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Results of the Archbold Expeditions. No. 72 Microhylid Frogs from New Guinea, with Descriptions of New Species

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INTRODUCTION

The four Archbold expeditions to New Guinea returned with extensive collections from diverse regions and habitats both on the island of New Guinea itself and more recently (1953) from the D'Entrecasteaux Islands off the southeastern end of New Guinea. On none of the expeditions was there a herpetologist present; nevertheless a remarkable wealth of reptiles and amphibians was obtained. The present work is the first of a series of papers dealing with the amphibians in these collections. Nine new species are described, and data are presented on the systematic status, distribution, variation, and ecology of numerous other forms. The scope of the paper has been broadened to include not only the specimens in the Archbold collections, but all other material from New Guinea in the collection of the American Museum. New Guinea frogs in the collection as of 1932 were reported by Burt and Burt (1932), but changes in taxonomy as well as correction of misidentifications have made it necessary to review this earlier material. Excepting the Archbold collections, there have been only two sources of material from New Guinea in recent years. Mr. Melvin Kurtz presented a collection made in the vicinity of Lae while on military duty, and Mr. E. Thomas Gilliard obtained numerous interesting specimens while collecting birds in the Wahgi Valley region.

Detailed accounts of the first three Archbold expeditions to New Guinea have been published (Archbold and Rand, 1935; Rand and

Brass, 1940; Archbold, Rand, and Brass, 1942), and an account of the fourth (1953) expedition is in preparation. The reader is referred to these papers for detailed information on habitat conditions at the various collecting stations.

For courtesies extended while at the Museum of Comparative Zoölogy, as well as for the loan of specimens, I wish to thank Mr. Arthur Loveridge. Dr. H. W. Parker, British Museum (Natural History), kindly compared specimens sent to him with material in the British Museum and offered opinions on their identity. Specimens were lent to me by the United States National Museum (through Dr. Doris Cochran) and the Chicago Natural History Museum (through Dr. Robert Inger). Mr. Charles M. Bogert read and criticized the paper in manuscript. To all these persons I am sincerely grateful.

METHODS

Measurements of tibia length and snout-vent length were taken with a vernier caliper to the nearest one-tenth of a millimeter. Snout-vent length was taken with the body straightened from the tip of the snout to the tip of the urostyle. Tibia length was taken from the fold of skin at the knee to the heel. Dimensions of the toe tips, length of orbit (from corner to corner), and length of snout (from tip to anterior corner of eye)

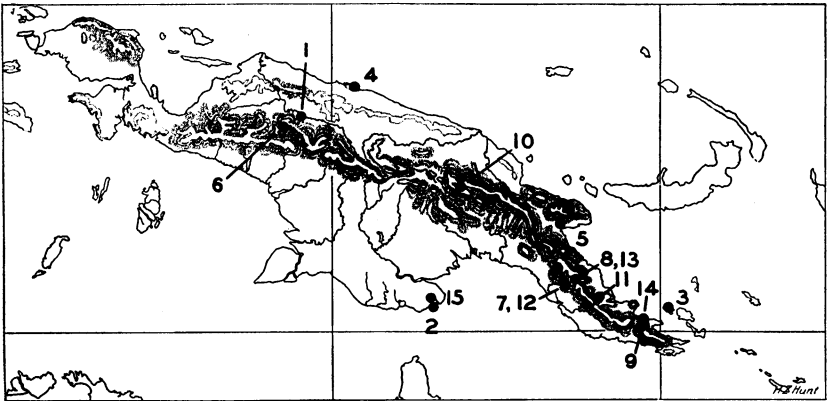


FIG. 1. Map of localities in New Guinea from which the American Museum of Natural History has specimens of microhylid frogs: 1, Bernhard Camp, Idenburg River; 2, Daru; 3, Goodenough Island; 4, Hollandia; 5, Lae; 6, Lake Habbema; 7, Mafulu (about 20 kilometers west-northwest of Mt. Tafa); 8, Mt. Albert Edward; 9, Mt. Dayman; 10, Mt. Hagen; 11, Mt. Lamington; 12, Mt. Tafa; 13, Murray Pass (about 20 kilometers south of Mt. Albert Edward); 14, Peria Creek crossing, Kwagira River; 15, Wuroi, Oriomo River.

were measured with an ocular micrometer in a binocular dissecting microscope. The tympanum diameter, also measured with the ocular micrometer, was taken as the horizontal diameter.

The ratio of tibia length to snout-vent length has been used as the measure of relative leg length, rather than the time-honored but dubious method of bringing the leg forward along the body and determining where the heel reaches. The latter method has been used only when it was necessary for comparison with descriptions of forms not available as specimens.

Localities from which American Museum specimens are recorded are mapped in figure 1. The name "North-East New Guinea" is used throughout for the region known variously in the past by that name, as German New Guinea, and as the Australian Mandated Territory. The term "Territory of Papua" is used for the region sometimes known as British New Guinea.

SPECIES REPRESENTED

Genyophryne thompsoni Boulenger

Albert Edward Range, Territory of Papua (A.M.N.H. No. 23822); Northern Division, New Guinea (A.M.N.H. No. 35405).

A.M.N.H. No. 35405 was identified by Burt and Burt (1932, p. 483) as *Asterophrys turpicola*, while the British Museum exchange specimen (A.M.N.H. No. 23822) was properly referred to *Genyophryne*. A.M.N.H. No. 35405 possesses both a smooth and a serrate palatal ridge (absence of the anterior smooth ridge was implied by Burt and Burt), is eleutherognathine, and agrees closely in both habitus and pigmentation with A.M.N.H. No. 23822 and with another specimen of the Albert Edward Mountains series (M.C.Z. No. 11646) with which it was compared.

Xenobatrachus macrops van Kampen

Bele River, 18 kilometers north of Lake Habbema, 2200 meters, Netherlands New Guinea (A.M.N.H. Nos. 43728, 43729, 43757, 43759, 43690); 9 kilometers northeast of Lake Habbema, 2800 meters, Netherlands New Guinea (A.M.N.H. No. 43724); 15 kilometers southwest of Bernhard Camp, Idenburg River, 1800 meters, Netherlands New Guinea (A.M.N.H. No. 49638).

The main difference between this species and *rostratus* seems to be the relatively larger eye of *macrops*. In this series of seven specimens, which range in length from 29 to 37 mm., the snout is from 1.1 to 1.3 times the length of the orbit, mean 1.19. The interorbital space is twice the width

of the upper eyelid. Several, but not all, of the specimens have the snout pustulose both above and below, as is described for *macrops*.

One individual possesses on one side two, rather than the customary single, vomerine spikes. This variation suggests that at least some of the three species of *Xenobatrachus* characterized by having paired spikes may be based on individual variants of other forms. *Xenobatrachus bidens* and *X. ophiodon*, forms with paired spikes, are each known from only a single specimen.

Xenobatrachus rostratus Méhely

North-East New Guinea (A.M.N.H. No. 23584).

This specimen was received in an exchange with the Zoological Museum in Berlin. The snout is prominent, pointed, 1.6 times the length of the orbit, and pustulose on its lower, anterior surface. The interorbital space is about three times the width of the upper eyelid. There is a fine white line from snout to vent. The body length is 28.2 mm.

In most respects this specimen agrees with Parker's (1934, pp. 56-57) description of the species. The eye is slightly larger than reported for *rostratus* ("snout . . . nearly twice as long as the diameter of the eye"), but as the specimen is small (*rostratus* reaches a length of 47 mm.), and juveniles usually have relatively larger eyes, the size of the eye is not a bar to regarding the frog as *rostratus*.

Asterophrys doriae Boulenger

Mount Lamington, Territory of Papua (A.M.N.H. Nos. 35406, 35407).

These specimens were reported by Burt and Burt (1932, p. 485) as *Xenorhina oxycephala* (= *Asterophrys oxycephala*), but they have little in common with that species. The snout is about 1.2 times the orbit length (not twice the length) and is bluntly rounded (not acutely pointed). The tympanum is distinct, not hidden or indistinct as in *oxycephala*. There are numerous light-tipped dark warts on the dorsal body surface, and the anterior and posterior surfaces of the femora bear large yellow spots on a black background, just as Parker (1934, p. 65) describes for *doriae*. In *oxycephala*, the posterior surfaces of the thigh, tarsus, and foot are black.

Asterophrys oxycephala is known from the north coast of New Guinea at Humboldt Bay and Japen (= Jobi) Island, while there are previous records for *doriae* in the same general vicinity as Mt. Lamington.

Asterophrys robusta Boulenger

East slope, Goodenough Island, 1600 meters, D'Entrecasteaux Islands, Territory of Papua (A.M.N.H. No. 56902).

The type locality of *robusta* is St. Aignan Island (= Misima Island, Louisiade Archipelago), almost 200 miles to the southeast of Goodenough Island. The Goodenough Island specimen agrees with Boulenger's description and illustration of *robusta* (1898, p. 480, pl. 38), except that the body is somewhat more slender (probably of little significance), and the toe tips are less expanded. There is also considerable similarity to *A. wilhelmana*, but the Goodenough Island specimen differs from *wilhelmana* in having a larger eye. This specimen, snout-vent length 40.8 mm., has an orbit length of 4.7 mm., while a *wilhelmana* of approximately the same size (40.3 mm.) has an orbit only 3.8 mm. long.

Asterophrys rufescens Macleay

North slope, Mt. Dayman, 700 meters, Maneau Range, Territory of Papua (A.M.N.H. Nos. 57112, 57361).

In both form and pigmentation these specimens agree closely with Parker's (1934, p. 62) description. Characteristic of this species are the pair of small tubercles beneath the chin and the relatively long legs. Tibia length/snout-vent length ratio for these two adult specimens (snout-vent lengths, 41 and 42 mm.) is 0.43 in each. Though the frogs are somewhat discolored by preservative, the dark lateral stripe shown in Boulenger's plate (1897, pl. 2, fig. 3) and the black, light-bordered, lumbar ocellus mentioned by Parker (1934, *loc. cit.*) can be distinguished in one of them.

One of the American Museum specimens was captured on July 21, 1953, by G. M. Tate on the banks of a rocky stream; the other was found by H. M. Van Deusen buried in loam and humus on July 25. The 700-Meter Camp on Mt. Dayman was described in expedition field notes as in oak forest-rain forest transition zone.

Asterophrys similis, new species

Figure 2

HOLOTYPE: A.M.N.H. No. A43722, adult female, collected by W. B. Richardson 9 kilometers northeast of Lake Habbema, 2800 meters, Netherlands New Guinea, on October 31, 1938.

PARATYPES: Seventeen specimens: A.M.N.H. Nos. A43725-A43727, 43730, 43748-43756, 43758, 43760, from Bele River, 18 kilometers north

of Lake Habbema, 2200 meters, Netherlands New Guinea, and A.M.N.H. Nos. 43721 and 43723, from the type locality. All were collected by W. B. Richardson in October and November, 1938.

DIAGNOSIS: Distinguished from all species of *Asterophrys* except *A. minima* by the following combination of characters: no finger discs, toe tips not dilated; snout usually less than one and one-half times the length

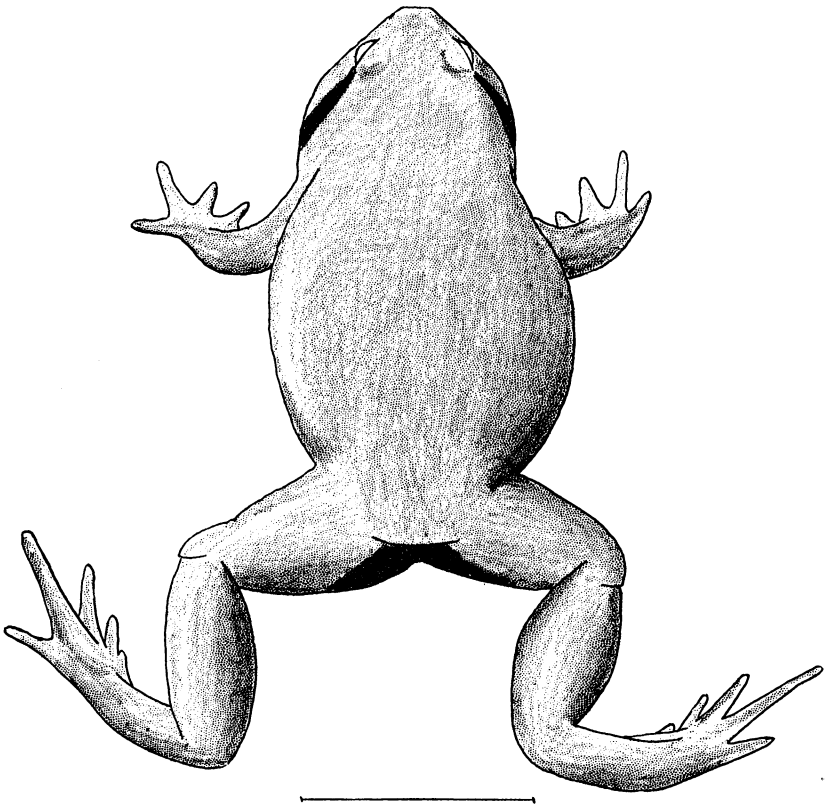


FIG. 2. Dorsal aspect of type specimen of *Asterophrys similis*, new species, A.M.N.H. No. 53722. The line represents a distance of 2 cm.

of the orbit; legs short; tympanum indistinct, slightly smaller than the diameter of the eye. From *A. minima*, which shares some of the diagnostic characters, *similis* differs in reaching a larger size (49 mm. as against 27 mm.). The toe tips of *similis*, though not expanded, are somewhat disc-like. The toes of *minima* are said to be without discs.

DESCRIPTION OF TYPE SPECIMEN: No maxillary or vomerine teeth;

maxillae meeting in front of the premaxillae (symphygnathine); no procoracoids or clavicles, sternum cartilaginous, no omosternum; terminal phalanges T-shaped.

Tympanum indistinct, slightly less than the diameter of the orbit. Tongue scarcely free behind and with a median furrow; a serrate posterior palatal fold preceded by a low, indistinct fold. Fingers without discs, toes with small discs no wider than the penultimate phalanx; fingers and toes free; subarticular and inner metatarsal tubercles faintly indicated as low, rounded eminences; fingers in decreasing order of length 3-4-2-1, toes 4-3-5-2-1. Eyes relatively small, interorbital space about two and one-half times the width of the upper eyelid; length of orbit 1.3 times the snout length; nares nearer tip of snout than eye; legs short, tibia length/snout-vent length = 0.37. The snout-vent length is 44.9 mm., head width 16.5 mm., and tibia length 16.4 mm.

The dorsal color is uniformly tan. A dark band follows the supratympanic fold from the posterior corner of the eye over the tympanum to the insertion of the forelimb (fig. 2). The gular area and chest are dark, with light mottling most pronounced in the throat region. The region of the cloacal opening, the rear of the femur, and the lower surface of the tarsal region are dark, while the under surfaces of the legs and the upper surfaces of the feet are light with a darker network.

VARIATION: The 17 paratypes agree in most particulars with the type specimen. The anterior palatal ridge is represented only by a median tubercle in some. The male specimens possess a median subgular vocal sac. The subarticular and inner metatarsal tubercles may be indistinguishable. The length of the orbit averages 1.35 times the snout length, range 1.2-1.5, $n = 17$. Tibia length/snout-vent length mean is 0.330, range 0.29-0.37, $n = 18$. The largest specimen in the series is a female, snout-vent length 49.4 mm. The gular area and chest are dark in all specimens. In some the whole abdominal region is dark, while in others there is light mottling present.

DISCUSSION: *Asterophrys oxycephala* bears some resemblance to *similis*, but has a longer snout (1.8 times the orbit diameter in the single specimen examined) and has expanded toe tips. The coloration of the dorsal body surface and hind limbs appears very similar in the preserved specimens. No other *Asterophrys* appears enough like the new form to cause confusion. However, there is considerable resemblance to *Xenobatrachus macrops*, a form that was collected at both *Asterophrys similis* stations. The specific name of the new *Asterophrys* was selected with this confusing similarity in mind. In most bodily proportions the two appear nearly identical. Also, in so far as can be determined from pre-

served material, they are similar in markings. The generic character of *Xenobatrachus*, the presence of vomerine spikes, will serve to distinguish the two. *Xenobatrachus* in addition may be differentiated by the presence of pustules on the snout and by a relatively larger eye (fig. 3).

Apparently the only character that separates *Xenobatrachus* and *Asterophrys* is the presence of vomerine spikes in the former. It may be questioned that this is sufficient basis for maintaining the two genera as distinct. At least one other genus, *Sphenophryne*, has forms both with and without vomerine spikes. An interesting feature of the skull of *similis* is that the anterior arm of the pterygoid passes almost straight forward

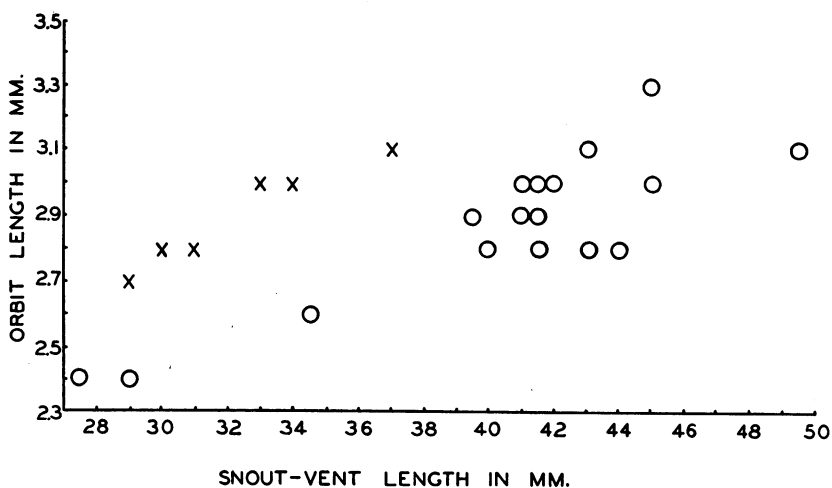


FIG. 3. Comparison of orbit length and snout-vent length in *Xenobatrachus macrops* (X) and *Asterophrys similis* (O). The larger eye of *macrops* serves to distinguish these two very similar species.

to meet the maxilla along a relatively small stretch of that bone. This is virtually identical to the condition seen in *Xenobatrachus rostratus* as illustrated by Méhelÿ (1901, pl. 11, fig. 1), while in *Asterophrys rufescens* (*ibid.*, pl. 4, figs. 1-2) the more usual situation is seen where the pterygoid curves forward to an extensive contact with the maxilla.

Asterophrys valvifera Barbour

Mafulu, 1250 meters, Territory of Papua (A.M.N.H. No. 58188); Hollandia, Netherlands New Guinea (A.M.N.H. No. 43695).

In the original description of this form, Barbour (1910, p. 90) remarked that the frog had "suffered a little by having been swallowed"

by a snake. It is often difficult to identify well-preserved microhylids; hence the assignment of specimens to a species described from a partly digested individual must be regarded as somewhat tentative. However, the specimens are in agreement with *valvifera* in relative eye size, tympanum size, and leg length, and also seem to have similar-sized finger and toe discs. The species has previously been reported from Mafulu by Parker (1936, p. 73).

Asterophrys wilhelmana Loveridge

Mount Hagen, 8000 feet, Wahgi Valley, North-East New Guinea (A.M.N.H. No. 56271).

This species was described as a race of *A. pansa* by Loveridge (1948, p. 419). Because *pansa* is referable to another genus (see account of *Cophixalus pansus*), *wilhelmana* must be treated as a distinct species.

The Mt. Hagen specimen has been compared with paratypes of *wilhelmana* and seems closely similar to those frogs in all pertinent respects. Mount Wilhelm, the type locality and only previously known station for this species, is about 70 miles to the east of Mt. Hagen.

Metopostira ocellata Ménély

Four kilometers southwest of Bernhard Camp, Idenburg River, 850 meters, Netherlands New Guinea (A.M.N.H. Nos. 49564-49566, 49569, 49570); Mafulu, 1250 meters, Territory of Papua (A.M.N.H. Nos. 58011-58014).

Locality records for this species indicate a wide distribution within New Guinea. Records range from the Vogelkop Peninsula, Hollandia, Idenburg River, and Lorentz River in the northwest to the Owen Stanley Range in the southeast and include both the north and south coasts of the island. The altitudinal range is also extensive, from coastal sites such as Katow in Papua (Parker, 1934, p. 69) and Matapau in North-East New Guinea (Loveridge, 1948, p. 420) to an elevation of 6000 feet in the Albert Edward Range of Papua (Parker, *loc. cit.*), but there are no specific records for higher elevations.

Baragenys cheesmande Parker

Figure 4

East slope, Mt. Tafa, 2070 meters, Territory of Papua (A.M.N.H. No. 58008).

The identity of this topotypic specimen has been confirmed by comparison with a paratype (M.C.Z. No. 19921). Field notes of the collector (A. L. Rand) state that the frog was found on the ground in a clearing

in the forest on June 6, 1933. Because the external form of this species has not previously been illustrated (Parker, 1936, p. 74, fig. 1, the lower jaw), a drawing of the American Museum specimen is presented here.

Sphenophryne brevicrus van Kampen

Mount Hagen, 8000 meters, North-East New Guinea (A.M.N.H. Nos. 56272, 58171-58174); 9 kilometers northeast of Lake Habbema, 2800 meters, Netherlands New Guinea (A.M.N.H. Nos. 43696, 43698); Bele River, 18 kilometers north of Lake Habbema, 2200 meters, Netherlands New Guinea (A.M.N.H. Nos. 43761-43764).

Loveridge (1948, p. 422) reported this species from Mt. Wilhelm, a locality about 70 miles east of Mt. Hagen. Other localities are far to the west in the mountains of Netherlands New Guinea.

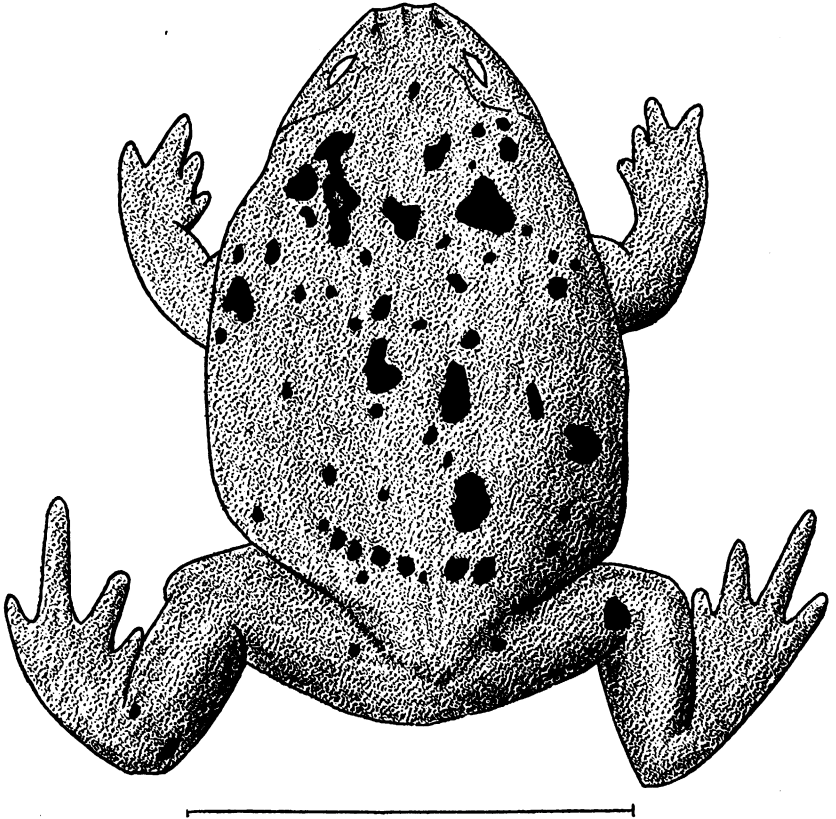


FIG. 4. Dorsal aspect of *Baragenys cheesmanae* Parker, A.M.N.H. No. 58008, topotype, Mt. Tafa. The line represents a distance of 2 cm.

In the Bele River specimens, the sides of the head and body are darker than the back, the light dorsal and dark lateral colors being sharply separated along a line beginning at the posterior corner of the eye and curving down on the flank, as shown in van Kampen's illustration of the type specimen (1913, pl. 11, fig. 8). The other Netherlands New Guinea individuals appear similar but are poorly preserved. Though the Mt. Hagen specimens are rather dark, a lateral band can be distinguished in these, too.

The relative uniformity of these American Museum specimens stands in contrast to the diversity of pattern seen in the Mt. Wilhelm series. This variation has been commented on by Loveridge (*loc. cit.*). In a sample of nine Mt. Wilhelm frogs that I examined, only three juveniles resemble the specimens from other localities. Some adults show an irregular, dark lateral line from the eye to the flank, but not the broad band described above. The dorsum and flanks are variously spotted or marbled. One of these frogs is sufficiently like the illustration of the type specimen of *Sphenophryne polysticta* (Méhely, 1901, pl. 12, fig. 4) that it could easily be mistaken for that species were not the fingers and toes without discs.

Relative tympanum size suggests a geographic trend. Tympanum-length/eye-length ratios for five Netherlands New Guinea, four Mt. Hagen, and six Mt. Wilhelm specimens average, respectively, 0.429, 0.532, and 0.628. Differences of such magnitude in such small frogs as these (snout-vent length *ca.* 25 mm.) could easily result from differences in the state of preservation. However, a similar trend seen in leg length (table 1) increases the probability that the populations do differ in proportions, though the samples are too small to be trustworthy. The tibia length/snout-vent length means for the samples are (in the same order) 0.316, 0.295, and 0.267.

Sphenophryne crassa, new species

HOLOTYPE: A.M.N.H. No. A56803, adult female, collected by G. M. Tate on the north slope of Mt. Dayman, Maneau Range, Territory of Papua, at an elevation of 2230 meters on May 25, 1953.

PARATYPES: Nine specimens: A.M.N.H. Nos. 56789, 56790, 56805, 56865, 57424, 57425, 57441-57443, collected on May 29 and June 13, 1953, at the type locality.

DIAGNOSIS: Distinguished from all other known species of *Sphenophryne* except *S. brevipes* and *S. brevicrus* in that the fingers lack expanded discs. *Sphenophryne crassa* differs from *brevicrus* in having small but distinct toe discs, structures lacking in *brevicrus*. The most ob-

vious differences between *brevipes* and *crassa* are the relatively wider head of *crassa*, its angular canthus rostralis (rounded in *brevipes*), and roughened dorsal body surface (smooth in *brevipes*).

DESCRIPTION OF TYPE SPECIMEN: No maxillary or vomerine teeth; maxillae not overlapping in front of premaxillae (eleutherognathine). Pectoral girdle with well-developed clavicles and cartilaginous coracoids, the clavicles slightly curved and reaching nearly to the midline of the pectoral girdle; no omosternum; sternum cartilaginous. Terminal phalanges T-shaped.

Body relatively short and chunky, head broad (head width/snout-vent length mean = 0.41, range 0.38-0.44, $n = 9$). Dorsal body surface roughened by numerous small pustules and folds; a)(-shaped interscapular fold, and a straight fold from the corner of the eye to the flank. Tympanum indistinct, slightly more than three-quarters of the length of the orbit. Tongue smooth and half free behind. An anterior lobular and a posterior serrate palatal ridge. Tips of fingers without enlarged discs, tips of toes enlarged into discs only slightly broader than the penultimate phalanges. Fingers and toes without webbing. A low, rounded, inner metatarsal tubercle is present; all other tubercles of hands and feet absent or almost indistinguishable. Fingers in decreasing order of length, 3-2-4-1; toes 4-3-5-2-1. Length of orbit (3.1 mm.), less than snout length, (3.5 mm.). Interorbital space about one and one-half times the width of the upper eyelid. Legs very short, tibia length/snout-vent length ratio 0.31. Snout-vent length 26.9 mm., tibia length 8.2 mm., head width 10.4 mm.

The dorsal body surface (in preservative) is brown; the flanks are lighter and the ventral surfaces pale, with darker spots and reticulations particularly evident on the throat. A dark line follows the postocular fold for a short distance above the tympanum. The side of the head is dark back to the region of the posterior corner of the eye, where it becomes somewhat lighter. There is a prominent eye spot in the groin. The limbs show no distinctive markings.

VARIATION: The description of the type specimen could stand in most respects for the paratypes as well. Some individuals are paler in dorsal coloration, and in most the ocellus in the groin is much less evident. The tympanum length/eye length mean for *crassa* is 0.786 (0.69-0.90). Tibia length/snout-vent length mean is 0.324 ± 0.006 , range 0.29-0.35.

DISCUSSION: In Parker's synopsis of the species of *Sphenophryne* (1934, p. 153), this new form would key out to the couplet containing *S. schlaginhaufeni* and *S. gracilipes*. The angular canthus rostralis brings some resemblance to *schlaginhaufeni* (a specimen of which was taken at

1550 meters on Mt. Dayman), but that form has finger discs and much longer hind limbs. *Sphenophryne brevipes*, a species that resembles *crassa* in lacking finger discs but possessing toe discs, is a relatively slimmer form. Three specimens of *brevipes* (M.C.Z. Nos. 28399, 28400, 28406) have a mean head width/snout-vent length ratio of 0.36, range 0.35–0.37, as compared to mean 0.41, range 0.38–0.44, for nine *crassa*.

The largest specimen is a gravid female, 26.9 mm. in snout-vent length, with ova approximately 3 mm. in diameter.

The Mt. Dayman specimens were collected by G. M. Tate and H. M. Van Deusen. The 2230-Meter Camp was in a region where fire-induced grassland had replaced forest except in valleys and ravines. The frogs were collected in such forest areas. Several frogs were located when calling from beneath a 3- to 6-inch layer of humus and loose leaves.

Sphenophryne cornuta Peters and Doria

New Guinea (presumably Territory of Papua) (A.M.N.H. No. 53396).

The only specimen of this species in the collection unfortunately bears no more specific locality data than "New Guinea, 1933–1934." The 1933–1934 expedition visited coastal localities from Port Moresby to Daru Island and penetrated inland to Mt. Albert Edward in the Wharton Range (Archbold and Rand, 1935).

Sphenophryne gracilipes Fry

Wuroi, Oriomo River, Territory of Papua (A.M.N.H. Nos. 53390–53395); Daru, Territory of Papua (A.M.N.H. No. 53389).

Although this species, described from the Cape York Peninsula of Australia, has not previously been reported from New Guinea, its presence there is not astonishing. The distribution conforms to a pattern set by many lowland forms common to the two regions.

The specimens were compared to Australian individuals (M.C.Z. Nos. 18375–18377, A.M.N.H. No. 54195) and were found to be similar in habitus and pigmentation. A dark brown streak beginning on the snout and passing through the eye, becoming ragged and diffuse in the shoulder region, is common to all specimens. Some individuals in both the Papuan and Australian series show a light middorsal line indistinct anteriorly.

Sphenophryne macrorhyncha van Kampen

Four kilometers southwest of Bernhard Camp, Idenburg River, 850 meters, Netherlands New Guinea (A.M.N.H. Nos. 49531–49533, 49537, 49538, 49540, 49541, 49572, 49617–19626, 49656, 49661); North-East New Guinea (A.M.N.H. Nos. 23604, 23605); New Guinea (A.M.N.H. No. 23601).

Burt and Burt, in their summary of Pacific Islands amphibians and reptiles in the American Museum of Natural History collections (1932, p. 484), reported A.M.N.H. Nos. 23604 and 23605 as *Sphenophryne fusca*. These, with A.M.N.H. No. 23601, were received in an exchange with the Zoological Museum of Berlin.

As Parker has noted (1940, pp. 259–260), there is sexual dimorphism in snout length in *macrorhyncha*. As the snout length is likely to be some-

TABLE 1
RELATIVE LEG LENGTHS, EXPRESSED AS THE RATIO OF TIBIA LENGTH TO SNOUT TO VENT LENGTH, IN SEVERAL SPECIES OF THE GENUS *Sphenophryne*

Species	N	Tibia Length/Snout-Vent Length $\bar{X} \pm \sigma_{\bar{x}}$	Range
<i>brevicrus</i>			
Vicinity of Lake Habbema	6	0.316 —	(0.27–0.36)
Mt. Hagen	4	0.295 —	(0.28–0.31)
Mt. Wilhelm	6	0.267 —	(0.24–0.29)
<i>brevipes</i>	3	0.397 —	(0.39–0.40)
<i>cornuta</i>	1	0.46 —	—
<i>crassa</i>	10	0.324 ± 0.006	(0.29–0.35)
<i>gracilipes</i>	6	0.430 —	(0.41–0.46)
<i>macrorhyncha</i>	13	0.396 ± 0.005	(0.36–0.42)
<i>palmipes</i>			
Mt. Dayman	42	0.395 ± 0.003	(0.36–0.43)
Goodenough Island	14	0.393 ± 0.004	(0.37–0.42)
<i>schlaginhaufeni</i>	1	0.54 —	—

what greater than the eye length in males, an attempt to identify such individuals in Parker's key to the species of *Sphenophryne* (1934, p. 153) could lead to incorrect assignment. Five other species (*S. cornuta*, *S. schlaginhaufeni*, *S. crassa*, *S. gracilipes*, and *S. palmipes*) are known to have the snout longer than the eye, at least in some males. Distinguishing characters are these: *S. cornuta* has finger discs larger than toe discs; *schlaginhaufeni* has longer hind legs and a)(-shaped fold on the back; *gracilipes* is small (17 mm.) and has scarcely enlarged finger discs; *palmipes* has fully webbed toes.

Within the series of specimens from 4 miles southwest of Bernhard Camp, there is considerable variation in the degree of expansion of the finger discs. While many would qualify as having the disc of the third finger "at least once and a half as broad as the penultimate phalanx" (Parker, 1934, p. 153), some show scarcely any enlargement at all. Individuals with small discs would key out to *S. polysticta*.

Loveridge (1935, pp. 56–57) referred *Austrochaperina robusta* Fry and *A. brevipes* Fry, both Australian species, to the synonymy of *Sphenophryne polysticta*. Working with many fewer specimens than were available to Loveridge, Parker (1934, p. 157) recognized *robusta* and *polysticta* as distinct species but also considered *brevipes* a synonym of *polysticta*. I have no new material bearing on this question but wish to point out that the type specimen of *polysticta* (Sattleberg, New Guinea) is reported as being adult and 16.5 mm. in length (Parker, 1934, p. 158), while the largest Australian specimens measure 27 mm. (Loveridge, 1935, p. 57). Although the species may truly show this wide range of adult size, the possibility that the Australian and Papuan populations represent different species will bear reviewing when more specimens from New Guinea become available.

Sphenophryne palmipes, new species

Figure 5

HOLOTYPE: A.M.N.H. No. A57331, adult female, collected by G. M. Tate on the north slope of Mt. Dayman, Maneau Range, Territory of Papua, at an elevation of 700 meters, on July 16, 1953.

PARATYPES: Forty-three specimens: A.M.N.H. Nos. A56602–A56604, 57062, 57066, 57074–57076, 57079, 57099, 57104, 57105, 57115, 57119, 57120, 57122–57124, 57131–57134, 57146–57148, 57162–57164, 57168–57170, 57213–57215, 57232–57236, 57333, 57335, 57339, 57340, collected on July 19 through July 23 at the type locality, by G. M. Tate.

DIAGNOSIS: Distinguished from all other species of its genus in having fully webbed toes and a prominent vomerine spike behind each internal naris.

DESCRIPTION OF TYPE SPECIMEN: No maxillary or vomerine teeth; maxillae not overlapping in front of the premaxillae (eleutherognathine); a single post-choanal spike on each prevomer. Pectoral girdle with well-developed coracoids and clavicles, the latter reaching from the scapula to the midline of the girdle; no omosternum; procoracoids and sternum cartilaginous. Terminal phalanges T-shaped.

No external sign of tympanum. Tongue smooth and half free behind. Two folds across the roof of the mouth at the entrance to the pharynx, the anterior relatively smooth and the posterior serrate. Digits with enlarged, spatulate tips, those of the front and hind toes being approximately equal in size and about twice the width of the penultimate phalanges, excepting the discs of the first finger and first toe which are relatively somewhat smaller. Fingers free, toes fully webbed, the web

reaching the discs of all toes but the fourth. Subarticular tubercles rounded, smooth, and inconspicuous; a low, rounded inner metatarsal tubercle is present; no outer metatarsal tubercle. Fingers, in decreasing order of length, 3-4-2-1; toes 4-3-5-2-1. Eyes large, interorbital space approximately equal to the width of the upper eyelid; length of orbit

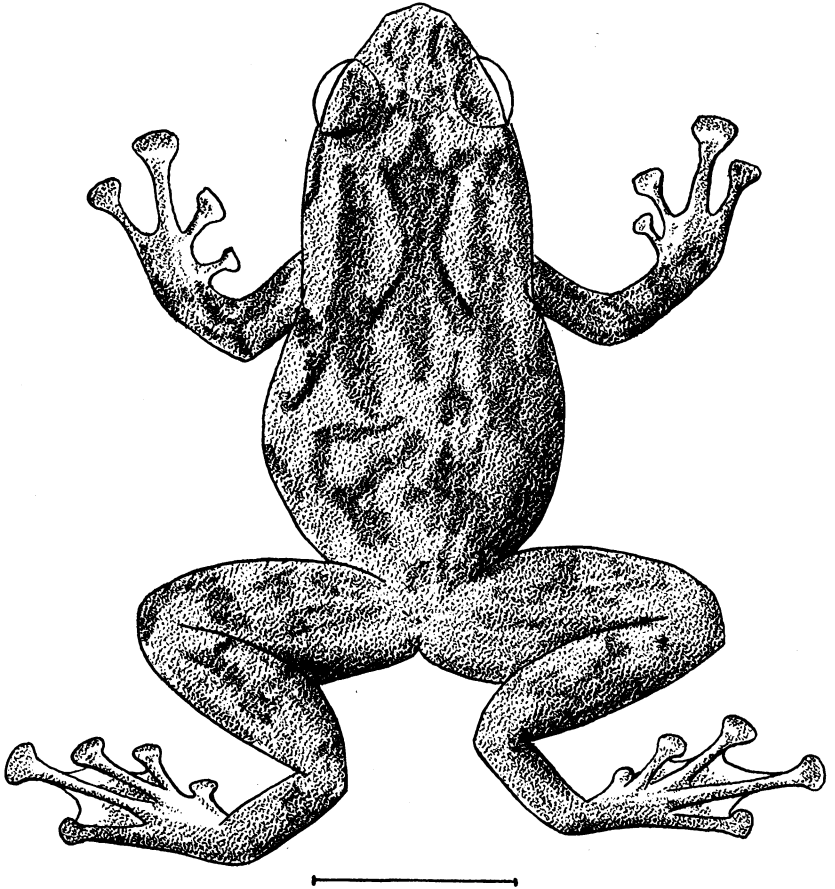


FIG. 5. Dorsal aspect of *Sphenophryne palmipes*, new species. Paratype, Mt. Dayman, 700 meters. The line represents a distance of 1 cm.

slightly greater than snout length. Nares closer to tip of snout than to anterior corner of eye. Legs relatively short, tibia length/snout-vent length 0.40. Snout-vent length 36.1 mm., tibia length 14.5 mm., head width 13.8 mm.

In preservative, the type has a dark purplish gray dorsal ground color

with indistinct darker mottling. A W-shaped mark is present across the back in the scapular region. Markings on the legs and arms form irregular blotches rather than regular cross bands. The abdomen and under surfaces of the limbs are light, while the throat shows gray mottling.

VARIATION: The long series of paratypes and the frogs from Goodenough Island differ very little from the description given of the type specimen. The males are without vocal sac openings or vocal sacs. Dissection reveals that an internal vestige of the tympanum is present and the columella is well developed, though there is no external indication of an ear. Adult males tend to have a longer and more pointed snout than the females or juveniles (often longer than the eye in males), but variation is considerable even among individuals that do not appear to have been appreciably distorted in being preserved. Similar sexual dimorphism has been recorded for *Sphenophryne macrorhyncha* by Parker (1940, pp. 259–260). The largest female in the series of 58 specimens measures 42.5 mm. in snout–vent length, the largest male 34.7 mm.

The W-shaped mark across the back sometimes combines with a triangular blotch between and behind the eyes to enclose a lighter butterfly-shaped area. A light interocular bar is often present. Occasional individuals are quite dark beneath, even on the abdomen and limbs.

DISTRIBUTION: In addition to the specimens collected at the type locality on the mainland of New Guinea, 14 individuals of this species were secured by members of the Fourth Archbold Expedition at two camps on the east slope of Goodenough Island, D'Entrecasteaux Islands, at elevations of 900 and 1600 meters.

ECOLOGY: The possession of extensively webbed toes marks this species as unique not only in its genus, but also among all known microhylids of New Guinea. The webbing suggests an aquatic or semi-aquatic habitat for *palmipes*, and this inference is borne out by field notes accompanying the specimens. The type specimen was found "in pools of rocky stream." Others were found on "banks of rocky stream," "in small creek," and "near small creek." The 1600-Meter Camp on Goodenough Island is described as in heavily mossed montane forest of mixed composition, containing numerous oak and *Castanopsis* trees, an abundance of tree ferns and *Pandanus*, and much scrambling bamboo. Frogs were collected here on October 9 to 11, 1953. The 900-Meter Camp on Goodenough Island (October 25–27) and the 700-Meter Camp on Mt. Dayman (July 19–23) were both in oak forest-rain forest transition zone.

The absence of tympanum and vocal sacs in *palmipes* may be correlated with the rocky stream habitat. Such a relationship has been suggested for *Ascaphus truei* in North America.

Ova up to 3.7 mm. in diameter were found in the Mt. Dayman frogs, collected July 19 to 24, 1953, and ova up to 4.5 mm. in the Goodenough Island specimens collected in October. As far as is known, all members of the subfamily Sphenophryinae produce large, heavily yolked eggs, and the larvae metamorphose prior to hatching. It would be of interest to know if the breeding habits of *Sphenophryne palmipes* are modified in accord with the semi-aquatic habits of the adults, but the site and manner of egg deposition are unfortunately unknown. Parker (1934, p. 159) records as “? *Sphenophryne* sp.” embryos with the pectoral girdle characteristic of *Sphenophryne* but with the toes two-thirds webbed, from “the pitcher of a *Nepenthes* at Kuching.” The presence of toe webbing suggests that these may be embryos of *S. palmipes*, but Noble (1931, p. 62) notes that the toes of microhylid larvae are apparently always webbed as they develop, though the webbing may be lost at metamorphosis.

Sphenophryne schlaginhaufeni Wandolleck

North slope, Mt. Dayman, Maneau Range, 1550 meters, Territory of Papua (A.M.N.H. No. 56734).

Among the species of *Sphenophryne* which have, as does this Mt. Dayman specimen, relatively long hind legs, it would, on a geographic basis, be more reasonable to expect *S. rhododactyla* (Owen Stanley Range) or *S. mehelyi* (Sattleberg) to occur in southeast New Guinea than a species hitherto known only far to the northwest (Setekwa River, Toricelli Mountains). However, in such features as can accurately be determined, this specimen is closer to *schlaginhaufeni* than to either of the others.

The second finger is as long as the fourth (shorter in *mehelyi* and *rhododactyla*); the tympanum is large, about three-quarters of the eye diameter (less than one-half in *mehelyi*); the toe discs are about one and one-half times the width of the penultimate phalanx (scarcely wider than the rest of the toe in *rhododactyla*); a)(-shaped fold is present between the shoulders (absent in *mehelyi* and *rhododactyla*); the fourth toe measures about three-quarters of the internarial distance (equal to that distance in *rhododactyla*).

Unfortunately the snout of this specimen has been pushed in, so that the relative lengths of eye and snout and the rounded or angular nature of the canthus rostralis cannot be determined. If a generous 25 mm. for snout-vent length be allowed (an exact measurement being impossible owing to the deformation of the snout), the tibia length/snout-vent length ratio is 0.54.

Specimens from Aitape and Toem reported as this species (Loveridge, 1948, p. 421) have, on examination and dissection, proved to be *Cophixalus oxyrhinus*.

Geoffrey M. Tate found the American Museum specimen on June 23, 1953, under moss on a tree in moist forest.

Oreophryne anthonyi Boulenger

West slope, Mt. Tafa, 2400 meters, Territory of Papua (A.M.N.H. Nos. 43666-43668, 58026-58044); east slope, Mt. Tafa, 2070 meters, Territory of Papua (A.M.N.H. Nos. 58045-58057); Murray Pass, Wharton Range, 2840 meters, Territory of Papua (A.M.N.H. Nos. 58015-58025, 58058-58066); north slope, Mt. Dayman, Maneau Range, 2230 meters, Territory of Papua (A.M.N.H. Nos. 56782, 56783, 56791, 56797-56799, 56801, 56811, 56815, 56816, 56818, 56860, 56863, 56864, 56875, 56876, 56916, 56925, 57426, 57436, 57437, 57440).

The type locality, Mt. Victoria, has been the only locality from which this species previously has been recorded. Mount Tafa lies about 50 kilometers (31 miles) northwest, and Murray Pass about 35 kilometers (22 miles) north-northwest, of Mt. Victoria. The Mt. Dayman locality is 209 kilometers (130 miles) east-southeast of the type locality.

With the exception of some proportions to be discussed below, the frogs from Mt. Tafa and Murray Pass agree well with Parker's account of the species (1934, pp. 168-169). The ontogenetic change in ventral color pattern mentioned by Parker is well shown in the extensive series of frogs from Mt. Tafa and Murray Pass. The smallest individuals tend to have dark venters, with a few small light spots. In larger specimens, the spots enlarge and gradually spread until first a dark reticulum and then only a few dark spots remain. The largest frogs may be totally light beneath. However, the amounts of dark and light pigment are not closely correlated with size, so that several frogs of a given size are likely to show considerable variation.

In contrast to the specimens discussed above, none of the Mt. Dayman frogs shows a very dark, spotted, or reticulate ventral surface. Most, even juveniles, are light beneath, with only a faint dusting of brown pigment. If it were possible to see and describe the various populations of *anthonyi* in life, the recognition of geographic races would probably be warranted.

A. L. Rand, who collected many of the Mt. Tafa and Wharton Pass specimens, noted the color (in life) of two adult frogs as follows: "Dark reddish brown mottled with blackish above, whitish spotted light red below. . . . Rich golden brown mottled blackish above and yellowish white with a few dark spots and patches of pale gold below."

The Mt. Dayman population, which appears somewhat different from typical *anthonyi* in pigmentation, also seems to have slightly smaller toe discs. The ratio of fourth toe disc width to third finger disc width averages in the northern populations 0.745 ± 0.002 , $n = 48$, and in the Mt. Dayman sample 0.660 ± 0.004 , $n = 22$. The difference between the means is statistically significant, but the overlap in ranges is sufficiently great that a taxonomically useful segregation of the two groups on the basis of the fourth toe/third finger ratio is not possible. Ranges of variation and means for this character are presented for several species of *Oreophryne* in table 2.

The Mt. Dayman specimens were found in relict patches of forest amid fire-induced grassland. No more specific data on the habitat are available. The Mt. Tafa and Murray Pass frogs were found in arboreal situations, some hidden in a species of epiphytic plant and others in pandanus leaves. Field notes of A. L. Rand describe the former habitat: "This *Hydnophytum* was an epiphyte on forest trees found from a few meters to 60 feet up. It had a bulbous [*sic*] base, from 6" to 16" across from which the branches grew. This irregular bulbous base was honey-combed with thin walled galleries and connecting cavities. There was usually a single opening an inch or so across. In the lower part was usually a single large cavity. Water collects in the cavities, and some plants probably contained more than a quart. We examined a number of these common growths and probably more than one quarter contained frogs."

The moist cavity of the plant serves as a breeding site. Clutches of eggs or newly hatched young numbering 18, 18, 20, 22, 24, and 31 were found, in all cases accompanied by adult frogs. In one instance eight hatchlings unaccompanied by an adult were found. Four times when frogs were found with eggs or newly hatched young, there were two frogs present; in the other two cases a single frog was found in each *Hydnophytum*. Two of the pairs were male-female pairs, and one of the single frogs was a male. The status of the other frogs with regard to sex cannot be determined. Females of the two pairs contained ova 2.5 and 3.0 mm. in diameter, respectively. The female of a male-female pair found without an egg cluster had ova 3.5 mm. in diameter.

The presence of pairs of frogs with egg masses suggests that the parents remain with the eggs up to hatching, but the possibility exists that the adult frogs had merely chosen the same plant in which to retire for breeding that had been used earlier. This would imply a rather extended breeding season, a distinct possibility, but only single clutches of eggs were found in the plants. Referring to "*Oreophryne verrucosa*" (= *O. idenburgensis* ?), van Kampen (1923, p. 114) states, "This species has

been found . . . in the cavities of *Hydnophytum* . . . Each plant usually contained two frogs and a clump of about 10 to 20 large eggs (about 5 mm. in diameter), which stuck by a string of mucilage to the ceiling of one of the largest cavities."

The eggs (preserved in alcohol) measure 4.5 to 5.5 mm. in diameter. Newly hatched frogs are about 7.5 mm. in snout-vent length. Eggs were found in plants on June 1, August 15, and August 22, and newly hatched frogs on August 15, August 30, and September 10.

In addition to the frogs found in *Hydnophytum* plants, several were found in pandanus leaves "mostly in the bases of the upper, younger leaves where water [had] accumulated." Among 20 frogs found in such situations, 13 were juveniles (but not hatchlings), five small adult but gravid females, one was a post-breeding female, and one a young adult male. No eggs or newly hatched young were found. Frogs were collected on June 2, August 14, and September 9, during the same period of time when breeding was going on in the epiphytes. The frogs found in *Hydnophytum* plants were, excluding hatchlings, all adults, with the possible exception of one young male, possibly subadult. It would appear that these epiphytic plants are specifically sought out as breeding sites.

A hylid frog, *Nyctimystes*, was found with several *Oreophryne* in a pandanus, but the frogs living in the *Hydnophytum* were found to share their plants with no other species. The presence of *Hyla mcgregori* (= *Hyla thesaurensis*) in *Hydnophytum*, together with the skink *Cryptoblepharus boutoni* and its eggs, was reported by Neill (1946).

Oreophryne biroi Méhely

North slope, Mt. Dayman, Maneau Range, 1550 meters, Territory of Papua (A.M.N.H. Nos. 56736, 56830); north slope, Mt. Dayman, Maneau Range, 1250 meters, Territory of Papua (A.M.N.H. No. 56846); north slope, Mt. Dayman, Maneau Range, 1000 meters, Territory of Papua (A.M.N.H. No. 56848).

These four specimens show a weak,)(-shaped, scapular fold. The region below the fold is darker than the middorsal region, emphasizing the fold even though the fold itself is faint. Three individuals show a dark, interorbital, triangular mark, with the apex prolonged between the shoulders. One frog is liberally spotted on the dorsal surfaces of the body and legs with white markings 1 to 2 mm. in diameter.

On pigmentation alone, the unspotted frogs could easily be mistaken for *Oreophryne anthonyi*, which was found at 2230 meters on Mt. Dayman. However, *anthonyi* is a larger frog (largest Mt. Dayman *anthonyi* 38 mm., largest *biroi* 31 mm.) with relatively smaller toe discs and relatively larger front feet. The width of the disc of the fourth toe is in *biroi*

from 0.95 to 1.00 (mean 0.978, $n = 4$) times the width of the third finger disc, and from 0.50 to 0.77 (mean 0.660, $n = 22$) in *anthonyi* from Mt. Dayman (table 2). The front feet of *biroi* are conspicuously smaller. Expressed as the ratio third finger length/head width, the figures are: *biroi*, range 0.50–0.53, mean 0.522, $n = 4$; *anthonyi*, range 0.60–0.75, mean 0.664, $n = 14$.

The Mt. Dayman specimens were collected in late June and early July. The following notes accompanied specimens: "In moist forest under moss on tree." "Bank of small stream in heavy forest." "On tree fern at head of gully."

TABLE 2

RELATIVE DEGREE OF EXPANSION OF TIPS OF DIGITS, EXPRESSED AS RATIO OF WIDTH OF FOURTH TOE DISC TO WIDTH OF THIRD FINGER DISC, IN SEVERAL SPECIES OF THE GENUS *Oreophryne*

Species	N	$\bar{X} \pm \sigma_{\bar{X}}$	Range
<i>anthonyi</i>			
Murray Pass, Mt. Tafa	48	0.743 \pm 0.002	(0.65–0.88)
Mt. Dayman	22	0.660 \pm 0.004	(0.50–0.77)
<i>biroi</i>	4	0.978	— (0.95–1.00)
<i>brevicrus</i>	5	0.864	— (0.83–0.89)
<i>flava</i>	32	0.702 \pm 0.010	(0.60–0.87)
<i>idenburgensis</i>	8	0.743 \pm 0.027	(0.62–0.86)
<i>inornata</i>	17	0.969 \pm 0.019	(0.85–1.17)
<i>insulana</i>	9	0.686 \pm 0.019	(0.61–0.77)
<i>parkeri</i> (type specimen)	1	0.800	—

Oreophryne biroi has been reported from many localities at relatively low elevations in the eastern half of New Guinea and from Ferguson Island in the D'Entrecasteaux group. I have seen one of the island specimens (M.C.Z. No. 3498), but its condition is too poor for one to be certain of the identification. It is possible that the frog on Ferguson Island may be one of the new species of *Oreophryne* described in this report from adjacent Goodenough Island, rather than *O. biroi*.

Oreophryne brevicrus, new species

HOLOTYPE: A.M.N.H. No. A43669, adult male, collected by W. B. Richardson at an elevation of 2800 meters, 9 kilometers northeast of Lake Habbema, Netherlands New Guinea, October 15, 1938.

PARATYPES: Four specimens, A.M.N.H. Nos. 43697, 43700-43702, collected at the type locality on October 15, 23, and 27, 1938, and A.M.N.H. No. 43694 from Lake Habbema, 3275 meters, August 16, 1938, all collected by W. B. Richardson.

DIAGNOSIS: The small adult size (largest of six specimens is 24 mm. in snout-vent length) and short hind limbs (mean tibia length/snout-vent length ratio is 0.325 for five specimens) will serve to distinguish this new form from other known *Oreophryne*.

DESCRIPTION OF TYPE SPECIMEN: No maxillary or vomerine teeth; maxillae not overlapping in front of the premaxillae (eleutherognathine); clavicles strongly arched, procoracoid-scapula connection probably but not certainly ligamentous; no omosternum, sternum cartilaginous; terminal phalanges T-shaped.

Paired, slit-like vocal sac openings present. Tympanum indistinct and less than half of the orbit diameter. Tongue smooth, half free behind. Two palatal ridges, the posterior well developed and serrate, the anterior more rounded, shorter, and less prominent. Digits with slightly enlarged tips, those of fingers slightly larger than those of toes. Disc of third finger less than twice the width of the penultimate phalanx. Fingers free, toes with a basal web. Subarticular and outer metatarsal tubercles very faintly indicated as low, rounded protuberances. Fingers in order of decreasing length 3-4-2-1 (four and two nearly equal); toes 4-5-3-2-1 (five very little longer than three). The feet are small, and the fingers and toes are relatively short. The ratio of third finger length to head width is 0.42. The snout is truncate and protrudes slightly; snout as long as orbit length; interorbital space two times the width of the upper eyelid. Nostrils nearer tip of snout than eye. Legs very short, tibia length 6.8 mm. Snout-vent length 22.5 mm., head width 8.2 mm.

In preservative the type is brown above and beneath, lighter on the venter and flanks. A lighter brown interocular bar is present, and dark,)(-shaped marks in the shoulder region, continued along the sides, separate the light flanks from the darker middorsal region. A short postocular dark stripe, such as is seen in *Oreophryne flava*, is present. The ventral surfaces show no definite pattern, merely an even scattering of melanophores.

VARIATION: The tympanum is indistinct and less than half of the orbit diameter in four of the five specimens, but is distinct and more than half in one. The disc of the third finger may be twice or less than twice the width of the penultimate phalanx. One individual has an additional toe on each hind foot. The snout may be as long as or shorter than the orbit length, and the interorbital space one and one-half to two times the width

of an upper eyelid. The tibia length/snout-vent length ratio ranges from 0.27 to 0.36, mean 0.325, $n = 5$.

DISCUSSION: The most distinctive feature of this new species is the relatively short limbs. There is scarcely any overlap in ranges of variation of tibia length/snout-vent length ratios of this species and the other seven species available for comparison (table 3). Another feature in which *brevicrus* differs from other Papuan species is in the degree of expansion of the tips of the digits. The disc of the third finger is at the most twice the width of the penultimate phalanx, while in other species this represents a minimum figure. With regard to relative widths of the finger and toe discs, *brevicrus* stands intermediate between forms such as *biroi* and *inornata* in which the toe discs are as large as or very nearly as large as the finger discs, and those with markedly larger finger discs, for example, *anthonyi* and *flava* (table 2). The truncate nature of the snout together with its prominence also seems to be distinctive of this form.

It is most unfortunate that the nature of the pectoral girdle, with regard to the procoracoid-scapula connection, cannot be certainly determined in these specimens owing to their relatively poor state of preservation. The connection appears ligamentous to me, but I cannot determine this to be surely the case.

It is conceivable that some of the proportions, for example, relative sizes of digital discs, may have been altered by shrinkage. However, these structures do not appear shrunken or distorted. The length of the limbs and digits could not have been materially changed by shrinkage, and it is here the species is most distinct.

Very probably this is a small species. The largest specimen is adult at 24 mm., but, as the series is so small, it cannot be said for certain that the species does not reach a somewhat larger size.

Oreophryne anthonyi, *O. idenburgensis*, and *O. inornata* may be presumed to differ from *brevicrus* in adult size, and also to differ in details of digital expansion. I have not had specimens of *O. crucifera* or *O. albopunctata* for comparison with *brevicrus*. The first of these is said to have the leg long enough so that the tibio-tarsal articulation reaches the eye when the leg is brought forward along the body. In *brevicrus* this joint will reach to the shoulder region. *Oreophryne albopunctata* is said to have the disc of the third finger wider than half of the diameter of the eye, hence a much larger disc than *brevicrus* in a specimen of approximately the same size.

Other species of a size similar to *brevicrus* are *biroi*, *flava*, and *insulana*. The toe discs of *biroi* are relatively larger and the fingers longer.

Oreophryne flava and *insulana* show a greater difference in size between the finger and toe discs. All species discussed above have longer limbs than *biroi*. *Oreophryne parkeri* has legs of similar length and similar finger and toe disc proportions, but has the tympanum only one-third of its diameter from the eye, whereas at least one full diameter separates these organs in *brevicrus*. It might be thought that *brevicrus* was a short-legged, high-mountain race of one of these other small species, but, if such is the case, I cannot say to which it is most closely related.

Oreophryne flava Parker

Fifteen kilometers southwest of Bernhard Camp, Idenburg River, 1800 meters, Netherlands New Guinea (A.M.N.H. Nos. 49632, 49634, 49636, 49639, 58147-58169).

If *O. celebensis*, of doubtful occurrence in New Guinea, be excluded, there are four known Papuan species of *Oreophryne* in which the procoracoid reaches the scapula as a cartilaginous rather than a ligamentous element as it does in these specimens. One of these four species, *O. idenburgensis*, described in this report, attains a much larger size than the frogs here referred to *flava*. These two forms are compared more extensively in the description of *O. idenburgensis*. Another, *O. kampeni*, has the toes one-third webbed and the third toe longer than the fifth, two conditions that mark it as distinct from the frogs from 15 kilometers southwest of Bernhard Camp.

The remaining alternatives are that these frogs represent either *O. crucifera*, *O. flava*, or an undescribed form. They agree in several respects with the description of *O. flava* (Parker, 1934, p. 168): snout rounded, not prominent; canthus rostralis rounded; interorbital space a little broader than upper eyelid; second and fourth fingers subequal (or fourth longer); fifth toe longer than third; toe discs smaller than finger discs; a short, dark streak from the posterior corner of the eye, above the tympanum; and a fine, white, middorsal line (in some specimens). There is considerable variation in tympanum size, so this character is of no use. The only major point of disagreement between the description of *O. flava* and these specimens lies in the toe webbing. The toes of *flava* are stated to be free, while our specimens show a slight basal web.

Oreophryne crucifera has webbed toes, but in several other respects differs from the specimens under discussion. *Oreophryne crucifera* has a truncate snout, angular canthus rostralis, interorbital space as broad as upper eyelid, second finger longer than fourth, third and fifth toes subequal, and toe discs a little smaller than finger discs (much smaller in specimens I have referred to *flava*).

I regard the differences between these specimens and *flava* as insufficient to justify the proposal of a new name for them. The extent of toe webbing is seen to vary in other species and is also affected by the state of preservation of the specimen.

If I am correct in regarding the Idenburg River specimens referred

TABLE 3

RELATIVE LEG LENGTHS, EXPRESSED AS THE RATIO OF TIBIA LENGTH TO SNOUT TO VENT LENGTH, IN SEVERAL SPECIES OF THE GENUS *Oreophryne*

Species	<i>N</i>	Tibia Length/Snout-Vent Length $\bar{X} \pm \sigma_{\bar{x}}$	Range
<i>anthonyi</i>			
Mt. Tafa	19	0.418 ± 0.003	(0.39-0.45)
Mt. Dayman	14	0.409 ± 0.005	(0.38-0.44)
<i>biroi</i>	4	0.406	(0.39-0.44)
<i>brevicrus</i>	5	0.325	(0.27-0.36)
<i>flava</i>	27	0.400 ± 0.004	(0.35-0.45)
<i>idenburgensis</i>	8	0.399 ± 0.008	(0.37-0.42)
<i>inornata</i>	17	0.390 ± 0.004	(0.36-0.42)
<i>insulana</i>	9	0.378 ± 0.002	(0.37-0.40)
<i>parkeri</i> (type specimen)	1	0.368	—

to *O. flava* by Parker (1934, p. 168) as *O. idenburgensis* (see account of that species), then *O. flava* is known only from the type specimen (Lorentz River) and the American Museum series.

The largest individual among 33 specimens of this species is a female, 26 mm. in snout-vent length, with enlarged ova.

Oreophryne idenburgensis, new species

HOLOTYPE: A.M.N.H. No. A49663, adult male, collected by W. B. Richardson 18 kilometers southwest of Bernhard Camp, Idenburg River, Netherlands New Guinea, at an elevation of 2150 meters, in February, 1939.

PARATYPES: Three adults and four juveniles, A.M.N.H. Nos. 49571, 49664-49669, bearing the same data as the holotype.

DIAGNOSIS: Differs from all *Oreophryne* except *annulata* and *flava* in having the fifth toe longer than the third and the procoracoid reaching the scapula. *Oreophryne idenburgensis* is a larger form than either of the other two, attaining a snout-vent length of 45 mm., as compared to 22 mm. for the Philippine *annulata* and 26 mm. for *flava* of New Guinea.

DESCRIPTION OF TYPE SPECIMEN: No maxillary or vomerine teeth; maxillae not overlapping in front of the premaxillae (eleutherognathine); clavicles arched, procoracoid reaching scapula as a cartilaginous element, no omosternum, sternum cartilaginous; terminal phalanges T-shaped.

Paired slit-like vocal sac openings present, a single internal subgular vocal sac. Tympanum indistinct but visible, a little less than one-half of the orbit length. Tongue smooth, half free behind. Two palatal ridges, the anterior one low, with indistinct lobes, the posterior one with distinct serrations. Digits with enlarged tips, those of the fingers larger than those of the toes. Disc of third finger about three times the width of the penultimate phalanx. Fingers free; toes with a slight basal web. Sub-articular and outer metatarsal tubercles faintly indicated as low, rounded protuberances. Fingers in order of decreasing length 3-4-2-1; toes 4-5-3-2-1. Snout and canthus rostralis rounded; snout shorter than orbit; interorbital space approximately equal to width of upper eyelid; nostrils nearer tip of snout than eye. Legs short, tibia length 17.8 mm., snout-vent length 43.5 mm., head width 15.5 mm. Feet relatively large, with long toes; ratio of third finger length to head width is 0.60.

In preservative the type is dark brown dorsally, and pale beneath, with a scattering of darker pigment cells.

VARIATION: Data on variation in relative expansion of digits and relative leg lengths are presented in tables 2 and 3. The toes may be almost free or may (as in the type) show a distinct basal web. The largest individual in the series is a female, snout-vent length 45.4 mm. The largest male measures 44.7 mm. Most specimens are unmarked dorsally or show only a faint trace of lighter mottling. However, one frog has a light, T-shaped mark crossing the sacral region and irregular white blotches and cross bars on the legs.

DISCUSSION: The only other species of *Oreophryne* that have the fifth toe longer than the third and the procoracoid reaching the scapula are *O. annulata* and *O. flava*. The first of these is a small species (maximum length 21.7 mm.; Inger, 1954, p. 447) found in the Philippines.

Oreophryne flava is evidently also a small species, because the largest of 33 specimens is a gravid female 26 mm. in snout-vent length, while *idenburgensis* reaches 47 mm. The ratio of width of third finger to orbit length differs in specimens of the two forms; in only five of 33 specimens of *flava* is the disc half as wide as the orbit length, while all eight *idenburgensis* have the disc wider than half of the orbit length. However, as the ratio changes with growth (see account of *Oreophryne anthonyi*), very small individuals of *idenburgensis* might fall within the range of *flava*. Unless sexual maturity can be demonstrated, it may prove difficult

to distinguish young *idenburgensis* from adult *flava*. All specimens of *flava* show a short dark streak from the posterior corner of the eye above the tympanum, while this mark is not seen in *idenburgensis*. This marking may prove to be a useful distinguishing characteristic.

In size and proportions *O. idenburgensis* bears a close similarity to *O. anthonyi*. The presence of a ligamentous attachment of the procoracoid to the scapula in *anthonyi* will serve to distinguish the two. The graph of third toe disc width/orbit length against snout-vent length (fig. 6) illustrates a slight but nevertheless significant difference in proportions of adults of the two species. *Oreophryne idenburgensis* and *O. anthonyi* appear to be the largest species of their genus, with third place falling to *O. inornata* of Goodenough Island.

Parker, in his description of *Oreophryne flava* (1934, p. 168), mentioned two specimens from 2400–2900 meters near the Idenburg River that were so shriveled that accurate identification was impossible. Concerning what was evidently the same lot of specimens, van Kampen (1923, p. 114) wrote: "This species has been found by Mr. W. C. van Heurn in the cavities of *Hydnophytum*. . . Each plant usually contained two frogs and a clump of about 10 to 20 large eggs (about 5 mm. in diameter)." The size of the eggs and the clutch size are reminiscent of the condition seen in *anthonyi*. It is difficult to believe that a frog as small as *flava* (if it is assumed that our specimens of *flava* are correctly identified) would produce eggs similar in size and number to a species almost twice its size. More likely the notes pertain to *O. idenburgensis*.

Oreophryne inornata, new species

HOLOTYPE: A.M.N.H. No. A57000, adult male, collected by H. M. Van Deusen at an elevation of 1600 meters on the east slope of Goodenough Island, D'Entrecasteaux Islands, Territory of Papua, on October 22, 1953.

PARATYPES: Sixteen specimens, A.M.N.H. Nos. 56731, 56903, 56904, 56909, 56912–56914, 56937, 56938, 56984, 56999, 57259–57262, 57353, all collected at the type locality between October 9 and 23, 1953, by K. M. Wynn, H. Van Deusen, and L. J. Brass.

DIAGNOSIS: The only other species of *Oreophryne* with toe discs approximately as wide as finger discs, a ligamentous connection between procoracoid and scapula, and the fifth toe longer than third is *O. biroi*. From this species, *inornata* is distinguished by larger size (40 as against 31 mm. in snout-vent length) and uniform dorsal coloration.

DESCRIPTION OF TYPE SPECIMEN: No maxillary or vomerine teeth; maxillae not overlapping in front of premaxillae (eleutherognathine);

arched clavicles, procoracoid connected to scapula by a ligament; no omosternum, sternum cartilaginous; terminal phalanges T-shaped, verging on Y-shaped.

There is an internal subgular vocal sac with slit-like openings. Tympanum less than one-half of orbit length. Tongue smooth, half free be-

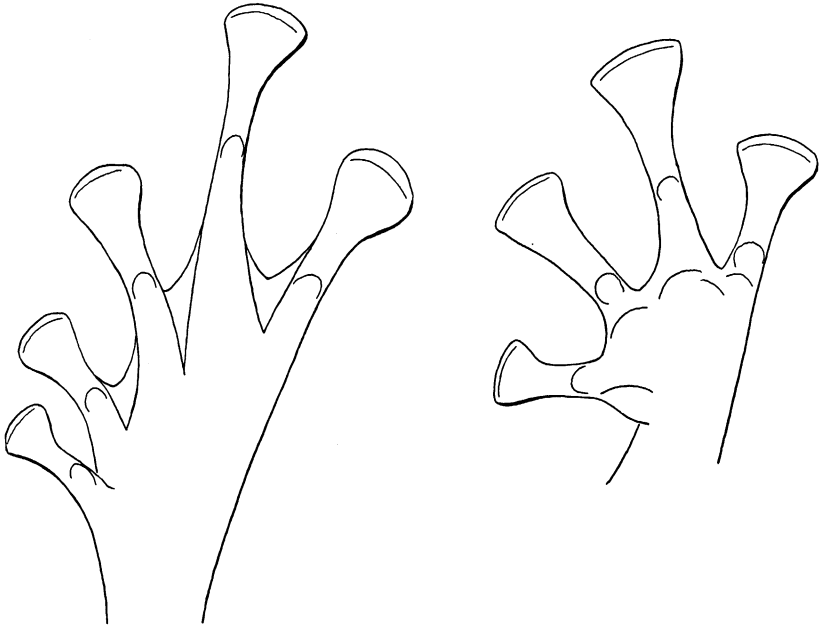


FIG. 7. Lower surfaces of left rear (left) and front feet of *Oreophryne inornata*. Note the similarity in size of the discs of the front and hind feet.

hind. A strong, serrate, posterior palatal ridge; anterior palatal ridge as long as posterior but with lower, more rounded lobes. Digits with enlarged discs, those of the front and hind limbs approximately equally expanded (fig. 7). Third finger disc usually slightly less than three times the width of the penultimate phalanx; fingers with a slight basal web, toes webbed at the base; subarticular tubercles low, rounded. Fingers in order of decreasing length 3-4-2-1 (rarely four is a little longer than two); toes 4-5-3-2-1 (five little longer than three). Canthus rostralis rounded, snout slightly truncate; snout shorter than orbit length; interorbital space about one and one-half times as broad as upper eyelid; nostrils nearer tip of snout than eye. Tibia length 13.7 mm., snout-vent length 36.3 mm., head width 13.3 mm. The ratio of third finger length to head width is 0.47.

The dorsal color is purplish brown, the uniformity relieved only by a very slightly darker area behind the ear. The ventral surfaces are pale, with a thin scattering of melanophores.

VARIATION: One of the remarkable features of this series of specimens is the relative uniformity of pattern (or rather, lack of pattern). Fourteen of the 16 frogs show a dorsal ground color that (in preservative) varies from gray to purplish brown; these specimens show no darker or lighter markings. Of the remaining two individuals, one is very pale, almost white, with an irregular dark interocular bar and dark scapular and sacral marks, and the other is dark dorsally, with some indistinct lighter mottling in the scapular region. The ventral surfaces of most specimens are quite pale and immaculate, though some are darkened (particularly in the gular region) by an even scattering of melanophores forming no pattern. This near uniformity of pigmentation is evidently not an artifact of preservation, for the series of specimens of *O. insulana* collected and preserved at the same time and place shows considerable pattern variation.

Data on variation in relative amounts of expansion of toe discs and relative leg lengths are presented in tables 2 and 3. The paratypes are closely similar to the type in details of body form, except that the snout is more rounded in some. The largest specimen is a gravid female, with snout-vent length 40.8 mm.

DISCUSSION: The characters of fifth toe longer than third, procoracoid connected to scapula by a ligament, and toe discs as large as finger discs are combined in only one other known species, *Oreophryne biroi*. This species is smaller than *inornata* (maximum known snout-vent length 31 mm.) and exhibits a variety of dorsal patterns but not the uniform pattern seen most frequently in *inornata*. *Oreophryne brevicrus* is somewhat like *inornata* in relative sizes of finger and toe discs, but is a smaller species with much shorter legs. *Oreophryne parkeri* also approaches *inornata* in pertinent characters, but it is a much smaller species, with the tympanum closer to the eye.

Oreophryne inornata was collected at the same time and place as *O. insulana* and evidently in the same habitat. Both species were recorded in field notes as having been found "In *Pandanus* tree," "Under tree root," "On ground in oak forest," on "Mossy upper branch of tree," and on "Vegetation close to ground." *Oreophryne inornata* was also found "In cut stem of climbing bamboo." It cannot be determined from the notes whether the two species were together at one spot or occupied their individual sites exclusively.

Oreophryne insulana, new species

HOLOTYPE: A.M.N.H. No. A57267, adult male, collected by K. M. Wynn at an elevation of 1600 meters on the east slope of Goodenough Island, D'Entrecasteaux Islands, Territory of Papua, on October 9, 1953.

PARATYPES: Eight adults, A.M.N.H. Nos. 56732, 56733, 56907, 56910, 56915, 57263, 57265, 57266; all collected at the type locality between October 9 and 23, 1953, by K. M. Wynn, H. Van Deusen, and L. J. Brass.

DIAGNOSIS: The characters of finger discs larger than toe discs, ligamentous connection between procoracoid and scapula, and fifth toe longer than third are combined in only one other *Oreophryne*, *O. anthonyi*, a much larger species (45 against 26 mm.) with relatively larger feet and relatively larger toe discs.

DESCRIPTION OF TYPE SPECIMEN: No maxillary or vomerine teeth; maxillae not overlapping in front of premaxillae (eleutherognathine); arched clavicles, procoracoid connected to scapula by a ligament; no omosternum, sternum cartilaginous; terminal phalanges T-shaped.

An internal subgular vocal sac with slit-like openings is present. Tympanum indistinct, its diameter less than one-half of the length of the orbit and separated from the orbit by about its own diameter. Tongue smooth, half free behind. A strong, serrate, posterior palatal ridge; anterior ridge represented by two low, rounded, median tubercles. Digits with enlarged tips, finger discs larger than toe discs (fig. 8). Third finger disc two and one-half times the width of the penultimate phalanx. Fingers free, toes with a basal web; subarticular tubercles indistinct. Fingers in order of decreasing length 3-4-2-1 (four very little longer than two); toes 4-5-3-2-1. Canthus rostralis rounded; snout rounded but verging on a truncate shape; snout slightly shorter than orbit length; interorbital space about one and one-half times as broad as the upper eyelid; nostrils nearer tip of snout than eye. Tibia length 8.1 mm., snout-vent length 21.1 mm., head width 8.8 mm.

The dorsal color is gray. There is a dark, W-shaped mark in the scapular region, with the posteriorly directed points of the W prolonged along the flanks. A thin, white, vertebral line extends from snout to anus and intersects a similar line on the femur. The under surfaces are paler than the dorsum and are without markings.

VARIATION: The paratypes are similar to the type in most pertinent respects. The anterior palatal fold is poorly developed in all, being represented by from one to three tubercles. Variation in relative toe disc proportions and tibia lengths is presented in tables 2 and 3. The largest specimen is a gravid female 25.6 mm. in snout-vent length.

Four specimens show a light middorsal line from the tip of the snout to the anus. In three of these, there is a short midfemoral line that intersects the middorsal line above the cloacal opening. All individuals show some darkening of the scapular area below a line marking the position of the)(-shaped folds seen in some species but not in this one. The mid-dorsal region may be lighter or darker than the flanks and, as do the

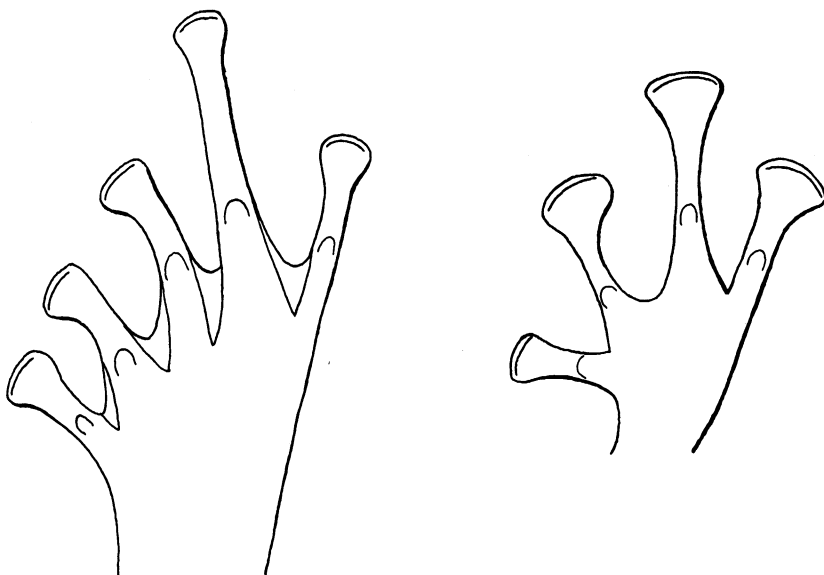


FIG. 8. Lower surfaces of left rear (left) and front feet of *Oreophryne insulana*. Note that the toe discs are smaller than those of the fingers.

flanks, usually shows dark mottling. The gular region and ventral limb and body surfaces are pale to dark brown, with irregular small light spots.

DISCUSSION: Only *Oreophryne anthonyi* of the Owen Stanley and Wharton ranges has a ligamentous scapula-procoracoid connection, fifth toe longer than third, and finger discs markedly larger than toe discs. The most conspicuous difference between *anthonyi* and *insulana* is in size; *anthonyi* reaches 45 mm., while the largest specimen of *insulana* is less than 26 mm. in length. Like *O. biroi*, *insulana* has smaller front feet than *anthonyi*. The ratio third toe length/head width may be used to illustrate this difference: *insulana*, mean = 0.456 (0.43–0.49), $n = 9$; *anthonyi* (Mt. Dayman), mean = 0.664 (0.60–0.75), $n = 14$. Also, the finger discs of *insulana* are relatively smaller than those of *anthonyi*, at least as regards adults of the two species.

Oreophryne brevicrus is similar to *insulana* in size, but has finger and toe discs more nearly the same size and shorter hind limbs. *Oreophryne parkeri* has relatively larger toe discs, and in it the tympanum is closer to the eye.

If the third and fifth toes of *insulana* were considered as subequal rather than the fifth longer, this species might be confused with *albo-punctata*. This latter form is reported to have the disc of the third finger wider than half of the diameter of the eye. The nine specimens of *insulana* show relatively smaller finger discs: the ratio of width of third finger disc to orbit length ranges from 0.38 to 0.50, mean 0.410. In this instance the two species may be directly compared, as all the *insulana* are adults 21 to 26 mm. in length and the type of *albo-punctata* is 25 mm. long.

The 1600-Meter Camp on Goodenough Island was in heavily mossed montane forest containing numerous oak and *Castanopsis* trees, an abundance of tree ferns and *Pandanus*, and much scrambling bamboo. Notes accompanying the specimens suggest that the species has both arboreal and terrestrial habits: "In *Pandanus* tree." "On ground in oak forest." "Mossy upper branch of tree." "Vegetation close to ground." "Under tree root."

Cophixalus ateles Boulenger

Mount Hagen, 8000 feet, Wahgi Valley region, North-East New Guinea (A.M.N.H. No. 58170).

The chief distinguishing character of this species, the extremely short first finger, is quite evident in this specimen. It is small (snout-vent length 14.4 mm.), and has relatively long legs (tibia length/snout-vent length = 0.465), agreeing with the description of *ateles* in these respects. The tympanum is a little less than half of the orbit diameter, but is rather indistinct, while *ateles* is said to have a distinct tympanum. The finger discs of the Mt. Hagen frog are larger than those of the toes, but I would not classify them as large and truncate, as those of *ateles* are said to be (Parker, 1934, p. 172).

Despite these differences, however, I think it best to assign this specimen to *ateles*. The species has been known from only two specimens from the type locality, so virtually nothing is known of intraspecific variation. If the present specimen is properly identified, the known range of the species is extended 350 miles to the northwest of the type locality, Moroka.

Cophixalus cheesmanae Parker

Peria Creek crossing, Kwagira River, 50 meters, Territory of Papua (A.M.N.H. No. 57386); Lae, North-East New Guinea (A.M.N.H. No. 52589); 4 kilometers southwest of Bernhard Camp, Idenburg River, 850 meters, Netherlands New Guinea (A.M.N.H. Nos. 49539, 49574); 15 kilometers southwest of Bernhard Camp, Idenburg River, 1800 meters, Netherlands New Guinea (A.M.N.H. No. 49637).

The specimens from Peria Creek and Lae agree in most respects with Parker's description of this species (1934, pp. 175-176), known previously only from two specimens collected by Miss L. E. Cheesman at Kokoda. There are unicolor patches on the anterior and posterior surfaces of the thighs, and in one specimen (A.M.N.H. No. 57386) a faint suggestion of the red or pinkish color described by Parker is retained. A distinct, straight fold passes from the posterior corner of the eye above the tympanum and terminates about the middle of the flank. This fold forms the upper boundary of a dark area that includes most of the tympanum and the region between the tympanum and the foreleg insertion.

The snout is described by Parker as "acutely pointed, prominent, once and a third as long as the eye" (1934, p. 175). In our specimens the snout is pointed or blunt (the latter condition possibly an artifact) and from 1.0 to 1.4 (mean 1.19) times the length of the orbit. In view of the variation in relative snout length seen in other microhylids (see Parker, 1940, pp. 259-260; Loveridge, 1948, p. 424; this report, p. 17, I do not feel that the fact that these specimens possess relatively short snouts need exclude them from reference to the species *cheesmanae*.

With regard to most bodily proportions and pigmentation of the hind limbs, the Idenburg River frogs are in agreement with those from the southeastern region of New Guinea and with Parker's original description. They do not, however, show the extensive area of dark pigmentation behind the eye that characterizes the frogs from the southeast. There is merely a short dark line running from the posterior corner of the eye above the tympanum and terminating at or shortly behind the posterior border of the tympanum. The Idenburg River localities are about 600 miles in an air line from the nearest locality for typical *cheesmanae* (Lae). When more material becomes available, it may prove desirable to recognize the northwestern population as a subspecies, but too little is yet known of the distribution and variation of this species to warrant such action at the present time.

Field notes of the collector of the Lae specimen, Melvin C. Kurtz, state that the frog was found in the early morning of August 10, 1944, sitting

on a branch of a tree overhanging a stream. The Peria Creek locality is described as in tall lowland rain forest.

Cophixalus cryptotympanum, new species

Figure 9

HOLOTYPE: A.M.N.H. No. A56842, adult female, collected by G. M. Tate at an elevation of 1370 meters on the north slope of Mt. Dayman, Maneau Range, Territory of Papua, on July 9, 1953.

PARATYPES: Thirty-seven specimens: A.M.N.H. Nos. 56739-56748, 56750-56751, 56753-56755, 56823, 56825-56829, 56831-56836, 56839-56841, 56843-56849, collected at the type locality by G. M. Tate between July 1 and July 9, 1953.

DIAGNOSIS: Differs from all species of the genus except *C. geislerorum*, *C. ornatus*, and *C. biroi* in having the tympanum hidden or very indistinct. *Cophixalus geislerorum* has webbed toes and *biroi* a dark streak along the side of the head and body, features lacking in the new form. In addition both *biroi* and *geislerorum* have relatively shorter legs than *cryptotympanum*. *Cophixalus ornatus* lacks the supratympanic fold and white mark from the eye to the tympanic region seen in *cryptotympanum*.

DESCRIPTION OF TYPE SPECIMEN: No maxillary or vomerine teeth; maxillae not overlapping in front of the premaxillae (eleutherognathine); no clavicle or procoracoid; no omosternum, sternum cartilaginous; terminal phalanges T-shaped.

Tympanum hidden. Tongue smooth, half free behind. A serrate posterior palatal ridge preceded by a median tubercle. Fingers and toes with enlarged truncate discs, those of the fingers larger than those of the toes. Disc of third finger about twice the width of the penultimate phalanx, fourth toe disc twice the width of the penultimate phalanx. Fingers in decreasing order of length 3-4-2-1, first finger about half the length of the second and with a small disc; toes 4-3-5-2-1. Fingers and toes free. Subarticular tubercles only very faintly indicated, metatarsal tubercles not distinguishable. Snout about as long as orbit, slightly prominent, obtusely pointed. Loreal region vertical, canthus rostralis rounded. Interorbital space about one and one-half times the width of the upper eyelid. A curved supratympanic fold. Legs relatively long, tibia length 12.2 mm., snout-vent length 26.8 mm., head width 10.0 mm. Skin with numerous small, elongate folds, especially well developed on the lateral body surface.

In preservative, the type is dark purplish brown dorsally. There is a curved light mark that passes from the posterior corner of the eye through the tympanum. Traces of an interocular light bar and darker markings on the dorsal body surface are evident. The under surfaces of the body and limbs are pale, with a diffuse mottling of darker pigment.

VARIATION: The male is without a vocal sac or vocal sac openings. In some specimens, the outline of the tympanum can barely be distinguished.

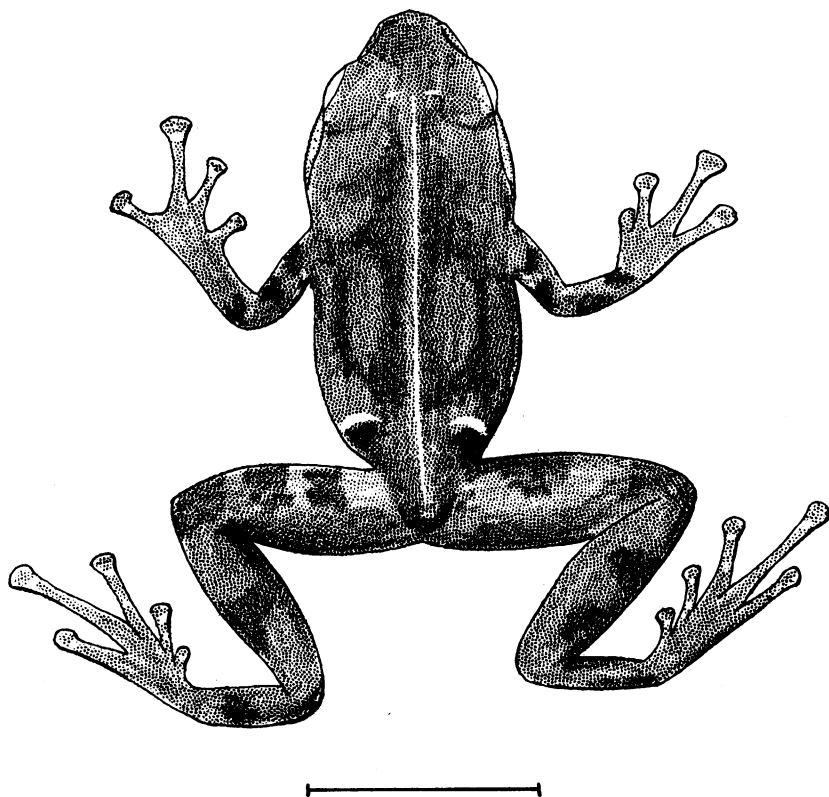


FIG. 9. Dorsal aspect of *Cophixalus cryptotympanum*, new species. Paratype, Mt. Dayman, 1370 meters. The line represents a distance of 1 cm.

Here its horizontal diameter appears to be about one-third of the orbit diameter. The disc of the fourth toe varies from scarcely enlarged to twice the width of the penultimate phalanx. The snout averages about as

long as the orbit, snout length/orbit length mean = 1.05 ± 0.02 (0.94–1.15), $n = 12$. The snout may appear rounded or obtusely pointed. Variation in relative leg length among several species of *Cophixalus* is presented in table 4. The largest individual in the series is a female 28.4 mm. in snout–vent length, containing ova 3 mm. in diameter.

Some individuals possess a fine white line from snout to vent. A dark spot margined anteriorly with white is seen in the groin of many specimens. The curved light mark that passes from the eye through the tympanum is seen in all specimens.

DISCUSSION: The species with which *cryptotympanum* is most likely to be confused are *C. geislerorum*, *C. ornatus*, and *C. biroi*, as each of these may have the tympanum hidden or indistinct. Both *geislerorum* and *biroi* have relatively short legs (heel to shoulder or tympanum in these, to or past the eye in *cryptotympanum*). In addition, *geislerorum* has webbed toes and *biroi* a dark streak along the side of the head and body.

To judge from the published descriptions the species that bears the closest similarity to *cryptotympanum* is *ornatus*. The tympanum is said to be about half of the eye diameter in *ornatus*, while it is more nearly one-third in the new form. Also, *ornatus* possibly has shorter legs. The heel is said to reach the tympanum or hind border of the eye, while in all *cryptotympanum* it reaches to or past the eye. However, a tibia length/snout–vent length value of 0.47, close to the mean for *cryptotympanum*, may be calculated from the drawing of *C. ornatus* (Fry, 1912, p. 92, fig. 38). It is unfortunate that specimens of *ornatus* have not been available so that a more objective analysis could be made. The supratympanic fold of *cryptotympanum* is not mentioned in descriptions of *ornatus*, nor is the white mark from the eye to the tympanic region. *Cophixalus ornatus* was described from Queensland and has been reported from Moroka, New Guinea, by Parker (1934, p. 173.) It is possible that the form herein described as *cryptotympanum* may be shown to represent a geographic variant of *ornatus*, but there is at present no evidence favoring subspecific allocation.

DISTRIBUTION: In addition to specimens taken at the type locality, single specimens were found at 1000, 1550, and 2230 meters on the north slope of Mt. Dayman. No other localities are known for this form, though it is conceivable that the *ornatus* reported from Moroka may be this species.

Most specimens were recorded as having been found at the bank of a small stream in heavy forest. One was under moss on a tree in moist forest, a type of shelter also used by *Sphenophryne schlaginhaufeni* and *Oreophryne biroi* on Mt. Dayman.

Cophixalus daymani, new species

HOLOTYPE: A.M.N.H. No. A56879, adult female, collected by G. M. Tate at an elevation of 2230 meters (7320 feet) on the north slope of Mt. Dayman, Maneau Range, Territory of Papua, on June 17, 1953.

PARATYPES: Seventy-eight specimens: A.M.N.H. Nos. 56781, 56784-56788, 56792-56796, 56802, 56804, 56806-56810, 56812-56814, 56817, 56819, 56820, 56849-56853, 56855-56859, 56861, 56862, 56866-56874, 56877, 56878, 56880-56883, 56917-56924, 56926, 56928-56934, 57427-57435, 57438, 57439, collected at the type locality by G. M. Tate, between June 4 and June 18, 1953.

TABLE 4

RELATIVE LEG LENGTHS, EXPRESSED AS THE RATIO OF TIBIA LENGTH TO SNOUT TO VENT LENGTH, IN SEVERAL SPECIES OF THE GENUS *Cophixalus*

Species	N	Tibia Length/Snout-Vent Length $\bar{X} \pm \sigma_{\bar{x}}$	Range
<i>ateles</i>	1	0.47	—
<i>cheesmanae</i>	5	0.489	(0.46-0.52)
<i>cryptotympanum</i>	18	0.455 \pm 0.005	(0.43-0.49)
<i>darlingtoni</i>	9	0.306 \pm 0.004	(0.28-0.32)
<i>daymani</i>	26	0.350 \pm 0.005	(0.31-0.38)
<i>oxyrhinus</i>	16	0.412 \pm 0.005	(0.38-0.44)
<i>pansus</i>	37	0.272 \pm 0.003	(0.25-0.31)
<i>parkeri</i>	1	0.38	—
<i>variegatus</i>	2	0.35	(0.34-0.36)
<i>verrucosus</i>	20	0.518 \pm 0.006	(0.47-0.58)

DIAGNOSIS: The following combination of characters will distinguish *C. daymani* from all *Cophixalus* except *C. ornatus* and *C. montanus*: third toe longer than fifth, toes free, finger discs larger than toe discs; inner finger well developed; snout shorter than eye. *Cophixalus montanus* of Halmahera has longer hind legs (heel to between eye and tip of snout; to tympanum in *daymani*). The loreal region of *ornatus* is vertical, that of *daymani* oblique.

DESCRIPTION OF TYPE SPECIMEN: No maxillary or vomerine teeth; maxillae not overlapping in front of the premaxillae (eleutherognathine); no clavicle or procoracoid; no omosternum, sternum cartilaginous; terminal phalanges T-shaped.

Tympanum indistinct but not hidden, the horizontal diameter slightly less than one-half of the length of the orbit. Tongue smooth, half free behind. The anterior palatal ridge is represented by one tubercle. A

serrate posterior palatal ridge is present. Fingers and toes with enlarged discs, those of the fingers larger than those of the toes. Disc of third finger about twice the width of the penultimate phalanx; disc of fourth toe only slightly wider than penultimate phalanx. Fingers in order of decreasing length 3-4-2-1, first finger about half of the length of the second and with a small disc; toes 4-3-5-2-1. Fingers and toes free. Subarticular and metatarsal tubercles very faintly indicated. Snout slightly shorter than orbit. Snout bluntly rounded, loreal region oblique, canthus rostralis rounded. Interorbital space one and one-half times the width of an upper eyelid. Tibia length 6.6 mm., snout-vent length 21.7 mm., head width 7.8 mm. Dorsal surface of body with numerous small pustules, venter more smooth.

The dorsal surfaces of the limbs and body are dark purplish brown in preservative, the under surfaces white or tan, with a scattering of brown pigment cells. The familiar groin mark of so many microhylids, a dark spot bordered anteriorly with white, is discernible.

VARIATION: The male is without a vocal sac or vocal sac openings. The anterior palatal ridge is poorly developed in all, being represented by three tubercles at the most. The subarticular and inner metatarsal tubercles are inconspicuous and often wanting. The snout is shorter than the orbit, snout length/orbit length mean = 0.86 ± 0.02 (0.77-0.96), $n = 26$. A slight supratympanic fold that usually does not extend past the posterior edge of the tympanum is present in most specimens, but is lacking in some, including the type. Data on variation in tibia length/snout-vent length ratio are presented in table 4. The largest specimen is the type, 21.7 mm. in snout-vent length.

No marked variation in pigmentation can be noticed in these somewhat darkened specimens.

DISCUSSION: In Parker's synopsis of the species of *Cophixalus* (1934, p. 171), this form would be identified as *C. ornatus*. The type localities of *ornatus* are Russell River and Cairns, northeast Queensland. It is reported from other localities in Queensland and from Moroka, New Guinea. In the description of *C. cryptotympanum* it is suggested that the Moroka specimen may represent that species. *Cophixalus daymani* is a very short-legged species and may differ from *ornatus* in this respect. If the proportions in Fry's illustration of *ornatus* are correctly drawn (1912, p. 92, fig. 38), this specimen has a tibia length/snout-vent length ratio of about 0.47, well out of the range (0.31-0.38) seen in the type series of *daymani*. Also, *ornatus* is said to have the loreal region nearly vertical (as in *cryptotympanum*), while in *daymani* this region is clearly oblique. The decision to regard the Mt. Dayman population as distinct

from *ornatus* has been influenced, too, by zoogeographic considerations. Other microhylids that are common to New Guinea and Queensland are forms of relatively low elevations, while *daymani* is known only from 2230 meters. It appears to be replaced at lower elevations on Mt. Dayman by *C. cryptotympanum* (2230–1000 meters) and *C. verrucosus* (700 meters).

The possibility that *daymani* represents merely a high-altitude form of *cryptotympanum* is doubtful, because a typical *cryptotympanum* was captured at the locality where all *daymani* were taken.

DISTRIBUTION: *Cophixalus daymani* is known only from the type locality. Specimens were captured between June 4 and June 17, 1953, and were recorded as being found in "isolated patch of forest in high grassland" and in "forested gully in high grassland."

Cophixalus oxyrhinus Boulenger

Four kilometers southwest of Bernhard Camp, Idenburg River, 850 meters, Netherlands New Guinea (A.M.N.H. Nos. 49536, 49554); east slope, Good-enough Island, D'Entrecasteaux Islands, 1600 meters, Territory of Papua (A.M.N.H. Nos. 56908, 56939, 56940, 56958, 56960, 56971, 56972, 56986, 56997, 56998, 57046–57048, 57050–57054).

This is one of the more easily recognized species of *Cophixalus*, unique within its genus in that the toe discs, though small by comparison with those of other species, are larger than the scarcely enlarged finger discs. A characteristic mark of *oxyrhinus* is a dark line that commences low on the snout and passes through the nostril and eye and over the tympanum. In some individuals the line continues onto the flank, and in others it becomes indistinct above the foreleg insertion. Animals in a dark phase of coloration have the region below the line almost as dark as the line itself, resulting in a dark face-mask effect. Often the tip of the snout is white.

This species has a wide distribution in New Guinea—at least from Hollandia and the Idenburg River in the northwest to the Owen Stanley Mountains and the D'Entrecasteaux Islands in the southeast. The Good-enough Island specimens were found on the ground in oak forest and near a small creek in oak forest.

Cophixalus pansus Fry

Mount Albert Edward, southwest slope, 3680 meters, Territory of Papua (A.M.N.H. Nos. 58105, 58120–58137); Mt. Albert Edward, southwest slope, 3811 meters, Territory of Papua (A.M.N.H. No. 58103); Murray Pass, Wharton Range, 3840 meters, Territory of Papua (A.M.N.H. Nos. 53397–53401, 58106–58119, 58138–58141).

This species was described by Fry (1917) from Mt. Scratchley, 12,200 feet (3658 meters), a locality about 35 kilometers south-southeast of Mt. Albert Edward and 20 kilometers southeast of Murray Pass, and was made the type species of a new genus, *Aphantophryne*. The most distinctive feature of this new genus was supposed to be the absence of the sternal plate. Parker, in his monograph of the family Microhylidae (1934), continued to recognize this genus but was forced to rely on the original description for the characters of the genus and species, not having any specimens available. *Aphantophryne pansa* was referred to the genus *Asterophrys* by Loveridge (1948), who described *A. pansa wilhelmana* and suggested that *Asterophrys minima* Parker should be regarded as a race of *A. pansa*.

The present series of specimens seemed to fit no described genus or species of microhylid. The skeletal characters (eleutherognathine, no clavicle or procoracoid, sternum present) seemed to indicate that they belonged with *Cophixalus*, but the external form was rather different from that of any described *Cophixalus*. In size, proportions, and color pattern, these frogs bore considerable resemblance to Fry's description and illustration of *pansa*. With this resemblance in mind, I sent three specimens from Mt. Albert Edward to Dr. H. W. Parker of the British Museum (Natural History) who kindly agreed to compare them with a cotype of *Aphantophryne pansa* (acquired since 1934) and to make certain anatomical investigations on that cotype.

Dr. Parker reports (*in litt.*) that the three frogs from Mt. Albert Edward are very similar in size, habitus, and proportions to the cotype of *pansa*. Furthermore, he notes that this cotype is eleutherognathine (hence cannot be referred to the symphagnathine genus *Asterophrys*), and, though the specimen is hard and shriveled, there appears to be a sternum present. Fry believed that the pectoral musculature of *pansa* was extensively modified, in keeping with the supposed absence of the sternum, but our specimens from Mt. Albert Edward and Murray Pass have pectoral musculature very similar to that illustrated for *pansa* (Fry, 1917, pl. 55).

If the genus *Aphantophryne* were to be retained, it would be defined as identical to *Cophixalus* in pertinent skeletal characters, but differing from members of that genus in having pointed rather than expanded tips of the digits, and in a more squat, toad-like habitus. I do not wish to reestablish a monotypic genus on such slender grounds, so I refer the species to *Cophixalus*. The differences between *Cophixalus pansus* and other members of the genus are not greater than are seen among members of other genera of Papuan microhylids. For example, *Sphenophryne*

brevicrus is a squat, pointed-toed species differing greatly from *S. schlaginhaufeni*, a species with expanded toe tips and relatively long legs and presumably of much different habits. Only a detailed study of the osteology of all Papuan microhylids will reveal if the generic characters currently in use provide a phylogenetically meaningful classification, or if the picture has been obscured and confused by convergence.

Asterophrys pansa wilhelmana Loveridge is symphagnathine and clearly a member of the genus *Asterophrys*. It must necessarily be referred to as a distinct species, *A. wilhelmana*. Although in the original description of *Asterophrys minima* (Parker, 1934, p. 67) no mention is made of the condition of the maxillary bones with respect to an overlapping of the premaxillaries, it is implicit in assignment to *Asterophrys* that the species is symphagnathine. It is a small species, most likely distinct from *A. wilhelmana*. Dr. D. L. Brongersma compared the British Museum cotype of *pansus* with the type of *minima* and concluded that they represented distinct species (Loveridge, 1948, p. 418).

The Mt. Albert Edward and Murray Pass specimens were collected between June 21 and August 14, 1933, by A. L. Rand and Richard Archbold. Most specimens were found under logs (often tree ferns) or rocks, frequently where there was standing water beneath the shelter. The eggs of this species, accompanied by adults, were found in situations similar to those frequented by non-breeding individuals. Eggs were found "in small cavity in ground under tree fern log grassland on top of hill in one of the driest situations here" (field notes of A. L. Rand, August 14). Another mass of 17 eggs in a bead-like string was found with two frogs, both males. A frog and a similar string of 10 to 15 eggs were found in a hollow measuring 30 mm. by 20 mm., 30 mm. beneath the surface under a stick. The frog was squatting in the back part of the cavity, with the front of the body over the eggs.

Both from the field notes of the collectors and from the specimens it is evident that this species exhibits considerable variation in coloration. Some specimens are (in preservative) dark purplish brown both above and beneath, while others are light tan or yellowish dorsally and ventrally. Intermediates between these extremes are not uniformly darker or lighter but are variously blotched or spotted with dark or light. A marking seen on all but the very lightest individuals is a light dash of varying length that begins just behind the posterior corner of the eye and passes through the tympanum at the lower margin of the supratympanic fold, in some specimens reaching to the insertion of the forelimb. Many specimens have a thin middorsal light line that intersects a similar line on the dorsal surface of the femur. One frog was reported in field notes as being "dull

bluish in color except [for] two inner toes on front foot and three inner toes on hind foot which are orange." Another was recorded as nearly all yellow.

Cophixalus parkeri Loveridge

A.M.N.H. No. 56273; Mt. Hagen, Wahgi Valley, 8000 feet, North-East New Guinea.

This form was described by Loveridge (1948, pp. 425–426) as a subspecies of *C. variegatus*. The type locality, Mt. Wilhelm, 8000 feet, is about 70 miles east of Mt. Hagen. The most conspicuous difference between *parkeri* and *variegatus* is in size. The type of *parkeri* measures 28 mm. in snout–vent length and the Mt. Hagen specimen 27 mm., while typical *variegatus* is adult at 18 mm. The fifth toe of *variegatus* is said to be "very distinctly longer than the third" (Parker, 1934, p. 176), and is so in specimens I refer to that species, while in the two specimens of *parkeri* these toes are approximately equal or the third is longer.

Mr. Loveridge kindly compared the Mt. Hagen specimen with the type of *parkeri* and reported (*in litt.*) that he considered them to be specifically identical. He noted only slight differences in tuberculosity and leg length. I feel that the two forms are best referred to different species.

This second specimen of *C. parkeri* was collected by Mr. E. Thomas Gilliard.

Cophixalus variegatus van Kampen

Six kilometers southwest of Bernhard Camp, Idenburg River, 1200 meters, Netherlands New Guinea (A.M.N.H. No. 49535); north slope, Mt. Dayman, 1550 meters, Maneau Range, Territory of Papua (A.M.N.H. No. 56737); New Guinea (A.M.N.H. No. 23583).

A character of importance in the definition of this species is the relatively long fifth toe, longer than the third, other species in the genus (excepting the extremely long-snouted *C. rostellifer* and the larger, shorter-legged *C. darlingtoni*¹) having the third toe longer or the two toes equal. These specimens show a long fifth toe and in most other particulars also agree with Parker's description of *variegatus* (1934, p. 176). In A.M.N.H. Nos. 49535 and 23583 the tympanum is distinct, but is half rather than two-thirds of the eye diameter. The Museum of Comparative

¹ This form was described as *C. biroi darlingtoni* by Loveridge (1948, pp. 423–424). It has the third toe shorter, rather than longer, than the fifth and other less distinctive differences from *C. biroi*. There is no evidence that the two forms intergrade, and the differences between them seem as great as between other recognized species.

Zoölogy has a specimen, received, as was A.M.N.H. No. 23583, from the Berlin Museum, that has the tympanum less than half of the eye diameter (Loveridge, 1948, p. 425).

A.M.N.H. No. 49535 is dark and its pattern cannot be made out, but A.M.N.H. No. 23583 shows several features of pigmentation mentioned for *variegatus*: a light line connecting the upper eyelids, a yellowish lateral streak from the upper eyelid to the groin (but merging to some extent with the ventral color), and a single broad cross bar on the femur, tibia, and tarsus.

The specimen from Mt. Dayman is small (body length 12.2 mm.) and somewhat distorted, so its identification must be regarded as provisional. The third toe is longer than the fifth, as in *variegatus*, but the tympanum is indistinct. In any event, it is clearly different from the other three species of *Cophixalus* taken on Mt. Dayman and, with the single exception of the condition of the tympanum, resembles the other specimens referred to *variegatus* very closely.

Burt and Burt (1932, p. 484) reported A.M.N.H. No. 23583 as *Hylophorbus montanus* (= *Cophixalus montanus*), the identity which it bore when received from Berlin as an exchange specimen. *Cophixalus montanus*, a form with the third toe longer than the fifth, was described from Halmahera. Parker (1934, p. 174) questions its occurrence in New Guinea.

The larger of two specimens examined by Parker was adult at a snout-vent length of 18 mm. The American Museum specimens are of approximately the same length, as is the specimen in the Museum of Comparative Zoölogy. It seems probable that *C. variegatus parkeri* Loveridge, the type of which measures 28 mm., represents a distinct species.

Cophixalus verrucosus Boulenger

Mafulu, 1250 meters, Territory of Papua (A.M.N.H. Nos. 58009, 58010); east slope, Goodenough Island, D'Entrecasteaux Islands, 1600 meters, Territory of Papua (A.M.N.H. Nos. 56976, 57049); north slope, Mt. Dayman, Maneau Range, 700 meters, Territory of Papua (A.M.N.H. Nos. 56601, 57061, 57064, 57069, 57077, 57078, 57102, 57103, 57106-57110, 57135, 57141, 57142, 57158, 57161, 57165, 57202-57205, 57207, 57209-57211, 57216-57219, 57221-57226, 57237-57240, 57356-57358, 57360).

Virtually all 44 frogs from Mt. Dayman show the white spots against a dark background on the anterior and posterior surfaces of the thigh that are characteristic of this species. *Cophixalus verrucosus* is similar to *C. cheesmanae*, but may be distinguished from that species both in the different pigmentation of the thigh and in that *verrucosus* lacks the fold of skin passing from the posterior corner of the eye to the flank.

The Mt. Dayman 700-Meter Camp is described as in oak forest-rain forest transition zone. Field notes accompanying the specimens indicate that the vast majority were taken on the banks of a rocky stream. Two were recorded as having been found on trees.

COMMENTS ON GENERIC AND SPECIFIC RELATIONSHIPS OF PAPUAN MICROHYLIDS

In the present paper I have followed the generic categories used by Parker (1934, 1936) but recognize that a critical review of the situation might reveal a different picture, perhaps as generically complicated as that recently and reasonably advanced for the microhylids of South America (Carvalho, 1954). The picture in the Papuan forms undoubtedly has been complicated both by the extensive radiation the various phyletic lines have undergone and by the convergence of these lines. Thus, for example, the genera *Cophixalus* and *Sphenophryne* each show a spectrum of forms ranging from squat, short-legged, burrowing or at least terrestrial forms to long-legged, tree frog types with expanded toe tips. These genera are differentiated on the basis of consistent and presumably conservative skeletal characters, but if external morphology, and ecology, were emphasized, a considerable shuffling of species in the genera would necessarily result.

Possibly some of the species described in this paper, as well as those previously described, will be shown to be geographic variants of forms already known. However, in our present state of knowledge concerning distribution and variation, it cannot be determined where the relationships lie. Given the multiplicity of forms seen in New Guinea, I consider it more of an error to associate one population with another on the subspecies level when the variation and distribution are little known than to refer to them as distinct species. The genus *Oreophryne* illustrates this point: there frequently occur in the same general region pairs of large and small species—*insulana* and *inornata* on Goodenough Island, *flava* and *idenburgensis* in the region of the Idenburg River, *anthonyi* and *biroi* on Mt. Dayman. *Oreophryne biroi*, a small form found on the mainland, bears considerable resemblance to *inornata*, a larger form of Goodenough Island where the small species niche is presumably filled by *insulana*. *Oreophryne biroi* might bear a subspecific relationship to one of the island forms, but which one cannot be said with confidence. Similarly, *O. anthonyi* is much like *O. idenburgensis*, but one has a ligamentous connection between the scapula and procoracoid, and the other a cartilaginous connection. There is no evidence of intergradation, so the two must be considered distinct species.

The generic and specific relationships of the numerous known microhylids, and many microhylids undoubtedly still to be discovered, will not be adequately known until the data gained from laboratory examination of the morphology can be correlated with field studies of habitat and distribution.

CHECK LIST OF THE MICROHYLID FROGS OF NEW GUINEA

Changes from the list presented by Loveridge (1948, pp. 324-325) include the several forms added to the known fauna in the present paper and those described by Loveridge (1955), as well as the elevation of some subspecies to species rank. An asterisk before the name indicates a form dealt with in the text. The list includes both animals of the mainland of New Guinea and those of the D'Entrecasteaux Islands, which are politically part of New Guinea.

- **Genyophryne thompsoni* Boulenger
- Xenobatrachus bidens* van Kampen
- Xenobatrachus giganteus* van Kampen
- **Xenobatrachus macrops* van Kampen
- Xenobatrachus ocellatus* van Kampen
- Xenobatrachus ophiodon* Peters and Doria
- **Xenobatrachus rostratus* Ménély
- Asterophrys bouwensi* de Witte
- **Asterophrys doriae* Boulenger
- Asterophrys microtis* Werner
- Asterophrys minima* Parker
- Asterophrys oxycephala* Schlegel
- **Asterophrys robusta* Boulenger
- **Asterophrys rufescens* Macleay
- **Asterophrys similis*, new species
- Asterophrys slateri* Loveridge
- Asterophrys turpicola* Müller
- **Asterophrys valvifera* Barbour
- **Asterophrys wilhelmana* Loveridge
- **Metopostira ocellata* Ménély
- Baragenys atra* Günther
- **Baragenys cheesmanae* Parker
- **Sphenophryne brevicrus* van Kampen
- Sphenophryne brevipes* Boulenger
- **Sphenophryne cornuta* Peters and Doria
- **Sphenophryne crassa*, new species
- **Sphenophryne gracilipes* Fry
- **Sphenophryne macrorhyncha* van Kampen
- Sphenophryne mehelyi* Parker
- **Sphenophryne palmipes*, new species
- Sphenophryne rhododactyla* Boulenger

- **Sphenophryne schlaginhaufeni* Wandolleck
- Oreophryne albopunctata* van Kampen
- **Oreophryne anthonyi* Boulenger
- **Oreophryne biroi* Méhely
- **Oreophryne brevicrus*, new species
- Oreophryne crucifera* van Kampen
- **Oreophryne flava* Parker
- **Oreophryne idenburgensis*, new species
- **Oreophryne inornata*, new species
- **Oreophryne insulana*, new species
- Oreophryne kampeni* Parker
- Oreophryne parkeri* Loveridge
- **Cophixalus ateles* Boulenger
- Cophixalus biroi* Méhely
- **Cophixalus cheesmanae* Parker
- **Cophixalus cryptotympanum*, new species
- Cophixalus darlingtoni* Loveridge
- **Cophixalus daymani*, new species
- Cophixalus geislerorum* Boettger
- **Cophixalus oxyrhinus* Boulenger
- **Cophixalus pansus* Fry
- **Cophixalus parkeri* Loveridge
- Cophixalus rostellifer* Wandolleck
- **Cophixalus variegatus* van Kampen
- **Cophixalus verrucosus* Boulenger

BIBLIOGRAPHY

ARCHBOLD, RICHARD, AND A. L. RAND

1935. Results of the Archbold Expeditions. No. 7. Summary of the 1933-1934 Papuan Expedition. Bull. Amer. Mus. Nat. Hist., vol. 68, pp. 527-579.

ARCHBOLD, RICHARD, A. L. RAND, AND L. J. BRASS

1942. Results of the Archbold Expeditions. No. 41. Summary of the 1938-1939 New Guinea Expedition. Bull. Amer. Mus. Nat. Hist., vol. 79, pp. 197-288.

BARBOUR, THOMAS

1910. A new genus of Amphibia Salientia from Dutch New Guinea. Proc. Biol. Soc. Washington, vol. 23, pp. 89-90.

BOULENGER, G. A.

1897. Descriptions of new lizards and frogs from Mount Victoria, Owen Stanley Range, New Guinea, collected by Mr. A. S. Anthony. Ann. Mag. Nat. Hist., ser. 6, vol. 19, pp. 6-13.
1898. Fourth report on additions to the batrachian collection in the Natural History Museum. Proc. Zool. Soc. London, pp. 473-482.

BURT, CHARLES E., AND MAY DANHEIM BURT

1932. Herpetological results of the Whitney South Sea Expedition. VI. Bull. Amer. Mus. Nat. Hist., vol. 63, pp. 461-597.

CARVALHO, ANTENOR LEITÃO DE

1954. A preliminary synopsis of the genera of American microhylid frogs. Occas. Papers Mus. Zool., Univ. Michigan, no. 555, pp. 1-19.

FRY, DENE B.

1912. Description of *Austrochaperina*, a new genus of Engystomatidae from north Australia. Rec. Australian Mus., vol. 9, pp. 87-106.
1917. Description of *Aphantophryne*, a new batrachian genus from New Guinea; with comparative notes on the pectoral musculature. Proc. Linnean Soc. New South Wales, vol. 41, pp. 770-785.

KAMPEN, P. N. VAN

1913. Amphibien, gesammelt von der Niederländischen Süd-Neu-Guinea-Expedition von 1909-1910. Nova Guinea, vol. 9, pp. 453-465.
1923. The amphibians of the Indo-Australian Archipelago. Leiden, E. J. Brill, Ltd., xii + 304 pp.

LOVERIDGE, ARTHUR

1935. Australian Amphibia in the Museum of Comparative Zoölogy, Cambridge, Massachusetts. Bull. Mus. Comp. Zoöl., vol. 78, pp. 1-60.
1948. New Guinean reptiles and amphibians in the Museum of Comparative Zoölogy and United States National Museum. *Ibid.*, vol. 101, pp. 305-430.
1955. New frogs of the genera *Asterophrys* and *Oreophryne* from New Guinea. Breviora, no. 50, pp. 1-5.

MÉHELÿ, L. VON

1901. Beiträge zur Kenntniss der Engystomatiden von Neu-Guinea. Termész. Füz., vol. 24, pp. 169-271.

NEILL, WILFRED T.

1946. An unusual habitat for frogs and lizards. Copeia, no. 4, p. 258.

NOBLE, G. KINGSLEY

1931. The biology of the Amphibia. New York and London, McGraw-Hill Book Co., Inc., 13 + 577 pp.

PARKER, H. W.

1934. A monograph of the frogs of the family Microhylidae. London, British Museum (Natural History), viii + 208 pp.
1936. A collection of reptiles and amphibians from the mountains of British New Guinea. Ann. Mag. Nat. Hist., ser. 10, vol. 17, pp. 66-93.
1940. Undescribed anatomical structures and new species of reptiles and amphibians. *Ibid.*, ser. 11, vol. 5, pp. 257-274.

RAND, A. L., AND L. J. BRASS

1940. Results of the Archbold Expeditions. No. 29. Summary of the 1936-1937 New Guinea Expedition. Bull. Amer. Mus. Nat. Hist., vol. 77, pp. 341-380.

