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NEW SPECIES OF FROGS FROM
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AND
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Cover illustration: *Litoria eschata*, sp.nov. from Rossel Island, Milne Bay Province, Papua New Guinea. Photo: Fred Kraus.

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New Species of Frogs from Papua New Guinea¹

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Abstract. The Papuan frog fauna, which includes more than 360 named species, is poorly known, with many species awaiting description and many more undoubtedly undiscovered because much of the region has been poorly surveyed. Many of the undescribed species in hand belong to taxonomically difficult genera, but several are uncontroversially distinctive and unambiguously diagnosed. Here we describe eight new species of distinctive frogs from Papua New Guinea, comprising species from three families and six genera. Half of these species come from the New Guinea mainland, and half come from adjacent islands. They include five microhylids, two ceratobatrachids, and one hylid.

INTRODUCTION

The Papuan region (New Guinea and associated islands plus the Solomon Islands) is one of the biologically richest areas on earth, with approximately 5–8% of the world's terrestrial biota (percentages vary by taxon) concentrated in about 0.5% of the world's land area. The frog fauna of this region is correspondingly diverse, with over 360 species described and scores more awaiting description. Much of the region remains poorly explored, and we estimate that a few hundred additional species likely await discovery. The Bishop Museum has been involved in biodiversity surveys in the Papuan region for several decades. In the past several years, surveys focused on reptiles and amphibians led to the discovery of a diversity of new frogs. In the course of our taxonomic studies of this material we have also discovered other distinctive new species present but ignored in existing collections. We already published some important amphibian findings (e.g., Kraus & Allison, 2004a, b, 2005a, b, 2006, 2007a, b), but we have a large backlog of additional species awaiting description. Most of these belong to large or taxonomically complicated genera requiring careful research in order to clearly diagnose taxa. However, some of these species are very distinctive morphologically, readily diagnosed, and scientifically uncomplicated. We describe a number of these species here.

MATERIALS AND METHODS

Specimens were fixed in 10% buffered formalin and transferred to 70% ethanol for storage. All measurements were made with digital calipers or an optical micrometer to the nearest 0.1 mm, with the exception that disc widths were measured to the nearest 0.01 mm. Measurements, terminology, and abbreviations follow Zweifel (1985) and Kraus & Allison (2006) for microhylids and ranids: body length from snout–vent (SV); tibia length from heel to outer surface of flexed knee (TL); horizontal diameter of eye (EY); distance from anterior corner of eye to center of naris (EN); internarial distance, between centers of external nares (IN); distance from anterior corner of eye to tip of snout (SN); head width at widest point, typically at the level of the tympana (HW); head length, from tip of

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snout to posterior margin of tympanum (HL); horizontal tympanum diameter (TY); length of hand from proximal margin of inner metacarpal tubercle to distal margin of third finger disc (HandL); length of foot from proximal margin of inner metatarsal tubercle to distal margin of fourth toe disc (FootL); width of the third finger disc (3rd F); width of the fourth toe disc (4th T). For the genus *Callulops*, to facilitate comparison with published information for poorly known species, we also employ a different, older standard for TL (TL_{fold}), which is measured from heel to tibial skin fold (Zweifel, 1972). Measurements, terminology, and abbreviations follow Kraus & Allison (2004a, b) for hylids, which differ from those for microhylids and ranids only in that IN and EN are measured to the medial and posterior extremities, respectively, of the external nares.

We recorded calls in the field using a Sennheiser K6 microphone and either a Sony Professional Walkman WM-D6C cassette recorder or a Sony MDSJE480 minidisc recorder. Call structure was analyzed using the computer program Avisoft-SASLab Pro(v4.34) available from Avisoft Bioacoustics (<http://www.avisoft.com/>).

As necessary, we confirmed generic assignment for microhylids using the presence of an eleutherognathine jaw and presence/absence of clavicles and procoracoids (Parker, 1934; Zweifel, 1972). Diagnostic comparisons to congeners relied on direct comparison to museum material (Appendix) and to information from Werner (1901), Barbour (1910), Boulenger (1914), Zweifel (1972), Richards *et al.* (1995), and Günther (2006) for *Callulops*; Macleay (1878), Méhely (1901), Zweifel (1972), Günther (2001), and Richards & Oliver (2007) for *Hylophorbus*; Zweifel (2000) for *Liophryne*; Menzies & Tyler (2004) for *Litoria*; Zweifel (1972) for *Mantophryne*; and Brown (1965), Brown & Tyler (1968), Allison & Kraus (2001), Fofopopoulos & Brown (2004), Brown *et al.* (2006a, b), and Kraus & Allison (2007) for *Platymantis*. Specimens of *Platymantis* examined are already listed in Allison & Kraus (2001) and Kraus & Allison (2007a) so are not repeated here.

Type specimens are deposited in the Bishop Museum, Honolulu (BPBM), Australian Museum (AMS), Museum of Comparative Zoology (MCZ), and Papua New Guinea National Museum and Art Gallery, Port Moresby (PNGNM). All latitude and longitude coordinates use the Australian Geodetic Datum, 1966 (AGD 66).

Microhylidae

Callulops omnistriatus sp. nov.

(Figs. 1A, 2A)

Holotype. BPBM 32098 (field tag FK 4947), adult female, collected by F. Kraus 0.2 km S and 0.5 km W Moro airstrip, 6.36875°S, 143.22431°E, 960 m, Southern Highlands Province, Papua New Guinea, 7 February 2002.

Paratypes. AMS R122199–207, R122210–12, BPBM 24719–20 (formerly AMS R 122208–09), Namosado, 6.25°S, 142.78333°E, 930 m, Southern Highlands Province, Papua New Guinea, October 1985; AMS R122292, Magidobo, 6.18333°S, 142.76667°E, Southern Highlands Province, Papua New Guinea, October 1985; AMS R122313–14, Bobole, 6.20°S, 142.7667°E, Southern Highlands Province, Papua New Guinea, October 1985.

Fig. 1. Photos in life of (A) holotype of *Callulops omnistriatus* (BPBM 32098), (B) paratype of *C. eremosphax* (BPBM 13155), (C) holotype of *Hylophorbus proekes* (BPBM 22761), (D) holotype of *Liophryne magnitympanum* (BPBM 19358), (E) holotype of *Litoria eschata* (BPBM 20654), (F) paratype of *Mantophryne axanthogaster* (BPBM 20402), (G) paratype of *Platymantis caesiops* (BPBM 22232), and (H) holotype of *Platymantis caesiops* (BPBM 22229).



Table 1. Mensural data for type series of *Callulops omnistriatus*. SV = snout-vent length, TL = tibia length, TL_{fold} = tibia length measured to skin fold, EY = eye diameter, EN = eye-naris distance, IN = internarial distance, SN = snout length, HW = head width, HL = head length, TY = tympanum diameter, 3rdF = width of third finger disc, 4thT = width of fourth toe disc.

Character	Males (n = 8)		Females (n = 10)	
	mean	range	mean	range
SV (mm)	57.0	55.0–59.6	59.1	49.9–66.9
TL _{fold} /SV	0.40	0.38–0.42	0.38	0.35–0.41
TL/SV	0.44	0.43–0.46	0.44	0.41–0.47
EN/SV	0.070	0.067–0.075	0.069	0.056–0.078
IN/SV	0.082	0.078–0.085	0.082	0.076–0.089
SN/SV	0.11	0.11–0.12	0.11	0.10–0.12
TY/SV	0.057	0.048–0.071	0.053	0.046–0.060
EY/SV	0.13	0.12–0.14	0.13	0.12–0.14
HW/SV	0.37	0.35–0.39	0.37	0.34–0.39
HL/SV	0.33	0.31–0.34	0.33	0.30–0.35
3rdF/SV	0.028	0.022–0.032	0.030	0.028–0.035
4thT/SV	0.037	0.033–0.043	0.036	0.033–0.039
EN/IN	0.86	0.82–0.91	0.85	0.68–0.98
3rd F/4th T	0.76	0.62–0.84	0.85	0.77–0.99
HL/HW	0.89	0.84–0.93	0.89	0.87–0.91

Diagnosis. A medium-sized species of *Callulops* (male SV = 55.0–59.6 mm, mean 57.0 mm; female SV = 49.9–66.9 mm, mean 59.1 mm) with moderately expanded discs on fingers and toes, all bearing well-developed terminal grooves; finger discs smaller than toe discs (3rdF/4thT = 0.62–0.99, mean 0.81); legs moderately long (TL/SV = 0.41–0.47, TL_{fold}/SV = 0.35–0.42); snout broad (IN/SV = 0.076–0.089, EN/IN = 0.68–0.98), truncate in dorsal view (Fig. 2A); eye large (EY/SV = 0.12–0.14, EY/SN = 1.0–1.3); foot long (FootL/SV = 0.42–0.48); dorsum uniformly gray-brown (with a violet wash in life); venter uniformly light gray-brown (with a lavender wash in life); and iris light green-bronze (Fig. 1A).

Comparisons with other species. *Callulops omnistriatus* is distinguished from *C. glandulosa*, *C. sagittatus*, *C. stictogaster*, and *C. wilhelmanus* in having expanded discs on the fingers and toes; from *C. boettgeri*, *C. eurydactylus*, *C. pullifer*, and *C. slateri* in having finger discs smaller than toe discs, with that of third finger less than twice as wide as penultimate phalanx; from *C. doriae*, *C. marmoratus*, and *C. personatus* in its uniform dorsal pattern (light brown spotted with black in *C. doriae*, clouded with dark brown in *C. marmoratus*, head and face darker than body in *C. personatus*); from *C. dubius* in its shorter leg (TL_{fold}/SV = 0.48 in *C. dubius*) and larger size (SV < 30 mm in *C. dubius*); and from *C. comptus*, *C. fuscus*, *C. humicolus*, and *C. kopsteini* in having the ventral surfaces uniformly light brown (flecked with white or light gray in *C. fuscus* and *C. kopsteini*; boldly mottled brown and yellow in *C. comptus* and *C. humicolus*). *Callulops omnistriatus* is most closely related to *C. robustus*, from which it is easily distinguished by its smaller size (male SV = 60.6–64.9 mm, mean 63.1 mm; female SV = 63.6–78.2 mm, mean 71.7 mm in *C. robustus*), longer legs (TL/SV = 0.35–0.40 in *C. robustus*), broader snout (IN/SV = 0.061–0.071, EN/IN = 1.0–1.2 in *C. robustus*), longer foot (FootL/SV = 0.35–0.41 in *C. robustus*), presence of well-developed terminal grooves on the discs of the first and second fingers (absent in *C. robustus*), presence of three subarticular tubercles on fourth toe (basal subarticular tubercle absent on T4 in *C. robustus*), dorsum violet-brown (reddish-brown in *C. robustus*) in life, palmar surfaces uniformly brown (with large amelanin patches in *C. robustus*), and iris light green-bronze (reddish-brown in *C. robustus*). The dorsa of all specimens are smooth, which further serves to distinguish the species from *C. robustus*, *C. humicolus*, and *C. comptus*, which all have rugose dorsa.

As currently understood, *C. robustus* ranges across all of New Guinea (Zweifel, 1972); its type locality is Misima Island, in the far southeastern extremity of its range. Given the variation we have seen within specimens assigned to this species, and the fact that the type locality is a remote offshore island, it is clear that *C. robustus* is a complex of species and that true *C. robustus* will likely be restricted to Misima. However, correcting the taxonomy of that species complex is a complicated matter beyond the scope of this paper, in part because insufficient material is available to resolve all taxa across New Guinea. Nonetheless, it makes sense to demonstrate that none of the three older names currently synonymized with *C. robustus* applies to the new species. Based on the holotype of *Mantophryne microtis* (from “German New Guinea”) and other conspecific specimens from Madang Province, *C. omnistriatus* differs from *M. microtis* in having a distinct terminal groove on the first finger (absent in type of *M. microtis* and Madang specimens of *C. robustus*), wider toe discs ($4^{\text{th}} \text{T/SV} = 0.033\text{--}0.043$ in *C. omnistriatus* vs. 0.030 in type of *M. microtis*), smooth lateral surfaces (pustulose in *M. microtis*), and a uniformly brown dorsum (with dense light flecking distributed across the lateral surfaces and front and rear of thighs in Madang specimens of *C. robustus*, cf. Zweifel, 1972: fig. 50). This last difference is also apparent from the original description of *M. microtis* (Werner, 1901), but the holotype is now faded and the flecking has disappeared. The new species differs from the holotype of *Pomatops valvifera* in lacking the yellow flecks and marblings that are widely distributed across the body and limbs of that specimen (cf., Barbour, 1910: fig. 1). Lastly, *C. omnistriatus* differs strikingly from the holotype of *Liophryne kampeni* (BMNH 1947.2.11.8) in snout shape (Fig. 2), having a truncate snout when viewed from above (rounded in *L. kampeni*) and a loreal region that is steeply oblique, inflated immediately anterior to the eye, and then highly concave posterior to the naris (loreal region uniformly flat and shallowly oblique in *L. kampeni*).

Description of holotype. An adult female with right-lateral incision. Head wide (HW/SV = 0.38), wider than long (HL/HW = 0.91), with steeply oblique, almost vertical, loreal region, conspicuously inflated immediately anterior to eye, concave posterior to naris; upper lip slightly inflated; dorsolateral margin of snout broadly rounded, S-shaped when viewed from above; nostrils horizontally compressed, directed laterally, closer to tip of snout than to eyes; internarial distance larger than distance from naris to eye (EN/IN = 0.88, IN/SV = 0.081, EN/SV = 0.071); snout rounded when viewed from side, truncate when viewed from above (Fig. 2A); eyes moderately large (EY/SV = 0.12); eyelid equal to width of interorbital distance; tympanum distinct and rather large (TY/SV = 0.060), annulus not obvious along posterior margin. Dorsum and sides microscopically pitted or wrinkled, appearing smooth to the unaided eye; ventral surfaces same. Fingers unwebbed, all bearing discs with well-developed terminal grooves; relative lengths $3 > 4 > 2 > 1$. Finger discs slightly less than twice width of penultimate phalanges. Subarticular tubercles low, not well developed; inner and outer metacarpal tubercles low, elongate. Toes unwebbed, all bearing discs with well-developed terminal grooves; relative lengths $4 > 3 > 5 > 2 > 1$. Toe discs twice width of penultimate phalanges, larger than those of fingers ($3^{\text{rd}}\text{F}/4^{\text{th}}\text{T} = 0.84$). Subarticular tubercles low but obvious, rounded, three on fourth toe; inner metatarsal tubercle a small, prominent oval; outer lacking. Hind legs short (TL/SV = 0.44, TL_{fold}/SV = 0.39).

Dorsum uniform medium brown, darker on eyelids and snout; rear of thighs same. Venter dirty white, densely and more or less evenly stippled with minute brown punctations, slightly denser anteriorly and under limbs than posteriorly. Palmar and plantar surfaces brown. Iris black; lower eyelid clear with brown anteriorly and posteriorly and with brown dorsal margin.

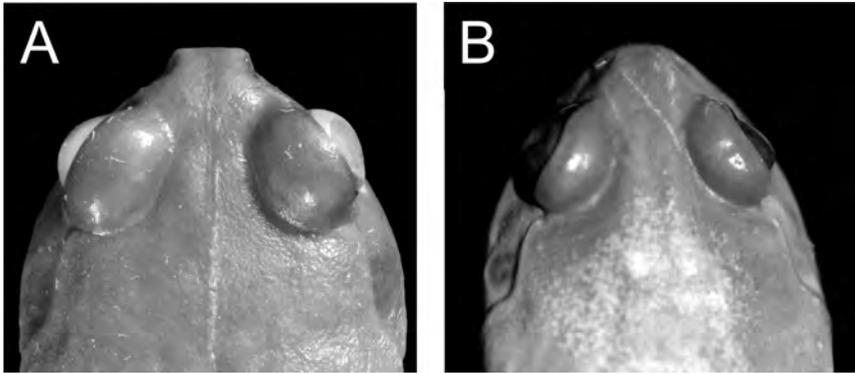


Fig. 2. Dorsal views of snouts of (A) holotype of *Callulops omnistriatus* (BPBM 32098), and (B) holotype of *Liophryne kampeni* (BMNH 1947.2.11.8), showing differences in slope of loreal region, sinuosity of canthus, and margin of snout.

Measurements (in mm).—SV = 61.9, TL = 27.4, TL_{fold}/SV = 24.0, HW = 23.3, HL = 21.3, IN = 5.0, EN = 4.4, SN = 7.1, EY = 7.3, TY = 3.7, HandL = 17.3, FootL = 28.8, 3rd F = 1.84, 4th T = 2.19.

Variation. Mensural variation in Table 1. Variation in color-pattern of paratypes negligible. One specimen with vague and faint yellow-brown dorsal mottling. Otherwise, but slight variation in the density of brown stippling dorsally and ventrally.

Color in life. Notes in life for holotype (Fig. 1A): “Dorsum brown with a hint of violet; face darker. Trace of lumbar ocelli. Venter lavender, darker on chin and throat and gradually from thighs to feet.”

Etymology. The name is a masculine compound Latin adjective formed from “*omnis*”, meaning “all”, and “*striatus*” meaning “grooved”, in reference to the characteristic terminal grooves on all digital discs.

Range. Known only from the southern flank of the Central Highlands, Southern Highlands Province, Papua New Guinea (Fig. 3, open squares).

Remarks. As noted above, all mainland New Guinean specimens of *Callulops* currently assigned to *C. robustus* almost certainly belong to other, currently unrecognized, species. However, sampling of specimens across the island is sparse and uneven. Given the need for obtaining further specimens and additional information on color in life and call structure across this expanse of terrain, it is currently infeasible to entirely resolve this taxonomic problem. In particular, the fact that two of the three names currently placed in the synonymy of *C. robustus* are known from single specimens from the poorly collected western half of the island necessitates that comprehensive resolution of this species complex await the collection of fresh topotypic material. Nonetheless, we are able to differentiate our new species from each of the previously proposed taxa to which it is related. Our diagnosis from Boulenger’s *Liophryne kampeni*, however, is the least certain. Morphometric differences between the two forms are not evident, although this is frequently the case in this morphologically conservative genus. Similarly, the faded nature of the holotype of *L. kampeni* makes compelling identification of color differences problematic. However, when compared side by side, the snout shapes of the two forms are markedly different (Fig. 2), and they seem to represent clearly distinct lineages. The type of *L. kampeni* was collected by the British Ornithologists’ Union Expedition of

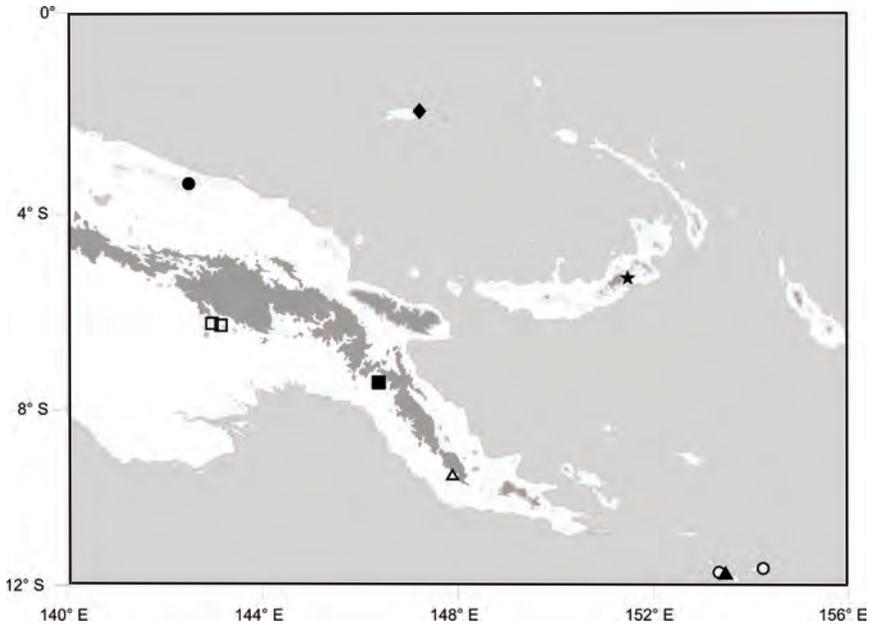


Fig. 3. Map of Papua New Guinea showing collection localities for *Callulops omnistriatus* (□), *C. eremnosphax* (■), *Hylophorbus proekes* (●), *Liophryne magnitympanum* (Δ), *Litoria eschata* (○), *Mantophryne axanthogaster* (▲), *Platymantis caesiops* (★), and *P. manus* (◆).

1910–1911 along the remote Mimika River, an area that has not been subject to additional herpetological collecting. Some species of reptiles and amphibians range along the greater extent of the southern versant of the Central Dividing Ranges in New Guinea, and it may be possible that future collecting will show our new species to vary clinally and be conspecific with *L. kampeni*. Against this, we note that many New Guinean amphibians previously thought to be wide-ranging single species are turning out to comprise parapatric or allopatric complexes of closely related species. Until such time as additional collecting should show snout shape to vary clinally, the most conservative approach seems to be to recognize the animals from Southern Highlands Province as a distinct species.

Callulops eremnosphax sp. nov.

(Fig. 1B)

Holotype. BPBM 13212 (field tag AA 14589), adult male, collected by A. Allison along E branch Avi Avi River, 5.5 km S and 5.6 km W of Tekadu Airstrip, 7.735°S, 146.496°E, 120 m, Gulf Province, Papua New Guinea, 20 October 1996.

Paratopotypes. BPBM 13155, collected 18 October 1996; BPBM 13169, collected 20 October 1996.

Diagnosis. A rather small species of *Callulops* (male SV = 33.7–36.1 mm, female SV = 42.7 mm) with small, expanded discs on fingers and toes, those on F1 and F2 lacking terminal grooves; finger discs smaller than toe discs ($3^{\text{rd}}\text{F}/4^{\text{th}}\text{T} = 0.69\text{--}0.81$); legs short

Table 2. Mensural data for type series of *Callulops eremnosphax*. SV = snout-vent length, TL = tibia length, TL_{fold} = tibia length measured to skin fold, EY = eye diameter, EN = eye-naris distance, IN = internarial distance, SN = snout length, HW = head width, HL = head length, TY = tympanum diameter, 3rdF = width of third finger disc, 4thT = width of fourth toe disc.

Character	BPBM 13155	BPBM 13169	BPBM 13212
Sex	male	female	male
SV (mm)	36.1	42.7	33.7
TL _{fold} /SV	0.33	0.33	0.34
TL/SV	0.40	0.40	0.41
EN/SV	0.072	0.068	0.068
IN/SV	0.094	0.096	0.095
SN/SV	0.11	0.11	0.12
TY/SV	0.044	0.047	0.056
EY/SV	0.12	0.14	0.13
HW/SV	0.37	0.39	0.41
HL/SV	0.34	0.35	0.35
3rdF/SV	0.022	0.027	0.025
4thT/SV	0.028	0.035	0.036
EN/IN	0.76	0.71	0.72
3rd F/4th T	0.81	0.78	0.69
HL/HW	0.92	0.90	0.84

(TL/SV = 0.40–0.41, TL_{fold}/SV = 0.33–0.34); snout broad (IN/SV = 0.094–0.096, EN/IN = 0.71–0.76); eye large (EY/SV = 0.12–0.14, EY/SN = 1.2–1.3); foot long (FootL/SV = 0.41–0.46); dorsum uniformly brown; venter brown on chin and throat, white on abdomen; and iris dark brown (Fig. 1B).

Comparisons with other species. *Callulops eremnosphax* is distinguished from *C. glandulosa*, *C. sagittatus*, *C. stictogaster*, and *C. wilhelmanus* in having expanded discs on the fingers and toes; from *C. boettgeri*, *C. eurydactylus*, *C. pullifer*, and *C. slateri* in having finger discs smaller than toe discs, with that of third finger less than twice as wide as penultimate phalanx; from *C. doriae*, *C. marmoratus*, and *C. personatus* in its uniform dorsal pattern (light brown spotted with black in *C. doriae*, clouded with dark brown in *C. marmoratus*, head and face darker than body in *C. personatus*); from *C. dubius* in its much shorter leg (TL_{fold}/SV = 0.48 in *C. dubius*) and larger size (SV < 30 mm in *C. dubius*); and from *C. comptus*, *C. fuscus*, *C. humicolus*, and *C. kopsteini* in having the ventral surfaces two-toned, with a brown chin and throat contrasting with a white belly (venter brown flecked with white or light gray in *C. fuscus* and *C. kopsteini*; boldly mottled brown and yellow in *C. comptus* and *C. humicolus*). *Callulops eremnosphax* is most closely related to *C. robustus* and *C. omnistriatus* sp. nov. It may be distinguished from *C. robustus* by its smaller size (male SV = 60.6–64.9 mm, mean 63.1 mm; female SV = 63.6–78.2 mm, mean 71.7 mm in *C. robustus*), longer legs (TL/SV = 0.35–0.40 in *C. robustus*), broader snout (IN/SV = 0.061–0.071, EN/IN = 1.0–1.2 in *C. robustus*), longer foot (FootL/SV = 0.35–0.41 in *C. robustus*), presence of three subarticular tubercles on fourth toe (basal subarticular tubercle absent on T4 in *C. robustus*), and dark chin and throat contrasting with white abdomen (ventral surfaces uniformly brown in *C. robustus*). The new species may be distinguished from *C. omnistriatus* sp. nov. by its smaller size (male SV = 55.0–59.6 mm, female SV = 49.9–66.9 mm in *C. omnistriatus*); absence of terminal grooves on the discs of F1, F2, and T1; dark chin and throat contrasting with white abdomen (ventral surfaces uniformly brown in *C. omnistriatus*); and dark-brown iris (green-bronze in *C. omnistriatus*).

As for *Callulops omnistriatus* sp. nov., it behooves us to compare *C. eremnosphax* to older names currently synonymized under *C. robustus*. *Callulops eremnosphax* differs from *Mantophryne microtis* in its much smaller size, uniform dorsum, and two-toned venter; specimens conspecific with the holotype of *M. microtis* range to at least 63 mm SV, have dense light flecking distributed across the lateral surfaces and front and rear of thighs, and have the venter uniformly stippled with brown. *Callulops eremnosphax* differs from the holotype of *Pomatops valvifera* in lacking terminal discs on the first and second fingers and first toes (J. Martinez, pers. comm.) and in lacking the yellow flecks and marblings that are widely distributed across the body and limbs of that specimen; and it differs from *Liophryne kampeni* in its much smaller size (female SV = 55.2 mm in *L. kampeni*), in lacking terminal discs on the first and second fingers and first toes, and in having the throat darker than the abdomen. None of these current synonyms of *C. robustus* applies to the new species.

Description of holotype. An adult male with left-lateral incision. Head wide (HW/SV = 0.41), wider than long (HL/HW = 0.84), with oblique loreal region, slightly concave posterior to naris; upper lip slightly inflated; canthus absent; nostrils directed laterally, closer to tip of snout than to eyes; internarial distance larger than distance from naris to eye (EN/IN = 0.72, IN/SV = 0.095, EN/SV = 0.068); snout rounded when viewed from side or from above; eyes moderately large (EY/SV = 0.13); eyelid wider than interorbital distance; tympanum indistinct and small (TY/SV = 0.056), annulus barely raised. Dorsum, sides, and venter smooth. Fingers unwebbed, bearing small discs, these with very shallow, poorly developed terminal grooves on F3 and F4, no grooves on F1 and F2; relative lengths $3 > 4 > 2 > 1$. Finger discs barely wider than penultimate phalanges. Subarticular tubercles low, rounded; inner and outer metacarpal tubercles elongate, well developed. Toes unwebbed, bearing discs, these with terminal grooves on T2–T5, absent on T1; relative lengths $4 > 3 > 5 > 2 > 1$. Toe discs larger than those of fingers ($3^{\text{rd}}\text{F}/4^{\text{th}}\text{T} = 0.69$); disc of fourth toe 1.5 times width of penultimate phalanx; disc of first toe barely wider than penultimate phalanx. Subarticular tubercles well developed, rounded, except for basal tubercle of T4, which is but slightly developed; inner metatarsal tubercle a small oval; outer lacking. Hind legs short (TL/SV = 0.41, $\text{TL}_{\text{fold}}/\text{SV} = 0.34$).

Dorsum brown, scarred with lighter brown markings; eyes, snout, and face slightly darker; sides with few, scattered pale-straw flecks; rear of thighs brown. Venter pale straw, heavily stippled with brown on chin, throat, and chest, almost clear on abdomen. Iris black; lower eyelid clear with brown anteriorly and posteriorly and with brown dorsal margin.

Measurements (in mm).—SV = 33.7, TL = 13.9, $\text{TL}_{\text{fold}}/\text{SV} = 11.4$, HW = 13.9, HL = 11.7, IN = 3.2, EN = 2.3, SN = 3.9, EY = 4.4, TY = 1.9, HandL = 8.9, FootL = 15.5, $3^{\text{rd}}\text{F} = 0.85$, $4^{\text{th}}\text{T} = 1.23$.

Variation. Mensural variation in Table 2. Color pattern in the two paratypes differs little from holotype except that BPBM 13169 with abdomen more invaded by brown stippling, although two-toned appearance of venter still distinct, and BPBM 13155 with abdomen heavily stippled with brown, thereby appearing but little lighter than anterior ventral regions.

Color in life. Head and dorsum uniform dark chocolate brown; upper flanks noticeably lighter brown, gradually turning to light gray-brown towards venter. Chin and throat dark brown; rest of venter light gray-brown. Iris dark brown (Fig. 1B).

Call. Males call from elevated sites at the base of trees, producing 6–10 barking notes. We were unable to record the call for analysis.

Etymology. The name is a single-ending compound Greek adjective derived from “ερεμνοσ”, meaning “dark”, and “σθηαξ”, meaning “throat”.

Range. Known only from the type locality in Gulf Province, Papua New Guinea (Fig. 3, filled square).

Ecological notes. All specimens were collected from the floor of alluvial wet forest.

***Hylophorbus proekes* sp. nov.**

(Figs. 1C, 4, 5)

Holotype. BPBM 22761 (field tag FK 11510), adult male, collected by F. Kraus 3.2 km SSE Mt. Sapau summit, 3.39329°S, 142.52826°E, 550 m, Torricelli Mts., West Sepik Province, Papua New Guinea, 20 May 2005.

Paratopotypes. BPBM 22760, collected 18 May 2005; BPBM 22762–63, collected 20 May 2005; BPBM 22764–66, collected 21 May 2005; BPBM 22767, PNGNM 24068–70, collected 22 May 2005; BPBM 22768, collected 23 May 2005; BPBM 22774–76, collected 24 May 2005; BPBM 22777, PNGNM 24072, collected 25 May 2005; BPBM 22778, collected 26 May 2005; BPBM 22779, collected 28 May 2005.

Paratypes. BPBM 22769–73, PNGNM 24071, 2.9–3.2 km SSE Mt. Sapau summit, 3.3908514°S, 142.5297297°E, 550–700 m, 23 May 2005.

Diagnosis. A medium-sized species of *Hylophorbus* (male SV = 26.5–35.4 mm, mean 32.9 mm; female SV = 33.0–36.7 mm, mean 34.5 mm) with a relatively long, pointed, protruding snout (Fig. 1C; SN/SV = 0.12–0.14); relatively short, broad head (HW/SV = 0.35–0.41, HL/HW = 0.83–0.96); dark gray-brown or mud-brown dorsum flecked or blotched with black; front of thighs and groin with conspicuous series of bright orange spots; gray venter flecked with dark gray, lacking bright colors; and a call consisting of a rapid train of 5–7 notes.

Comparisons with other species. *Hylophorbus proekes* is distinguished from all other members of the genus (8 species) by its angulate, protruding snout, (roundly bulbous or truncate in all other species) and its conspicuous series of orange spots in the groin and extending along the anterior face of the thigh. It is further distinguished from *H. nigrinus* and *H. picoides* in lacking a broad black lateral band; from *H. richardsi* and *H. tetraphonus* by its larger size (male SV < 28 mm in those species); from *H. wondiwoi* by its relatively shorter, broader head (HL/HW = 0.95–1.11 in *H. wondiwoi*), dark-brown dorsum (light brown in *H. wondiwoi*), and absence of yellow on the venter; from *H. sextus* in its larger tympanum (TY/SV = 0.055 in *H. sextus*), dark-brown dorsum (light brown in *H. sextus*), and call consisting of a train of 5–7 notes (2–4 in *H. sextus*); from *H. rainerguentheri* by its relatively shorter, broader head (HL/HW = 1.04–1.11 in *H. rainerguentheri*) and call consisting of a train of 5–7 notes (call train lasting up to two minutes in *H. rainerguentheri*); and from *H. rufescens* in its broader head (HW/SV = 0.32 in holotype of *H. rufescens*), dark-brown dorsal color (reddish brown in *H. rufescens*), and gray venter (yellowish red in *H. rufescens*). Currently, the names *Metopospira macra* and *M. ocellata* are synonymized with *H. rufescens* (Zweifel, 1972), but are likely to prove valid species once new material and call recordings from their type localities can be examined. *H. proekes* is not synonymous with these forms either. From *M. macra* it differs in its longer, pointed snout (SN/SV = 0.10 and snout roundly bulbous in holotype of *M. macra*) and broader head (HW/SV = 0.34 in *M. macra*). From *M. ocellata* it differs in its smaller size (SV = 33–42 mm in *M. ocellata*), gray-brown dorsum (greenish brown in *M. ocellata*), inconspicuous lumbar ocelli (conspicuous in *M. ocellata*), absence of red flecks on dorsum and posterior surface of thighs (often present in *M. ocellata*), and call consisting of a train of 5–7 notes (call a long train of notes in *M. ocellata*).

Table 3. Mensural data for type series of *Hylophorbus proekes*. Data include only adult animals. SV = snout–vent length, TL = tibia length, EY = eye diameter, EN = eye–naris distance, IN = internarial distance, SN = snout length, HW = head width, HL = head length, TY = tympanum diameter, 3rdF = width of third finger disc, 4thT = width of fourth toe disc.

Character	Males (n = 14)		Females (n = 3)	
	mean	range	mean	range
SV (mm)	32.9	26.5–35.4	34.5	33.0–36.7
TL/SV	0.55	0.47–0.57	0.54	0.52–0.57
EN/SV	0.073	0.063–0.083	0.071	0.068–0.074
IN/SV	0.101	0.093–0.109	0.100	0.097–0.104
SN/SV	0.12	0.12–0.14	0.12	0.12–0.12
TY/SV	0.073	0.064–0.085	0.077	0.076–0.080
EY/SV	0.12	0.11–0.13	0.12	0.12–0.12
HW/SV	0.38	0.36–0.41	0.37	0.35–0.38
HL/SV	0.34	0.32–0.37	0.34	0.34–0.34
3rdF/SV	0.031	0.027–0.035	0.031	0.030–0.032
4thT/SV	0.051	0.047–0.058	0.049	0.047–0.052
EN/IN	0.72	0.64–0.81	0.70	0.66–0.74
3rd F/4th T	0.60	0.52–0.66	0.62	0.61–0.64
HL/HW	0.90	0.83–0.96	0.93	0.91–0.96

Description of holotype. An adult male with right-lateral incision. Vocal slits present. Head wide (HW/SV = 0.39), wider than long (HL/HW = 0.87), with vertical loreal region; upper lip slightly inflated; canthus rounded, strongly concave when viewed from above; nostrils directed laterally, closer to tip of snout than to eyes; internarial distance much larger than distance from naris to eye (EN/IN = 0.64, IN/SV = 0.099, EN/SV = 0.063); snout acutely angulate and projecting when viewed from side, pointed when viewed from above; eyes moderately large (EY/SV = 0.12); eyelid equal to width of interorbital distance; tympanum distinct and large (TY/SV = 0.075), annulus slightly raised. Dorsum and sides pustulose, with dense network of tiny, anastomosing wrinkles covering most of surface; thin raised vertebral ridge extends from tip of snout to urostyle; additional low, elongate dermal ridges between eyes and in suprascapular region. Ventral surfaces finely granular. Fingers unwebbed, bearing discs with shallow terminal grooves; relative lengths 3>2>4>1. Finger discs 1.5–2 times wider than penultimate phalanges. Subarticular tubercles well developed, rounded; inner and outer metacarpal tubercles well developed, with large medial metacarpal tubercle between them. Toes unwebbed, bearing discs with terminal grooves; relative lengths 4>3>5>2>1. Toe discs much larger than those of fingers (3rdF/4thT = 0.52); disc of fourth toe 2.5 times width of penultimate phalanx; disc of first toe 1.5 times wider than penultimate phalanx. Subarticular tubercles well developed, rounded; inner metatarsal tubercle a large, prominent oval; outer lacking. Hind legs relatively long (TL/SV = 0.52).

Dorsum brown, heavily stippled and mottled with dark gray-brown, imparting an overall impression of a more-or-less uniformly dark gray-brown animal. Sides same but with a few obscure black blotches; most lateral pustules partially rimmed in black; elongate black blotch in inguinal region, bordered anteriorly by irregular, tiny pale-tan spots. Tympanum light brown, margined above by a narrow black supratympanic bar. Face same

Table 4. Call characteristics for *Hylophorbus proekes*.

Specimen	Call No.	Total Notes	Mean Pulses/Note	Call Duration (s)	Mean Note Duration (s)	Mean Internote Duration (s)	Repetition Rate (notes/s)	Dominant Frequency (Hz)
BPBM								
22761	A	6	2.2	1.30	0.1081	0.1310	4.2	1030
"	B	6	1.8	1.27	0.1052	0.1269	4.3	1030
"	C	7	2.1	1.52	0.1065	0.1286	4.2	1030
"	D	7	2.1	1.55	0.1062	0.1343	4.1	1030
"	E	5	2.2	1.08	0.1064	0.1368	4.1	1030
"	F	6	2.2	1.32	0.1037	0.1392	4.1	1030
"	G	7	2.1	1.53	0.1036	0.1336	4.2	1030
BPBM								
22762	A	7	2.4	1.54	0.1021	0.1380	4.1	990
"	B	7	2.4	1.57	0.0973	0.1473	4.1	990

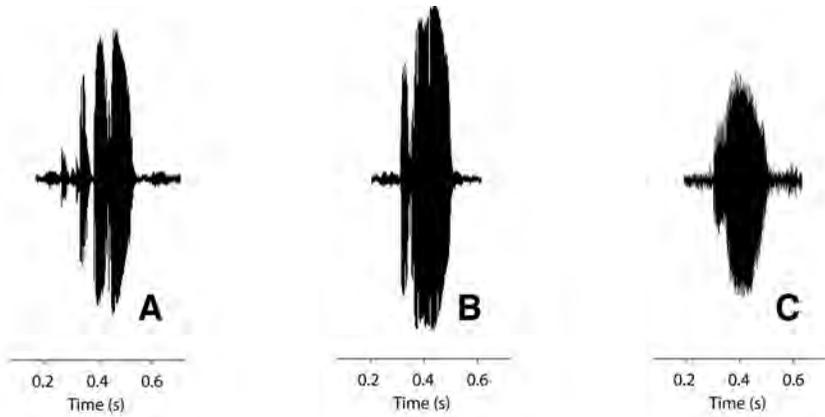


Fig. 4. Waveforms of notes from calls of *Hylophorbus proekes*. (A) Note 1 from BPBM 22762, call A (B) Note 4 from same call (C) Note 4 from BPBM 22761, call B. See Table 4 for additional details. .

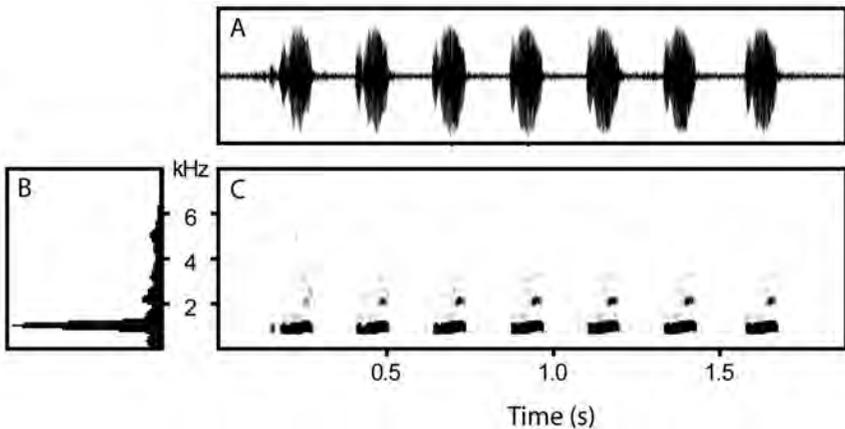


Fig. 5. (A) Waveform, (B) power spectrum, and (C) spectrogram of the complete call of call G (Table 4) of *Hylophorbus proekes* (BPBM 22761) recorded by F. Kraus 3.2 km SSE Mt. Sapau summit, 3.39329° S, 142.52826° E (AGD66), Torricelli Mtns., 550 m, West Sepik Province, Papua New Guinea, at 1920 h, 20 May 2005. Air temperature 23.6 °C

dark gray-brown as dorsum, with a small, slightly darker smudge below eye, but no distinctly differentiated dark subocular blotch. Rear of thighs mostly black, with a few large very pale straw flecks; band of brown proximally; black below vent. Fore of thighs dark brown on ventral half, with three (right) or two (left) large white blotches on dorsal half; similar large white blotch in groin. Venter very pale gray-white heavily flecked with brown throughout, somewhat sparser flecking on posterior abdomen, densest on chest and throat. Palmar and plantar surfaces dark gray-brown. Iris black speckled with silver.

Measurements (in mm).—SV = 33.4, TL = 17.3, HW = 13.1, HL = 11.4, IN = 3.3, EN = 2.1, SN = 4.0, EY = 4.1, TY = 2.5, HandL = 8.7, FootL = 15.5, 3rd F = 0.90, 4th T = 1.73.

Variation. Mensural variation in Table 3. In dorsal aspect, snout varies from angulate ($n = 13$) to gently rounded ($n = 3$) to truncate ($n = 9$). Of the twelve animals with a rounded or truncate snout, seven are immature, suggesting that some of this variation is ontogenetic and that most animals eventually attain an acutely angulate snout. In side view, snout acutely angulate in 19 but somewhat more rounded dorsally in six. Of these six, four are immature, again suggesting that acute angularity is rarely undeveloped in adults. Canthus varies from straight and slightly swollen to highly concave. Most animals not so dark as holotype; color varies from medium brown to sepia to dark gray-brown in preservative. Dorsal pattern typically limited to lateral field of small blotches and flecks, which usually comprise a small series of flecks and arose blotches arrayed more-or-less linearly along dorsolateral surface from scapula to groin; in scapular region this line of flecks dips ventrally to approach arm insertion. One or two specimens have a few obscure brown blotches mid-dorsally; one has bright burnt-orange blotches or flecks on postero-lateral surface of body, dorsal surface of upper arm, above arm insertion, and above rictus. All but one paratype have one or more white blotches in groin; of these, all but two also have one or more white blotches arrayed in a row along anterior face of thigh. Lumbar ocelli reduced and inconspicuous in most animals, and appear moderately developed in about one-third of specimens. Abdomens vary from heavily to sparsely flecked with dark brown, with only two specimens sparsely flecked. Rears of thighs always dark brown but can be sparsely or heavily invaded by light-brown or pale gray-white flecks.

Color in life. BPBM 22760 had plain dark-brown dorsum and sides; light purple-gray venter heavily mottled with dark gray everywhere but posterior abdomen; bright yellow-orange spot in groin, bordered anteriorly by small black blotch; and tan iris. Holotype with two orange spots on anterior face of each thigh as well as an inguinal blotch of the same color. Dorsum of BPBM 22762 dark mud-brown with black spots dorsolaterally, same orange spots in groin and anterior face of thighs as noted for holotype, and light brassy iris. BPBM 22765, brown with small black spots and dark blood-red blotches on sides, shoulders, and forearms; orange spots in groin; two orange spots on anterior face of each thigh; and light gray-brown iris.

Call. The call is a rapid train of 5–7 pulsed, barking notes delivered at intervals of 8–27 s. We recorded nine calls from two individuals (Table 4). Their calls were similar and ranged in duration from 1.08–1.57 s. The first note invariably included 3–4 pulses. This was most pronounced in BPBM 22762 (Fig. 4A). Subsequent notes generally had two pulses (Fig. 4B), but in some cases the notes were unpulsed or had weak, barely discernible pulses (Fig. 4C). The mean number of pulses per note was 2.2 (range 1–4). The mean varied from 1.8–2.2 among the nine recorded calls. The mean duration of notes was 0.1044 s (range 0.0978–0.1370). The first note was generally the longest, with a mean duration of 0.1322 s (range 0.1060–0.1390), compared to a mean duration of 0.0991 s (range 0.0931–0.1125) for subsequent notes. The interval between notes averaged 0.1351 s (range 0.1233–0.1410), producing a mean repetition rate of 4.2 notes/s (range 4.1–4.3). The relatively even spacing of the notes is apparent in the spectrogram (Fig. 5A). The mean dominant frequency was 1020 Hz (range 990–1030) with a tendency for the frequency to increase slightly over the duration of the note (Fig. 5B–C).

Etymology. The name is an unchanging one-ending Greek adjective meaning “pointed in front” in recognition of the species’ most immediately distinctive feature.

Range. Known only from the S slope of Mt. Sapau, Torricelli Mts., West Sepik Province, Papua New Guinea (Fig. 3, filled circle).

Ecological notes. This species was fairly common in primary lowland and lower montane rainforest ranging from 450–1150 m. Most animals came from a forested site on

steep slopes of greasy mud, with a canopy of >30 m and a somewhat open, uncrowded understory. Animals usually called while hidden under leaves, but also called sometimes from exposed sites on the ground. Animals always called at night, beginning soon after dark. They were often difficult to locate due to their habit of calling, relocating a short distance away, then calling again.

Liophryne magnitympanum sp. nov.
(Figs. 1D, 6)

Holotype. BPBM 19358 (field tag FK 8949), adult male, collected by F. Kraus at Siruohu, W slope Mt. Obree, 9.44467°S, 148.00923°E, 1640 m, Central Province, Papua New Guinea, 31 January 2004.

Paratopotypes. BPBM 19368–70, collected 12 February 2004.

Paratypes. BPBM 19359–67, PNGNM 24073–75, W slope Mt. Obree, 9.4574275°S, 148.027702°E, 1800–1840 m, Central Province, Papua New Guinea, 4–7 February 2004.

Diagnosis. A small species of *Liophryne* (male SV = 17.8–26.5 mm, female SV = 26.5 mm) having a large, distinct tympanum (TY/SV = 0.082–0.110); sharp canthus; infrequent single-note boop call; and lacking vocal slits in males.

Comparisons with other species. The new species differs from all other *Liophryne* (6 species) except *L. allisoni* in its small size. It differs from *L. allisoni* in lacking vocal slits and in having a large, distinct tympanum, sharp canthus, and an infrequent single-note call (call a train of rapidly repeated notes in *L. allisoni*). The absence of vocal slits separates this species from all other *Liophryne* except *L. similis* (and possibly *L. rubra*, for which males are not yet known), which, in addition to its larger size, has an advertisement call consisting of a train of rapidly repeated notes.

Description of holotype. An adult male with right-ventrolateral incision. Head wide (HW/SV = 0.44), wider than long (HL/HW = 0.94), with steeply sloped, almost vertical loreal region; canthus rounded, but distinct, straight when viewed from above; nostrils directed laterally, about equidistant between tip of snout and eyes; internarial distance considerably larger than distance from naris to eye (EN/IN = 0.59, IN/SV = 0.14, EN/SV = 0.082); snout gently angulate and projecting when viewed from side, gently angulate when viewed from above; eyes moderately large (EY/SV = 0.13); eyelid approximately 3/4 width of interorbital distance; tympanum distinct and large (TY/SV = 0.11), with a clear annulus. Dorsum with pair of angular dermal ridges in scapular region, mid-vertebral ridge posteriorly, two dorsolateral ridges running from behind eyes to midbody, and numerous shorter ridges dorsally and dorsolaterally. Lateral and ventral surfaces smooth. Fingers unwebbed, bearing discs with terminal grooves; relative lengths 3>4>2>1. Finger discs barely wider than penultimate phalanges. Subarticular tubercles well developed, rounded; inner and outer metacarpal tubercles well developed, with large medial metacarpal tubercle between them. Toes unwebbed, bearing discs with terminal grooves; relative lengths 4>3>5>2>1. Toe discs much larger than those of fingers (3rdF/4thT = 0.58); disc of fourth toe 1.5 times width of penultimate phalanx; disc of first toe slightly wider than penultimate phalanx. Subarticular tubercles well developed, rounded; inner metatarsal tubercle small, oval, well developed; outer lacking. Hind legs moderately long (TL/SV = 0.53).

Dorsum light gray-tan, heavily stippled with small black flecks, with vague inguinal ocelli (Fig. 1D). Top of head same; side of face dark brown; tympanum largely dark

Table 5. Mensural data for type series of *Liophryne magnitypanum*. Data include only adult animals. SV = snout-vent length, TL = tibia length, EY = eye diameter, EN = eye-naris distance, IN = internarial distance, SN = snout length, HW = head width, HL = head length, TY = tympanum diameter, 3rdF = width of third finger disc, 4thT = width of fourth toe disc.

Character	Males (n = 14)		Female (n = 1)
	mean	range	
SV (mm)	23.6	17.1–26.5	26.5
TL/SV	0.52	0.48–0.57	0.50
EN/SV	0.082	0.075–0.099	0.083
IN/SV	0.14	0.13–0.15	0.12
SN/SV	0.16	0.15–0.18	0.15
TY/SV	0.10	0.082–0.11	0.102
EY/SV	0.13	0.12–0.14	0.12
HW/SV	0.43	0.42–0.45	0.40
HL/SV	0.39	0.37–0.42	0.38
3rdF/SV	0.027	0.022–0.029	0.028
4thT/SV	0.046	0.041–0.049	0.050
EN/IN	0.60	0.54–0.66	0.67
3rd F/4th T	0.58	0.50–0.65	0.55
HL/HW	0.91	0.87–0.97	0.94

Table 6. Call characteristics for *Liophryne magnitypanum*.

Specimen		Mean	Mean	Dominant
		Call	Intercall	
		Duration	Duration	Frequency
		(s)	(s)	(Hz)
BPBM 19358	A	0.4967	18.8	1050
"	B	0.5023	18.9	1030
"	C	0.5026	17.7	1050
"	D	0.5141	17.0	1050
"	E	0.5307	16.5	1050
"	F	0.4923	17.7	1050
"	G	0.4914	–	1070
Uncaptured	A	0.4134	12.8	1010
"	B	0.4318	16.6	1030
"	C	0.4180	16.1	1030
"	D	0.4149	18.7	1030
"	E	0.4369	18.2	1010
"	F	0.4399	–	1010

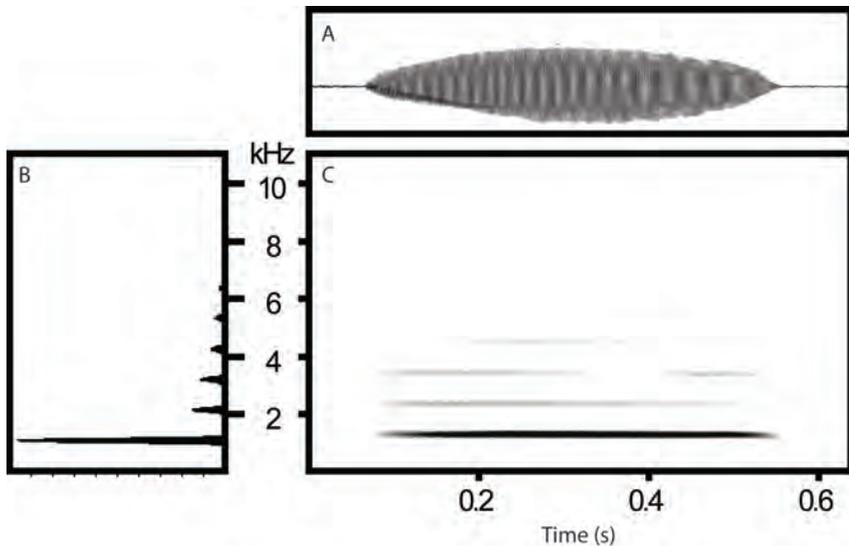


Fig. 6. (A) Waveform, (B) power spectrum, and (C) spectrogram of the complete call of call G (Table 6) of *Liophryne magnitypanum* (BPBM 19358) recorded by F. Kraus at Siruohu, W slope Mt. Obree, 9.44467°S, 148.00923°E, 1640 m, Central Province, Papua New Guinea at 1930 h, 31 January 2004. Air temperature 18.4 °C.

brown. Lateral surfaces same but with more dark flecking; dorsolateral folds subtended by line of denser black flecking; horizontal black band along lower surface of groin. Rear of thighs same as dorsum but heavily mottled with dark brown on posteroventral surfaces; fore of thighs light gray-tan above, with broad dark-brown band on lower half. Venter light straw with anastomosing network of black stippling, densest laterally and on chin and throat, sparsest on abdomen and centers of thighs. Palmar and plantar surfaces light straw heavily maculated with dark brown.

Measurements (in mm).—SV = 23.2, TL = 12.4, HW = 10.1, HL = 9.5, IN = 3.2, EN = 1.9, SN = 3.7, EY = 3.0, TY = 2.6, HandL = 5.5, FootL = 12.1, 3rd F = 0.65, 4th T = 1.13.

Variation. Mensural variation in Table 5. Dorsal color ranges from dark brown to light gray-tan, former about twice as common as latter. Inguinal ocelli vague but present in all. Three smallest animals heavily stippled with black across abdomen, so this may vary ontogenetically.

Color in life. Field notes for holotype (Fig. 1D): “Dorsum tan, stippled with black, with two pale tan lumbar ocelli; face heavily stippled with black. Suprascapular fold pigmented with black below from eye to forearm insertion. Iris dark brown. Chin to chest pearl mottled with gray; belly and under thighs pale yellow, also mottled with gray but less obvious. Black stripe in groin and along anterior face of thigh. Rear of thighs tan with a line of small, fusing black blotches.” BPBM 19360 with entire ventral surface from throat to legs deep, dark yellow, and dark color of face extending down entire side of animal; BPBM 19361, posterior ventral area washed with very pale yellow instead. BPBM 19368 and 19369, dorsum light yellow-brown; BPBM 19370, pink-brown.

Call. Animals emit single-note “boop” calls no more than 3x/min and often only

once every five minutes or so. We recorded 13 calls from two individuals (Table 6). The mean duration of the call note was 0.4681 s (range 0.4134–0.5307). The amplitude (volume) of the call note increases gradually during the first half of the call and then gradually decreases to termination (Fig. 6A). The call note is finely tuned, with a mean dominant frequency of 1040 Hz (range 1010–1070) and well-developed harmonics (Fig. 6B–C).

Etymology. The name is a Latin noun in apposition combining “*magnus*”, meaning “large”, and “*tympanum*”, meaning “drum”. It is in reference to the character most readily separating this species from its closest relative, *L. allisoni*.

Range. Known only from the western slope of Mt. Obree, Central Province, Papua New Guinea (Fig. 3, open triangle).

Ecological notes. Animals were found in primary lower-montane rainforest from 1640–1840 m. They call at night from under leaf litter or from within shallow burrows in the soil or in compacted leaf litter. They were fairly common but could not often be collected because of their cryptic habits. A few animals were found travelling across the ground surface at night.

***Mantophryne axanthogaster* sp. nov.**

(Figs. 1F, 7)

Holotype. BPBM 20411 (field tag FK 9639), adult male, collected by F. Kraus along Gesirava River, W slope Mt. Rio, 11.49179°S, 153.41261°E, 127 m, Sudest Island, Milne Bay Province, Papua New Guinea, 18 April 2004.

Paratopotypes. BPBM 20397–410, PNGNM 24081–84, collected 15–16 April 2004; BPBM 20412–18, collected 18 April 2004; BPBM 20419–21, collected 19 April 2004.

Paratypes. BPBM 20422, near Gesirava River, 11.4913949°S, 153.41667°E, 130–150 m, Sudest Island, 22 April 2004; BPBM 20423, PNGNM 24085, W slope Mt. Rio, 11.50435°S, 153.42957°E, 630 m, Sudest Island, 23 April 2004; BPBM 20424–26, near summit of Mt. Rio, 11.50815°S, 153.43086°E, 730–800 m, Sudest Island, 23 April 2004.

Diagnosis. A medium-sized species of *Mantophryne* (male SV = 40.1–45.9 mm, mean 43.5 mm; female SV = 38.6–51.7 mm, mean 47.8 mm) with modest sexual size dimorphism (mean female mass/mean male mass = 1.3, maximum female mass/maximum male mass = 1.6), relatively narrow head (HW/SV = 0.35–0.40, mean 0.38; HL/HW = 0.87–0.99, mean 0.95), brown dorsum flecked or mottled with dark brown (Fig. 1F), and gray venter lacking bright colors.

Comparisons with other species. *Mantophryne axanthogaster* is readily distinguished from *M. lateralis* and *M. infulata* in lacking a broad black lateral band. It is distinguished from *M. louisidensis* in its smaller size (male SV = 40.3–54.6 mm, mean 47.1 mm; female SV = 73.2–83.6 mm, mean 79.4 mm in *M. louisidensis*), modest sexual size dimorphism (mean female mass/mean male mass = 5.0, maximum female mass/maximum male mass = 4.2 in *M. louisidensis*), narrower head (HW/SV = 0.39–0.48, mean 0.44; HL/HW = 0.72–0.94, mean 0.82 in *M. louisidensis*), dorsum brown obscurely flecked or mottled with dark brown (uniform brown or gray in *M. louisidensis*), and venter light gray mottled with dark gray (bright yellow or orange-yellow in *M. louisidensis*).

Description of holotype. An adult male with mid-ventral incision. Vocal slits present. Head wide (HW/SV = 0.36), wider than long (HL/HW = 0.97), with oblique loreal region; canthus rounded, shallowly concave when viewed from above; nostrils directed laterally, closer to tip of snout than to eyes; internarial distance larger than distance from naris to eye (EN/IN = 0.82, IN/SV = 0.090, EN/SV = 0.074); snout rounded and projecting when viewed

Table 7. Mensural data for type series of *Mantophryne axanthogaster*. Data include only adult animals. SV = snout-vent length, TL = tibia length, EY = eye diameter, EN = eye-naris distance, IN = internarial distance, SN = snout length, HW = head width, HL = head length, TY = tympanum diameter, 3rdF = width of third finger disc, 4thT = width of fourth toe disc.

Character	Males (n = 18)		Females (n = 8)	
	mean	range	mean	range
SV (mm)	43.5	40.1–45.9	48.7	44.1–51.0
TL/SV	0.48	0.45–0.50	0.47	0.45–0.51
EN/SV	0.077	0.070–0.084	0.074	0.069–0.080
IN/SV	0.091	0.085–0.099	0.086	0.078–0.092
SN/SV	0.12	0.11–0.13	0.12	0.11–0.12
TY/SV	0.053	0.048–0.061	0.055	0.047–0.068
EY/SV	0.14	0.13–0.15	0.13	0.13–0.15
HW/SV	0.38	0.35–0.40	0.37	0.36–0.39
HL/SV	0.36	0.34–0.38	0.36	0.35–0.37
3rdF/SV	0.029	0.024–0.033	0.027	0.023–0.030
4thT/SV	0.041	0.037–0.045	0.037	0.034–0.040
EN/IN	0.85	0.79–0.92	0.86	0.77–0.95
3rd F/4th T	0.70	0.59–0.84	0.71	0.63–0.78
HL/HW	0.95	0.91–0.97	0.95	0.93–0.98

from side, almost truncate when viewed from above; eyes moderately large ($EY/SV = 0.15$); eyelid 1.5 times width of interorbital distance; tympanum modest in size ($TY/SV = 0.053$), annulus distinct anteriorly, indistinct posteriorly. Dorsum with faint, scattered dermal pustules. Lateral and ventral surfaces smooth. Fingers unwebbed, bearing discs with shallow terminal grooves; relative lengths $3 > 4 > 2 > 1$. Finger discs barely wider than penultimate phalanges. Subarticular tubercles well developed, rounded; inner and outer metacarpal tubercles well developed, with large medial metacarpal tubercle between them. Toes with rudiment of basal webbing, except between T1 and T2, bearing discs with terminal grooves; relative lengths $4 > 3 > 5 > 2 > 1$. Toe discs larger than those of fingers ($3^{rd}F/4^{th}T = 0.66$); disc of fourth toe twice width of penultimate phalanx; disc of first toe 1.5 times wider than penultimate phalanx. Subarticular tubercles well developed, rounded; inner metatarsal tubercle a large, prominent oval; outer lacking. Hind legs short ($TL/SV = 0.41$).

Dorsal ground color pale straw, heavily suffused with brown stippling, which imparts to animal overall medium-brown appearance; eyelids and tip of snout somewhat darker. Superimposed on this are irregular dark brown flecks and mottling, with a denser array of brown mottling in dorsolateral region and two slightly larger irregular brown blotches in inguinal regions. Some of dark brown mottling is formed into small ocelli surrounding the dermal pustules. Venter pale straw mottled with brown, densest on chin, sparsest on abdomen. Front and rear of thighs pale straw heavily mottled with dark brown, heavier on rear surface; dark brown rim around anus. Iris silver stippled and veined with black.

Measurements (in mm).—SV = 43.3, TL = 20.5, HW = 15.7, HL = 15.2, IN = 3.9, EN = 3.2, SN = 5.3, EY = 6.4, TY = 2.3, HandL = 11.3, FootL = 21.3, 3rdF = 1.10, 4thT = 1.66.

Variation. Mensural variation in Table 7. Dorsal color pattern is remarkably uniform, with minor degrees of variation in strength and density of dark dorsal flecking. Several specimens have a concentration of dark mottling in dorsolateral region, others have it reduced to modest-sized axillary and inguinal blotches, others show no concentration of dark flecking dorsolaterally. Venter range from boldly mottled throughout to hav-

Table 8. Call characteristics for *Mantophryne axanthogaster*.

Specimen	Call No.	Total Notes	Mean Pulses/Note	Call Duration (s)	Mean Note Duration (s)	Mean Internote Duration (s)	Repetition Rate (notes/s)	Dominant Frequency (Hz)
BPBM 20400	A	16	5.1	9.13	0.1296	0.4706	1.7	2060
"	B	15	4.8	8.22	0.1273	0.4507	1.7	2060
"	C	15	5.1	7.71	0.1300	0.4112	1.9	2060
"	D	16	5.5	8.87	0.1293	0.4532	1.7	2060
BPBM 20411	A	13	4.0	6.60	0.1199	0.4197	1.9	2230
"	B	14	3.5	7.65	0.1160	0.4633	1.7	2150
"	C	13	3.2	6.69	0.1164	0.4315	1.8	2230
"	D	13	3.7	6.86	0.1179	0.4439	1.8	2150
"	E	13	3.7	6.84	0.1175	0.4424	1.8	2150
BPBM 20412	A	15	4.5	6.78	0.1307	0.3445	2.1	2150
"	B	17	4.8	7.64	0.1329	0.3364	2.1	2150
"	C	18	5.0	8.95	0.1348	0.3836	1.9	2150
"	D	17	4.9	8.68	0.1310	0.4030	1.9	2150

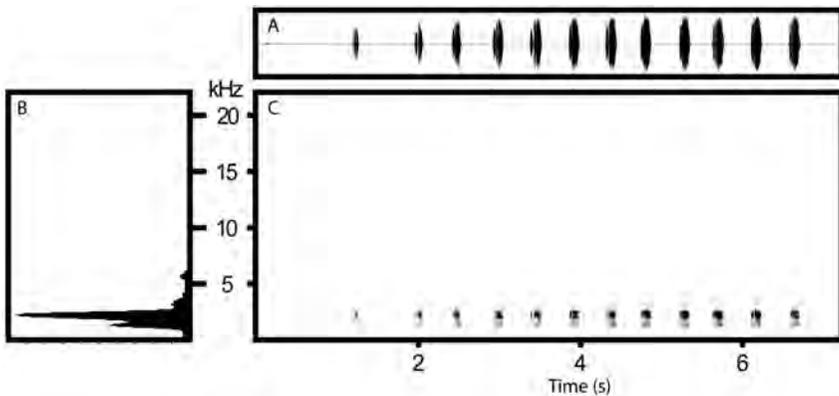


Fig. 7. (A) Waveform, (B) power spectrum, and (C) spectrogram of the complete call of call G (Table 8) of *Mantophryne axanthogaster* (BPBM 20411) recorded by F. Kraus along the Gesirava River, W slope Mt. Rio, 11.49179°S, 153.41261°E, 127 m, Sudest Island, Milne Bay Province, Papua New Guinea at 1840 h, 18 April 2004. Air temperature 26.5 °C.

ing abdomen largely clear; most are similar to holotype. Brown mottling on rear of thighs varies from medium to dark brown. A few specimens have the dark axillary blotches margined above with an obscure pale straw border.

Color in life. BPBM 20397: “Dorsum brown, obscurely mottled and flecked with dark brown. Iris brassy brown. Venter light gray mottled with dark gray. Rear of thighs dark brown with few pale straw flecks.” Most animals had an orange-brown cast to dorsum.

Call. This species produces a series of loud, barking notes. We recorded 13 calls produced by three individuals (Table 8). The calls had a mean of 15 pulsed notes (range 13–18). The mean number of pulses per note ranged from 3.3 to 5.5 for the 13 calls and averaged 4.4. Calls averaged 7.74 s (range 6.60–9.13) in length. Individual notes averaged 0.1256 s in duration (range 0.1160–0.1348). The interval between notes is several times longer than the duration of the notes, averaging 0.4195 s (range 0.3364–0.4706) and producing a mean repetition rate of 1.8 notes/s (range 1.7–2.1). The first note generally has a low amplitude and short duration; the amplitude increases quickly, reaching maximum amplitude by the third or fourth note of the call (Fig. 7A). The duration of the notes generally increases successively over the course of the call. The notes are fairly finely tuned, with a mean dominant frequency of 2135 Hz (range 2060–2230) and no significant frequency modulation (Fig. 7B–C).

Etymology. The name is an unchanging one-ending adjective formed by combining the Greek terms “α-“ for “without”, “ξανθισ” for yellow, and “γαστερ” for “belly. It recognizes one of the most distinctive features of the species *vis a vis* *M. louisiadensis*, with which it was formerly included.

Range. Known only from Sudest Island, Louisiade Islands, Milne Bay Province, Papua New Guinea (Fig. 3, filled triangle).

Ecological notes. This species was abundant from primary lowland rainforest at 100 m to cloud forest at the top of Mt. Rio (800 m). It seemed to be more common in the immediate vicinity of streams. Animals called from exposed sites on the ground, often next to small piles of leaf litter. They usually called at night, but would occasionally call on rainy days too.

Remarks. This species was included within *Phrynomantis* (now *Mantophryne*) *louisiadensis* by Zweifel (1972), who noted and discussed the size and relative tibia differences that help diagnose the new species, but he had only a small sample of specimens from Sudest Island. It would be difficult to mistake the two species in life.

The mensural differences between *Mantophryne axanthogaster* and *M. louisiadensis* compared above are even greater if one restricts comparison between the two to the same sex. For example, for males, HL/HW = 0.91–0.97, mean 0.95 in *M. axanthogaster* and 0.72–0.89, mean 0.81 in *M. louisiadensis*; while for females the same values are 0.87–0.99, mean 0.95 in *M. axanthogaster* and 0.77–0.86, mean 0.81 in *M. louisiadensis*. For males, HW/SV = 0.35–0.40, mean 0.38 in *M. axanthogaster* and 0.40–0.47, mean 0.43 in *M. louisiadensis*. Corresponding values for females are 0.36–0.40, mean 0.38 in *M. axanthogaster* and 0.43–0.48, mean 0.45 in *M. louisiadensis*. Similarly, for males TL/SV = 0.39–0.44, mean 0.42 in *M. axanthogaster* and 0.45–0.51, mean 0.48 in *M. louisiadensis*; while for females the same values are 0.40–0.44, mean 0.42 in *M. axanthogaster* and 0.48–0.53, mean 0.50 in *M. louisiadensis*.

Hylidae

Litoria eschata sp. nov.

(Figs. 1E, 8)

Holotype. BPBM 20654 (field tag FK 10097), adult male, collected by F. Kraus S slope Mt. Rossel, 11.35552°S, 154.22459°E, 720 m, Rossel Island, Milne Bay Province, Papua New Guinea, 3 May 2004.

Paratopotypes. BPBM 20655–57, collected 5 May 2004.

Paratypes. BPBM 20658–60, along Rupu River, 11.33537°S, 154.22470°E, 280 m, Rossel Island, Milne Bay Province, Papua New Guinea, 12 May 2004; BPBM 20661–81, PNGNM 24076–80, Wupu River, 11.33805°S, 154.22385°E, 280 m, Rossel Island, Milne Bay Province, Papua New Guinea, 12 May 2004.

Referred specimens. AMNH 60107–09, Abaleti, Milne Bay Province, Papua New Guinea; AMNH 60012, Joe's Landing, Sudest Island, Milne Bay Province, Papua New Guinea.

Diagnosis. A medium-sized species of *Litoria* (male SV = 36.2–42.3 mm, mean 39.0 mm; female SV = 44.5–48.7 mm, mean 45.8 mm) having almost fully webbed hands, white bones, uniformly green dorsum (Fig. 1E), yellow venter, caramel-brown hidden surfaces of thighs, and a single-note advertisement call with a dominant frequency of 2230–2490 Hz.

Comparisons with other species. The only other Papuan *Litoria* (87 species) with fully webbed hands and a uniformly green dorsum are *L. graminea*, *L. dux*, *L. sauroni*, *L. huntorum*, *L. multiplica*, and *L. aruensis*. The first four are much larger frogs, *L. multiplica* has deep blue or violet spots on the lateral and/or ventral surfaces, and *L. aruensis* has green bones.

Litoria eschata has been included (as *Litoria* sp. indet.) in the *L. gracilentia* species group (Menzies & Tyler, 2004), which they diagnose as having a light canthal stripe. In addition to *L. aruensis*, discussed above, this group includes the species *L. auae*, *L. kumae*, and *L. elkeae*. However, in none of our specimens is such a stripe evident (cf. Fig. 1E). This absence may serve as a diagnostic difference with the other members of this group, although this feature can be difficult to detect in preserved specimens, so we accept this conclusion only tentatively. In overall appearance *Litoria eschata* certainly seems to belong to this group but it differs from *L. auae*, *L. kumae*, and *L. elkeae* in having more webbing on the hand (hands half webbed in those three species) and in apparently lacking the light canthal stripe. *Litoria eschata* can be further distinguished from *L. kumae* by its larger size (male

SV = 24.3–30.0 mm, mean 27.2 mm; female SV = 24.8–33.6 mm, mean 29.8 mm in *L. kumae*), in having rear of thighs caramel-brown (orange in *L. kumae*), and the lower dominant frequency of its call (2660–3240 Hz in *L. kumae*); from *L. auae* by its larger size (male SV = 27.1–36.2 mm, mean 32.6 mm; female SV = 38.1–41.9 mm, mean 40.2 mm in *L. auae*), lack of scattered pale yellow spots on dorsum (frequent in *L. auae*), having rear of thighs caramel-brown (golden yellow in *L. auae*), and the lower dominant frequency of its call (2600–3100 Hz in *L. kumae*); and from *L. elkeae* by its larger size (male SV = 25.5–30.4 mm, mean 29.2 mm; female SV = 33.8–36.0 mm, mean 35.0 mm in *L. elkeae*), lack of scattered pale yellow spots on dorsum (frequent in *L. elkeae*), having rear of thighs caramel-brown (yellow in *L. elkeae*), and in having a single-note advertisement call (double-note in *L. elkeae*). *Litoria eschata* also has a more rounded canthus than does *L. auae*, and this may also serve to distinguish it from other members of the *L. gracilentia* group.

Description of holotype. An adult male with short anterior incision on right side. Head moderately wide (HW/SV = 0.37), shorter than wide (HL/SV = 0.36, HL/HW = 0.98); loreal region oblique; canthus concave, rounded; nostrils closer to tip of snout than to eyes; internarial distance less than distance from external naris to eye (EN/IN = 1.2, IN/SV = 0.091, EN/SV = 0.12); snout truncate when viewed from side, broadly rounded when viewed from above; eyes moderate (EY/SV = 0.12), not especially protuberant, eyelid not as wide as interorbital distance; tympanic ring distinct but top margin just covered by supratympanic skin fold, horizontal diameter greater than half width of eye (TY/EY = 0.71).

Skin of dorsal surfaces finely granular; ventral surfaces of body and thighs coarsely granular, finer on chest and under arms, smooth under shanks. Weak white glandular ridge along outer margin of each forearm. Well-developed yellow glandular ridge along inner margin of each tarsus. Peritoneum white.

Fingers almost fully webbed, formula $\text{I}2.5\text{--}2.5\text{III}1\text{--}2\text{III}1.5\text{--}1\text{IV}$; relative lengths $3 > 4 > 2 > 1$; tips flattened into discs bearing circum-marginal grooves; discs 1.5 times wider than penultimate phalanges; single rounded subarticular tubercle present at base of each penultimate phalanx; low inner metacarpal tubercle present, outer absent; F1 with nuptial pad of brown dermal asperities extending from wrist to base of penultimate phalanx, covering posterior two-thirds of dorsal side of F1. Toes well-webbed, formula $\text{II}1.5\text{--}2\text{III}1\text{--}2\text{III}1\text{--}1.5\text{IV}1.5\text{--}1\text{V}$; relative lengths $4 > 5 > 3 > 2 > 1$; tips flattened into discs with circum-marginal grooves; discs approximately 1.5 times width of penultimate phalanges; inner metatarsal tubercle prominent, outer small and poorly developed. Hind legs moderately long (TL/SV = 0.55).

Vomeropalatines with two patches of teeth (6 on each side) between internal nares. Vocal slits and sac present.

In preservative, dorsal ground color uniform light blue, this limited to a narrow and intermittent mid-dorsal line on upper arms and thighs. Chin latex white, remainder of venter pale orange-yellow. Webbing pale straw dorsally; lateral margins of webbing, and phalanges, stippled with black. Front and rear surfaces of thighs brown. Dusting of white below anus. Iris very pale copper stippled with black; sclera black; upper margin of lower eyelid stippled with black.

Measurements (in mm). – SV = 40.8, TL = 22.5, HW = 15.1, HL = 14.8, IN = 3.7, EN = 4.3, SN = 6.7, EY = 4.9, TY = 2.9.

Variation. Mensural variation in Table 9. Dorsal color of paratypes uniformly light blue in preservative. Brown stippling on rear of thighs reduced in two specimens, making those surfaces appear a pale salmon orange. Dermal ridge along inner margin of tarsus can vary in its development; when developed it is most usually pale straw in color, but five paratypes have the yellow pigment seen in the holotype. Iris pale silver or pale yellow.

Table 9. Mensural data for type series of *Litoria eschata*. Data include only adult animals. SV = snout-vent length, TL = tibia length, EY = eye diameter, EN = eye-naris distance, IN = internarial distance, SN = snout length, HW = head width, HL = head length, TY = tympanum diameter.

Character	Males (n = 29)		Females (n = 4)	
	mean	range	mean	range
SV (mm)	39.0	36.2–42.3	45.8	44.5–48.7
TL/SV	0.56	0.53–0.59	0.56	0.54–0.57
EN/SV	0.10	0.10–0.11	0.10	0.10–0.11
IN/SV	0.092	0.081–0.102	0.091	0.084–0.096
SN/SV	0.16	0.16–0.18	0.17	0.16–0.17
TY/SV	0.060	0.053–0.071	0.064	0.060–0.069
EY/SV	0.12	0.10–0.13	0.11	0.10–0.12
HW/SV	0.37	0.35–0.40	0.37	0.34–0.38
HL/SV	0.34	0.33–0.37	0.34	0.33–0.35
EN/IN	1.1	1.0–1.3	1.2	1.1–1.2
HL/HW	0.92	0.88–0.98	0.94	0.91–0.97

Table 10. Call characteristics for *Litoria eschata*.

Specimen	Call No.	Duration (s)	Total Pulses	Pulse Rate (Pulses/s)	Dominant Frequency (Hz)
BPBM 20658	A	1.63	121	74.2	2410
"	B	1.65	125	75.8	2230
BPBM 20661	A	1.34	97	72.4	2490
"	B	1.43	114	79.7	2490

Color in life. Holotype (Fig. 1E): “Dorsum uniform green-yellow. Fore and aft of thighs caramel brown with a yellow overlay. Venter yellow, especially intense on chin, throat, and laterally. Webbing orange-yellow. Iris pale tan or brass with an orange wash.” BPBM 20655 had dorsum lime green, venter yellow, margins of limbs rimmed in yellow, and iris brass or pale peach. BPBM 20658 had iris orange-yellow and hidden surfaces of thighs caramel brown with yellow around margins. Specimens were apple green at night, changing to yellow-green in daylight (Fig. 1E).

Call. This species produces a single-note, pulsed call. We recorded four calls from two individuals (Table 10). These averaged 1.51 s in duration (range 1.34–1.65). The call begins at a barely audible level and then gradually increases in amplitude to termination (Fig. 8A). The pulses ranged from about 13 to 16 ms in duration, producing a mean rate of 75.5 pulses/s (range 72.4–79.7). The mean dominant frequency was 2405 Hz (range 2230–2490) with no modulation during the course of the call (Fig. 8B–C).

Etymology. The name is a feminine Greek adjective meaning “last”, in reference to the remote range of the species at the extreme southeastern end of Papua New Guinea.

Range. Known only from Rossel and Sudest islands, Louisiade Islands, Milne Bay Province, Papua New Guinea (Fig. 3, open circles).

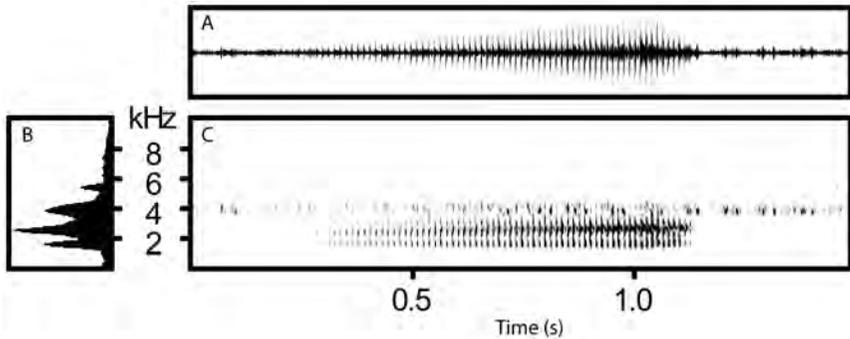


Fig. 8. (A) Waveform, (B) power spectrum, and (C) spectrogram of the complete call of call A (Table 10) of *Litoria eschata* (BPBM 20661) recorded by F. Kraus at Wupu River, 11.33805°S, 154.22385°E, 780 m, Rossel Island, Milne Bay Province, Papua New Guinea, at 0025 h, 12 May 2004. Air temperature 25.3 °C.

Ecological notes. Animals were found in primary lowland rainforest and mid-elevation cloud forest from 280–750 m, being more abundant at lower elevations. They call infrequently at night perched on leaves and limbs 2 m above the ground and higher, clustered around small pools of water collecting in pig wallows and rock depressions.

Remarks. This species was referred to *Litoria aruensis* by Tyler (1968), and was noted to belong to the *L. gracilentia* species group by Tyler & Menzies (2004) but not provided a name by them, pending provision of larger series and call information. Specimens examined by the latter authors include AMNH 60104–10 from Rossel Island and AMNH 60012 (erroneously labelled by them “AMNH 60112”) from Sudest Island. We examined some of these same specimens, listed earlier. We did not include them as paratypes because of absence of information on color in life and because their manner of preservation makes their measurement less reliable compared to the specimens summarized in Table 9. Nonetheless, there is no reason to not regard the entire series as belonging to this species.

Ceratobatrachidae

Platymantis caesiops sp. nov.

(Figs. 1G,H, 9, 10)

Holotype. BPBM 22229 (field tag FK 10742), adult male, collected by F. Kraus 9 km NNW Marmar, Nakanai Mts., 5.4473°S, 151.46307°E, 865 m, New Britain Island, East New Britain Province, Papua New Guinea, 23 February 2005.

Paratopotypes. BPBM 22230, collected 23 February 2005; BPBM 22231–39, PNGNM 24036, collected 24 February 2005; BPBM 22243, collected 25 February 2005; BPBM 22253, PNGNM 24038, collected 27 February 2005; BPBM 22255–58, PNGNM 24041, collected 28 February 2005.

Paratypes. BPBM 22240–42, 9.2 km NNW Marmar, 5.44439°S, 151.46546°E, 800 m, New Britain Island, 24 February 2005; BPBM 22244–46, PNGNM 24037, same data as BPBM 22240–42 but collected 25 February 2005; BPBM 22247–49, 8.8 km NNW Marmar, 5.4483695°S, 151.4671171°E, 940 m, New Britain Island, 25 February 2005; BPBM 22250–52, same data as BPBM 22247–49 but collected 26 February 2005; PNGNM 24039, same data as BPBM 22240–42 but collected 27

Table 11. Comparison in finger disc measurements between *Platymantis caesiops* and *P. browni*. SV = snout-vent length, TY = tympanum diameter, 1stF = width of first finger disc, 2ndF = width of second finger disc, 3rd F = width of third finger disc.

Character	<i>Platymantis caesiops</i>		<i>Platymantis browni</i>	
	mean	range	mean	range
1st F/SV	0.026	0.020–0.031	0.020	0.015–0.026
2nd F/SV	0.049	0.037–0.062	0.031	0.024–0.044
3rdF/SV	0.062	0.053–0.076	0.042	0.019–0.055
1st+2nd+3rd/SV	1.69	1.37–2.19	1.18	0.82–1.82
1st+2nd+3rd/TY	2.64	2.25–3.34	1.80	1.12–2.61

Table 12. Mensural data for type series of *Platymantis caesiops*. Data include only adult animals. SV = snout-vent length, TL = tibia length, EY = eye diameter, EN = eye-naris distance, IN = internarial distance, SN = snout length, HW = head width, HL = head length, TY = tympanum diameter, 1stF = width of first finger disc, 2ndF = width of second finger disc, 3rdF = width of third finger disc, 4thT = width of fourth toe disc.

Character	Males (n = 31)		Females (n = 3)	
	mean	range	mean	range
SV (mm)	21.7	18.8–23.3	24.4	22.4–25.5
TL/SV	0.48	0.45–0.52	0.47	0.46–0.50
EN/SV	0.103	0.094–0.110	0.099	0.095–0.103
IN/SV	0.097	0.089–0.106	0.094	0.087–0.098
SN/SV	0.16	0.15–0.17	0.16	0.15–0.17
TY/SV	0.068	0.058–0.079	0.063	0.063
EY/SV	0.15	0.14–0.17	0.16	0.15–0.16
HW/SV	0.40	0.38–0.43	0.39	0.36–0.40
HL/SV	0.38	0.36–0.41	0.37	0.36–0.38
1st F/SV	0.026	0.020–0.031	0.031	0.030–0.031
2nd F/SV	0.049	0.037–0.062	0.053	0.052–0.053
3rdF/SV	0.062	0.053–0.076	0.064	0.062–0.066
4thT/SV	0.038	0.030–0.049	0.039	0.037–0.040
EN/IN	1.06	1.00–1.16	1.05	1.00–1.09
3rd F/4th T	1.62	1.43–2.14	1.64	1.56–1.78
HL/HW	0.96	0.91–1.01	0.96	0.94–0.98

February 2005; BPBM 22254, PNGNM 24040, 11.3 km NNW Marmar, 5.42868°S, 151.45654°E, 850 m, New Britain Island, 28 February 2005.

Diagnosis. A small species of *Platymantis* (male SV = 18.8–23.3 mm, female SV = 22.4–25.5) having widely expanded finger discs (3rd F/SV = 0.053–0.076) larger than those of toes (3rd F/4th T = 1.43–2.14), rather narrow snout (EN/IN = 1.00–1.16), small rounded pustules on dorsal skin, basal webbing between toes, red-orange in groin and on hidden surfaces of thighs (Fig. 1G), no dark loreal stripe, gray-blue iris (Fig. 1G, H), and call consisting of a variable series of clicks and buzzes.

Comparisons with other species. The new species differs from all Papuan members of the genus (32 species) except the arboreal/semi-arboreal species *P. browni*, *P. guppyi*, *P. macrosceles*, *P. mamusiorum*, *P. nakanaiorum*, *P. neckeri*, and *P. nexipus* in having expanded finger discs, which are larger than the toe discs. Juvenile *P. boulengeri* can also have this fea-

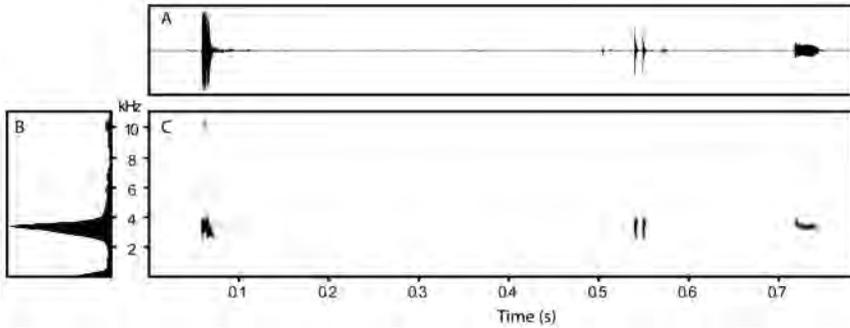


Fig. 9. (A) Waveform, (B) power spectrum, and (C) spectrogram of a complete call from *Platymantis caesiops* (BPBM 22230) recorded by F. Kraus at 9 km NNW Marmar, Nakanai Mts., 5.4473°S, 151.46307°E, 865 m, New Britain Island, East New Britain Province, Papua New Guinea, at 2220 h, 23 February 2005. Air temperature 21.0 °C.

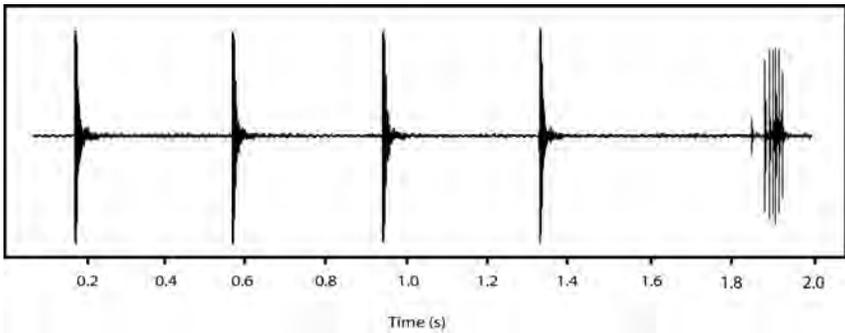


Fig. 10. Waveform of a complete call from *Platymantis caesiops* (BPBM 22230) containing only clicks and a terminal buzz. Recorded by F. Kraus at 9 km NNW Marmar, Nakanai Mts., 5.4473°S, 151.46307°E, 865 m, New Britain Island, East New Britain Province, Papua New Guinea, at 2220 h, 23 February 2005. Air temperature 21.0 °C.

ture, but in that species 3rd F/SV is never greater than 0.039 and 3rd F/4th T is never greater than 1.07, while in *P. caesiops* they are never smaller than 0.053 and 1.43, respectively. Furthermore, *P. Boulengeri* has a black face and a fan-shaped array of dorsal ridges, both lacking in *P. caesiops*. *P. caesiops* differs from *P. guppyi*, *P. neckeri*, and *P. nexipus* in its much smaller size (male SV = 44.5–63.4 mm in *P. guppyi*, 38.6–43.3 mm in *P. neckeri*, 35.4–44.7 mm in *P. nexipus*, but 18.8–23.3 mm in *P. caesiops*). It differs from *P. macrosceles* in its shorter, rounded snout (protuberant, pointed, and with a sharp canthus in *P. macrosceles*); dorsal skin with low, rounded pustules (with well-developed, pointed asperities in *P. macrosceles*); and brown color (bright green, often with light brown blotches in *P. macrosceles*). It differs from *P. nakanaiorum* in the presence (vs. absence in *P. nakanaiorum*) of basal webbing between the toes, its smaller size (male SV = 34.2–35.8 mm in *P. nakanaiorum*), and call consisting of a series of clicks and buzzes (bell-like call in *P. nakanaiorum*). It differs from *P. mamusiorum* in its smaller size (male SV = 27.4–30.7 mm in *P. mamusiorum*), broader snout (EN/IN = 1.50 in *P. mamusiorum*), presence of basal web-

bing between all toes (vs. vestigial webbing only along T3 and T4 in *P. mamusiorum*), and blotched dorsal color pattern (reticulum of brown lines in *P. mamusiorum*).

Platymantis caesiops is most similar to *P. browni*, from which it differs in its larger finger discs (Table 11), weakly pustulose dorsal skin (with pair of curved dermal ridges behind the eyes in *P. browni*), red-orange flash markings in the groin and hidden surfaces of thighs (brown in *P. browni*), gray-blue iris (bronze in *P. browni*), absence of dark loreal stripe (present in *P. browni*), and details of the call (see below).

Description of holotype. An adult male with right-ventrolateral incision and digestive tract removed. Vocal slits present. Head wide (HW/SV = 0.41), wider than long (HL/HW = 0.96), with oblique, shallowly concave loreal region; canthus rounded, concave when viewed from above; lips somewhat inflated, convex when viewed from above; nostrils small, directed laterally, closer to tip of snout than to eyes; internarial distance equal to distance from naris to eye (EN/IN = 1.00); snout slightly rounded, not projecting, when viewed from side, acutely rounded when viewed from above; eyes large (EY/SV = 0.16); eyelid 3/4 width of interorbital distance; pupil horizontal; tympanum distinct, fairly large (TY/SV = 0.072) but less than half width of eye (TY/EY = 0.45), with a distinct annulus. Supratympanic fold short, poorly defined. Dorsal and lateral surfaces with numerous small pustules; ventral surface granular. Fingers unwebbed, relative lengths 3>4>2>1; tips flattened into wide discs (3rd F/SV = 0.056) bearing terminal grooves, much wider than penultimate phalanges. Subarticular and metacarpal tubercles well-developed, former protuberant. All toes with basal webbing, bearing flattened discs with terminal grooves (4th T/SV = 0.039); relative lengths 4>3>5>2>1. Toe discs smaller than finger discs (3rd F/4th T = 1.45). Subarticular tubercles well-developed, protuberant; inner metatarsal tubercle large and oval, outer small and round; plantar surface lacking small supernumerary tubercles. Hind legs moderately long (TL/SV = 0.49).

Color in preservative.—Dorsum dark brown with large, irregular silver-white blotch on posterior half of back, this containing small dark brown blotches within (Fig. 1H). Vague silver-white smear above each scapula and between eyes; dark brown flecks scattered irregularly elsewhere on dorsum. Sides lighter brown with few dark-brown flecks. Tympanum mostly light brown but with dark brown along upper quarter. Face brown flecked with dark brown and silver-white; small dark-brown blotch along anterior part of canthus. Rear of thighs medium brown with scattered tiny flecks of pale straw; fore of thighs same but with much denser light flecking. Venter medium brown heavily and uniformly covered with tiny silver-white flecks. Palmar and plantar surfaces brown; discs and subarticular tubercles translucent light gray. Iris black heavily covered with tiny brass flecks.

Measurements (in mm).—SV = 20.7, TL = 10.2, HW = 8.4, HL = 8.1, IN = 2.2, EN = 2.2, SN = 3.4, EY = 3.3, TY = 1.5, 3rd F = 1.16, 4th T = 0.80.

Variation. Mensural variation in Table 12. Dorsal color varies from tan to dark brown. Some indication of blotching usually present, most often as a mid-dorsal dark blotch running from eyes to sacral region (Fig. 1G), but one paratype with a mid-dorsal tan blotch on a brown ground. A few specimens have a hint of pale tan dorsolateral striping, but this never distinct. A light interorbital bar is present in 12 specimens, but this varies in intensity. Most venters are like holotype, but a few specimens have light straw ground color heavily and evenly stippled with minute brown punctations. Most have small brown blotch in loreal region, but this never forms a loreal stripe. Rear of thighs of tan specimens light tan stippled with tiny brown punctations. Flecking in iris usually silver.

Color in life. Holotype (Fig. 1H): “Dorsum faintly reddish brown with dark-brown irregular blotching, one large central tan blotch, and tan heels. Iris gray-blue. Venter charcoal gray heavily peppered with minute light gray flecks, rear of thighs same. Dark

orange-red wash in groin, on top half of rear of thighs, and under shanks. Little tan blotching in scapular region and above stylus.” BPBM 22230, brown with no tan blotches; BPBM 22231–33, orange-brown with dark-brown markings (Fig. 1G); PNGNM 20438, yellow-brown; BPBM 22255, dark tan with brown blotches and hint of pale dorsolateral stripes; BPBM 22256, dark brown with ochre dorsolateral stripes and interorbital bar.

Call. The call of *Platymantis caesiops* consists of a variable series of clicks and buzzes. The call is so variable that call parameters can not be summarized tabularly, so we illustrate (Figs. 9, 10) and describe this variation in detail. We recorded two individuals. Individual BPBM 22230 produced 22 calls during a 260-second recording sequence. These included a complex call that had three elements: a harsh click of about 30 ms duration followed 500 ms later by a short, lower-amplitude pulsed buzz; the call terminated 200 ms later in an extended-duration (50 ms) low-amplitude click (Fig. 9A). The overall call has a dominant frequency of about 3400 Hz (Fig. 9B–C). The beginning click has the same dominant frequency but also includes a second peak at about 3010 Hz. The dominant frequency of the middle note is centered within a broad band with a slight peak at 3530 Hz. The final note is finely tuned and drops slightly in frequency from a peak of 3780 Hz at the beginning to 3530 Hz at the end of the note.

Only three calls (14%) in the recording of BPBM 22230 had all three elements. Half the calls (11) included a single click or a series of 2–4 slow clicks with a repetition rate of 2.6/s followed by the buzz (Fig. 10). Three calls consisted only of a series of 3–5 clicks, two calls included only the buzz, one call lacked the buzz but included the initial and terminal elements, and one call included only the terminal element.

The call of BPBM 22241 was less variable. It produced 13 calls in a 150-second recorded sequence. Seven (54%) consisted only of 1–4 clicks with a repetition rate of 3.08/s, four (31%) included only the buzz followed at a ~150 ms interval by a very low-amplitude termination note, one included only the buzz, and one included only a single click followed by the buzz. These call types are all represented in the sequence recorded for BPBM 22230.

The call is similar to that of *Platymantis browni* but with a number of consistent differences. Allison & Kraus (2001) analyzed four recordings of *Platymantis browni* from the type locality in New Ireland and reported that it too produced a variable series of clicks and buzzes. A complete sequence is shown in Figure 4F in Allison & Kraus (2001). That call includes three elements: a rapid series of clicks with a repetition rate of 55/s, followed at a ~100 ms interval by a single, lower-amplitude and higher-frequency pulsed note that was described as a buzz, and terminating immediately in a long, unpulsed note that imparts a slight upslurred quality to the buzz.

In contrast, the *Platymantis caesiops* call sequence of BPBM 22230 (Fig. 9A) includes only one click in the first element (as opposed to up four rapid clicks in *P. browni*). There is a ~500 ms interval between the first elements and the middle element in *P. caesiops* (vs 100 ms in *P. browni*), and there is a 200-ms interval between the middle and terminal elements in *P. caesiops* (vs. no interval in *P. browni*).

Although BPBM 22241 produced a more limited calling repertoire, its calls consistently differed from those of *P. browni* in having a slow repetition rate between clicks (vs. fast in *P. browni*) and in having an interval between the buzz and the terminal note (vs. no interval in *P. browni*).

Both species sometimes produce calls that consist only of single clicks, but such calls are relatively rare in *P. caesiops*. Although the new species commonly produces calls consisting only of clicks, most (80%) of those calls consist of a rapid series of 2–5 clicks, sometimes with the final pulsed note (Fig. 10). *Platymantis browni*, in contrast, common-

ly produces single-click calls at 2- to 3-second intervals, interspersed with other calls (e.g., Figure 4A in Allison & Kraus [2001]). However, in call sequences that include all three elements, the first element in calls of *P. caesiops* consists only of a single click. This element consists of a rapid series of clicks in calls of *P. browni* that include all three elements. *Platymantis browni* also commonly produces a call consisting only of the buzz; *P. caesiops* rarely does this.

Our studies of call variation in *Platymantis caesiops* and *P. browni* are continuing, but current evidence suggests that both species possess the same three, presumably homologous, call elements. They differ in the repetition rates of clicks, the length of the interval between call elements, the number of notes or pulses in the initial two elements, and in the relative amplitudes of all elements.

Etymology. The name is an unchanging one-ending Greek adjective meaning “possessing a gray-blue eye”.

Range. Known only from the vicinity of Jacquinot Bay, New Britain, East New Britain Province, Papua New Guinea (Fig. 3, star). Likely to range widely across New Britain at moderate elevations.

Ecological notes. This species was abundant in primary and advanced secondary rainforest from 800–950 m elevation, being found in ravine bottoms, on slopes, and on the top of the plateau. Animals called from hidden locations, frequently from hanging dead leaves, 1–2.5 m above ground level. Calling began before sundown and extended throughout much of the night.

Remarks. This species is clearly closely related to *Platymantis browni* from nearby New Ireland, but differs in a number of morphological, color-pattern, and call characteristics. Previous reference to *P. browni* occurring on New Britain based on a report by S. Richards (Allison & Kraus, 2001) probably refers to the new species and needs to be re-evaluated.

Platymantis manus sp. nov.

(Fig. 11)

Holotype. MCZ 87512, adult male, collected by F. Parker at Lorengau, Manus Island, Manus Province, Papua New Guinea, 4 April 1973.

Paratopotype. MCZ 87513, adult male, same data as holotype.

Diagnosis. A small species of *Platymantis* (male SV = 28.8–30.3 mm) having expanded finger discs ($3^{\text{rd}} \text{ F/SV} = 0.048\text{--}0.054$) larger than those of toes ($3^{\text{rd}} \text{ F/4}^{\text{th}} \text{ T} = 1.32\text{--}1.68$), almost vertical lores, narrow snout ($\text{IN/SV} = 0.096\text{--}0.097$, $\text{EN/IN} = 1.04\text{--}1.10$), smooth dorsal skin, basal webbing between the toes, and dorsum with brown mottling/freckling on a straw ground color (Fig. 11A).

Comparisons with other species. The new species differs from all Papuan members of the genus (33 species) except the arboreal/semi-arboreal species *P. browni*, *P. caesiops*, *P. guppyi*, *P. macroseles*, *P. manusiorum*, *P. nakanaiorum*, *P. neckeri*, and *P. nexipus* in having expanded finger discs, which are larger than the toe discs. Juvenile *P. boulengeri* can also have this feature, but in that species $3^{\text{rd}} \text{ F/SV}$ is never greater than 0.039 and $3^{\text{rd}} \text{ F/4}^{\text{th}} \text{ T}$ is never greater than 1.07, while in *P. manus* they are 0.048–0.054 and 1.32–1.68, respectively. Furthermore, *P. boulengeri* has a black face and a fan-shaped array of dorsal ridges, both lacking in *P. manus*. *P. manus* differs from *P. guppyi*, *P. neckeri*, and *P. nexipus* in its much smaller size (male SV = 44.5–63.4 mm in *P. guppyi*, 38.6–43.3 mm in *P. neckeri*, 35.4–44.7 mm in *P. nexipus*, but 28.8–30.3 mm in *P. manus*). It differs from *P.*

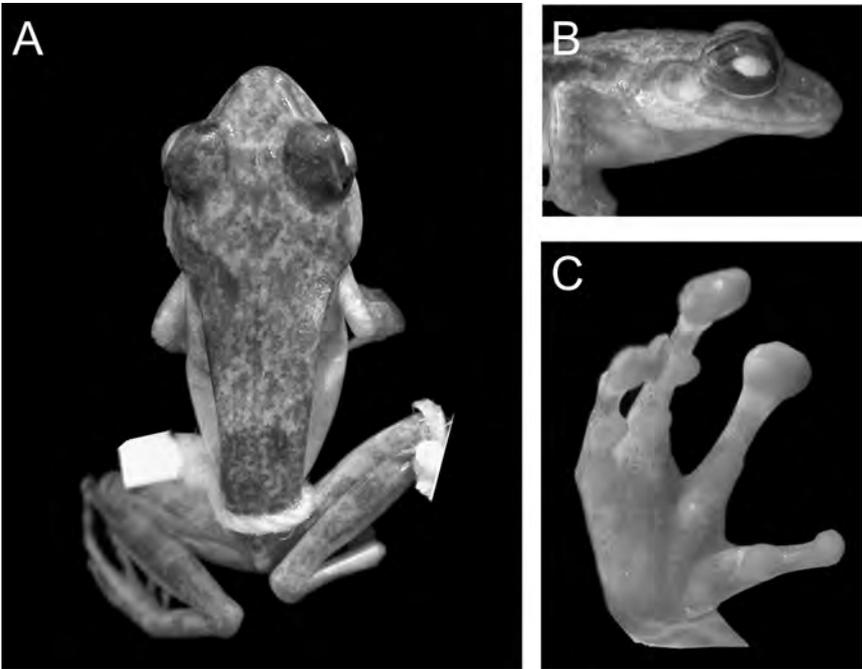


Fig. 11. (A) Dorsum, (B) side of head, and (C) palmar view of hand of holotype (MCZ 87512) of *Platymantis manus*.

macroscelus in its shorter, rounded snout (protuberant, pointed, and with a sharp canthus in *P. macroscelus*); smooth dorsal skin (with well-developed, pointed asperities in *P. macroscelus*); and brown color (bright green, often with light brown blotches in *P. macroscelus*). It differs from *P. nakanaiorum* in the presence (vs. absence in *P. nakanaiorum*) of basal webbing between the toes, its smaller size (male SV = 34.2–35.8 mm in *P. nakanaiorum*), and brown mottling/freckling on a light ground (uniformly colored or blotched in *P. nakanaiorum*). It differs from *P. mamusiorum* in its broader snout (EN/IN = 1.50 in *P. mamusiorum*), almost vertical lores (vs. gently sloping in *P. mamusiorum*), and presence of basal webbing between all toes (vs. vestigial webbing only along T3 and T4 in *P. mamusiorum*).

Platymantis manus appears most similar to *P. browni* and *P. caesiops* sp. nov. It differs from *P. browni* in its narrower and more pointed snout (IN/SV = 0.094–0.123 in *P. browni*), vertical lores (oblique in *P. browni*), wider finger discs (3rd F/SV = 0.019–0.049 in *P. browni*), larger size (male SV = 17.3–23.4 mm in *P. browni*), smooth skin (vs. having a pair of curved dermal ridges extending from eye to shoulder in *P. browni*), somewhat more extensive toe webbing, and freckled/mottled dorsal pattern (blotched in *P. browni*). It differs from *P. caesiops* sp. nov. in its larger size (male SV = 18.8–23.3 mm in *P. caesiops*), narrower and more pointed snout, vertical lores (oblique in *P. caesiops*), smooth skin (with low pustules in *P. caesiops*), and freckled/mottled dorsal pattern (blotched in *P. caesiops*).

Description of holotype. An adult male with left-lateral incision. Vocal slits present. Head wide (HW/SV = 0.39), wider than long (HL/HW = 0.96), with vertical loreal region and flared lip; canthus rounded, straight when viewed from above (Fig. 11A); nostrils small, directed laterally, much closer to tip of snout than to eyes; internarial distance less than distance from naris to eye (EN/IN = 1.04); snout rounded when viewed from side (Fig. 11B), acutely rounded when viewed from above; eyes large (EY/SV = 0.15); eyelid almost equal to width of interorbital distance; pupil horizontal; tympanum distinct, fairly large (TY/SV = 0.080) but only approximately half width of eye (TY/EY = 0.53), with distinct annulus (Fig. 11B). Supratympanic fold short, poorly defined. Dorsal, lateral, and ventral surfaces smooth. Fingers unwebbed (Fig. 11C), relative lengths $3 > 4 > 2 > 1$; tips flattened into wide discs (3^{rd} F/SV = 0.054) bearing terminal grooves, much wider than penultimate phalanges. Subarticular and metacarpal tubercles well-developed. Right foot missing, healed over; apparently result of old injury or metamorphic defect. All toes with basal webbing, bearing flattened discs with terminal grooves (4^{th} T/SV = 0.032); relative lengths $4 > 3 > 5 > 2 > 1$. Toe discs smaller than finger discs (3^{rd} F/ 4^{th} T = 1.68). Subarticular tubercles well-developed; inner metatarsal tubercle large and oval, outer small and oval; plantar surface lacking small supernumerary tubercles. Hind legs moderately long (TL/SV = 0.48).

Color in preservative. —Dorsal ground color dark straw heavily mottled/freckled with medium brown; eyelids darker, almost black. Tops of limbs barred (legs) or blotched (arms) with medium brown. Loreal region brown; light straw mottled with brown on upper lip and face. Sides light straw minutely stippled with black and dark brown, stippling denser dorsally and becoming sparser ventrally, imparting an overall two-toned effect of a dark dorsum and light sides/venter. Rear of thighs light straw with heavy black stippling. Brown blotch covers upper third of each tympanum; remainder light straw. Venter light straw with scattered minute black stippling. Palmar and plantar surfaces heavily stippled with minute brown punctations.

Measurements (in mm).—SV = 28.8, TL = 13.8, HW = 11.3, HL = 10.9, IN = 2.8, EN = 2.9, SN = 4.8, EY = 4.3, TY = 2.3, 3^{rd} F = 1.55, 4^{th} T = 0.92.

Variation. The paratype is slightly larger (SV = 30.3 mm) and clearly has granular skin on the abdomen. Variation from holotype in proportions negligible, greatest difference being in disc widths (3^{rd} F/SV = 0.048, 4^{th} T/SV = 0.036, 3^{rd} F/ 4^{th} T = 1.32). In color, it differs from holotype in being light brown above mottled with fewer dark-brown blotches. Light-straw vertebral stripe extends from sacrum to snout tip, crossed by interocular bar of same color. Sides mottled with darker brown, not giving two-toned impression. Venter light straw mottled with brown.

Etymology. The name is a noun in apposition; it refers both to the island from which the species is derived as well as to the Latin word for “hand”, in reference to the conspicuous appearance that the enlarged discs endow to that appendage.

Range. Known only from Manus Island, Admiralty Islands, Manus Province, Papua New Guinea (Fig. 3, diamond).

DISCUSSION

The new species described in this report bring the number of Papuan frog species described since 2000 to 126 and the overall total number of species to 385. We have descriptions of another ten species in press. It is clear from these recent descriptions (and mirrored by a quick perusal of Fig. 3) that new species are being found throughout New Guinea and its satellite islands and are not confined to any one particular region. Based on our recent surveys of approximately 20 sites scattered across Papua New Guinea, we

have found new species of frogs at virtually all locations, including areas close to the largest cities of the country. It is clear from our experience that the anuran fauna of the Papuan region remains poorly characterized and that the overall total number of species of frogs is likely to exceed 700 and possibly 800.

Importantly, beta diversity (species turnover rates across geographic space) among the Papuan anuran fauna is high, apparently resulting from a high proportion of narrowly endemic species. Approximately 25% of Papuan frogs remain known only from their type localities, and most of the species described in the past decade conform to this pattern. This could, of course, merely be an artifact of currently incomplete sampling of these species' ranges, and some of these species will no doubt prove to have wider distributions with improved collecting effort. But several of the newly described species clearly represent restricted-range species, being known only from satellite islands or ecologically restricted areas of upland habitat. Of the eight frogs described in this paper, three clearly fall into this category, and some of the remainder may do so as well. This brings to at least 128 the number of Papuan frogs with known geographic ranges of 500 km² or less in size. As well, 27 species of frogs are restricted to small satellite islands of New Guinea, although a few of these islands are somewhat larger than 500 km² in size. We have descriptions of another ten such restricted-range species in press and have at least another 25 such frogs awaiting description. This brings to more than 170 the number of endemic Papuan frogs having very limited geographic ranges, and the real number is certainly much larger given the incompleteness of surveys in this region.

What this pattern indicates more generally is that a significant proportion of the Papuan frog fauna may be especially vulnerable to habitat loss, either from direct clearing or from projected climate changes. Recent studies make clear that the rate of forest loss in at least Papua New Guinea is higher than previously estimated (Shearman *et al.*, 2008), and major losses may be occurring in adjacent countries too. Although current climate models do not allow for reliable prediction of fine-scale, local-level changes in climatic parameters, species with restricted ranges—especially those on offshore islands or on montane habitat islands—are likely to be especially threatened by habitat loss attendant upon changing climatic regimes. The Papuan anuran fauna appears to contain a large proportion of species meeting this description. A recent global assessment of amphibian populations demonstrated that approximately one-third of all amphibian species are threatened with extinction (Stuart *et al.*, 2004, 2008), largely through the actions of habitat destruction or spread of chytrid disease. The Papuan frog fauna contributed little to this total, with only 11 species considered at risk (Stuart *et al.*, 2008), although our surveys show three of these species to be common and improperly included in that total. However, based on range-size limitations summarized above, recent patterns of forest loss, and ongoing climate change, we believe the currently small fraction of Papuan frogs at risk to be an unreliable guide to future risk. Status monitoring of these numerous vulnerable species will be a major challenge for future conservation efforts in the region.

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APPENDIX. Specimens Examined

Callulops comptus: Papua New Guinea: Western Highlands Province: Wahgi Divide, 8000 ft (AMNH 65316–18, paratypes).

Callulops humicolus: Papua New Guinea: Eastern Highlands Province: Kotuni, S slope Mt. Otto, 7000–8000 ft (AMNH 66244, 66258–59, 113584, 113682, paratypes), Mt. Michael, 10,800 ft (AMNH 66510, paratype), Daulo Pass (AMNH 76970, paratype).

Callulops robustus: Papua New Guinea: Milne Bay Province: Misima Island (BMNH 1947.2.11.5–7, syntypes), Oya Tau, Misima Island, 320–860 m (BPBM 16806–12, 16814–16).

“*Callulops robustus*”: Indonesia: West Papua Province: Mimika River (BMNH 1947.2.11.8, holotype of *Liophryne kampeni*); Morobe Province: Seperagambang, Sarawaget Range, 1920 m (BPBM 1208–12), Kalalo (BPBM 3687–89), Mindik (BPBM 3690); “German New Guinea” (ZMB 16499, holotype of *Mantophryne microtis*).

Hylophorbus rufescens: Papua New Guinea: Western Province: Katow, Binaturi River (AMS 30826, holotype); Indonesia: West Papua Province: junction of Mosso River and Tami River (RMNH 4631, holotype of *Metopostira macra*).

Liophryne allisoni: Papua New Guinea: Morobe Province: 20–25 km SSE Kaisinik (BPBM 6230, paratype), Mt. Kaindi (BPBM 6358, 9702, paratypes), Mt. Missim (BPBM 6417–18, 8475, 8515, 9374–76, 9379, 9389–90, 9408, 9550, 9554, 9628–32, paratypes; BPBM 9551, 9556–58, 10900–11, 21503–12).

Litoria auae: Papua New Guinea: Chimbu Province: Crater Mountain Research Station, 9.6 km E of Haia, 850–1100 m (BPBM 23554–57), Doido (AMS 114659, 114687, 114702–03), Haia Village (AMS 114730); Gulf Province: Darai Plateau, 15.7 km N and 2 km E of Koumaio Landing Ground, 420 m (BPBM 28226); Southern Highlands Province: Waro (AMS 132372–79); Western Province: Emeti (AMS 66717–18).

Litoria kumae: Papua New Guinea: Southern Highlands Province: Malanda (AMS 132382), Tari (BPBM 1084–88).

Mantophryne louisiadensis: Papua New Guinea: Milne Bay Province: S slope Mt. Rossel, 720–770 m, Rossel Island (BPBM 20142–43, 20145–51, 20429–33), NE slope Mt. Rossel, 280–640 m, Rossel Island (BPBM 20144, 20152–64, 20427–28, 20434–39), Rossel Island (BMNH 1947.2.11.1, holotype).

Platymantis browni: Papua New Guinea: New Ireland Province: Weitin River Valley, 13 km N, 10.5 km W of river mouth, 4.5035°S, 152.93737°E, 240 m (BPBM 11888–91, 11901–03, paratypes), Weitin River Valley, 8 km N, 7 km W of river mouth, 4.55452°S, 152.96375°E, 150 m (BPBM 12019, 12042, 12089–90, 12097–115, 12150, 12187–92, 12195, paratypes), Hans Meyer Range, 4.45342°S, 152.94148°E, 1000–1220 m (BPBM 11954, holotype, 11943–44, 11946, 11955–65, 11973, 11977–83, paratypes).

