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A New Species of Microhylid Frog, Genus *Oreophryne*, from Papua New Guinea

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ABSTRACT

I describe a new species of *Oreophryne* from Southern Highlands Province and Western Province, Papua New Guinea, bringing the total number recognized in the genus to 29, of which 18 occur on New Guinea and islands immediately adjacent. Many New Guinean species await description. The new species is a small, scansorial, rainforest-dwelling frog distinguished from others of the genus in aspects of morphology, color pattern, and advertisement call.

INTRODUCTION

Oreophryne is possibly the most species-rich genus of microhylid frogs in New Guinea. With 22 species recognized on mainland New Guinea and adjacent islands (the one described herein included), it is approached at present only by *Austrochaperina* and *Xenobatrachus*, and is approached by *Cophixalus* (19 species), and by *Cophixalus* (20 species). However, the first two of these have been revised (Zweifel, 2000; Blum and Menzies, 1988), and *Cophixalus* has received considerable attention (but no comprehensive revision), whereas the existence of numerous undescribed *Oreophryne* is known (Hyndman and Menzies, 1990; Richards et al., 2000). Given that any thorough revision of *Oreophryne* is likely to be far in the future, I offer the present species description as one small step in that direction.

METHODS

I made measurements with dial calipers read to the closest 0.1 mm or, if appropriate, used a binocular dissecting microscope with an ocular micrometer read to the nearest 0.05 mm. Sex of the specimen was apparent if it was a male calling when captured. Otherwise, I determined males by the presence of vocal sac openings or by examination of go-

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nads, and females by examination of gonads. I limited osteological study to examining the pectoral girdle to verify generic assignment and to determine the extent of the procoracoid cartilage. Color descriptions of living frogs are from field notes and photographs.

The audiospectrogram and waveform illustrated were produced on a Kay 5500 DSP Sona-Graph. I analyzed the calls—measurements of rates, note and call durations, dominant frequencies—with the aid of the CECIL computerized speech analysis system (Hunt, 1993).

The following abbreviations pertain to measurements made on each specimen:

EN	Distance between anterior edge of eye opening and center of external naris
EY	Distance between anterior and posterior edges of eye opening
FD	Width of disk of third finger measured at a right angle to the axis of the digit with the disk flattened against a glass plate
FT	Length of foot between proximal edge of inner metatarsal elevation and tip of fourth toe
HD	Length of hand between proximal edge of inner metacarpal elevation and tip of third finger
HW	Head width at widest point, generally at the level of the tympanum or jaw angle
IN	Distance between centers (not medial edges) of external nares
SVL	Length from snout to vent—from tip of snout to cloacal opening
TD	Width of disk of fourth toe measured as in FD

Specimens examined are in the American Museum of Natural History (AMNH) and South Australian Museum, Adelaide (SAMA).

Oreophryne notata, new species

Figure 1

HOLOTYPE: AMNH A-81198 (field no. RZ 7518), collected by R.G. Zweifel on August 8, 1968 at Ialibu, elevation 1920 m, Southern Highlands Province, Papua New Guinea.

PARATYPES: AMNH A-81196, 81197, and 81199 from the type locality, obtained on August 7 (81196, 81197) and August 11, 1968 (81199); SAMA R56776–56778, from Tabubil, 550 m, Western Province, Papua New Guinea (5.259°S, 141.220°E), collected by Stephen Richards, Andrew Dennis, and Michael Cunningham on November 23, 1994.

Fig. 1. *Oreophryne notata*, AMNH A-81196, paratype, SVL 19.3 mm.

ETYMOLOGY: The specific name is an adjective derived from the Latin *nota* (mark, letter), in reference to the diagnostic pattern on the lores.

DIAGNOSIS: The combination of small size (less than 25 mm SVL), unwebbed toes, well-developed digital disks, fifth toe longer than third, and a pale, inverted U-shaped mark on the loreal region immediately anterior to the eye distinguishes this species from all other *Oreophryne* species known at this time.

DESCRIPTION OF HOLOTYPE: Adult male (calling when captured) with the following measurements (in mm) and proportions: SVL 18.5, HW 7.4, TL 8.9, EY 2.6, EN 1.55, IN 1.85, HD 6.3, FT 8.6, FD 1.25 (penultimate phalanx 0.5), TD 1.1 (O.5); HW/SVL 0.400, TL/SVL 0.481, EY/SVL 0.141, EN/SVL 0.084, IN/SVL 0.100, HD/SVL 0.341, FT/SVL 0.368, FD/SVL 0.068, TD/SVL 0.059.

Snout seen from above almost truncate but slightly pointed, in profile vertical, slightly rounded; canthus rostralis distinct but rounded, slightly curved, lores sloping outward, nearly flat, barely concave; nares scarcely visible from above; tympanum small, indistinct; eyes large, the corneal outline visible from beneath, interorbital span 2.3 mm, eyelid 1.6 mm. Relative lengths of fingers 3 >

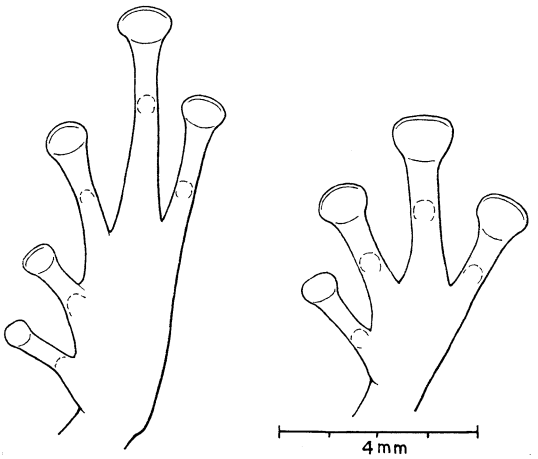

Fig. 2. Plantar and palmar views of foot and hand of *Oreophryne notata*, AMNH A-81197, paratype.

$2 > 4 > 1$, first finger one-half length of second, no webbing, all with well-developed terminal disks, that of first finger narrower than those of the other fingers, subarticular elevations indistinct, low, rounded (as in a paratype, fig. 2). Relative lengths of toes $4 > 5 > 3 > 2 > 1$, fifth only slightly longer than third, no webbing, all with well-developed terminal disks, subarticular elevations indistinct, low, rounded, inner metatarsal elevation elongate, low, rounded (fig. 2). A typical *Oreophryne* clavicle is present, and the procoracoid apparently reaches scapula as a narrow cartilaginous band.

In preservative, the dorsal surfaces are pale yellow-brown with a darker melanic stipple in no obvious pattern; lumbar ocelli are not evident. There is a dark, slightly elongate postocular/supratympanic marking but none on the canthus rostralis. The upper lip is darker than the dorsal surface, and a pale, inverted ''U'' is faintly indicated in the loreal area. Ventral surfaces are pale with uniform dark stippling from the mandibular symphysis to the tip of the abdomen. The soles and palms have melanic stippling. Anterior and posterior surfaces of the thighs have some light patches surrounded by melanic stippling.

In life the dorsal ground color was gray-brown with little trace of markings other than a slightly darker area on and between the posterior half of the eyelids and faint traces of lumbar ocelli. The facial region was slightly darker than the dorsal ground and had an inverted U-shaped white mark anterior to the eye. The hind legs had a reddish tint. The ventral surfaces were pale translucent gray with lighter flecks.

TABLE 1
Body Proportions of *Oreophryn notata*

Ratio	Mean $\pm \sigma_m$	Range	N
TL/SVL	0.493 ± 0.007	0.468–0.511	7
HW/SVL	0.391 ± 0.006	0.366–0.413	7
EY/SVL	0.145 ± 0.003	0.137–0.161	7
EN/SVL	0.089 ± 0.002	0.082–0.099	7
IN/SVL	0.098 ± 0.002	0.092–0.106	7
EN/IN	0.907 ± 0.024	0.838–1.000	7
HD/SVL	0.312 ± 0.011	0.278–0.341	5
FT/SVL	0.455 ± 0.009	0.438–0.486	5
FD/SVL	0.065 ± 0.003	0.051–0.070	7
TD/SVL	0.056 ± 0.002	0.048–0.060	7

VARIATION IN TYPE SERIES: The largest of seven specimens is a female (AMNH A-81199) of 20.8 mm SVL with ova greater than 1.0 mm in diameter; the smallest adult male (SAMA R56776) is 17.4 mm (a male of 14.2 mm may not be mature); the holotype male is adult at 18.5 mm SVL and another male measures 19.3 mm. Body proportions are summarized in table 1, regression equations in table 2. Selected proportions are graphed in figures 3 and 4.

An inverted loreal U marking is present in all seven specimens. In life the dorsal ground color of AMNH A-81196 was shades of tan, darkest on the back of the head but abruptly lighter on the snout beginning at a transverse midocular line. The loreal region and below the eye were darker than the tan lateral body

TABLE 2
Regression Statistics for *Oreophryn notata*[a]

	α	β	r	N
TL/SVL	0.659	0.900	0.962	7
HW/SVL	0.186	1.291	0.997	7
EY/SVL	0.270	0.787	0.901	7
EN/SVL	0.285	0.596	0.900	7
IN/SVL	0.224	0.714	0.906	7
FD/SVL	0.010	1.161	0.907	7
TD/SVL	0.050	1.038	0.876	7

[a] Power curves of the form $Y = \alpha \times \beta$.

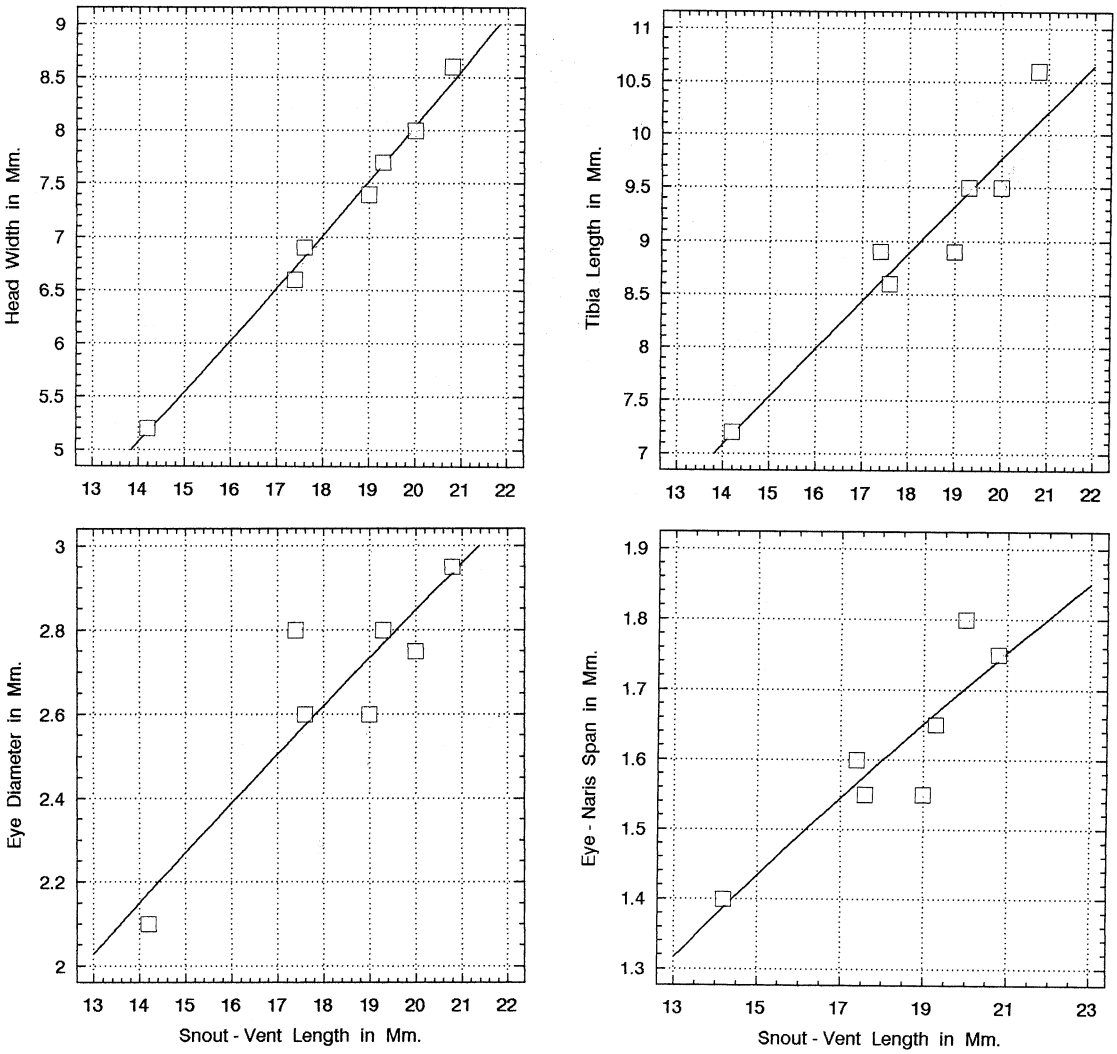

Fig. 3. Regressions of head width, tibia length, eye diameter, and eye–naris span on snout–vent length in *Oreophryne notata*. See table 2 for regression statistics.

surface, giving a slight face-mask effect. The hind legs had a reddish tint (more so than in the holotype), most pronounced on the anterior and posterior surface of the thighs. The chin was unmarked gray, the chest and abdomen pale reddish brown with overlying gray flecks and mottling. Undersides of the hind limbs were similar to the abdomen but with slightly more reddish and the gray mottling more intense. The iris was reddish gold, the pupil a horizontal ellipse.

SAMA R56778 has the following features of color pattern: A light interocular line, top of snout gray, head darker behind interocular line; a narrow, white, diagonal postocular streak; dorsum pale to the vent with dark figures, bordered laterally by an ill-defined dark streak containing a lumbar ocellus; lateral region below dark streak variously spotted dark and light; anterior, posterior, and dorsal surfaces of arms and thighs variously dark spotted and maculated on light ground; a large pale area on lower shank to heel; all undersides with melanic stippling on pale

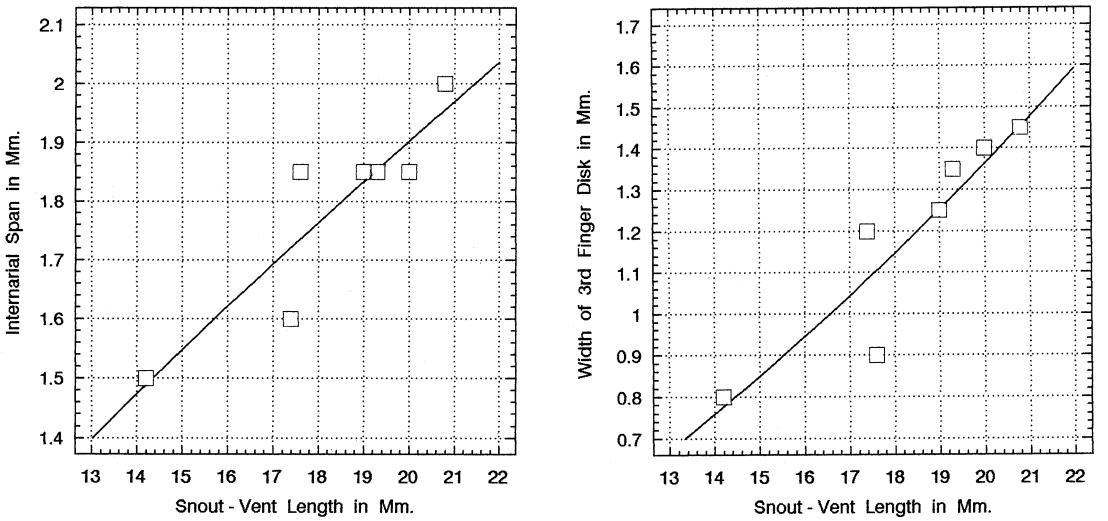

Fig. 4. Regressions of internarial span and width of 3rd finger disk on snout–vent length in *Oreophryne notata*. See table 2 for regression statistics.

ground, stipples more aggregated on abdomen than on chin and chest; a narrow pale area on underside of thigh.

The connection of the procoracoid to the scapula appears to be cartilaginous rather than ligamentous in two specimens examined, but this needs to be verified by clearing and staining when additional specimens become available.

ADVERTISEMENT CALL: The call is a series of peeping notes (fig. 5). I recorded two calls of the holotype at an air temperature of 15.4°C. One call lasting 5.3 sec had 21 notes with a duration of 0.10–0.13 sec uttered at 3.9 notes/sec; the other 4.9 sec with 20 notes of 0.10 sec duration and a rate of 4.0/sec. Most notes were unpulsed, but a few had two or three weak pulses. The dominant frequency was 3500–3600 Hz. The recording is archived on AMNH Herpetology Department cassette no. 185. Stephen Richards (personal commun.) heard these frogs at Tabubil giving

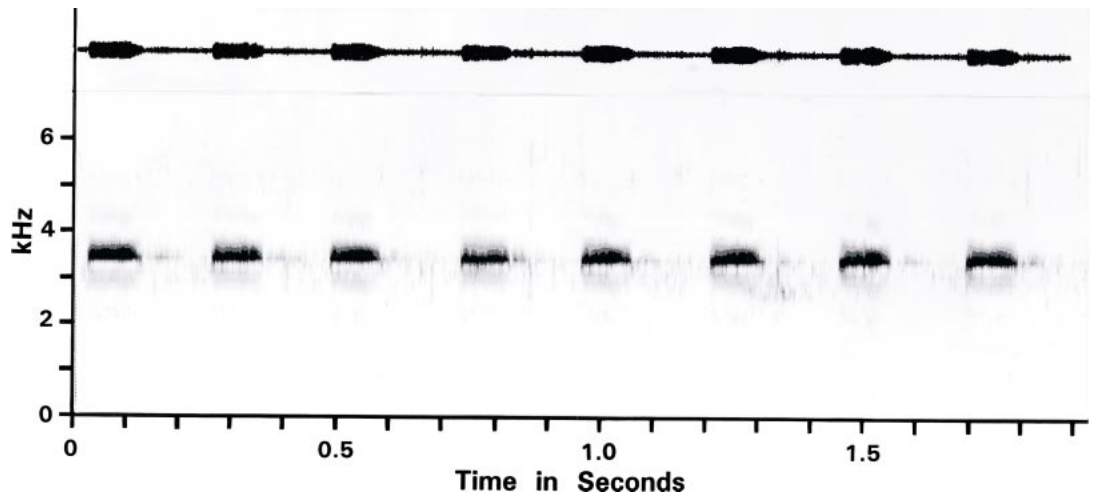

Fig. 5. Waveform and audiospectrogram of part of an advertisement call of the holotype of *Oreophryne notata*; 59-Hz filter.

a ''peeping call from high in trees''; this supports the association by morphology of the Tabubil specimens with those from Ialibu.

COMPARISONS WITH OTHER SPECIES: Two species somewhat similar in morphology to *O. notata* are *Oreophryne atrigularis* and *Oreophryne wapoga*, described by Günther and Richards (2001) from localities in western Papua.[2] These species have well-developed digital disks and unwebbed toes, as does *O. notata*, but the third toe is longer than the fifth. The black or dark brown throat, sharp canthus rostralis, and somewhat pointed snout of *O. atrigularis* and *O. wapoga* are additional differences. Both species apparently are larger than *O. notata*, with males about 20–23 mm in length and the single female specimen (*atrigularis*) 26 mm.

The advertisement calls of *Oreophryne atrigularis* and *O. wapoga* are similar, a series of brief, distinctly pulsed notes. These calls contrast with the peeps of *O. notata*, which at the most show slight pulsation that does not interrupt the continuity of a note.

A number of extralimital species of *Oreophryne* lack or have only a trace of toe webbing, but among described New Guinean species most have definite webbing. There are exceptions in addition to the two discussed above: *Oreophryne minuta* (Richards and Iskandar, 2000) is a tiny frog of less than 12 mm SVL that lacks digital disks; *O. brevicrus* (Zweifel, 1956)[3] is a frog of high elevations with short legs, maximum TL/SVL 0.418 vs. minimum of 0.468 in *notata*. Parker (1934: 168) described the holotype of *O. flava* (Zoological Museum, University of Amsterdam no. 5632) as having the toes ''free''. My notes on this specimen mention ''a small but distinct basal web'', and my description of specimens I identified as this species also mention a ''slight basal web'' (Zweifel, 1956: 26). The type specimen differs from *O. notata* also in its narrower HW, shorter TL, and wider IN.

HABITAT AND HABITS: Ialibu is in gently rolling country. Numerous small, low-gradient streams dissect the land around the site and larger, rocky rivers are within 3–8 km. Much of the immediate area was grassland, probably anthropogenic. Unlogged forest, the trees heavy with epiphytes, was within 2.5 km by road, and less easily accessible forest was nearer the Station. Rain fell every day and night (though not continuously) of my stay of one week in August, and the summit of Mt. Giluwe (4200 m), 24 km distant, was visible on only one day. At Ialibu, *Oreophryne notata* called at night in a forested area from perches slightly more than a meter above the ground in shrubs; one caller was on the upper surface of a broad leaf. Local children brought me the largest (female) specimen which they said they found in a pandanus tree. Stephen Richards (personal commun.) stated that the paratypes from Tabubil all were ''found on leaves of epiphytes and arboreal ferns in trees''.

ASSOCIATED SPECIES: Apart from *Oreophryne notata*, most of the other 14 species of frogs collected at Ialibu in the same period are widespread in the highlands of Papua New Guinea: *Litoria angiana, L. darlingtoni, L. iris, L. modica, L. multiplica*; *Nyctimystes foricula, N. kubori, N.* sp. (*papua* group, see Richards and Johnston, 1993: 76, and Zweifel, 1983: 18); *Albericus darlingtoni* or *A. fafniri, A. swanhildae, A. tuberculus*; *Cophixalus cryptotympanum, C. riparius*; *Rana grisea*.

Identification of the species of *Albericus* requires some amplification. *Albericus darlingtoni* and *A. fafniri* are not reliably distinguished on morphology alone (Menzies, 1999), and I did not hear calling. Specimens collected belong to one (or both?) of these species, however. *Albericus swanhilde* is identified by its unique advertisement call, a brief (ca. 0.06 sec) peep that I recorded. Ialibu is the third locality for this species, about 40 km southeast of the type locality. The identification of *A. tuberculus* is conditional. The specimen (AMNH A-81166) was heard to give a ''buzz'' advertisement call (Menzies, 1999; Richards et al., 1992) but was not recorded. The small size (14.0 mm SVL), warty skin, call type, and locality are consistent with identification as *A. tuberculus*, but without a recording of the call for

[2] Most recently known as Irian Jaya.

[3] In the original description (Zweifel, 1956: 24), *O. brevicrus* was described as ''toes with a basal web''. Reexamination of the holotype and other specimens indicates that the webbing might better be described as absent or as having only a slight trace.

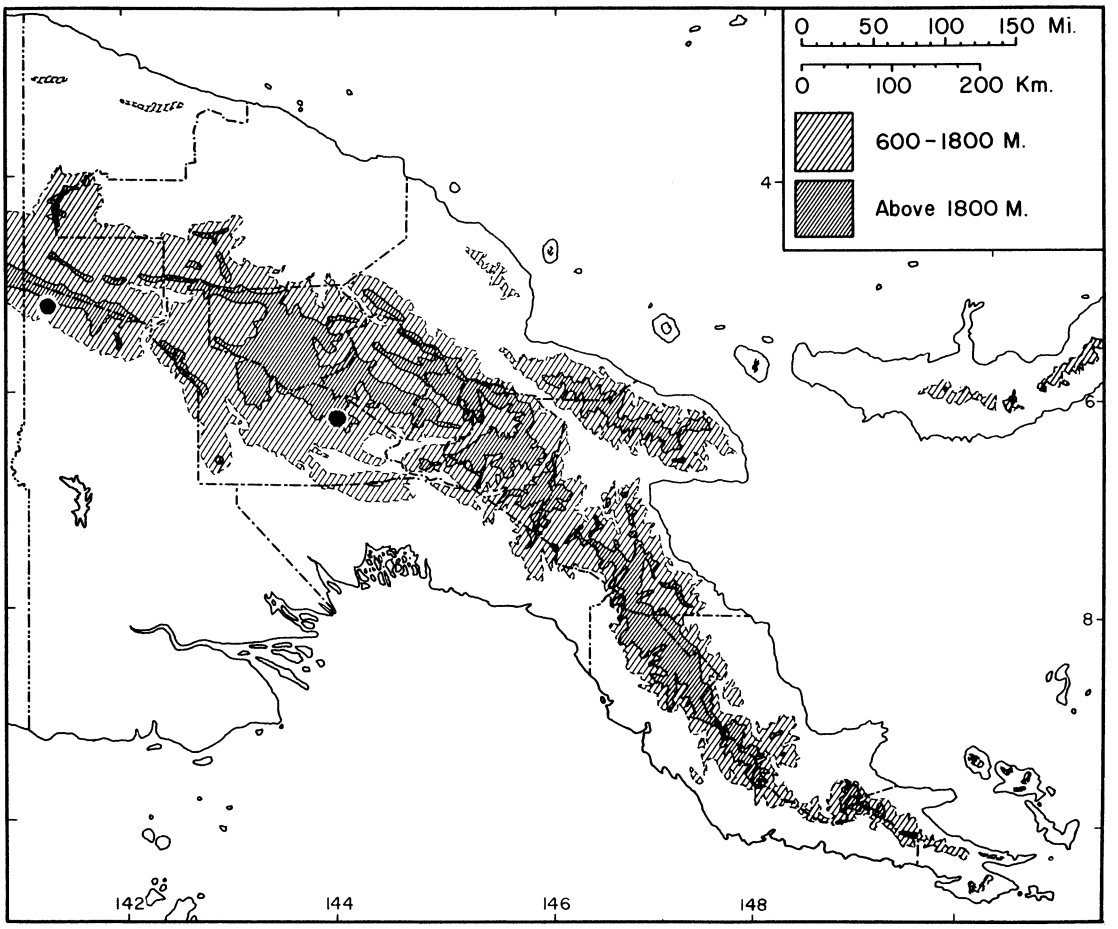

Fig. 6. Distribution of *Oreophryne notata* in Papua New Guinea. The easternmost spot is the type locality.

detailed analysis, assignment to species must be tentative.

DISTRIBUTION: *Oreophryne notata* is known from Papua New Guinea at the type locality in Southern Highlands Province, and at Tabibul, Western Province (fig. 6). The localities are about 325 km apart.

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