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A New Species of Microhylid Frog (Genus *Cophixalus*) from Australia

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The Australian fauna of microhylid frogs has been known to include only five species, two of *Cophixalus* and three of *Sphenophryne* (Zweifel, 1962 and 1965). Collections made by the junior author near Cooktown, North Queensland, in 1968 include numerous specimens of a *Cophixalus* distinct not only from the two species previously known from Australia, but also from the many species of the Papuan region. The purpose of the present paper is to describe this new species.

Measurements of specimens in millimeters were made with an ocular micrometer for all dimensions except for length from snout to vent, which was measured with vernier calipers. The following measurements were recorded (abbreviations used are in parentheses): length from snout to vent (S-V); length of tibia, from the heel to the fold of skin on the knee (TL); distance from the anterior corner of the eye to the center of the naris (E-N); internarial distance, from center to center of the external nares (In); head width (HW); diameter of orbit, measured between anterior and posterior corners of the eye (Eye); horizontal diameter of tympanum, including the tympanic ring (Ear).

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Australia. We are grateful to this organization and also to Mr. Charles Tanner of Cooktown, who arranged accommodation, gave freely of advice, and spared valuable time to assist in collecting in the Cooktown area. Mrs. Frances W. Zweifel has our thanks for drawing figure 1.

Specimens on which this description is based are housed in several museums. We thank the responsible authorities for permission to make use of this material: The Australian Museum, Sydney, Mr. Harold Cogger; the Museum of Comparative Zoology, Harvard College, Dr. E. E. Williams; the National Museum of Victoria, Melbourne, Mr. J. McNally; the South Australian Museum, Adelaide, Mr. Michael Tyler.

ABBREVIATIONS

A.M., the Australian Museum
A.M.N.H., the American Museum of Natural History
M.C.Z., the Museum of Comparative Zoology
N.M.V., the National Museum of Victoria
S.A.M., the South Australian Museum

Cophixalus exiguus, new species

HOLOTYPE: S.A.M. No. R 10311, collected by Fred Parker at an elevation of between 1800 and 2000 feet on Mt. Hartley, 23 miles south and 5 miles east of Cooktown, Queensland, on June 10, 1968.

PARATYPES (ALL FROM QUEENSLAND): A.M.N.H. Nos. 81308–81310, A.M. Nos. R26842–26834, M.C.Z. Nos. 73278–73287, 73289–73297, N.M.V. Nos. D13170–13172, and S.A.M. Nos. R9732, R9796, R10035–10040, all from the type-locality; M.C.Z. No. 73288 from Mungumby Creek, 16 miles south of Cooktown, elevation 1500 feet; M.C.Z. No. 75131 from Home Rule, Slaty Creek, elevation 600 feet, 19 miles south and 2 miles east of Cooktown; S.A.M. No. R9832 from Big Tableland, 17 miles south and 2 miles east of Cooktown, elevation 2000 feet. All paratypes were collected by Fred Parker.

DIAGNOSIS: This species differs from its Australian congeners in its small size (maximum known length from snout to vent, 18.3 mm.), its relatively long hind legs (TL / S-V mean 0.406), and in having relatively small digital discs, with the disc on the third finger narrower than the one on the fourth toe. *Cophixalus ornatus* reaches a larger size (26 mm.) and has finger discs much broader than those of the toes. *Cophixalus neglectus* is also larger (28 mm.) than *C. exiguus* and has much shorter hind legs (TL / S-V maximum in *neglectus,* 0.33, compared with the minimum of 0.37 in *exiguus*). Additional comparisons, including those with Papuan species, are made in a following section.

FIG. 1. Dorsal view of holotype of *Cophixalus exiguus* (S.A.M. No. R10311). ×4.4.

DESCRIPTION OF TYPE SPECIMEN (FIG. 1): The holotype is a gravid female containing ova approximately 1.3 mm. in diameter, and has the following measurements (in millimeters): S-V, 18.3; TL, 6.8; HW, 7.5; Eye, 2.5; E-N, 1.4; In, 1.8; Ear, 1.2; width of disc of third finger, 0.7; width of disc of fourth toe, 0.9.

The maxillary bones are eleutherognathine; their anterior ends do not broadly overlap the premaxillaries. There are no teeth. The pectoral girdle lacks clavicles and procoracoids.

The head is slightly narrower than the body. The snout is rounded, with the nares much closer to the tip of the snout than to the eye. The nares are directed laterally, but have a slight upward tilt. The internarial distance is greater than the distance from eye to naris. The can-

thus is rounded, the loreal region oblique and flat. The eyes are large, with the length of the orbit about equal to the length of the snout. The interorbital space is broader than an upper eyelid. The border of the tympanum can scarcely be distinguished.

The relative lengths of the fingers are $4 > 3 > 2 > 1$. The discs are small, that of the third finger being about twice the width of the penultimate phalanx. The disc of the first finger is poorly developed, but it and the others bear terminal grooves. The relative lengths of the toes are $4 > 3 > 5 > 2 > 1$. All toes bear relatively small discs with terminal grooves. The disc of the fourth toe is slightly less than twice the width of the penultimate phalanx, but is larger than the disc of the third finger. There are small, low, rounded subarticular tubercles on both hands and feet. Low, rounded inner and middle metacarpal tubercles are present, the latter much the larger. The only elevation on the foot is a small inner metatarsal tubercle.

The skin of the body and limbs is largely smooth both dorsally and ventrally, although small tubercles are evident on the upper surfaces of the hind legs. In preservative, the body is gray-brown dorsally and yellowish brown ventrally. There is an indistinct, dark V-shaped mark between the eyes and a similarly indistinct H-shaped mark in the scapular region. A dark brown line marks the slight supratympanic fold, and there are scattered dark brown markings on the flanks and lower back. The upper lips and sides of the face bear brown markings slightly darker than the ground color. The hind limbs are unmarked above, but there are dark flecks on the anterior surfaces of the thighs. The posterior side of the thigh is dark brown distally. The chin and chest are flecked with gray-brown, but pigmentation is reduced to a fine scattering of melanophores in the abdominal region. The under sides of the hind legs are spotted and mottled with brown.

Variation in the Type Series: The holotype, S-V 18.3 mm., is the largest specimen. The specimens vary in several proportions as follows (mean $\pm$ its standard error, range; N = 39): TL / S-V, 0.406 ± 0.003 (0.37–0.46); HW / S-V, 0.393 ± 0.004 (0.34–0.48); E-N / In, 0.844 ± 0.009 (0.73–0.94); E-N / S-V, 0.078 ± 0.001 (0.069–0.087); In / S-V, 0.092 ± 0.001 (0.084–0.106); Eye / S-V, 0.135 ± 0.001 (0.125–0.152). The disc of the third finger is slightly but consistently smaller than that of the fourth toe in all but one of 39 specimens; the discs of the unique individual are equal in width. The terminal phalanges (as seen in a specimen cleared and stained with alizarin red) are strongly T-shaped. Long slits placed laterally in the floor of the mouth of the male open into a subgular vocal sac.

Most specimens resemble the holotype in dorsal color pattern: uniform pale brown above, some individuals with scattered darker spots or with paired dark tubercles on the posterior part of the back. In several specimens, the H-shaped mark of the scapular region is prolonged posteriorly into dorsolateral streaks. Individuals of this sort may have the sides and snout pale yellow-brown and the back darker gray-brown in life (fig. 2). One individual of the general "type" color pattern has a light vertebral hairline. One specimen had a pale yellowish middorsal band, obscurely dark-edged, that was paler than the relatively light brown of the sides of the body (fig. 3). Similar polymorphism is seen in *Cophixalus ornatus* (Zweifel, 1962, pp. 8, 9). The lumbar ocelli are typically faint, but are distinct in a very dark specimen.

In life, the eye is silvery to pale yellow above and below the horizontal pupil, and there is a deep red area at both anterior and posterior edges of the eye. The ventral surfaces are translucent yellowish brown to brown with some opaque white and yellow spots, with concentrations of melanophores mainly under the head and legs. All specimens had (in life) a deep red blotch in the groin, and in some there were scattered dark melanophores in this area.

Some individuals have small dorsal tubercles, either scattered or arranged bilaterally in pairs.

Comparisons with other Species: Twenty-one species of *Cophixalus* are presently recognized (including *C. exiguus*) and more in the fauna of New Guinea await description. Only four of these resemble *C. exiguus* in having finger discs that are smaller than those of the toes: *C. tagulensis, C. oxyrhinus, C. shellyi,* and *C. neglectus.* The first of these is known only from Sudest Island in the Louisiade Archipelago and is distinctive in that it possesses webbed toes. It cannot be considered a close relative of *C. exiguus.* Another Papuan species with small finger discs, *C. oxyrhinus,* is a relatively large form (37 mm. S-V) with a prominent snout. It also does not seem to be closely related to the new species. *Cophixalus shellyi,* a montane species of New Guinea, is similar to *C. exiguus* in size but has a much lower E-N / In ratio than that in *exiguus* (mean in *shellyi,* 0.68; in *exiguus,* 0.84) and differs in pigmentation. The disc of the third finger rarely is wider than that of the fourth toe in *shellyi,* as described for the holotype (Zweifel, 1956, p. 2); more often the two are equal or that of the toe is wider.

The Australian species *Cophixalus neglectus* has poorly developed digital discs, with that of the third finger usually smaller than that of the fourth toe, but otherwise differs from *C. exiguus* in several important respects. All five specimens of *neglectus* are larger (minimum length,

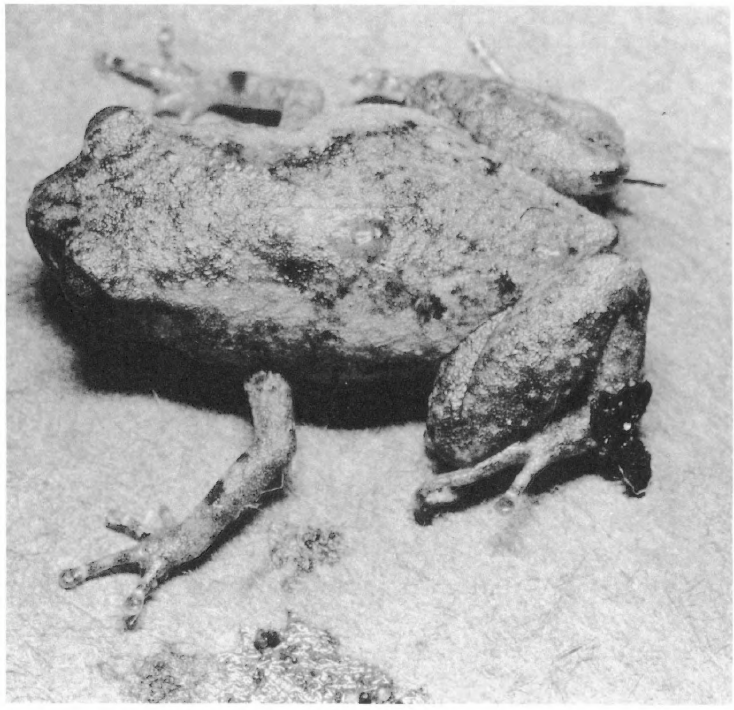

FIG. 2. Paratype of *Cophixalus exiguus* (M.C.Z. No. 73289). ×4.2.

22 mm. S-V) than any of 39 *exiguus* (maximum, 18 mm. S-V). There is no overlap between the ranges of variation in the E-N / In ratio of the two species (maximum for *neglectus,* 0.71; minimum for *exiguus,* 0.73), and the leg lengths are similarly disparate (TL / S-V maximum for *neglectus,* 0.33; minimum for *exiguus,* 0.37).

Some of the differences in size and proportions among the *Cophixalus* of Australia are evident in figures 4 and 5. The relatively greater tibia length of *C. exiguus* is apparent in figure 4, and the greater distance from eye to naris of *C. ornatus* is seen in figure 5.

Zweifel (1962, pp. 13–14) discussed three specimens from Mt. Spurgeon, Queensland, that have small finger discs (fourth toe disc equal to or larger than disc of third finger), but were not referable to *C. neglectus* because of other differences in proportions. Direct comparison of these specimens (M.C.Z. Nos. 18384–18386) with the type series of *exiguus* reveals some resemblance in general appearance in addition to the similarity in disc size, but differences in proportions are present. The legs of the frogs from Mt. Spurgeon are shorter, with a maximum ratio of

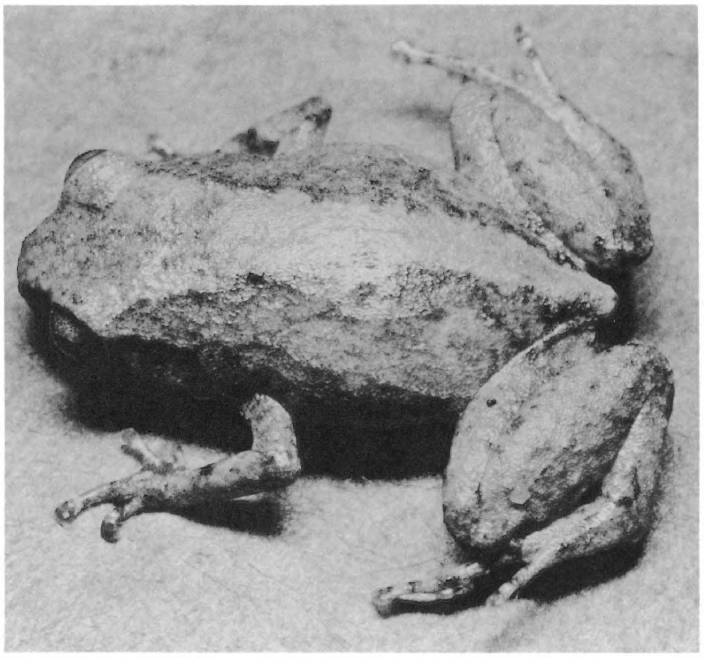

FIG. 3. Paratype of *Cophixalus exiguus* (M.C.Z. No. 73290). ×4.2.

tibia length to length from snout to vent of 0.36 compared with a minimum of 0.37 in *exiguus*. The relative size of the eye appears to be smaller in the specimens from Mt. Spurgeon: Eye / S-V, mean 0.123 (0.120–0.125), compared with 0.135 (0.125–0.152). The placement of the external nares relative to each other and to the eyes is not significantly different between specimens in the two samples. The ranges of the ratios E-N / In (0.77–0.85) and In / S-V (0.087–0.090) of the specimens from Mt. Spurgeon fall within the ranges calculated for *exiguus*. We think it significant that two of the three specimens from Mt. Spurgeon are larger (20 and 22 mm., S-V) than any *exiguus*.

We believe that although *Cophixalus exiguus* is probably most closely related to the unidentified form from Mt. Spurgeon, the latter is still too poorly known to be defined adequately. In leg length it is closest to *C. neglectus,* in size to *C. neglectus* and *C. ornatus,* and in narial ratios to *C. exiguus* and *C. ornatus*. It would be premature to describe the form from Mt. Spurgeon as a new species until an adequate series of specimens is available.

The external similarity of *Cophixalus* and *Sphenophryne* could lead to

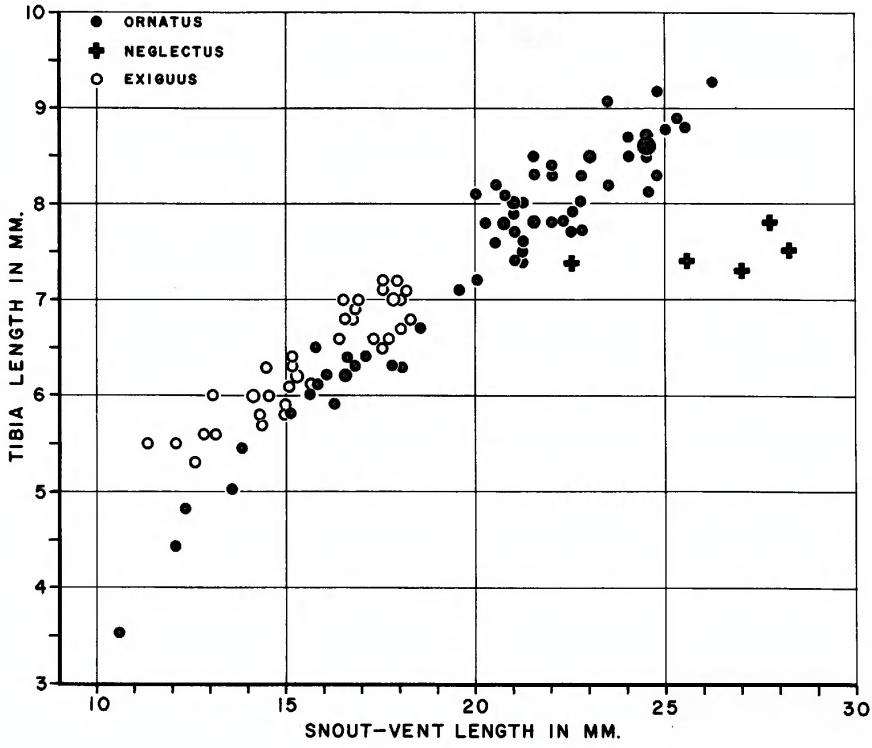

FIG. 4. Relationship of tibia length to body length in Australian *Cophixalus*. Progressively larger spots indicate two or three specimens with identical measurements.

some confusion if the key generic character—the presence or absence of the clavicle—is not determined for certain. If an attempt to identify *Cophixalus exiguus* were made using the key to Australian species of *Sphenophryne* (Zweifel, 1965), it would key out to *S. robusta* or *S. pluvialis,* more likely to the former. Both species of *Sphenophryne* differ from *C. exiguus* in their lower E-N / In ratios. The minimum in *C. exiguus* (0.73) just overlaps the maximum in *S. pluvialis* (0.74), and although there is overlap in the ranges of *S. robusta* and *C. exiguus,* the means are quite different: *robusta,* 0.698 ± 0.012 (0.62–0.82); *exiguus,* 0.844 ± 0.009 (0.73–0.94).

HABITS AND HABITAT: All specimens were found under logs, stones, and leaf litter in primary rain forest, both near to, and away from, waterways. All were found by day; none was discovered in the open on either wet or dry nights. When uncovered, these small frogs rapidly attempted

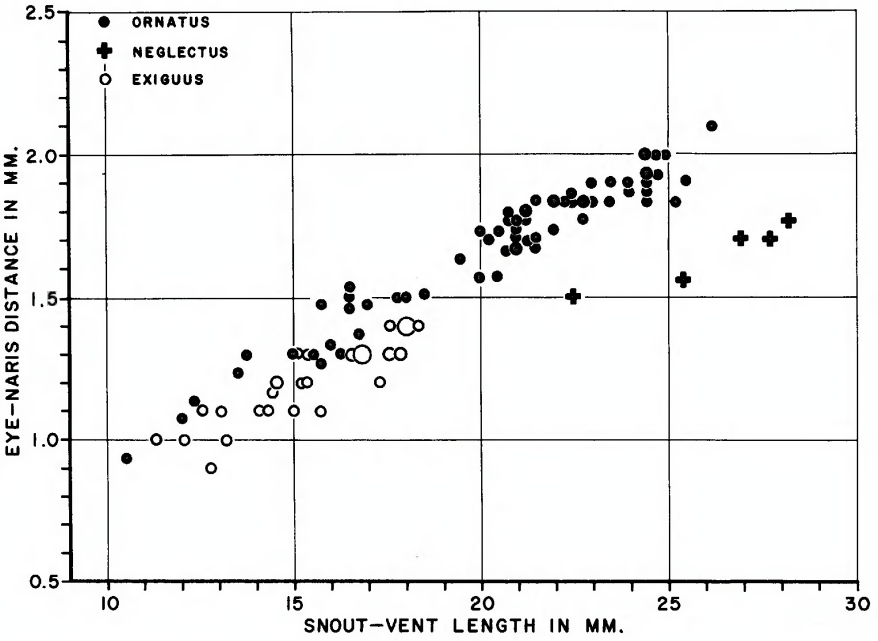

FIG. 5. Relationship of distance from eye to naris to body length in Australian species of *Cophixalus*. Progressively larger spots indicate two or three specimens with identical measurements.

to escape into leaf litter and under other cover. No call was heard that could be traced to this species.

ETYMOLOGY: The Latin *exiguus,* an adjective meaning small, is appropriate for this species, as it is one of the smallest species in its genus.

DISTRIBUTION: The localities cited for the holotype and paratypes are the only ones known for the species. The area of distribution is at the northern end of the belt of rain forest that extends approximately from Cooktown to Townsville (Zweifel, 1962, fig. 1). No *Cophixalus* have yet been taken in the northern parts of the Cape York Peninsula, although *Sphenophryne* occurs there.

KEY TO THE SPECIES OF *Cophixalus* IN AUSTRALIA

1. Disc of third finger markedly broader than that of fourth toe . . . *C. ornatus*
   Disc of third finger only as broad as or narrower than that of fourth toe 2
2. TL / S-V equal to 0.37 or greater (mean, 0.406); E-N / In equal to 0.73 or greater (mean, 0.844); maximum size *ca.* 18 mm. S-V . . . . . *C. exiguus*

TL / S-V equal to 0.33 or less (mean, 0.287); E-N / In equal to 0.71 or less (mean, 0.680); maximum size *ca.* 28 mm. S-V ..... *C. neglectus*

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