

A new species of *Xenorhina* (Anura: Microhylidae) from western New Guinea

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Abstract.—We describe a new species of fossorial frog, *Xenorhina adisca*, from the Sudirman Mountains of western New Guinea. The new species is distinguished from its congeners in lacking discs on fingers and toes, having moderately long legs, large eyes, and a long, pointed snout, and having a red venter with black “pants” markings under the groin. It is currently known only from the type locality. The limited mobility of members of this genus make them highly susceptible to endemism, and it seems likely that additional species await discovery along the south versant of the Central Dividing Range of New Guinea.

Xenorhina is a genus of seven endemic New Guinea species (Zweifel 1972, Blum & Menzies 1988, Allison & Kraus 2000) closely allied with the equally endemic *Xenobatrachus*, from which it differs in lacking odontoid spikes. Clear synapomorphies distinguishing these two genera are lacking (Burton 1986) and further phylogenetic study may result in the synonymization of the latter with the former. Of the seven species of *Xenorhina* currently recognized, six are terrestrial or fossorial, and one has secondarily adopted an arboreal life style (Allison & Kraus 2000). All species are found in the western part of the island, ranging from western Papua New Guinea to the western end of Papua (formerly Irian Jaya). Most *Xenorhina* species occur at moderate to high altitudes (1000–3500 m), although *X. oxycephala* is a widespread lowland species.

During a biological survey in southwestern Papua in 1997 we discovered a new species of *Xenorhina* and describe it below.

Materials and Methods

Specimens were euthanized in the field by immersion in chlorotone, fixed in 10%

buffered formalin, and then transferred to 70% ethanol for storage. All measurements were made to the nearest 0.1 mm with digital calipers or an optical micrometer, except that disc widths were measured to the nearest 0.03 mm. We follow the methodology and use the terminology of Zweifel (1972, 2000) and Kraus & Allison (2001): distance from anterior corner of eye to center of naris (EN); diameter of eye (EY); width of disc on third finger (FD); foot length from proximal edge of sole to tip of 4th toe (FT); hand length from proximal edge of palm to tip of 3rd finger (HD); head width at widest point, typically at the level of the tympana (HW); internarial distance, between centers of external nares (IN); distance from anterior corner of eye to tip of snout (SN); body length from snout to vent (SV); width of disc on fourth toe (TD); tibia length from heel to skin fold of knee (TL_{fold}); tibia length from heel to outer surface of flexed knee (TL_{knee}); tympanum diameter (TY). The two different measures of TL are provided because measurement technique varies in the literature: the latter measurement is generally the more reliable across a variety of microhylid genera and is the standard in more recent taxonomic

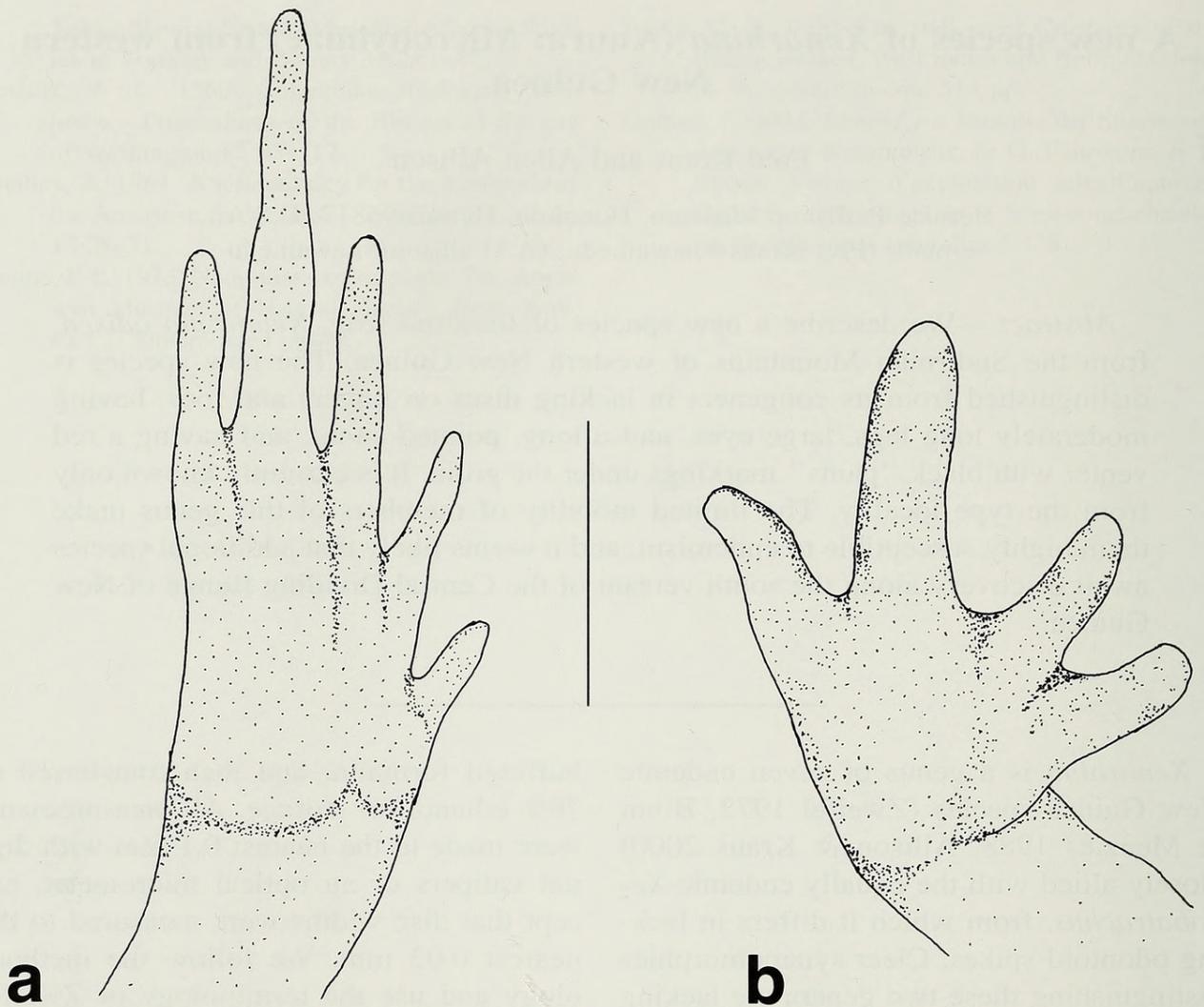


Fig. 1. Right foot (a), and hand (b) of holotype (MZB 8403) of *Xenorhina adisca*, showing absence of discs. Scale bar is 2 mm.

treatments, but the former measurement is published for a wider array of taxa (Zweifel 1972). Sex was determined by examination of gonads and vocal slits.

We confirmed generic assignment of the frogs by the presence of a symphygnathine jaw, absence of vomeropalatine spikes, lack of a broad subdermal sheet of bone behind the eye, absence of cutaneous tubercles on the eyelids, and presence of a pointed snout and small eyes. Type specimens are deposited in the Museum Zoologi Bogor, Indonesia (MZB) and the Bernice P. Bishop Museum, Honolulu (BPBM). Additional comparative material is housed in the collections of the University of Papua New Guinea (UPNG).

Xenorhina adisca, new species

Figs. 1–3

Holotype.—MZB 8403 (field no. AA 15395), adult female, collected by Allen Allison at Tembagapura, 4.14009°S, 137.09782°E, 2200 m elev., Sudirman Mountains, Papua (=Irian Jaya), Indonesia, on 17 March 1997.

Paratypes.—MZB 8404 and BPBM 14915, juvenile and adult female, respectively, same data as holotype.

Diagnosis.—A small (SV = 18.8–23.6 mm) species of *Xenorhina* lacking finger and toe discs (Fig. 1), and having moderately long legs ($TL_{\text{fold}}/SV = 0.35\text{--}0.38$, $TL_{\text{knee}}/SV = 0.39\text{--}0.40$), large eyes ($EY/SV = 0.072\text{--}0.080$), and a relatively long point-

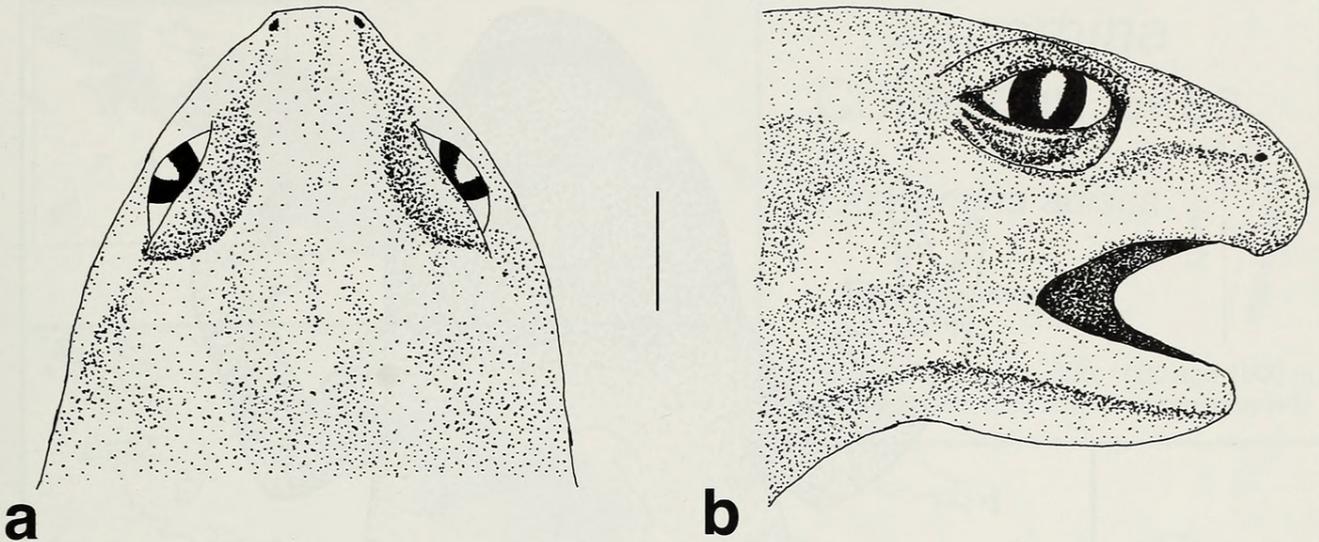


Fig. 2. Dorsal (a) and lateral (b) views of the head of holotype (MZB 8403) of *Xenorhina adisca*. Scale bar is 3 mm.

ed snout with a high EN/IN ratio (1.1–1.2, Fig. 2).

Description of holotype.—An adult female. Head moderately wide (HW/SV = 0.32), merging with body with no constriction at neck; oblique loreal region, no canthus rostralis; nostrils much closer to tip of snout than to eyes (Fig. 2); internarial distance less than distance from external naris to eye (EN/IN = 1.1, IN/SV = 0.068, EN/SV = 0.072); snout rounded when viewed from side and from above (Fig. 2); eyes of moderate size (EY/SV = 0.072), eyelid less than one-half width of interorbital distance; tympanic ring indistinct, horizontal diameter equal to width of eye.

Dorsal and lateral surfaces with scattered low rounded tubercles, especially concentrated on end of snout (Fig. 2). Supratympanic fold slight. Ventral surfaces smooth.

Fingers unwebbed, relative lengths $3 > 4 > 2 \approx 1$, tips somewhat flattened but lacking discs and circummarginal grooves (Fig. 1); very low areas of thickened skin on inner metacarpal surfaces, but not developed into actual tubercles. Toes unwebbed, relative lengths $4 > 3 > 5 > 2 > 1$; tips rounded and lacking discs and circummarginal grooves; low skin thickenings present on inner metatarsal surfaces, but not developed into tubercles. Hind legs mod-

erately long ($TL_{\text{fold}}/SV = 0.35$, $TL_{\text{knee}}/SV = 0.40$).

The vomeropalatines lack enlarged odontoid spikes.

Ground color of dorsal surfaces of body and limbs brownish yellow in preservative, heavily and evenly suffused with dark brown, which is densest dorsally and lighter laterally. Obscure chocolate brown flecks are scattered on dorsum and sides. Tympanum somewhat lighter in color and with an obscure chocolate brown supratympanic stripe that extends across the dorsal margin of the tympanum and ends just anterior to the forelimb insertion. A chocolate brown patch surrounds the anus. Ventral ground color of body and limbs brownish yellow with many tiny dark brown flecks scattered throughout and most densely concentrated on chin, throat, groin, and undersides of limbs, forming “pants” in the groin and upper thighs (Fig. 3). Palms and soles mottled light gray and chocolate brown.

Measurements (in mm).—SV = 23.5, $TL_{\text{fold}} = 8.3$, $TL_{\text{knee}} = 9.5$, HW = 7.6, IN = 1.6, EN = 1.7, SN = 2.4, EY = 1.7, TY = 1.7, HL = 4.9, FL = 10.1, FD = 0.58, TD = 0.50.

Variation.—One of the paratypes is an adult female; the other is near adult size but of undetermined sex. Mensural variation in

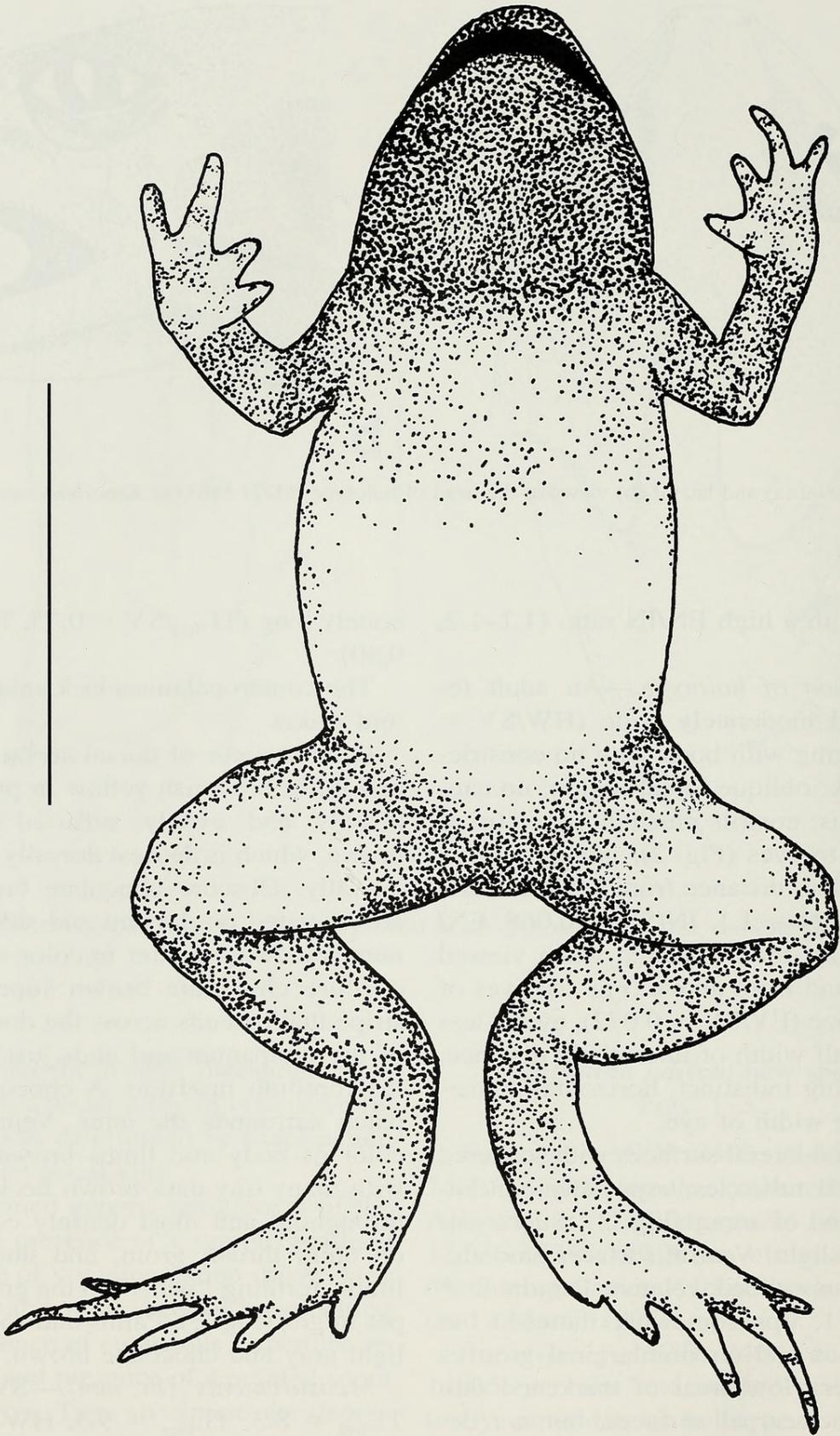


Fig. 3. Underside of holotype (MZB 8403) of *Xenorhina adisca*, showing strongly melanized gular region and "pants" in the groin and upper thighs. Scale bar is 10 mm.

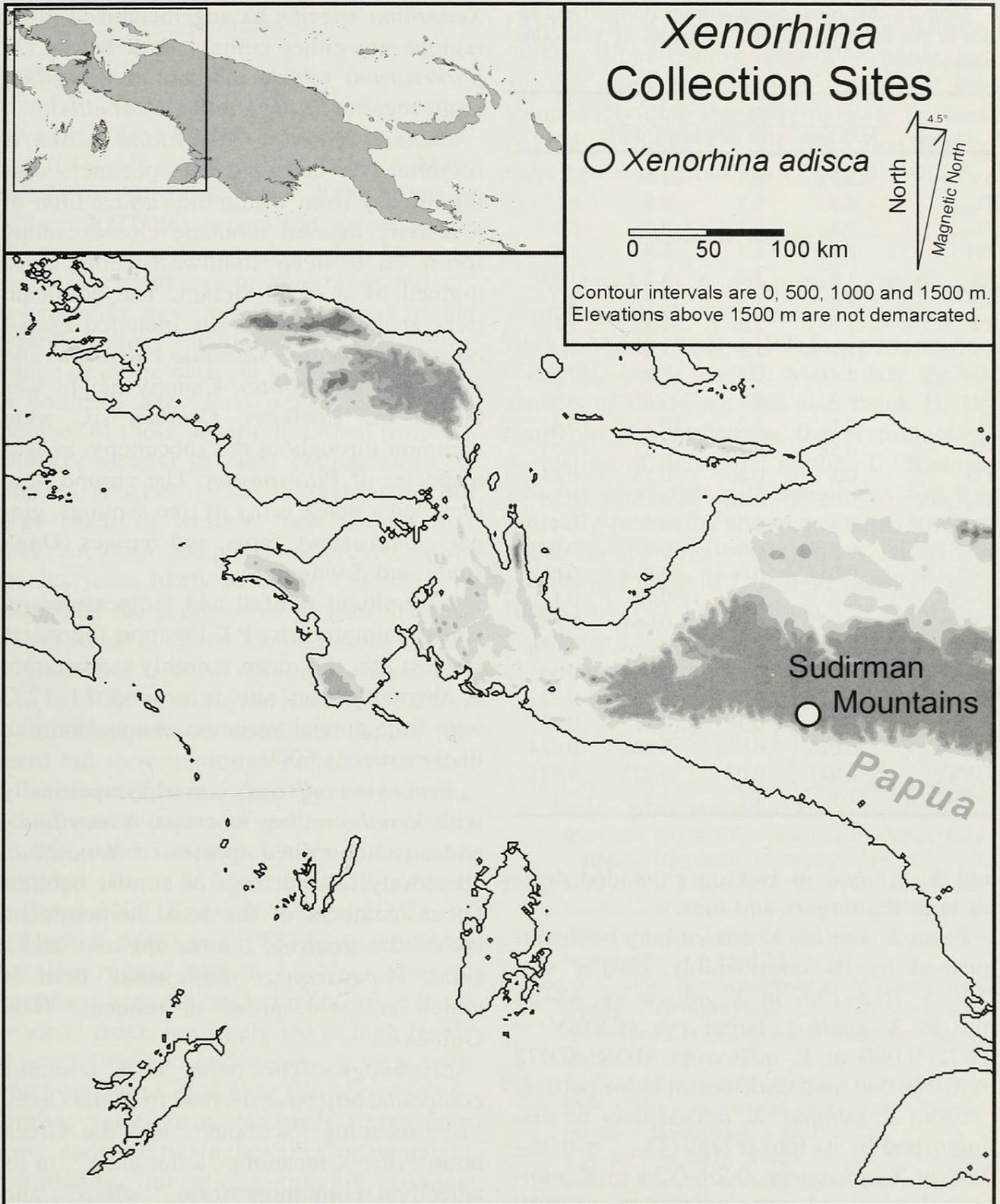


Fig. 4. Map of western New Guinea showing the type locality of *Xenorhina adisca*.

the small sample at hand is minor (Table 1) and there are no noteworthy differences in color pattern among the three specimens.

Color in life.—Dorsum dark brown; venter bright red.

Call.—Unknown. All available specimens are female or immature.

Comparisons to other species.—*Xenorhina adisca* may be distinguished from all other species of the genus except *X. similis*

Table 1.—Mensural measurements (in mm) and ratios of the holotype and two paratypes of *Xenorhina adisca*.

Character	Specimen			Mean
	MZB 8403	MZB 8404	BPBM 14915	
SV	23.5	18.8	23.6	22
TL _{fold}	8.3	6.7	8.9	8
TL _{knee}	9.5	7.3	9.5	8.8
EN	1.7	1.3	1.8	1.6
IN	1.6	1.2	1.5	1.4
SN	2.4	1.9	2.7	2.3
TY	1.7	1.5	1.5	1.6
EY	1.7	1.5	1.8	1.7
HW	7.6	6.3	8.2	7.4
HL	4.9	4.1	5.5	4.8
FL	10.1	8.2	10	9.4
FD	0.58	0.48	0.53	0.53
TD	0.5	0.38	0.53	0.47
TL _{fold} /SV	0.35	0.36	0.38	0.36
TL _{knee} /SV	0.4	0.39	0.4	0.4
EN/SV	0.072	0.069	0.076	0.073
IN/SV	0.068	0.064	0.064	0.065
SN/SV	0.1	0.1	0.11	0.11
TY/SV	0.072	0.08	0.064	0.072
EY/SV	0.072	0.08	0.076	0.076
HW/SV	0.32	0.34	0.35	0.34
HL/SV	0.21	0.22	0.23	0.22
FL/SV	0.43	0.44	0.42	0.43
FD/SV	0.025	0.026	0.022	0.024
TD/SV	0.021	0.02	0.022	0.021
EN/IN	1.1	1.1	1.2	1.1

and *X. minima* in lacking expanded discs on both the fingers and toes.

From *X. similis*, *X. adisca* may be distinguished by its considerably smaller size (SV = 18.8–23.6 in *X. adisca* vs. 48–51 mm in *X. similis*), larger eye (EY/SV = 0.072–0.080 in *X. adisca* vs. 0.058–0.072 in *X. similis*), and dark dorsal color pattern.

From *X. minima*, *X. adisca* may be distinguished by its longer legs (TL_{fold} = 0.35–0.38 in *X. adisca* vs. 0.29–0.34 in *X. minima*), longer and more pointed snout (EN/IN = 1.1–1.2 in *X. adisca* vs. 0.83–0.84 in *X. minima*), dark dorsal color pattern, and red (vs. cream) venter.

Xenorhina adisca is further distinguished from all other members of the genus by its ventral color pattern, which includes a dark chin and throat and dark “pants” in the groin and upper thighs (Fig. 3). Other

Xenorhina species having melanized gular regions are either entirely dark below (*X. parkerorum*) or are mottled in the groin/thigh region (*X. arboricola*, *X. similis*).

Ecological notes.—*Xenorhina adisca* is fossorial. We collected our specimens during the day from within the surface litter of a heavily mossed montane closed-canopy forest on a steep southwest-facing slope drained by a small stream. The dominant trees at the collection site included *Elaeocarpus nubigenus*, *Saurauia calyptrate* and *Polyosma integrifolia*. Canopy height was 20–30 m. Treeferns, *Cyathea* sp., were common throughout the subcanopy, as was a species of *Pittosporum*. The ground flora included a dense array of tree saplings, gingers, *Elatostema*, ferns, and mosses (*Dawsonia* and *Sphagnum*).

Intermittent rainfall and temperature records maintained by P.T. Freeport Indonesia suggest that the mean monthly temperature at the collection site is around 11–12°C with little annual variation. Annual rainfall likely exceeds 6000 mm.

Xenorhina adisca occurred sympatrically with *Xenobatrachus macrops*, *X. ocellatus*, and an undescribed species of *Xenorhina*, all closely related frogs of similar habitus. Other members of the local herpetofauna included a treefrog, *Litoria angiana*, and a skink *Papuascincus stanleyanus*, both of which are widespread in montane New Guinea.

Etymology.—The name is a feminine compound adjective derived from the Greek “a”, meaning “without”, and the Greek noun “disc”, meaning “a flat plate”, in its adjectival combining form “-disca”, and refers to the absence of digital discs in the species.

Distribution.—*Xenorhina adisca* is known only from the type locality (Fig. 4) but is likely to prove more widely distributed along the southern versant of the Central Dividing Range of western New Guinea.

Remarks

Thirteen of the 26 species now recognized in *Xenorhina* and *Xenobatrachus* have been described in the last quarter century (Menzies & Tyler 1977, Blum & Menzies 1988, Allison & Kraus 2000, Kraus & Allison 2002, this paper) and we are aware of additional undescribed species. Most recently described taxa of *Xenorhina* and *Xenobatrachus* have been discovered in the central valleys of the Central Dividing Range or in the outlying north coast ranges. In contrast, *Xenorhina adisca* is the first member of these genera described from the southern versant of New Guinea since *X. minima* (Parker 1934). Considering the large tracts of western New Guinea that have not been adequately surveyed, more species seem likely to occur. Our surveys confirmed the presence of at least six species of *Xenorhina* and *Xenobatrachus* along an altitudinal transect ranging from sea level to ca. 3000 m along the road from Timika to Tembagapura in southern Papua. We heard but were unable to collect what may be additional species. This appears to be the richest concentration of species yet reported for this clade; other sites have 3–4 species recorded (Blum & Menzies 1988, Allison & Kraus 2000, Kraus & Allison 2002).

Blum & Menzies (1988) have remarked that the rugged terrain of New Guinea, combined with the limited mobility of these fossorial frogs, has likely led to high levels of speciation and endemism—a view with which we agree. However, the degree of endemism varies in scale: several taxa may prove endemic to single valley or mountain complexes, but others inhabit broader, though geographically limited, regions encompassing several distinct mountain ranges. The taxa described from the Eipo Valley (Blum & Menzies 1988) may prove to fit the former pattern, whereas *Xenorhina arboricola*, *Xenobatrachus zweifeli*, and *Xenobatrachus tumulus* are already known to inhabit multiple discrete mountain ranges along the north coast of Papua New Guinea

(Allison & Kraus 2000, Kraus & Allison 2002). What pattern generally holds for species along the southern versant of the Central Dividing Range remains to be seen but most known species from that region have broad distributions (Zweifel 1972).

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Appendix
Specimens Examined

- Xenorhina arboricola*: BPBM 13745, 1.3 km S, 2.3 km E summit of Mt. Hunstein, Hunstein Mts., 1000 m, East Sepik Prov., Papua New Guinea; BPBM 13746–77, S slopes of Mt. Menawa, 8.5 km N, 14 km E Utai aerodrome, Bewani Mts., 1200 m, West Sepik Prov., Papua New Guinea.
- Xenorhina bouwensi*: BPBM 1015, Sibil Valley, Star Mts., 1250 m, Irian Jaya [= Papua], Indonesia; BPBM 3686, 3.2 km N Dasiga, New Guinea.
- Xenorhina eiponis*: UPNG 7406 (paratype), Mungona, 1800 m, Irian Jaya [= Papua], Indonesia.
- Xenorhina minima*: UPNG 7409, Serabum, 2400 m, Irian Jaya [= Papua], Indonesia.
- Xenorhina oxycephala*: BPBM 13756–57, 2 km W Utai aerodrome, 260 m, West Sepik Prov., Papua New Guinea; BPBM 14269, 8.7 km N, 9.8 km E Mt. Hunstein, 75 m, East Sepik Prov., Papua New Guinea.
- Xenorhina parkerorum*: UPNG 9358–59, Nogar Village, Keowagi, 2200 m, Simbu Prov., Papua New Guinea.



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