A new species of the frog genus *Platymantis* from the mountains of Yapen Island, northern Papua Province, Indonesia (Amphibia: Anura: Ranidae)

RAINER GÜNTHER

Museum für Naturkunde, Humboldt-Universität zu Berlin, Invalidenstr. 43, D-10115 Berlin, Germany. E-mail: rainer.guenther(at)rz.hu-berlin.de

Abstract. A new species of *Platymantis* is described on the basis of recently collected material from a mountain region in the centre of Yapen Island in the north of the Papua Province of Indonesia. The new species is clearly smaller than all hitherto known *Platymantis* from New Guinea and adjacent islands, except *P. cheesmanae*, and has unique advertisement calls for the genus. Besides different calls, a series of morphological traits separate the new species from all other *Platymantis* from the Australopapuan region.

Kurzfassung. Auf der Grundlage neuer Aufsammlungen in den Bergen der Insel Yapen im Norden der indonesischen Provinz Papua wird eine neue Art der Runzelfrösche, Gattung *Platymantis*, beschrieben. Die neue Art hat, ausgenommen *Platymantis cheesmanae*, eine geringere Körpergröße als die anderen *Platymantis*-Arten der Region und außerdem abweichende Paarungsrufe. Außer durch die unterschiedlichen Paarungsrufe lässt sich die neue Art auch durch bestimmte Körperproportionen abgrenzen.

Key words. Amphibia, Anura, Ranidae, *Platymantis,* new species, morphology, ecology, calling behaviour, Papua, New Guinea.

Introduction

The 55 species of the genus *Platymantis* presently known, two-thirds of them described since1960, mainly occur on the Philippines (26 species) and in the Solomon and Bismarck Archipelagos (22 species). Some species inhabit the Moluccas, the Admirality Islands, Fiji and Palau but none have been recorded from Sulawesi or Borneo. Seven species are known from New Guinea and adjacent islands (for references see FROST, 2004 and FOUFOPOULOS & BROWN, 2004). GÜNTHER (1999) anticipated that many more species may be expected on New Guinea with its adjacent islets given the general distribution of the genus *Platymantis* and the tremendous ecological diversity within the Papuan region.
During field work by the author and Papuan colleagues on Yapen Island (Cenderawasih Bay, northern Papua Province, Indonesia) in the years 2002 and 2003 a new *Platymantis* species was detected which will be described herein.

Material and methods

All frogs were collected at night after locating them by their advertisement calls. Some specimens were photographed the next day and all were fixed in 2 % formalin. From some specimens small tissue samples from the thigh muscle were taken and stored in 75 % ethanol in order to enable later DNA sequencing. All the material was transferred to 75 % ethanol in the museum´s collection.
The following measurements were taken with a sliding calliper (> 10 mm) or with a binocular dissecting microscope fitted with an ocular micrometer (< 10 mm) to the nearest 0.1 mm: **SUL** – snout-urostyle length from tip of snout to distal tip of urostyle bone; **TL** – tibia length: external distance between knee and ankle; **TaL** – length of tarsus: external distance, tarsal and ankle joints held at right angles; **T4L** – length of 4th toe: from tip of toe to proximal end of inner metatarsal tubercle; **T4D** – transverse diameter of disc of 4th toe; **T1L** – length of

first toe, distal of the inner metatarsal tubercle; **MTL** – length of the inner metatarsal tubercle; **F3D** – transversal diameter of disc of 3rd finger; **HL** – head length, from tip of snout to posterior margin of tympanum; **HW** – head width, taken in the region of tympana; **SL** – snout length: from an imaginary line connecting centres of eyes to tip of snout; **END** – distance from anterior corner of orbital opening to centre of naris; **IND** – internarial distance between centres of nares; **ED** – eye diameter, from anterior to posterior corner of orbital opening; **TyD** – horizontal diameter of tympanum; **GFD** – distance between glandular folds directly behind eyes.

Advertisement calls were recorded under natural conditions with a Sony Digital Audio Tape (DAT) Walkman TCD-D 100 and a Sennheiser microphone MKE 300 and later analysed with Avisoft-SAS Lab software. All specimens of the new species for the time being are stored in the Museum für Naturkunde Berlin (ZMB) and given registration numbers of this institution. Part of these types will be transferred to the Museum Zoologicum Bogoriense (MZB) at Cibinong after the completion of study.

The holotype (BMNH 1947.2.4.43) as well as seven paratypes (BMNH 1947.2.7.6, 1947.2.7.11, 1947.2.7.12, 1947.2.7.15, 1947.2.17.8, 1947.2.17.10 and 1947.2.17.14) of *Platymantis cheesmanae* from the Natural History Museum London were used for comparative studies. Moreover, the holotype of *Platymantis batantae* from the American Museum of Natural History (AMNH 74192), three specimens of *P. batantae* from the collection of the University of Papua New Guinea (UPNG 8479, 8480 and 8497) and various specimens of *P. papuensis, P. punctatus*. *P. cryptotis* and *P*. *bimaculata* from the ZMB collection were also compared to the new species.

Figs. 3 and 8 are by Vera Heinrich, all others are by the author.

Platymantis wuenscheorum spec. nov. (Figs. 1–7 and Tab. 1)

Holotype. ZMB 67215 (field number=FN 7765), adult male, collected by R. GÜNTHER and M. KAPISA on 7 July 2003 on a ridge of the Amoman Mountain (about 9 km direct line east of the top of the Tamampi) near the road to the Ambaidiru Village, about 17 km direct line NE of Serui, 1°45´S and 136°19´E, altitude 1100 m above sea level, Yapen Island, Papua Province, Indonesia.

Paratypes. ZMB 67214 (FN 7751), ZMB 67216 (FN 7766), ZMB 67217 (FN 7767), ZMB 67218 (FN 7768), ZMB 67219 (FN 7785) and ZMB 67220 (FN 7786). All six paratypes are adult males and collected from 5 to 9 July 2003. Collectors were the same as for the holotype and collection site was about one km around the locus typicus. No females were found.

Diagnosis. With a snout-urostyle-length from 23.2 mm to 26.9 mm in seven adult males, the new species is clearly smaller than all other New Guinean species except *P. cheesmanae*. The latter is even smaller than *P. wuenscheorum* spec. nov., has different head proportions and a much longer inner metatarsal tubercle (callus internus). Ratio MTL/T1L is 0.33–0.41 in the new species but 0.62–0.84 in *P. cheesmanae*. Advertisement calls of *P. wuenscheorum* spec. nov. consist of one to six double clicks and are unique among Papuan *Platymantis*.

Description of the holotype. Measurements are listed in Tab. 1. Snout rounded in profile (Fig. 1a) and slightly acuminate in dorsal view. Canthus rostralis distinct and straight, loreal region concave, nostril closer to end of snout than to anterior margin of eye. Diameter of tympanum nearly half of that of the eye, pupil horizontally oval. Tongue broadens markedly and about half free posteriorly, its posterior margin deeply notched, and with a lingual process on its median anterior surface. Vocal slits were not exposed. Upper jaw with teeth and also well developed vomerine teeth in two oblique series between and behind the choanae. No webs between fingers, subarticular tubercles and three metacarpal tubercles present, in addition a supernumerary tubercle at the base of fingers 2, 3 and 4; tips of fingers slightly dilated

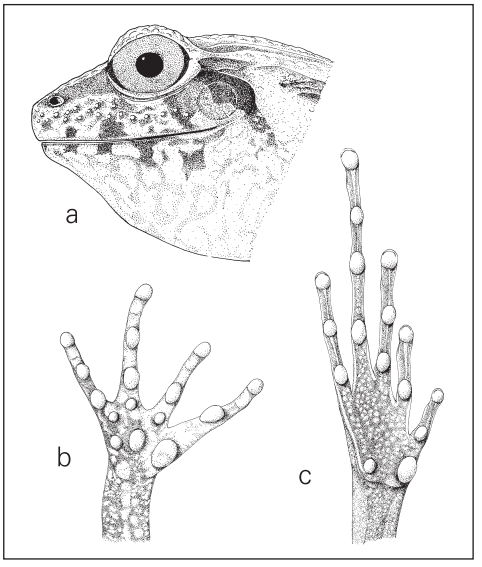


Fig. 1: Holotype of *Platymantis wuenscheorum* spec. nov., (a) lateral view of head, (b) ventral view of right hand, (c) ventral view of right foot.

with traces of circummarginal grooves only, relative length of fingers 3>1>2>4 (Fig. 1b). No webs between toes, relative length of toes 4>3>5>2>1 (Fig. 1c). Toe tips broader than that of fingers and with distinct circummarginal grooves. Subarticular tubercles as well as a larger inner and a smaller outer metatarsal tubercle well expressed, no plantar tubercles. Dorsal surface of head with many tubercles, fewer and smaller tubercles on remainder of dorsum. Conspicuous dorsolateral skin folds, beginning in the shoulder region and extending to the lumbar region and two narrow and elongate paravertebral dermal ridges between dorsolateral folds. Supratympanic folds moderately developed. More tubercles in living than in preserved frogs; other folds, ridges and tubercles also more conspicuous in living frogs. Entire underside of head, body and extremities smooth in the preserved specimen, belly and inferior surface of thighs slightly granular in life.

Figs. 2–3: **2**: Dorsolateral view of the living holotype of *Platymantis wuenscheorum* spec. nov. **3**: Ventral view of the living holotype of *Platymantis wuenscheorum* spec. nov.

Colouration of the preserved holotype. Basic colour of dorsal surface greyish brown, dark brown transversal bands on limbs, a dark brown longitudinal stripe below dorsolateral fold, this is dorsally bordered by a whitish longitudinal stripe. Dark brown spots on anterior flanks, along upper and lower lip and one bent spot from eye through tympanum to anterior insertion of anterior limb, anal region also dark brownish. Posterior surface of thighs finely mottled pale grey and brownish. Ventral side whitish, throat and chest with confluent grey mottling.

Colouration in life. Basic colour of dorsum reddish-brown, paravertebral ridges red-orange, some scattered blackish spots, dark longitudinal stripe inferior to dorsolateral fold less conspicuous than in fixative and inferior posterior limbs as well as inguinal region auburn (Figs. 2 and 3).

Table 1. Measurements and ratios of the holotype (ZMB 67215) and six paratypes of *Platymantis wuenscheorum* spec. nov. Measurements in mm, abbreviations are explained in "Material and methods".

ZMB-No.	67214	67215	67216	67217	67218	67219	67220
SUL	23.2	24.5	24.2	23.7	25.6	26.9	23.7
TL	12.2	12.8	11.8	12.3	13.6	14.0	13.4
TaL	7.3	7.7	7.0	6.9	7.9	8.2	7.8
L4T	11.8	12.0	11.8	11.8	13.5	14.3	12.7
T4D	0.7	0.6	0.7	0.7	0.6	0.6	0.6
L1T	2.4	2.5	2.5	2.8	2.8	2.9	2.4
MTL	0.8	0.9	1.0	1.0	1.1	1.2	0.9
F3D	0.6	0.5	0.6	0.7	0.4	0.5	0.4
HL	10.2	10.2	10.3	10.4	10.3	12.0	9.5
HW	11.1	11.2	11.3	11.2	11.8	12.3	10.2
SL	4.1	4.8	4.9	4.7	5.5	5.2	5.0
END	2.8	2.8	2.8	2.9	3.2	3.3	2.8
IND	2.8	2.9	3.0	3.0	3.0	3.0	2.7
ED	3.8	4.0	4.3	4.0	4.0	4.2	3.5
TyD	1.9	1.8	2.0	2.0	1.9	2.4	1.8
GFD	8.1	8.0	8.1	8.0	9.0	9.1	7.9
TL/SUL	0.53	0.52	0.49	0.52	0.53	0.52	0.57
TaL/SUL	0.31	0.31	0.29	0.29	0.31	0.30	0.33
T4D/SUL	0.030	0.024	0.029	0.029	0.31	0.30	0.33
T4D/F3D	1.17	1.20	1.17	1.00	1.50	1.20	1.50
MTL/T1L	0.33	0.36	0.40	0.36	0.39	0.41	0.38
HL/SUL	0.44	0.42	0.43	0.44	0.40	0.45	0.40
HL/HW	0.92	0.91	0.91	0.93	0.87	0.98	0.93
END/IND	1.00	0.97	0.93	0.97	1.07	1.10	1.04
ED/SUL	0.164	0.163	0.178	0.169	0.156	0.156	0.148
TyD/ED	0.50	0.45	0.47	0.50	0.48	0.57	0.51
SL/SUL	0.176	0.196	0.198	0.198	0.215	0.193	0.211
GFD/SUL	0.35	0.33	0.33	0.34	0.35	0.34	0.33

Variation in the paratypes. Variation in absolute measurements and ratios of various body parts is documented in Tabl. 1. Body size of these adult males varied from 23.2 mm to 26.9 mm, mean 24.5 mm, SD 1.3. Skin texture in the preserved specimens less strongly expressed than in living ones. Five specimens exhibit more or less strongly developed dorsolateral folds, these may be interrupted for short distances, especially on the anterior back; all have paravertebral skin ridges which may show broader interruptions, some have additional short dermal ridges on various parts of the dorsum. Tubercles may be numerous (as in ZMB 67217) or missing entirely (ZMB 67220), some tubercles, especially in the head region, are the rule. Ventral surface of head, body and limbs smooth in all paratypes. Some specimens have very small vocal slits near the angles of the mouth others do not exhibit vocal slits at all (while being mature!).

Fig. 4: Paratype of *Platymantis wuenscheorum* spec. nov. (ZMB 67220) with grey dorsal and lateral surface, characteristic black spots on anterior back, between eyes, subcanthal and on anterior flanks and ochre upper arms.

Basic dorsal colouration of the preserved specimens lighter or darker greyish-brown. Upper flanks have the same colour as the dorsal region in five frogs, but one (ZMB 67216) has a lighter dorsum up to the tip of snout. Four specimens have dark brown crossbars on limbs, in two specimens there are only traces of indistinct crossbars. Five specimens exhibit a dark band between eyes which is bordered by a lighter area anteriorly. A dark brown spot from posterior eye margin through upper tympanum to insertion of foreleg in all specimens and a few dark spots in most specimens on anterior back and on anterior flanks. Two specimens have a longitudinal whitish dorsolateral stripe and one (ZMB 67219) has a fine whitish vertebral line from tip of snout to anus and continuing on hind legs up to the fifth toe. One paratype (ZMB 67220) had a very uniformly grey coloured dorsal surface in life, except for two dark spots in the shoulder region, on the anterior flanks and a dark bar between eyes (Fig. 4), in all others dorsal surface with some inconspicuous lighter or darker spots and/or stripes. In all specimens throat more strongly mottled with grey than abdomen, inferior thighs do not show mottling at all in several frogs. Some small dark spots on the inferior insertion of the forelimb, in the region of knee and on upper and lower lips, and dark areas along the inner surface of forearm are conspicuous in most paratypes. Dorsal colour in life varied from pale grey-brown over red-brown to dark grey-brown, colour of dark spots was from brown to blackish, the upper arm was light brown or ochre (Fig. 4). Basic colour of throat, chest and abdomen in the living specimens was whitish, that of inferior limbs flesh-coloured to red-brown. Most frogs showed a red-brown inguinal region in life.

Distribution. All specimens of the new species were encountered in a 50 m broad and one km long strip on the Amoman Mountain around the locus typicus. This area is situated along the road to the village of Ambaidiru at 900 m to 1150 m above sea level.

Fig. 5: Terra typica of *Platymantis wuenscheorum* on the Amoman Mountain in Central Yapen.

Habitat and habits. The original habitat of the new species is certainly primary rainforest, as most specimens were encountered in that habitat type. They stayed directly on soil or on leaf litter under bushes and trees where small hollows were preferred. No specimens were seen climbing on leaves or were hidden under ground. Patches of secondary vegetation which replaced the original rain forest on some places were also inhabited by *P. wuenscheorum* spec. nov., but in lower density (Fig. 5). Frogs called from twilight till at least 10:00 p.m. (the latest I was in their habitat). We counted about 200 calling males within the above mentioned area, calling activities were noted during both wet and dry weather. They shared their habitat with the following other anuran species: One *Platymantis*, one *Choerophryne*, four *Oreophryne*, one *Hylophorbus*, two *Xenorhina*, one *Austrochaperina*, one *Cophixalus* and three *Litoria*.

Vocalisation. The advertisement calls of *Platymantis wuenscheorum* spec. nov. consist of double notes. These have a click-like sound and were uttered as single events or in series up to six. The initial note of a double-click has three or four pulses, the interval between the first pulses is shorter than that between the last pulses (Fig. 6a). The second note is not pulsed at all or only in its second part. There is a weak modulation from higher to lower frequency (Fig. 6b). Dominant frequency of the first part of this note centres around 2.75 kHz (Fig. 7) and that of its second part centres around 2.5 kHz. Internote intervals are shorter than intervals between calls (double-clicks in series). Frequency of the initial click ranges from 1.0 to 3.5 kHz with dominant frequency at 2.75 kHz and a subdominant peak around 1.7 kHz. Mean duration of six calls (one double-click each) was 108 ms, SD 6.2, range 97–115 ms. Mean duration of two double-clicks (n=6) was 361 ms, SD 25.5, range 312–380 ms; mean duration of three double-clicks (n=8) was 535 ms, SD 10.8, range 520–552 ms; mean duration of four double-clicks (n=3) was 779 ms, SD 6.4, range 775–786 ms; mean duration of five double-clicks (n= 7) was 1040 ms, SD 46.4, range 998–1140 ms and one series of six double-clicks lasted 1.3 s. While both note-types started suddenly with a high amplitude, they ceased slowly whereby the end of notes was difficult to determine exactly. In the following measures only the main sound-energy was considered. Mean duration of initial note (n=45) was 33 ms, SD 6.4,

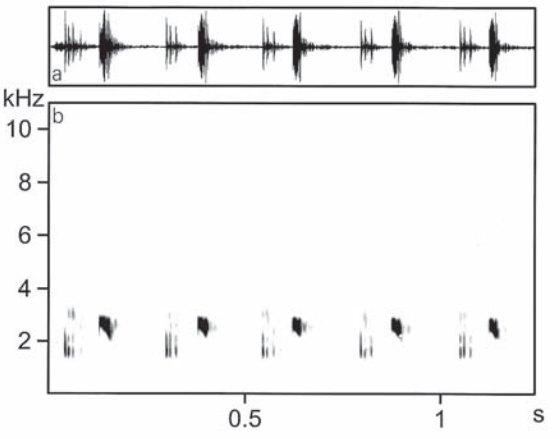


Fig. 6: Advertisement call series of *Platymantis wuenscheorum* spec. nov. consisting of five double clicks, (a) oscillogram, (b) audiospectrogram.

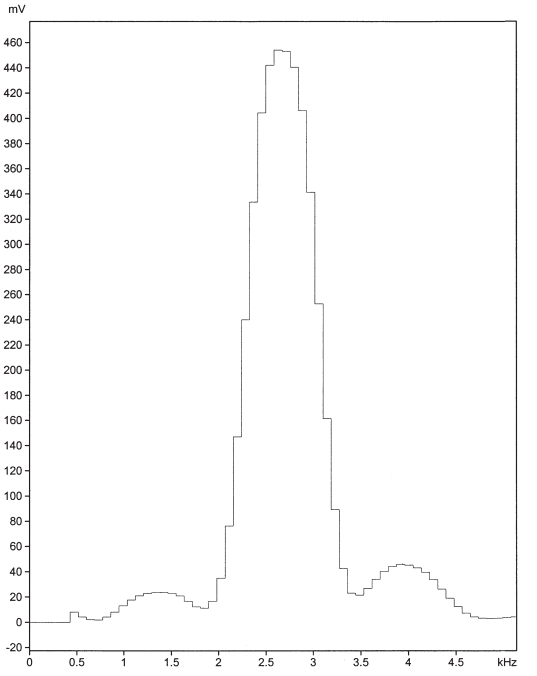
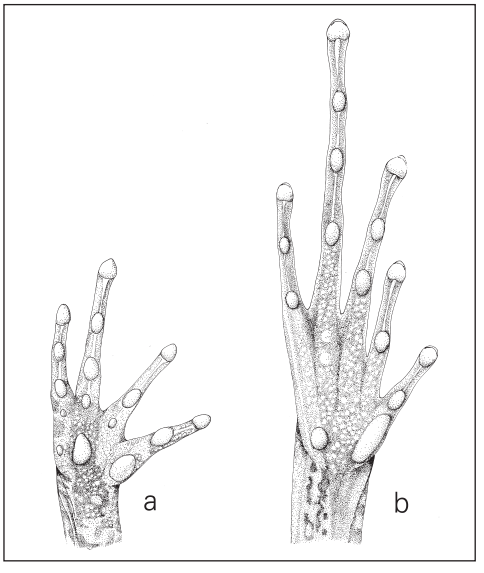


Fig. 7: Frequency spectrum of first part of the second note of a double click of *Platymantis wuenscheorum* spec. nov..

range 24–50 ms; mean duration of internote interval (n=47) was 44 ms, SD 7.4, range 31–60 ms; mean duration of second note (n=44) was 36 ms, SD 6.6, range 25–55 ms, and duration of the interval between the second note of an antecedent and the initial note of the following double-click within a call series averaged 116 ms, SD 15.7, range 89–157 ms (n=26). Mean call repetition rate within call series was 5.3/s, SD 0.57 (n=11).



Etymology. The specific epithet *wuenscheorum* is a patronym in genitive plural honoring my good friends ROSI and JOCHEN WÜNSCHE from Blumberg Village near Berlin. I also intend to commemorate the other members of my circle of friends SYBILLE and CLAUS POHLE, USCHI and HEINZ STREIFFELER, HEIDI and ULLI THIEKE and ULLA and CONNY WIEGANK with whom my wife and I made numerous biological excursions and with whom we celebrated many birthday and New Year´s Eve parties since the 1960s. As an English common name I recommend Wuensche´s Wrinkled Ground Frog and as a German common name Wünsches Runzelfrosch.

Fig. 8: (**a**) ventral view of the right hand of a paratype (BMNH 1947.2.7-11) of *Platymantis cheesmanae;* (**b**) ventral view of the right foot of the same specimen.

Comparison with other species. *P. papuensis*. *P. punctata, P. cryptotis, P. batantae* and *P. bimaculata* are of a considerably larger size than *P. wuenscheorum* and have more or less numerous tubercles on the ventral surface of the feet (ZWEIFEL, 1969; GÜNTHER, 1999). Moreover, none of them utters advertisement calls consisting of double-clicks like *P. wuenscheorum*. *P. cheesmanae* from the Cyclops Mountains seems to be most closely related, considering both morphology and ecology. There are, however, several clear differences between both, requiring the description of the new species. Most males of *P. cheesmanae* measure less than 23 mm snout-urostyle-length, most males of *P. wuenscheorum* have a SUL of more than 23 mm. First finger is longer than second in *P. wuenscheorum* but shorter than second in *P. cheesmanae* (Fig. 8a). The best diagnostic feature is the relative length of the inner metatarsal tubercle, which is much longer in *P. cheesmanae*: Ratio MTL/T1L varied from 0.33–0.41 in *P. wuenscheorum* (n=7) and from 0.62–0.84 in *P. cheesmanae* (n=8) (Fig. 8b). Highly significant statistical differences exist in several other quantitative characters. The following differences between the type specimens of the new species (n=7) and *P. cheesmanae* (8 specimens of the type series) have a Student´s t-value of more than 3.0 and a P-value less than 0.001: Ratio END/IND (t=7.4, P=0.000003), ED/SUL (t=5.5, P=0.00005), HL/SUL (t=5.3, P=0.00007), GFD/SUL (t=4.5, P=0.0003) and TL/SUL (t=3.9, P=0.0009). Accordingly, *P. wuenscheorum* has a significantly broader internarial distance, larger eyes, a longer head, a greater distance between glandular folds directly behind eyes and longer tibiae than *P. cheesmanae*.

Moreover, advertisement calls of *P. cheesmanae* always consist of one note, never of double-clicks. These notes (calls) follow one another at the beginning of a call series more slowly than at the end of a call series. One call series of 10 calls, for example, lasted 42 s. The first and second call were separated by 19 s while the intercall interval between last two calls was only 1.26 s. Calls commenced suddenly with maximum amplitude and no pulse structure but faded with some pulses (Fig. 9a). Their frequency shows a slight down- and up-modulation (Fig. 9b) and centres with two peaks around 3.3 kHz (Fig. 10). Some calls exhibit only one frequency peak of the same magnitude. Mean duration of 10 calls was 27.8 ms, SD 1.68, range 26–30 ms (it was difficult to determine the end of the calls because of their protracted and imprecise ends). While notes of *P. wuenscheorum* and *P. cheesmanae* have nearly the same length, the dominant frequency of the latter´s notes is considerably higher.

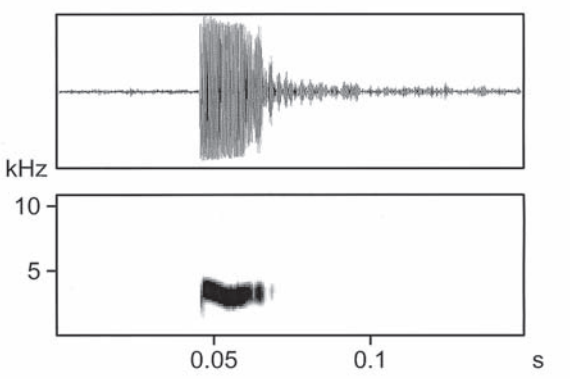


Fig. 9: Advertisement call of *Platymantis cheesmanae*, (a) oscillogram and (b) audiospectrogram of the same call.

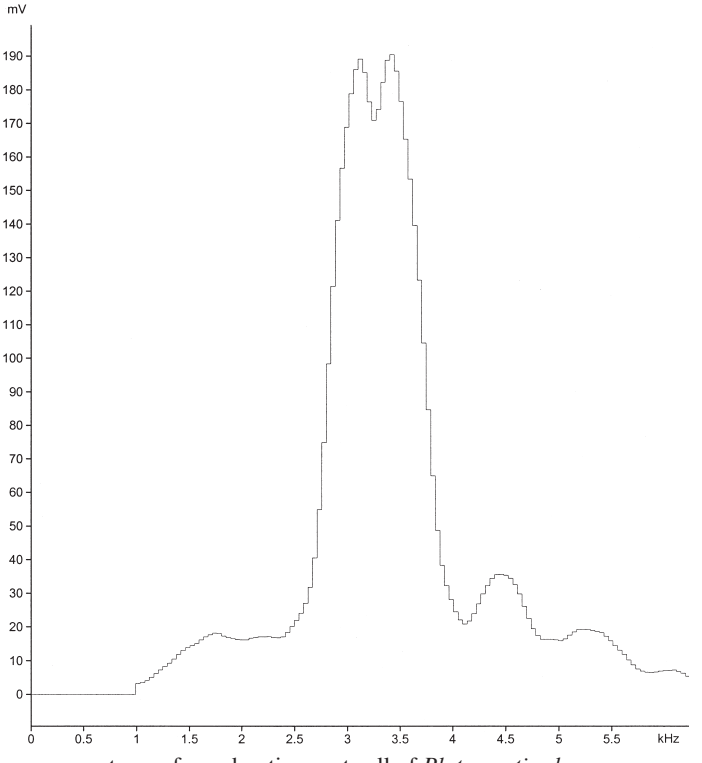


Fig. 10: Frequency spectrum of an advertisement call of *Platymantis cheesmanae*.

From comparisons of homologous sequences of 383 base pairs of the mt 12S r RNA gene from *Platymantis papuensis, P. cryptotis, P. punctata, , P. bimaculata, P. wuenscheorum, P. corrugata* and *P. mimula* result that *P. bimaculata* and *P. wuenscheorum* are more closely related to one another than to any other species investigated (K.-J. Schulze, pers. comm.). However, judging from external morphology, both *P. bimaculata* and *P. wuenscheorum* are closer related to other species. It is *P. cheesmanae* in the case of *P. wuenscheorum* (see above) and *P. batantae* in the case of *P. bimaculata*.

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