITIVE ELAPIDS

Despite their specialization in other characters, *Utrocalamus* and its relatives may be regarded as primitive in some aspects of their maxillary dentition, particularly in the feeble enlargement of the fangs. In the majority of elapids the fangs are relatively enormous in contrast with the solid teeth on the maxillae, and in many genera only the tubular fangs remain, always in paired sockets to permit replacement of one fang while the alternate one is in use (Bogert, 1943). But in *Utrocalamus* and its relatives the teeth gradually diminish in size from front to back, and the solid teeth are near replicas of the fangs. However, only the two anterior teeth are tubular with the suture or weld in the venom canal running from the entrance lumen to the discharge orifice. Curiously enough, a groove similar to that on the true fangs is present on each solid tooth as well, and on some teeth there are concavities in the respective positions of the entrance lumen and the discharge orifice that conceivably represent vestiges of a venom canal. These were evidently so conspicuous on the type specimen of *Ogmodon* that Peters (1864, fig. 4d, 4e) depicted all eight teeth as though they were tubular fangs.

Similar grooves are present on the solid teeth of other elapids. These grooves, of course, may have no phylogenetic significance, but it may be suggested that they

represent traces of fang structures that were actually functional in the ancestral stock. If so the two anterior teeth have become more highly specialized for the conduction of venom while the posterior teeth have degenerated and in the most highly specialized elapids have been completely lost. The retention of relatively large solid teeth behind the fangs in *Utrocalamus* and its close allies is probably coupled with the meager enlargement of the fangs (Bogert, 1943, p. 330). The diastema in other elapids is apparently present in order to provide the necessary space on the inner side of the jaw for teeth in the replacement series. In *Utrocalamus* sufficient space is present to accommodate the replacement series of both the small fangs and the non-specialized teeth.

In proportion to the total length, *Utrocalamus* has the shortest fangs of any elapid known, and it is extremely doubtful whether it is dangerous to man. De Jong (1927, p. 306) says that "Apparently it is a very common species" and he quotes Mr. Gjellerup who says, "according to the Papuas this snake is harmless." The stomachs of all the specimens examined by us were empty, but a somewhat larger relative, *Pseudapistocalamus nymani* (A.M. N.H. No. 59067, from Mafulu, Central Division), contained a sarcophagid fly larva (identified by Dr. Howard C. Cur-

ran). It may be presumed that most of these exiguous elapids are insectivorous.

Ogmodon, which retains more scale rows and more maxillary teeth than any other snake in the assemblage, is probably the most primitive. Its isolated position on the

periphery of the range of the family tends to confirm this assumption. Other elapids have more teeth on the maxilla, but on all of them the fangs are proportionately larger than the solid teeth and set off from them by a diastema.

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