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Revisionary Notes on Australian Microhylid Frogs of the Genus *Sphenophryne*

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In a review of the microhylid frogs of Australia (Zweifel, 1962), I recognized three species of *Sphenophryne* and concluded that these were the forms named *Austrochaperina robusta*, *A. gracilipes*, and *A. brevipes* by Fry (1912, 1915). I proposed a substitute name, *Sphenophryne fryi*, for *A. brevipes*, because the name *brevipes* was preoccupied in the genus *Sphenophryne*, but I presumed that the other two species were valid.

Recently I was privileged to examine the specimens in the Australian Museum and the Macleay Museum in Sydney and the Zoölogisch Museum in Amsterdam on which Fry based his descriptions. I find that, contrary to my assumption, Fry did not name the three species that I recognized but named one species twice. Therefore, it is necessary to provide a new name for the species diagnosed in my previous paper as *Sphenophryne robusta* (Fry) and to allocate the name *robusta* to the proper species.

Methods of making measurements were detailed in my previous paper and need not be repeated here. I am grateful to Mr. S. Daan for assisting me in the examination of specimens at the Zoölogisch Museum, Amsterdam. Mr. Harold Cogger not only made the type specimens in the Australian Museum available to me, but also facilitated my study of specimens in the Macleay Museum, Sydney. My visits to the museums in Amsterdam

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and Sydney were made possible by National Science Foundation Grant GB-2217. The following abbreviations are used:

A.M., Australian Museum, Sydney
A.M.N.H., the American Museum of Natural History
C.N.H.M., Chicago Natural History Museum
M.C.Z., Museum of Comparative Zoölogy at Harvard College
M.M., Macleay Museum, Sydney
Z.M.A., Zoölogisch Museum, Amsterdam

Sphenophryne robusta (Fry)

Austrochaperina robusta FRY, 1912, p. 89, fig. 37, pl. 9.

Austrochaperina gracilipes FRY, 1912, p. 93, pl. 8, figs. 1, 1a, 1b.

Sphenophryne gracilipes: PARKER, 1934, p. 155. LOVERIDGE, 1935, p. 56. ZWEIFEL, 1956, p. 13; 1962, p. 30.

Fry based his original description of *robusta* on 10 specimens; nine he assigned to variety A and the tenth to variety B. Subsequently (1915), he gave variety B the specific name *brevipes*, and it now stands as *Sphenophryne fryi* Zweifel, 1962. The description of *gracilipes* was based on a single specimen.

I have examined the type specimen of *gracilipes* (A.M. No. 4536) and the type series of *robusta*. The type of *robusta* is A.M. No. 5295. Seven additional specimens of the type series are grouped together as M.M. No. 53, and one specimen (Z.M.A., No. 5877) is in Amsterdam. In addition there is A.M. No. 5296, an alcoholic specimen largely skeletonized. The specimens in the Macleay and Amsterdam museums are listed as cotypes, but evidently Fry used this term in the way "paratype" is used today, for in the catalogue of the Australian Museum he specifically designated one specimen as the type and others as cotypes.

Upon plotting the eye-naris and internarial measurements of the specimens in the type series of *robusta* on scatter diagrams previously published (Zweifel, 1962, figs. 9, 11), I found that these measurements did not coincide with those of the individuals that I had referred to this species. Rather, the type series of *robusta* appears to be composed of larger individuals of the form that I had called *gracilipes*. The distance from eye to naris and the internarial distance are both shorter in the types of *robusta* than that in specimens of comparable size that I referred to *robusta*. It appears, then, that I applied the name *robusta* incorrectly. The specimens to which I applied this name evidently represent an undescribed species which was unrepresented in Fry's collections. This species is named below in the present paper.

The question remains whether *robusta* and *gracilipes* are distinct species.

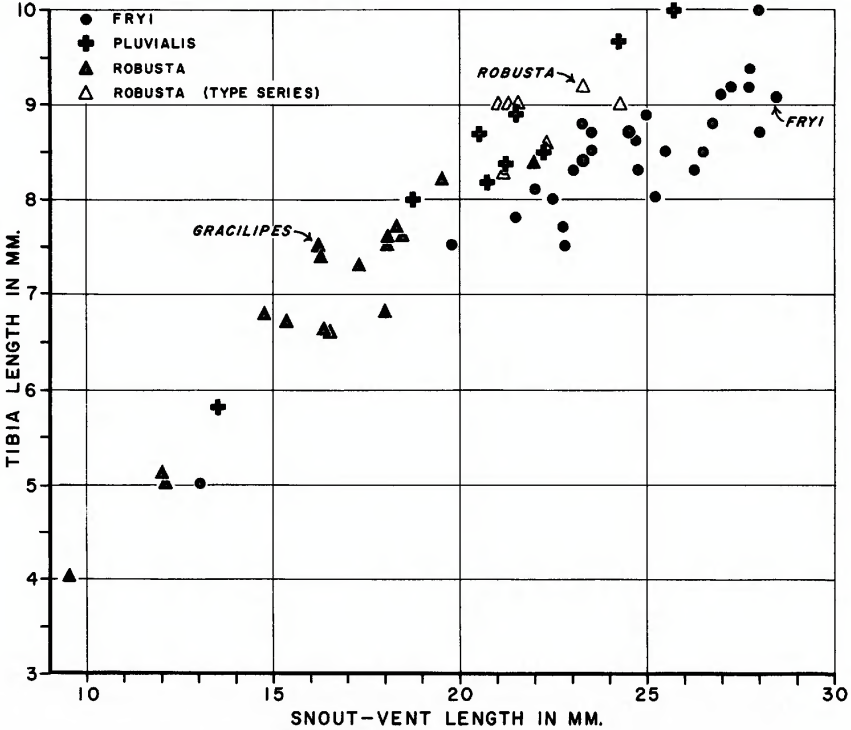


FIG. 1. Relationship of tibia length to body length in Australian *Sphenophryne*. Type specimens are indicated by names and arrows.

Although Fry gave detailed descriptions of each of them, he compared *robusta* and *gracilipes* only in a brief key (1912, p. 89) in which *robusta* falls in the couplet "Snout slightly prominent" and *gracilipes* in "Snout very prominent, longer than the orbital diameter." I find no differences between the type of *gracilipes* and the type series of *robusta* in the internarial or eye-naris measurements that best express snout shape. The ratio of internarial distance to snout-to-vent length (IN/S-V) in *gracilipes* is 0.099, whereas in eight specimens of *robusta* the average is 0.101, range 0.093-0.108. The ratio of eye-to-naris distance to snout-to-vent length (E-N/S-V) is 0.068 in *gracilipes* and averages 0.069 in eight specimens of *robusta*, range 0.064-0.077. The ratio of distance from eye to naris to internarial distance (E-N/IN) is 0.687 in *gracilipes* and averages 0.683, range 0.62-0.75, in eight individuals of *robusta*.

The legs of the type of *gracilipes* are proportionately slightly longer than those of any frog in the type series of *robusta*. The ratio of tibia length to snout-to-vent length (TL/S-V) is 0.463 in *gracilipes*, 0.399 (0.37-0.43) in

eight specimens of *robusta*. The two samples are similar in the ratio of head width to snout-to-vent length: 0.357 (0.32-0.40) in seven specimens of *robusta* and 0.333 in *gracilipes*.

The type specimens of both forms are now rather bleached, but there is nothing in the original descriptions indicative of striking differences in color or pattern.

I find no differences, therefore, between *gracilipes* and *robusta* that would confirm their specific distinctness. When the additional specimens that

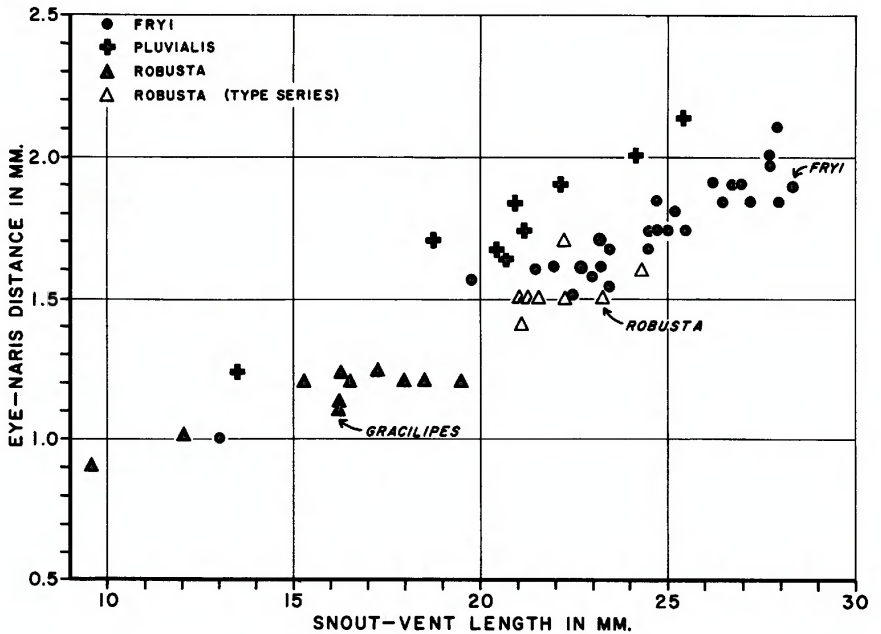


FIG. 2. Relationship of distance from eye to naris to body length in Australian *Sphenophryne*. Type specimens are indicated by names and arrows.

I had earlier referred to *gracilipes* are considered, this view is strengthened. The scatter diagrams of pertinent measurements of this group of specimens (figs. 1-3) suggest that only one species is represented. If *robusta* and *gracilipes* are indeed distinct species, as Fry supposed, I can find no way of diagnosing them.

The names *gracilipes* and *robusta* were proposed in the same publication. I follow page priority in choosing the name *robusta* for the species.

DIAGNOSIS: *Sphenophryne robusta* differs from *S. fryi* chiefly in leg length. The scatter diagram (fig. 1) shows little overlap in distribution, a fact that is confirmed by the ratio of tibia length to snout-to-vent length:

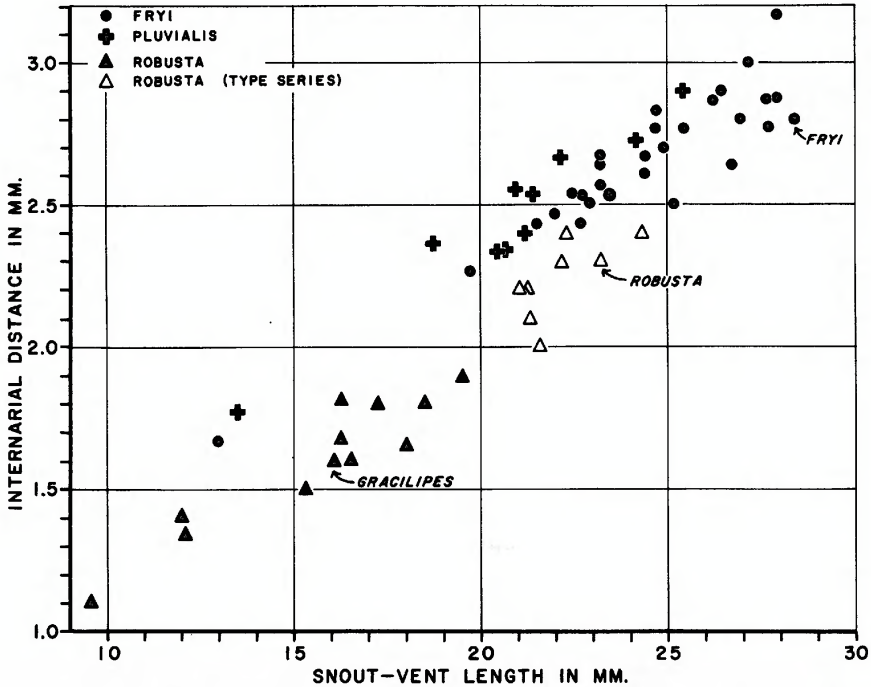


FIG. 3. Relationship of internarial distance to body length in Australian *Sphenophryne*. Type specimens are indicated by names and arrows.

robusta 0.413 ± 0.005 (0.37-0.46) $N = 25$; *fryi* 0.346 ± 0.004 (0.31-0.38) $N = 29$. Only eight specimens, four of each species, have ratios in the common zone of 0.37-0.38.

Sphenophryne robusta is compared with *S. pluvialis* in the description of the latter species that follows. Comparisons in my previous paper (Zweifel, 1962, pp. 35-36) of *gracilipes* with other species of *Sphenophryne* living in New Guinea will stand for *robusta* and those species.

DESCRIPTION: The description of *gracilipes* provided earlier (Zweifel, 1962, pp. 31-33) will serve for *robusta* as defined here.

DISTRIBUTION: *Sphenophryne robusta* is the most widely distributed Australian microhylid. It occurs from southern New Guinea to the type locality, the Russell River (between Innisfail and Cairns), Queensland. Specific locality records and a list of specimens examined were given under *S. gracilipes* in my previous paper (Zweifel, 1962, p. 36). To this list are to be added the type specimen (A.M. No. 5295) and eight "co-types" (paratypes), all from the type locality: M.M. No. 53 (six specimens), A.M. No. 5296, and Z.M.A. No. 5877.

***Sphenophryne pluvialis*, new species**

Austrochaperina robusta: ANDERSSON, 1916, p. 7 (?part).

Uperolia marmorata: BARBOUR, 1914, p. 202.

Sphenophryne robusta [*sic*]: PARKER, 1934, p. 157 (?).

Sphenophryne polysticta: LOVERIDGE, 1935, p. 57 (part).

Sphenophryne robusta: ZWEIFEL, 1962, p. 19, fig. 7.

TYPE: A.M.N.H. No. 54195, collected by the Archbold Cape York Expedition at Speewah, elevation 1500 feet, Queensland, on April 9, 1948.

DIAGNOSIS: *Sphenophryne pluvialis* is distinguished from *S. fryi* by its relatively longer hind legs, longer snout, and slightly smaller maximum size. The mean ratio of tibia length to snout-to-vent length is 0.407 in *pluvialis* and 0.346 in *fryi*, and the minimum observed in *pluvialis*, 0.38,

TABLE 1
RATIOS OF TIBIA LENGTH AND HEAD WIDTH TO SNOUT-TO-VENT LENGTH
IN AUSTRALIAN SPECIES OF *Sphenophryne*

	TL/S-V			N	HW/S-V			N
	Mean	σm	Range		Mean	σm	Range	
<i>S. fryi</i>	0.346 ± 0.004	(0.31-0.38)	29	0.397 ± 0.003	(0.33-0.42)	29		
<i>S. pluvialis</i>	0.407 ± 0.007	(0.38-0.45)	10	0.377 ± 0.009	(0.36-0.45)	10		
<i>S. robusta</i>	0.413 ± 0.005	(0.37-0.46)	25	0.343 ± 0.002	(0.30-0.41)	19		

is equal to the maximum in *fryi*. Difference in snout shape is best expressed by the ratio of eye-to-naris distance to snout-to-vent length. The mean in *pluvialis* is 0.084 and in *fryi* is 0.071; as in leg length, the minimum ratio observed in *pluvialis* is equal to the maximum in *fryi*, 0.079. The largest specimen of *fryi* is the type, 28.4 mm. snout to vent, whereas the maximum length for any specimen in my series of *pluvialis* is 25.5 mm.

Sphenophryne pluvialis differs from its other Australian congener, *S. robusta*, in having a relatively shorter internarial distance and relatively less distance between eye and naris. Although ranges of the ratios E-N/S-V and IN/S-V (see table 2) overlap broadly if all specimens are considered, the distribution of these measurements on the scatter diagrams (figs. 2, 3) shows no overlap. The overlap in ratios results from changes in ratios with growth that produce curvilinear regression when plotted. When specimens less than 16 mm. in snout-to-vent length are omitted from the calculations, the ratios show no overlap: E-N/S-V, *pluvialis* 0.083 (0.079-0.090) *N* = 9, *robusta* 0.068 (0.064-0.077) *N* = 16; IN/S-V, *pluvialis* 0.117 (0.112-0.126) *N* = 9, *robusta* 0.100 (0.092-0.110) *N* = 16. Com-

TABLE 2
 RATIOS OF EYE-TO-NARIS DISTANCE AND OF INTERNARIAL DISTANCE TO SNOUT-TO-VENT LENGTH,
 AND OF EYE-TO-NARIS DISTANCE TO INTERNARIAL DISTANCE IN AUSTRALIAN SPECIES OF *Sphenophryne*

	E-N/IN			E-N/S-V			IN/S-V					
	Mean	σ_m	Range	\mathcal{N}	Mean	σ_m	Range	\mathcal{N}	Mean	σ_m	Range	\mathcal{N}
<i>S. fnyi</i>	0.649	± 0.006	(0.59-0.72)	29	0.071	± 0.003	(0.065-0.079)	29	0.109	± 0.001	(0.098-0.127)	29
<i>S. phui iis</i>	0.714	± 0.005	(0.68-0.74)	10	0.084	± 0.001	(0.079-0.091)	10	0.118	± 0.002	(0.112-0.131)	10
<i>S. robusta</i>	0.698	± 0.012	(0.62-0.82)	19	0.071	± 0.002	(0.064-0.094)	19	0.103	± 0.001	(0.092-0.117)	20

parisons with species of *Sphenophryne* found in New Guinea were made in my previous paper (Zweifel, 1962, pp. 23-25) under the name *S. robusta*.

DESCRIPTION: The description of *Sphenophryne robusta* (Zweifel, 1962, pp. 20-22) was based on the same specimens referred here to the new species, so it is unnecessary to repeat that description.

The name *pluvialis* alludes to the rain-forest habitat of this species.

DISTRIBUTION: *Sphenophryne pluvialis* is known from only three localities in the general vicinity of Cairns, Queensland: Kuranda (C.N.H.M. Nos. 29026, 29028-29032, M.C.Z. Nos. 7603, 19256, paratypes); Lake Eacham (C.N.H.M. No. 29034, paratype); Speewah, 1500 feet (A.M.N.H. No. 54165, holotype).

Sphenophryne fryi Zweifel

The status of this species remains unchanged. It may be added that my examination of the type specimen (A.M. No. 2285) confirms the conspecificity of the type and the specimens that I referred to this species. The similarity of the type to the other specimens is seen in figures 1-3.

KEY TO THE SPECIES OF *Sphenophryne* IN AUSTRALIA

The key that appeared in my previous paper (Zweifel, 1962, p. 38) requires modification, as is indicated below. The reader should consult the earlier paper for comments on the generic identification of Australian microhylid frogs. If measurements are made according to the methods I used (Zweifel, 1962, p. 4), the key that follows provides a means of distinguishing the forms included. The differences between species are sufficiently slight that even minor variation in the technique of measuring may give significantly different ratios.

1. TL/S-V in most specimens less than 0.38 (mean, 0.346) *S. fryi*
2. TL/S-V in most specimens 0.38 or greater (mean, 0.41) 3
3. E-N/S-V of adult specimens 0.079 or greater (mean, 0.083), IN/S-V 0.112 or greater (mean, 0.117) *S. pluvialis*
- E-N/S-V of adult specimens less than 0.079 (mean, 0.068), IN/S-V less than 0.112 (mean, 0.100) *S. robusta*

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