STUDIES ON THE FAUNA OF SURINAME AND OTHER GUYANAS: No. 50.

THE "WORLD'S LARGEST TOAD" AND OTHER HERPETOLOGICAL SPECIMENS FROM SOUTHERN SURINAME

by

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In this short paper we list the herpetological specimens collected in southern Surinam (Dutch Guiana) by Mr. and Mrs. RUDOLF FREUND in November and December, 1961, and include ecological notes made by the FREUNDS at the time. This area is one from which collections are rare, so that distributional data are generally unavailable. Of special interest is the seemingly common occurrence there, and in adjacent parts of Guyana (formerly British Guiana). of giant specimens of the toad *Bufo marinus*, of such length and weight to indicate that these animals are the "world's largest toads".

The collecting localities are shown on the outline map (Fig. 200) and available habitat data are given in the species list.

HUMPHREY & FREUND (1962) have given a more complete description of the areas adjacent to the Käysergebergte and Sipaliwini airstrips in a report on the birds of these areas. All animals collected by the FREUNDS in Surinam were donated to the Peabody Museum of Natural History, Yale University.

We wish to thank Dr. R. G. ZWEIFEL for permission to examine specimens at the American Museum of Natural History and for his personal help with some of the identifications. Dr. E. E. WILLIAMS of the Museum of Comparative Zoology, Harvard University, confirmed the identification of the two tortoises, *Geochelone denticulata* and *G. carbonaria*, and Dr. C. J. GOIN kindly identified the *Hyla boesemani* Mr. JOHN HOWARD and Mr. PERCY MORRIS took the photographs of the living toads. Miss ALICE GRANDISON, and Dr. WERNER C. A. BOKERMANN, DORIS M. COCHRAN,

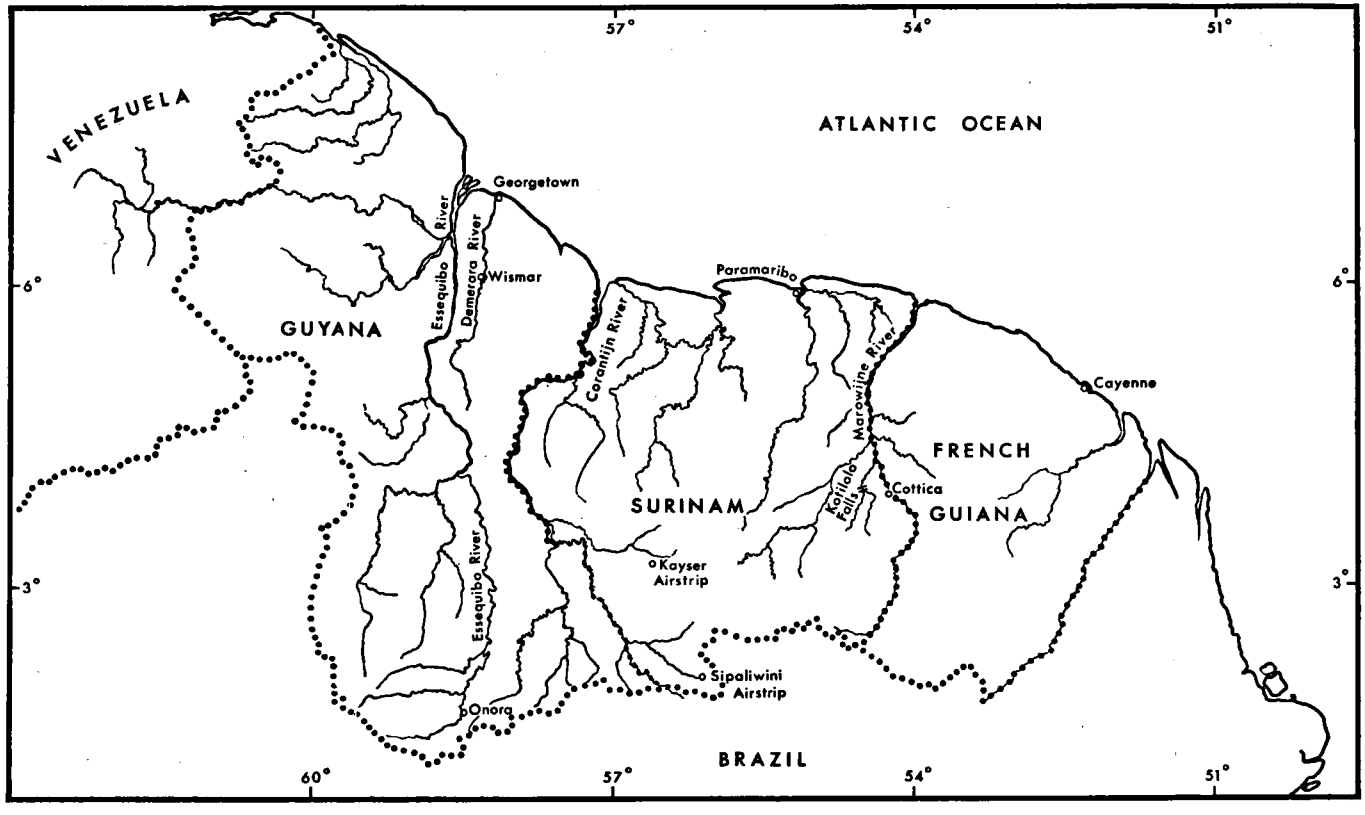

Fig. 200. Map of the Guianas showing the collecting localities listed.

M. S. HOOGMOED, Jr., JEAN GUIBÉ, and D. C. GEIJSKES have communicated with us concerning the toads, and to them we are grateful. Miss WARD WHITTINGTON kindly prepared the map and the graphs.

SPECIMENS COLLECTED

LACERTILIA

(1) **Plica plica** (Linnaeus, 1758)

YPM R5913 was shot in camp at Sipaliwini airstrip, 11 December. – This iguanid would be expected in southern Surinam, as its distribution covers most of central and northern South America, including Tobago and Trinidad (BURT, 1931).

(2) **Cnemidophorus lemniscatus lemniscatus** (Linnaeus, 1758)

YPM R5909–5910 were collected in a drainage ditch at Käysergebergte airstrip, 24 November. – The general distribution is Tobago and Trinidad, Venezuela, the Guianas, northeastern Brazil and Ecuador, and north through Central America.

(3) **Kentropyx calcaratus** Spix, 1825

YPM R5907 was collected 25 November and R5908 29 November, on Käysergebergte airstrip. – The distribution includes most of northern South America.

SERPENTES

(4) **Atractus major** Boulenger, 1894

YPM R 5912 was collected in jungle bordering Sipaliwini airstrip on 7 December. – This species has hitherto been reported only from the Oriente region of Ecuador. Similar, possibly conspecific, forms are found in the upper margin of the Amazon basin in Venezuela, Colombia, Perú and Bolivia (SAVAGE, 1960). As far as we can determine, this is the first record from Surinam.

(5) **Oxyrhopus petola** (Linnaeus, 1758)

YPM R5911 was caught along a sandy trail leading into the jungle from the edge of Käysergebergte airstrip, at 0800 hours, 2 December. – The distribution (PETERS, 1960) has been reported as Central America. Amazonian South America, and the western coast of Ecuador and Colombia.

CHELONIA

(6) **Geochelone denticulata** (Linnaeus, 1766)

(7) **Geochelone carbonaria** (Spix, 1824)

Two specimens of each of these two species of tortoises were collected in late November within 10 meters of each other on the Paru Savannah near Sipaliwini airstrip. – The tortoises were brought by the FREUNDS to the United States alive; three of them ate well in captivity and were subsequently loaned to a zoological park, in which they could not later be found. The fourth specimen soon died of starvation; its skeleton is no. 5261 in the Peabody Museum's osteological collection. The distribution of these two species of tortoises is approximately the same (Trinidad and northern South America, Colombia, Venezuela, the Guianas, Perú, Bolivia, and Brazil), although *G. carbonaria* has not yet been reported from the southeastern coast of Brazil (WILLIAMS, 1960).

ANURA

(8) **Hyla boesemani** Goin, 1966

YPM A1351 was collected on 6 December on a guest house at Käysergebergte airstrip. – Previously reported only from Zanderij and Onverwacht (both in Surinam district), this present record from a more inland region indicates that this recently described species (GOIN, 1966), may range widely.

(9) **Leptodactylus bolivianus** Boulenger, 1898

YPM A1321 was caught along Oranje Kreek at Käysergebergte airstrip on 1 December. – The distribution (RIVERO, 1961) has been reported as being in Central America, and south through Perú, Bolivia and Brazil.

(10) **Leptodactylus podicipinus** (Cope, 1862)

YPM A1314 was collected on 8 December at the edge of a small pool at Sipaliwini airstrip. – COCHRAN (1954) lists specimens from Bolivia and southern and northeastern Brazil, and refers to reports from Paraguay, Guyana, Venezuela and Ecuador The species has also been reported from central Argentina.

(11) **Leptodactylus poecilochilus** (Cope, 1862)

YPM A1312–1313 were collected 7 December, at the edge of a small pool adjacent to Sipaliwini airstrip. – The distribution has been reported by RIVERO (1961) as Costa Rica, Panamá, Colombia, and Venezuela.

(12) **Bufo marinus** (Linnaeus, 1758)

A1350 is a single number for 13 individuals, one large and 12 recently metamorphosed, collected in a drainage ditch at Käysergebergte airstrip, 24 November; A1320 was captured at night on Käysergebergte airstrip 24 November. A887–889 are two extremely large females and an associated large male collected at Käysergebergte airstrip, 24 November. – RIVERO (1961) has reported the natural distribution of this species as being from Texas through México, Central America, and Venezuela into northern South America; populations have, however, been widely introduced elsewhere because of their supposed capabilities for reducing the numbers of insects.

BIZE OF SUFO MARINUS

The specimens of *Bufo marinus* collected at the Käysergebergte airstrip are of interest for a number of reasons, but particularly with regard to the large size of the females. Only three other recorded specimens of *Bufo marinus*, all females, are approximately as large as are the two females reported here (Table 5). Of these three formerly known, two are from the interior of Guyana; one of these (BMNH 1936. 12.3.47) was collected sometime before 1844 by ROBERT SCHOMBURGK from the ' Upper Essequibo" during that redoubtable explorer's research in the interior of British Guiana. However, the size of this specimen has seemingly not hitherto been published. The other specimen (AMNH 46559) from Guyana was collected at Onora, and its length has been published (BLOMBERG, 1952; OLIVER & SHAW, 1953; BOGERT, 1954), but curiously the extremely large size of this individual has failed to excite any great attention. The third specimen (RMNH 4981) priorly known is from Kotilolo Falls in the Gonini River, Surinam.

With the present records of these large toads, we can now assume that a population of such giant *Bufo marinus* extends throughout the southern interior of both Surinam and Guyana, and perhaps

TABLE 5

SIZES OF THE FIVE LARGEST KNOWN SPECIMENS OF *Bufo marinus*, AND OF YPM A887 ♂

AMNH = American Museum of Natural History, New York; BMNH = British Museum (Natural History), London; RMNH = Rijksmuseum van Natuurlijke Historie, Leiden; YPM = Yale Peabody Museum, New Haven.

Sex	Specimen No.	Locality	Snout-vent length	Weight
♂	YPM A887	Käysergebergte airstrip, Surinam	12.5 cm	0.24 kg (8½ oz.)
♀	YPM A888	Käysergebergte airstrip, Surinam	22.5 cm	1.57 kg (3 lbs., 7½ oz.)
♀	YPM A889	Käysergebergte airstrip, Surinam	20.8 cm	1.26 kg (2 lbs., 12½ oz.)
♀	AMNH 46559	Onora, Guyana	22.5 cm	(Not recorded)
♀	BMNH 1936.12.3.47	"Upper Essequibo", Guyana	22.4 cm	(Not recorded)
♀	RMNH 4981	Kotilolo Falls, Gonini River, Surinam	23.0 cm	(Not recorded)

beyond into the adjacent parts of Brazil, Venezuela, and French Guiana.

We wish to emphasize that these five female specimens of *Bufo marinus* establish this species as having the largest known individuals of toads. *Bufo blombergi* from Colombia may equal these large *B. marinus* from the Guianas in snout-vent length (BLOMBERG, 1952), but is not as robust an animal. Although VAN KAMPEN (1923) listed the Indo-Australian *Bufo asper* as reaching a snout-vent of 260 mm, this claim remains undocumented and must be considered to be an error or misprint until a definite specimen of that size is collected. INGER (1964) distinguished the larger toads of Borneo and Sumatra as a distinct species, *Bufo juxtasper*; the largest individual of which we can find a record has a snout-vent length of 215 mm.

True *B. asper* from the East Indies seemingly is much smaller; the largest one of which we can find a record is a Javanese specimen of approximately 136 mm (INGER, 1964). However, TAYLOR & ELBEL (1958) recorded a *B. asper* from Thailand with a length of 215 mm.

BEHAVIOR OF THE GIANT BUFO MARINUS

The three specimens collected by the FREUNDS at Käysergebergte airstrip on 24 November, 1961, following the first rains of the season, were members of a much more numerous population, as these toads emerged in numbers and were, for the few days thereafter that the FREUNDS remained in the area, numerous on the airstrip and in pools adjacent to it.

All of the toads observed were in amplexus; each female was of a size similar to those collected (ca. 225 mm), and each was clasped by a male considerably smaller. The breeding season of this population of *B. marinus* would seem thus to begin typically in middle or late November, with the coming of the rains which end what is locally known as the "little dry season". The giant female from Onora (AMNH no. 46559), was also being clasped by a much smaller male (snout-vent length 157 mm) when collected (23 December, 1937).

Each female constructed a flat-bottomed, shallow "nest" (ca. 25 cm diameter and 6.0–7.5 cm deep) in sandy areas at the edges of newly-created pools adjacent to the airstrip. Each nest had a raised rim and was filled with water, in which the female sat, with the male on her back. After three days of intermittent but heavy rains more of the animals seemingly emerged, as they were seen on the airstrip itself, always in pairs with the males clasping. Particularly at night, the females could be seen hopping across the airstrip or through the adjacent underbrush, carrying the males passively. If the two members of a mated pair were separated forcibly, a matter of some difficulty, the male rejoined the female immediately, mounted, and clasped her. Clasping was of the type typical for toads, with the male's forelimbs grasping the female tightly, immediately posterior to her paratoid glands (Fig. 201).

One such mated pair was placed for temporary safekeeping under an inverted washbasin, but the female hopped vigorously away, carrying both male and basin.

At night, the toads were particularly easy to see on or adjacent to the airstrip, as two pairs of eyes, the male's above and the female's below, gleamed back from any light.

The three toads YPM A887–9 were taken first to Paramaribo and kept there for several days before being flown to New York and then taken by car to New Haven, Connecticut. One female, YPM A889, lost her mate in being captured. She suffered erosion of the tip of the snout and the surfaces of the facial ridges during transport; these injuries healed rapidly after she was placed in an aquarium with wet soil and given some giant cockroaches (*Blaberus craniifer*) for food. Once healed, she was killed and preserved.

The other two, male and female, were in amplexus and remained so throughout this period of travel and for some days thereafter. At first, they were kept in a glass-sided aquarium rather small for their size; after several days the male separated himself from the female and for some weeks kept apart from her. The female ate giant cockroaches on numerous occasions, discarding the elytra, but the male was

never observed to take food after his arrival in the United States. In early April 1962 these two toads were moved to a water-tight, glass-fronted container approximately 1.5 m square. Here they lived for almost a year.

When first placed in the larger container, they stayed in a small pool within it for several hours, but then emerged to hop around the whole interior. The female dug a well with walled sides, somewhat similar to the "nests" constructed by females in southern Surinam when first seen the previous November. The male worked his way beneath her, where he stayed for two days; he then left her and buried himself, except for this eyes and the top of his head, in the moist soil of another corner of the terrarium. A day later they had moved back into the pool, and were in amplexus again after approximately half an hour. Two hours later the female, carrying the male, returned to her dirt-rimmed "nest", and remained there for eight days with the clasping male. She then returned to the pool for a half-hour, after which she dug herself a new "nest" without the male moving from her back. During this period of eight days and the subsequent week the pair remained in amplexus; the female ignored several frogs, but ate a few roaches.

Other matters then interfered and further observations were not made on the toads until July, 1962; at this time they were separate again, with the female continuing to eat sparingly. The male remounted the female in December, 1962. Of interest is this return to amplexus, under relatively constant and extremely artificial conditions, at approximately the normal time (November) for the initiation of amplexus in nature.

The pair entered the pool in their box during the first week in January and both shed their skins but did not eat them. The toads separated several days later and the male, extremely emaciated, died 12 February, 1963. The female had eaten little throughout the several preceding months, and refused food after shedding. She died 13 April, 1963.

GROWTH IN BUFO MARINUS

Casual inspection of specimens of *Bufo marinus* of different sizes led to an impression that different parts had grown at different rates than had the trunk and head (snout-vent length). For example, the paratoid glands of the largest individuals bulged tremendously (Pl. III), accentuating their apparent length, and the heads looked to be relatively broader than were those of small specimens. This latter appearance was emphasized by the greater development and more rugged appearance of the facial ridges on the larger specimens. Careful measurements of numerous individuals of different sizes proved that some of these appearances of nonlinear growth were illusory, but some were valid; however, the general proportions (with some exceptions to be discussed below) of bodily parts of the smallest toads (1.55 cm snout-vent length) were the same as those

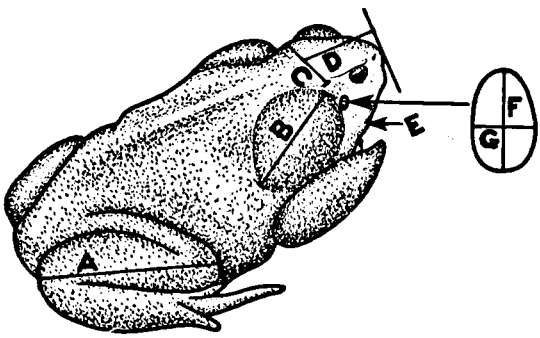

Fig. 201. Diagram of *Bufo marinus* showing the measurements made: A. Right lower leg length. – B. Greatest length of the paratoid gland. – C. Head width. – D. Head length. – E. Angle of jaw; the measurements from point E on one side to the identical point on the opposite side is the "Upper jaw width". – F. Greatest diameter of the tympanum. – G. Length of tympanum, taken at right angle to F.

of the largest specimen (22.5 cm), which is approximately 3,000 times the bulk of the smallest.

As compared to snout-vent length, this identity of growth rate is obvious for the right lower leg length (Fig. 202).

The paratoid gland (Fig. 204) grows more slowly than does the head and body until the young toad is about 7.5 cm long, but thereafter grows at a rate similar to that of the head and body.

The upper jaw and the head grow in width at identical rates (Fig. 206), but, verifying the viewer's first impression, the head (and thus the upper jaw also) in the larger specimens has grown relatively wider with increase in size (Fig. 205).

An anterior bulging of the paratoid over the tympanum in the larger specimens straightens the posterior edge of the tympanum and reduced its length (Fig. 201, G); this factor accounts for the depression of the upper part of the curve in Fig. 207.

Available data were added to the graphs (Figs. 202–207) on sizes of the respective parts of *Bufo paracnemis*, a species closely related to *B. marinus*, and of *Bufo blombergi*; this latter species is the other giant Neotropical toad. Except for the shorter paratoid in *Bufo blombergi*, these large toads seem to be similar to *B. marinus* in linear proportions and rates of growth, for the parts measured.

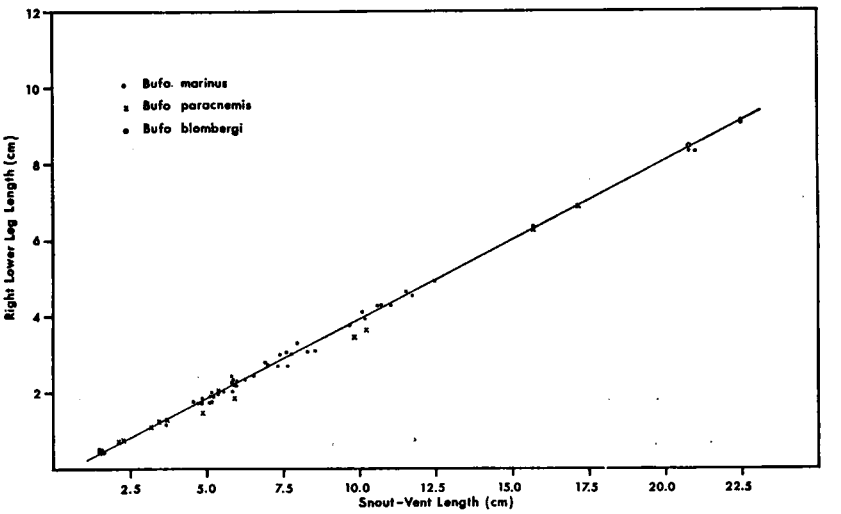

Fig. 202. Relation between lower leg length and snout-vent length in toads of different sizes.

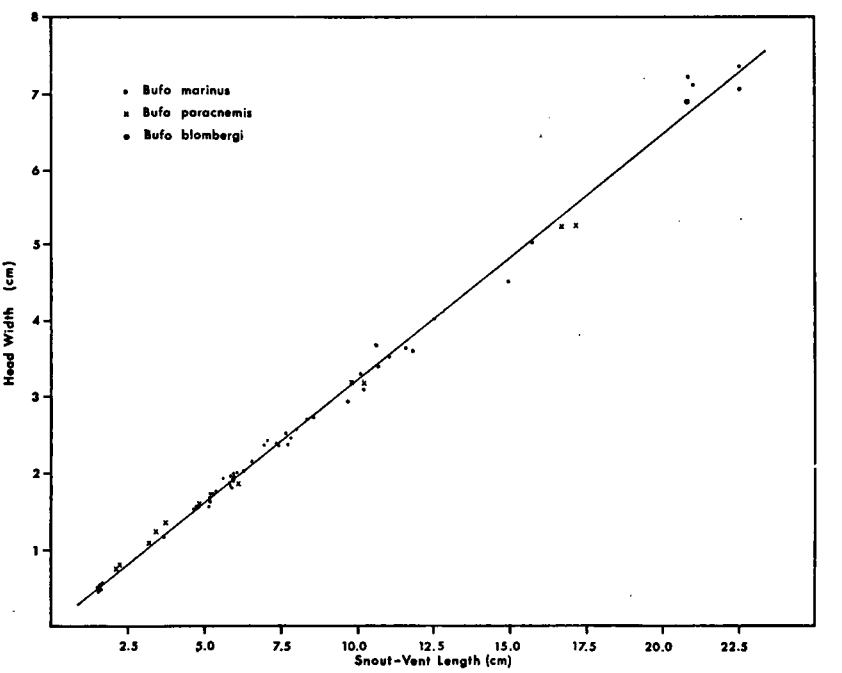

Fig. 203. Relation between head width and snout-vent length in toads of different sizes.

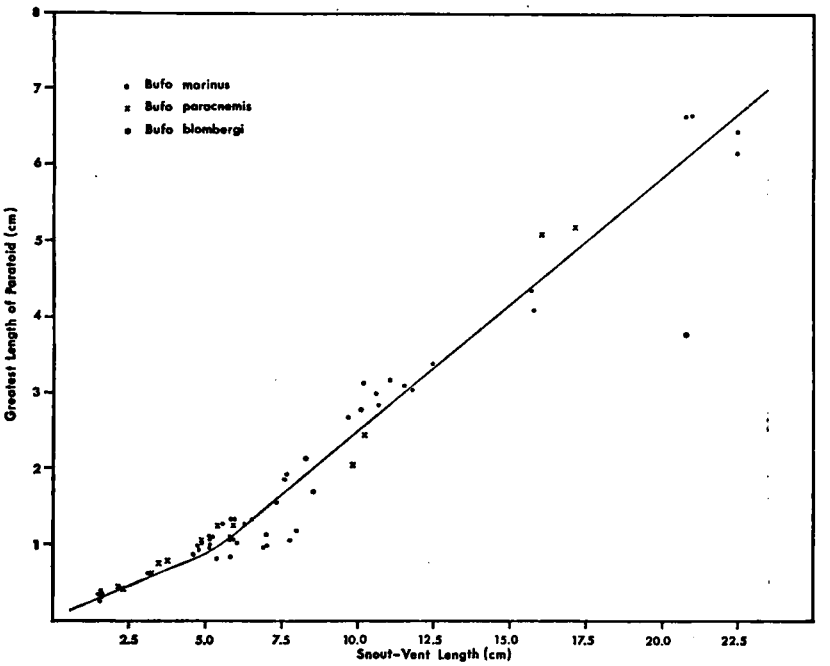

Fig. 204. Relation between greatest length of paratoid and snout-vent length in toads of different sizes.

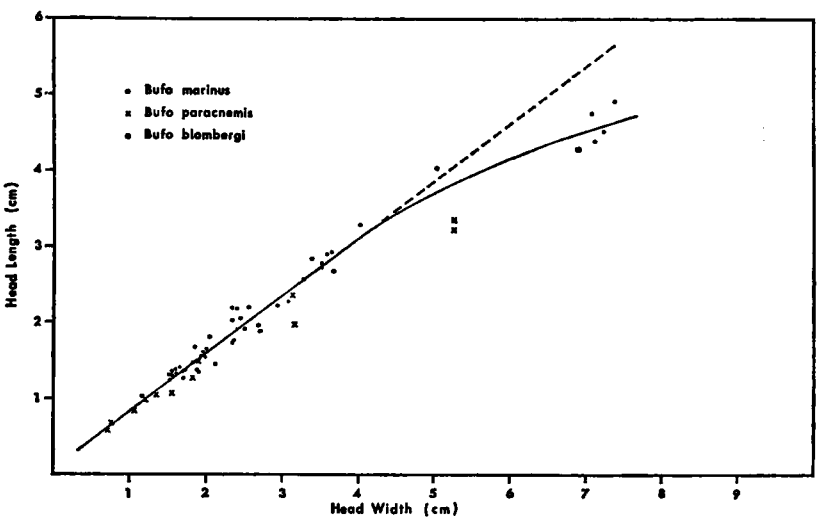

Fig. 205. Relation between head length and head width in toads of different sizes.

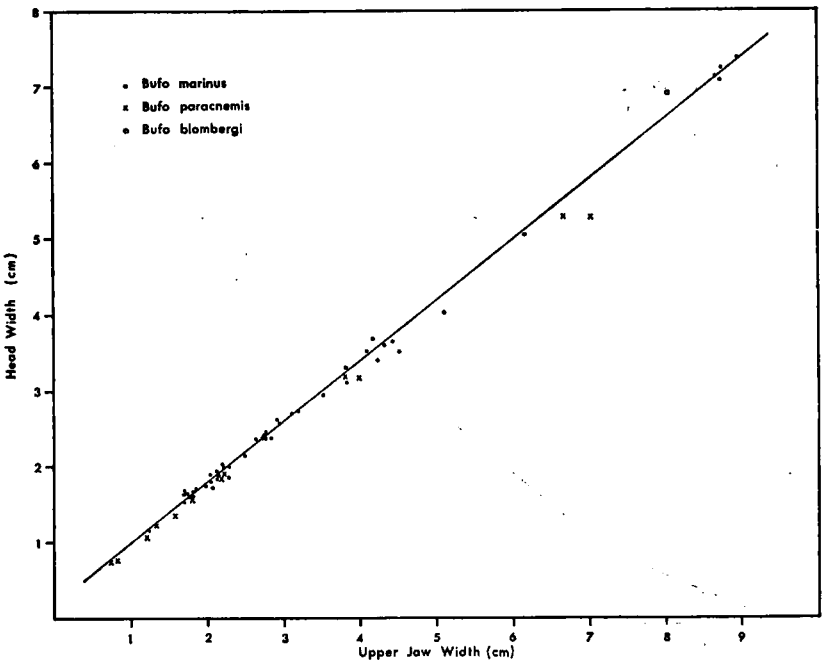

Fig. 206. Relation between head width and upper jaw width in toads of different sizes.

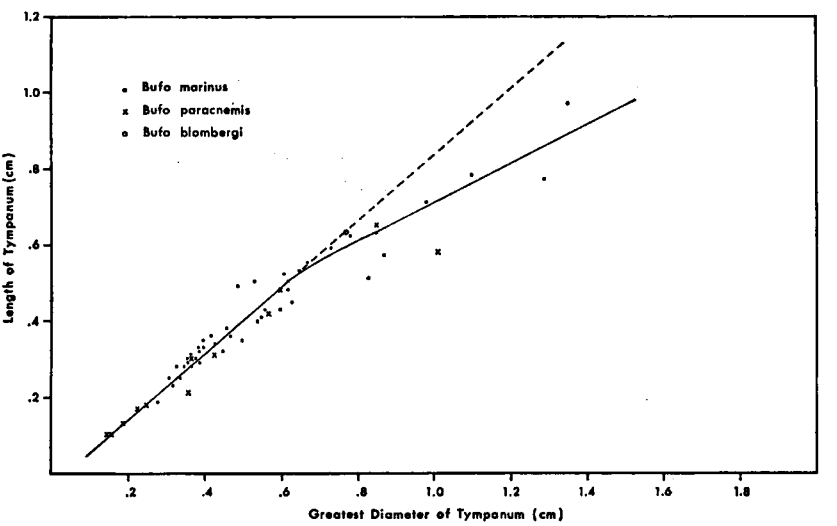

Fig. 207. Relation between the length of tympanum and greatest diameter of tympanum in toads of different size.

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A lateral view of *Bufo marinus* from Käysergebergte airstrip, Surinam (YPM A887–888) in amplexus, with a specimen of *Rana clamitans* for comparison of size.