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# A new species of treefrog of the genus *Litoria* (Anura, Hylidae) from Biak Island off northwest New Guinea

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**Abstract**. The island of Biak, situated off the northwestern coast of New Guinea, is much more ecologically homogenous than the nearby island of Yapen and is twice as far from the New Guinea mainland. More than thirty species of anurans are known to the author from Yapen, but many of these await formal description. Only six species representing three genera are as yet known from Biak, with the widely distributed Australopapuan *Litoria infrafrenata* being the only hylid frog. During the course of fieldwork on Biak Island between 2002 and 2003 the author documented a second species of *Litoria,* which subsequently turned out to be undescribed. It is defined in the present contribution. Measuring 27-33 mm in snout-urostyle-length, the new species is a moderately small *Litoria*. Its dorsal surface is light to dark olive or brownish green, the posterior sides of the thighs are blackish, and the throat is orange in males. Conspicuous traits include two yellowish to olive, irregularly shaped, dorsolateral stripes in most specimens. Advertisement calls are relatively soft and emitted at intervals of several minutes. Calls usually consist of rasping sounds of 200-400 ms in duration with a mean pulse rate of 163 pulses per second. Their dominant frequency is around 4 kHz. The new species was found in swamps with thickets of trees and brush. Eggs have brown animal and white vegetative poles. A consideration of all available data suggests that the new species is related to the *Litoria nigropunctata* group (exclusive of those inhabitants of mountain streams which deposit their eggs on leaves outside the water). It is, however, not possible to assign it to this group without reservations.

Key words. Amphibia, Anura, Hylidae, *Litoria*, new species, morphology, osteology, bioacoustics, Papua Province, New Guinea, Indonesia.

## Introduction

The island of Biak is situated in the Pacific Ocean, some 120 km off the northwestern coast of New Guinea. It is largely composed of lowlands that are covered with moist forests and bushlands (more rarely with localised grasslands or mangrove swamps). The island was heavily deforested in the past. Wooded mountains are exclusive to the northwest of Biak and the adjacent island of Supiori, rising to altitudes of up to 700 m (Biak) and 1000 m a.s.l. (Supiori), respectively. Including Supiori Island, Biak measures about 120 km in length and has a maximum width of 40 km. The geological substructure of the twin island consists mainly of coral calcrete that is covered with a more or less substantial layer of humus so that the frequent rains seep away rather quickly. As a consequence the number of perennial water bodies is relatively low. Between the main island and Biak lies the island of Yapen with a similar size as Biak (Fig. 12). Yapen is a "Land-bridge" island with rather recent geological connections to mainland New Guinea whereas Biak is an "Oceanic" island which was never connected to New Guinea. Most species have reached Biak via overwater dispersal followed by evolution of endemic forms in isolation from both the mainland and Yapen (Helgen 2004). But, in the long run Yapen could play a role as stepping stone for the colonisation of Biak. The "Oceanic" origin and position, the mostly flat relief, the ecological devastations and the scarcity of

water bodies are probably major reasons for the fact that Biak is poor of anuran species when compared with the ecologically much more diverse "Land-bridge" island of Yapen at least at the elevations of up to 300 m a.s.l. the author has visited. Older literature (KAMPEN 1923, TYLER 1968) mentions only *Litoria infrafrenata* and *Platymantis papuensis* from Biak. In 2003, the occurrence of *Rana (Papurana) daemeli* and *Callulops* cf. *robustus* was documented (GÜNTHER 2003a), and a new species, *Oreophryne kapisa*, was described (GÜNTHER 2003b). In the framework of excursions in 2002 and 2003, the author together with MARTHINUS KAPISA from Biak managed to record from various locations *Rana (Papurana)* cf. *papua* and a hitherto unknown species of tree frog in the genus *Litoria*, the latter of which is defined here.

## Material and methods

The type series comprises eighteen males and one female. These were captured by opportunistically searching the vegetation near water bodies during the day as well as at dusk and the first half of the night. Most specimens were located acoustically. Some specimens were photographed alive on the next day. All frogs were anaesthetized with Chlorobutanol and stored in 2% formalin for the period of their transport. On reaching the museum collection, all specimens were transferred into 80% ethanol. One specimen (ZMB 67735) was turned into a cartilage/bone sample following the methods suggested by DINGERKUS & UHLER (1977) with minor modifications. Sexes were identified on the basis of the presence or absence of pigmented thumb pads. The following measurements (in mm) were taken with a calliper (> 10 mm) and an ocular micrometer in a bifocal microscope (< 10 mm): snout-urostyle length from the tip of the snout to the end of the urostyle (SUL), tibial length (TL), tarsal length (TaL), length of 4th toe from the tip of the toe to the proximal base of the inner metatarsal tubercle (L4T), distance between supratympanal folds immediately behind the eyes (GFD), length of the 1st toe from its tip to the distal end of the metatarsal tubercle (T1L), length of the metatarsal tubercle (LMT), transverse diameter of the terminal disc of the 4th toe (T4D), transverse diameter of the terminal disc of the 3rd finger (F3D), head length from the tip of the snout to the posterior margin of the tympanum (HL), head width at the level of the tympana (HW), snout length from the tip of the snout to an imagined line connecting the centres of the eyes (SL), distance between the anterior corner of the eye and the centre of the nostril (END), distance between the centres of the nostrils (IND), horizontal diameter of the eye (ED), and horizontal diameter of the tympanum (TyD). The entire type series has preliminarily been deposited and catalogued in the Museum für Naturkunde der Humboldt-Universität zu Berlin (formerly Zoologisches Museum Berlin) (ZMB). Intentions are to pass on a portion of the type material to the Museum Zoologicum Bogoriense in Cibinong (formerly Bogor), Indonesia, and also a museum in Papua, once appropriate conditions have been established there.

Calls were recorded using a Sony Walkman TCD-D 100 (DAT) equipped with a Sennheiser MKE 300 microphone at distances ranging from 1 to 3 m and analyzed with Avisoft-SAS Lab software.

## Description of the new species

### *Litoria biakensis* sp. n.

Holotype**:** ZMB 67740, an adult male, collected by R. GÜNTHER and M. KAPISA on 22 March 2002, in the swamp forest at the village of Arwe, ca. 6 km southwest of Korem (Korim), 100 m a.s.l., coordinates 0º56'S, 136º00'E, Biak Island in the Cenderawasih Bay, Papua Province, Indonesia.

Paratypes**:** ZMB 67730-37, ZMB 67738-39, ZMB 67741-45, ZMB 68418-19 and 68420. ZMB 67730-47 were collected on 21 and 22

March 2002, respectively, ZMB 68418-19 on 16 April 2002, and ZMB 68420 on 18 June 2003. All paratypes were collected within a radius of 500 m around the type locality by the persons mentioned above and some local people. ZMB 67738 is the only adult female; all other specimens are males.

Diagnosis: Measuring 27.7-31.2 mm (29.5 mm on average) in SUL in 18 males, and 33.1 mm in one female, the new species is a moderately small member of the genus *Litoria*. The terminal discs of the fingers are only slightly wider than those of the toes. Other diagnostic characteristics are the presence of a quadratojugal, anterolateral processes on the hyoid plate, and a flange on the medial edge of the metacarpal of the third finger, the absence of vomerine teeth, a relatively narrow head (HL/HW 0.99-1.11), the position of the nostrils (END/IND 1.03-1.19), and an olive to brownish colouration of the dorsal surfaces to which are added in most live specimens two lighter dorsolateral stripes. Furthermore, its rasping advertisement calls of 236-537 ms (mean value 366 ms) in duration, and a mean pulse rate of 163 pulses/second.

Description of the holotype: Measurements (in mm) and proportions are as follows: SUL 31.2, TL 16.9, TaL 10.6, L4T 12.1, GFD 9.0, T1L 3.5, LMT 1.1, T4D 1.2, F3D 1.2, HL 9.8, HW 9.0, SL 5.5, END 3.2, IND 2.7, ED 3.4, TyD 1.7, TL/SUL 0.54, TaL/SUL 0.34, T4D/SUL 0.038, T4D/F3D 1.00, HL/SUL 0.31, HL/HW 1.09, END/IND 1.19, ED/SUL 0.109, TyD/ED 0.50, SL/SUL 0.176, and MTL/T1L 3.18. Head slightly longer than wide and as wide as the anterior body; head length equals 31% of the SUL; snout protruding and rounded in profile, rounded with an indication of a point in dorsal view (Fig. 1). Nostrils raised, situated dorsolaterally and near the tip of the snout; rostral edge straight and rounded; loreal region slightly concave; eye large, protruding and with a horizontal pupil; tympanum half as large as the eye, its upper rim covered by the tympanal fold. Tongue oval, relatively small, its rear margin slightly indented and fused

Fig. 1. Aspects of the head region of the holotype of *Litoria biakensis* sp. n.; top - dorsal, middle - lateral, and bottom - ventral view.

to the floor of the oral cavity except for its posterior margin. Choanae rounded, relatively small, and situated close to pars palatina of the maxilla. Slit apertures to the gular vocal sac in the floor of the mouth begin at the level of the angles of the mouth and extend to the middle of the tongue. Fingers moderately long; terminal discs wider by about one-third than the terminal phalanges; narrow cutaneous fringes along the sides of the fingers; webbing between fingers I and II reduced to basal fringes,

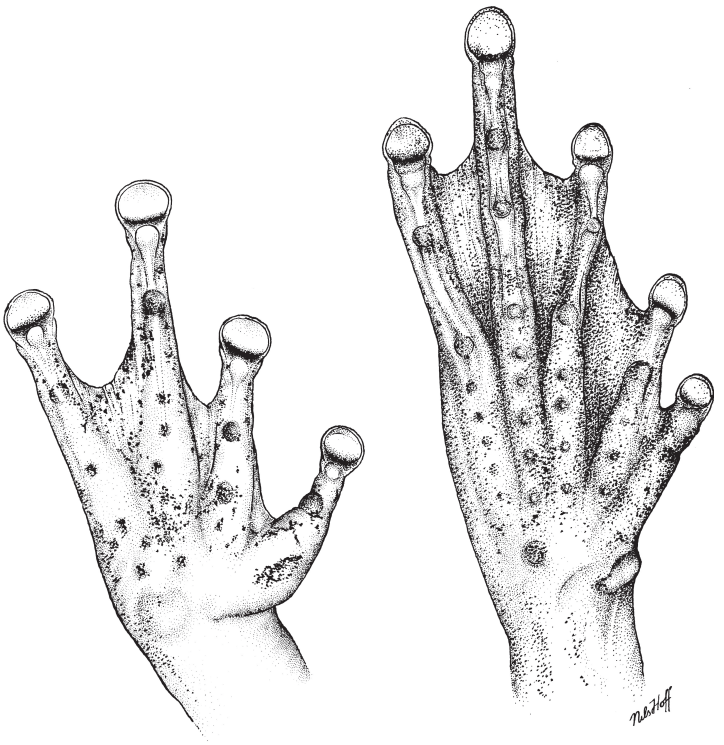

Fig. 2. Ventral side of hand (left) and foot (right) of the holotype of *Litoria biakensis* sp. n.

between II and III reaching to the distal subarticular tubercle, and developed best between III and IV (see Fig. 2). Besides subarticular tubercles and the weakly expressed palmar tubercles there are further small tubercles on the lower sides of the fingers. A brownish thumb pad is situated on the upper side of the basal (thickened) half of the thumb. Relative lengths of the fingers: III>IV>II>I. Toes also of moderate length, terminal discs exactly as wide as those on the fingers; all toe and finger discs with marginal grooves. Webbing between all toes reaches almost to the bases of the discs (Fig. 2). Besides subarticular tubercles and a bean-shaped inner metatarsal tubercle, there is a small outer metatarsal tubercle and several "supernumerary" plantar tubercles. Relative lengths of the toes: IV>V>III>II>I. Dorsal skin smooth, with a few scattered small tubercles; skin on throat and chest smooth, that of the abdomen and the lower sides of the upper thighs granular. A low, smooth-margined skin fringe extends from the inner metatarsal tubercle almost to the knee.

Dorsal colour in preservative light brownish with diffuse darker spots on the head and body. Upper sides of the limbs without spots and slightly lighter than the head and body. Posterior side of the upper thigh blackish in colour where it is concealed by the lower thigh; lower side of head and body cream-coloured without spots, that of the limbs with a few greyish brownish speckles.

Morphological variation within the type series: Eighteen males have a mean length of 29.5 mm (SD 1.01), with the smallest male measuring 27.7 mm and the largest 31.2 mm. The female is 33.1 mm SUL. There is relatively little variation in body proportions (Tab.

Fig. 3. Male paratype of *Litoria biakensis* sp. n. in life showing an olive ground colour of the dorsal side.

Fig. 4. Male paratype of *Litoria biakensis* sp. n. in life with a dark greyish brown dorsal side.

Fig. 5. Colour in life of the posterior sides of the upper thighs in a paratype of *Litoria biakensis* sp. n.

Fig. 6. Colour in life of the ventral side in a male paratype of *Litoria biakensis* sp. n.

1). The female specimen has not been included in Table 1, but all of its proportions fall within the range of variation given for the males. All specimens show a narrow skin fringe along the outer edge of the first toe that extends past the inner metatarsal tubercle and reaches almost to the knee.

Half of the preserved specimens have a light grey colouration of all dorsal surfaces, and the other half show dark grey colours with either a brownish or bluish tinge. Darker and/or lighter spots are present as exceptions only, and the dorsolateral stripes that were olive in life, have remained visible in a bluish colouration in only a few specimens. The rear side of the upper thigh is blackish in the area concealed by the lower thigh in all specimens. Most frogs exhibit a blackish inguinal region,

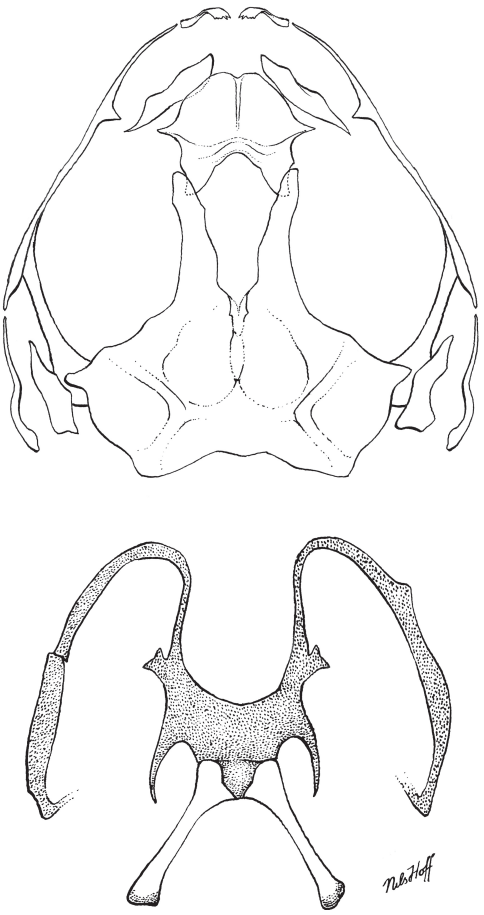

Fig. 7. Dorsal view of the skull of a paratype of *Litoria biakensis* sp. n. (top), and ventral aspect of its hyoid structure (bottom).

blackish proximal anterior sides of the upper thighs, and blackish areas on the lower thigh adjacent to the upper thigh. Throat, chest and abdomen are without spots in all specimens and show a yellowish cast. The lower surfaces of the limbs have the same shade of colour, but show diffuse pigment spots particularly on their edges. The lower sides of the hands and feet are pigmented the most.

The dorsal sides of all specimens in life were fairly homogenous in colour. The ground colour consisted of lighter or darker shades of olive, greenish brown, or greyish brown with a greenish hue (Figs. 3 and 4). Eighty percent of the frogs had two irregularly shaped, continuous or interrupted, dorsolateral stripes of light yellowish to dark olive colour. In a majority of cases, these stripes began at the posterior margins of the eyes and continued to the inguinal region. The frogs usually became darker after capture, particularly when exposed to daylight. In most frogs the light dorsolateral stripes became indistinct or disappeared altogether during this process. The entire snout, or the sides of the snout, were a similar colour to the dorsolateral stripes, but the area from beneath the eye to the insertion of the front legs in many cases was an even lighter shade of green or yellow. The iris was yellowish with a brown reticulation. The flanks were yellowish, and the posterior sides of the upper thighs, the flexure of the groin including the proximal portion of the upper thigh, and the inner sides of the lower thighs were blackish with a blue tint (Fig. 5). Throat and chest usually had an orange colouration, and the abdomen and lower sides of the thighs showed a lighter shade of yellow (Fig. 6).

Osteological traits (based on a cartilage/bone sample, ZMB 67735): Frontoparietals fused to the otoccipitals with wide sutures; frontoparietal fontanel of moderate size, wider anteriorly

| Ratio | Mean | SD | Range |
|---|---|---|---|
| TL/SUL | 0.57 | 0.013 | 0.54-0.59 |
| TaL/SUL | 0.35 | 0.009 | 0.33-0.36 |
| T4D/SUL | 0.038 | 0.003 | 0.032-0.042 |
| T4D/F3D | 0.87 | 0.06 | 0.71-1.00 |
| HL/SUL | 0.33 | 0.013 | 0.31-0.35 |
| HL/HW | 1.06 | 0.034 | 0.99-1.11 |
| GFD/SUL | 0.30 | 0.009 | 0.29-0.32 |
| END/IND | 1.10 | 0.049 | 1.03-1.19 |
| ED/SUL | 0.117 | 0.006 | 0.105-0.133 |
| TyD/ED | 0.49 | 0.033 | 0.41-0.53 |
| SL/SUL | 0.168 | 0.08 | 0.145-0.181 |
| MTL/T1L | 0.35 | 0.04 | 0.30-0.43 |

Tab. 1. Body ratios of the type series (n=18) excluding the female of *Litoria biakensis* sp.n. SD = standard deviation of mean value; for a key to the other abbreviations see "Material and methods".

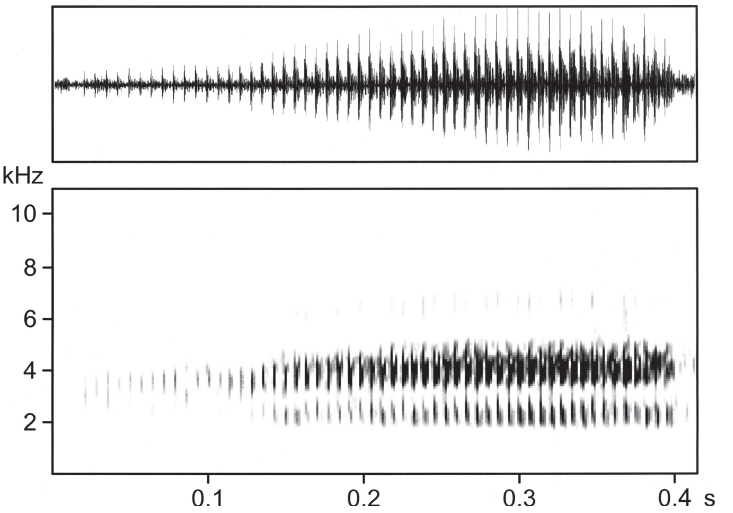


Fig. 8. Oscillogram (top) and audiospectrogram (bottom) of an advertisement call of *Litoria biakensis* sp. n.

than posteriorly; sphenethmoid wide, with a lateral processus each; nasals widely separated, in loose contact with the sphenethmoid and without contact to the processus posterior of the pars facialis of the maxillary (Fig. 7a). Zygomatic processus of the squamosum short, otic processus longer, but without contact to the crista parotica. Intermaxillary relatively wide and serrated, its processus palatinus long and pointed and not in contact with its neighbour, its pars facialis well developed. Prevomera weakly expressed, widely separated and without serration; palatinum beginning only at the edge of the sphenethmoid and extending to the maxillary; parasphenoid with narrow alae and a very long and anteriorly sharply pointed processus cultriformis. Hyoid plate much wider than long, with long posterolateral processes and anterolateral processes that are situated relatively far forward (Fig. 7b). Arciferous shoulder girdle without peculiarities, likewise the bones of the limbs in which the metacarpals III show a medial flange; the intercalary structures are ossified, and the prepollex is well developed. Vertebral column with eight widely separated procoelous presacral vertebrae whose neural arches are very weakly expressed and do not overlap. The 7th and 8th presacral vertebrae and the sacrum show anomalies in the present sample. Sacrum with much widened diapophyses; ilia lacking a dorsal ridge; urostyle with a dorsal ridge that extends to the middle of its length.

Voice: The first advertisement calls could be heard at dusk and the last were audible around 23.00 h. Males called from perches 2-3 m high on leaves of bushes or trees. Calls usually consisted of single rasping sounds that were emitted at intervals of several minutes. More rarely, call series were uttered composed of 2-4 rasping calls within a few seconds. Besides the longer rasping advertisement calls males occasionally produced short series of 1-8 loud single pulses. Such calls were produced by males perched at heights between 0.5 and 1.5 m. It is likely that they represent distress calls since similar sounds were also heard from specimens that were in contact in the confinement of a plastic bag. Occasionally the distress calls would turn into "typical" rasping advertisement calls. Seventy-seven advertisement calls had a mean duration of 366 ms (SD 76), with a range from 236 to 537 ms. Calls of up to 800 ms in length were occasionally heard. Almost all advertisement calls show

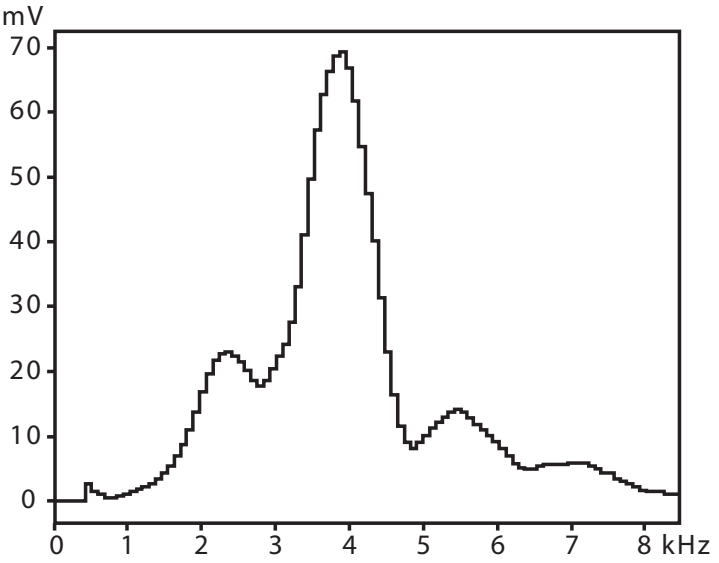


Fig. 9. Distribution of frequencies in an advertisement call of *Litoria biakensis* sp. n.

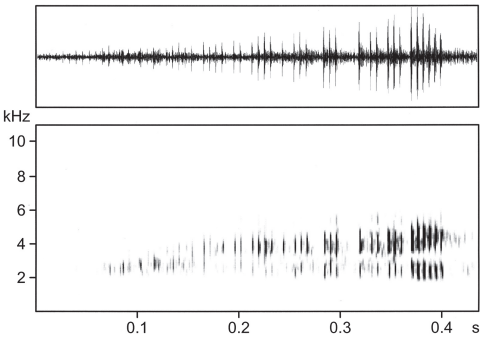


Fig. 10. Oscillogram (top) and audiospectrogram (bottom) of an advertisement call consisting of pulse groups of *Litoria biakensis* sp. n.

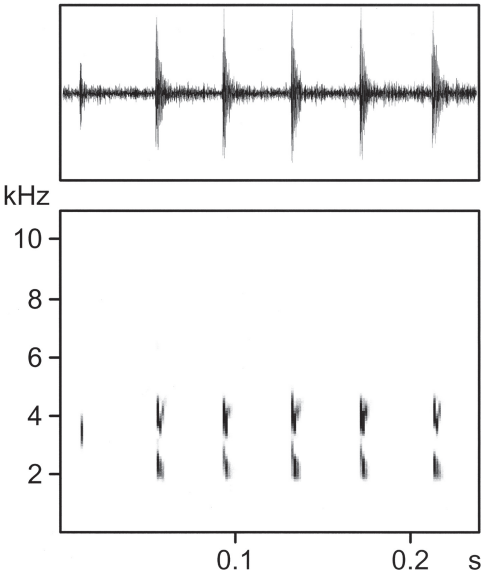


Fig. 11. Oscillogram (top) and audiospectrogram (bottom) of a distress call of *Litoria biakensis* sp. n., consisting of a series of six distinct pulses.

a clearly pulsed pattern, with the pulses following each other at fairly constant intervals throughout the entire call. Their volume is reduced at the beginning of the call, it rises during the course of the call, and reaches its maximum only in the second half of the call (Fig. 8, top). Some calls fade towards the end, whereas others end abruptly at maximum volume. The dominant frequency peaks at 4 kHz, the fundamental frequency lies at 2.3 kHz, and an additional frequency band is grouped around 5.8 kHz (Figs. 8b and 9). The dominant frequency shows a slight rise during the


Fig. 12. Map of Papua, Province of Indonesia, with collecting sites of *Litoria biakensis* sp. n. (1) Swamp 6 km SW of Korim (Korem); (2) Warsa (Biawer).

course of the first half of the call. The mean pulse rate of twenty calls is 163 pulses/s (SD 9.3). There were only a few calls, in which the pulses deviated from their regular distribution and were arranged in groups instead (Fig. 10). Duration of the strong individual pulses within the distress calls is less than 10 ms. These strong pulses start off at maximum volume and exhibit a steep decline in volume (Fig. 11, top). Their frequency bands are distributed in a manner similar to those within the advertisement calls (Fig. 11, bottom), but the fundamental frequency often represents the dominant frequency as well. Their mean repetition rate was 25 per second (range 20-40). All calls were recorded at a temperature of 27 °C.

Distribution: So far the new species has only been found at two localities on the island of Biak: a swamp 6 km southwest of the fishing village of Korim (Korem), that is 1 km north of the village of Arwe, where the holotype was secured, and in the vicinity of the mouth of a stream that is surrounded by a marsh at the village of Warsa (Biawer) on the northeast coast (coordinates 0°48'S and 135°56'E) (Fig. 12).

Habitat and behaviour: The type locality is densely vegetated with bushes and slender trees on the eastern margins of a little-used track. Larger trees were absent as an obvious result of prior logging. The frogs concentrated on the fringes of a narrow ditch that was filled with water 10-30 cm deep and certainly served

Fig. 13. Type locality of *Litoria biakensis* sp. n.

as a spawning site (Fig. 13). Most of them sat on the leaves of bushes and trees between 1.5 and 3 m above the ground, and only a few specimens were spotted perched on herbaceous plants and grasses at 30-80 cm above the ground, or above 3 m on trees. Minor calling activity was noted at the end of March in 2002 as well as in mid-June in 2003. A census conducted in the evening of 22 March 2002 revealed about 30 calling males along a 100 m stretch of the path. Larvae of *Litoria biakensis* were not seen at the time, and only one amplectant pair was found in the vegetation near the water. The oviducts and uteri of the female contained ripe eggs with diameters of 1.4-1.7 mm. Their vegetative poles showed a light yellowish colouration, and the animal poles were brownish. The limited calling and reproductive activity during March and April suggests that the main spawning period occurs at another point of time. Sharing the habitat of the new species of treefrog were *Platymantis papuensis*, *Litoria infrafrenata* (no larvae), *Rana* (*Papurana*) cf. *papua* (also present in the form of larvae at a late developmental stage), and *Oreophryne kapisa*.

Etymology**:** The Latin suffix -ensis means "concerning the habitat", signifying "living on Biak" in the present combination. For a German vernacular name I suggest "Biaklaubfrosch" and for an English equivalent, "Biak-Treefrog".

## Comparisons with other species

Using the identification key to the tree frogs of New Guinea by TYLER (1968), the new species keys out nearest to *Litoria louisiadensis*. For this species TYLER states "tympanum invisible", but the respective illustration (Fig. 39 on page 120) shows (probably in error) the presence of a tympanum. *L. biakensis* has clearly visible tympana, and also differs from *L. louisiadensis* with regard to various head proportions. For example, according to TYLER, the END/IND quotient is 0.66-0.77 in *L. louisiadensis*, but amounts to 1.03-1.19 in *L. biakensis*. From morphological, anatomical and ecological viewpoints the new species may be closest to the *L. nigropunctata* group or the *L. bicolor* group as defined by TYLER & DAVIES (1978). A closer relationship with the *L. bicolor* group is suggested by the natural habitat (swamps of the lowlands), the relatively narrow head, the extent of the webbings on the hands and feet, the presence of anterolateral processes (alary processes) on the hyoid plate, the absence of vomerine teeth, and the small eggs with their brown pigmentation around the animal pole. These arguments are opposed by larger body measurements, an olive green to olive brown versus a grass green colouration, the presence of a medial flange on metacarpal III, and the advertisement calls, that have been described by MENZIES (1976) for the *L. bicolor* group as "always a quiet series of clicks, trills and buzzes, in various specific combinations".

The *L. nigropunctata* group is likely to not be a monophyletic grouping (Johnston & Richards 1994, Günther 2004), since at least the mountain stream-dwelling members, such as *L. iris*, lay large, uniformly yellowish greenish eggs outside the water and probably constitute a separate evolutionary lineage.

*L. biakensis* differs from members of the *L. nigropunctata* group by minor characteristics such as a narrower head, a larger tympanum, more pronounced webbings on the feet, the absence of discrete pigment spots on the dorsal side, and the presence of anterolateral processes on the hyoid plate. Regarding the colour pattern, similarities exist with the colour phase A (Menzies 1972, Fig. 4A, and 1976, Plate 4b) of *L. vocivincens*, which forms part of the *L. nigropunctata* group. However, this species is distinctly smaller (23.2-26.5 mm in snout-vent length in 11 adult males, and 23.3-26.8 mm in 9 adult females), and has a different advertisement call. According to Menzies (1972), the latter are composed of "a continuous succession of unmelodious buzzes each lasting about 160 msec and spaced 300-800 msec apart". It should be recalled that the advertisement calls of *L. biakensis* were emitted at much greater intervals and had a mean duration of 366 ms.

*L. biakensis* differs clearly in various traits, including external morphology and advertisement calls, from the recently described species *L. majikthise* (Johnston & Richards 1994), *L. wapogaensis* (Richards & Iskandar 2001), *L. rubrops* (Kraus & Allison 2004), *L. umarensis*, and *L. verae* (Günther 2004) that were placed near the *L. nigropunctata* group, as well as *L. singadanae* (Richards 2005). This is easily verified by comparing the photographs of live specimens illustrated in the respective publications.

Based on the discussed complexes of characteristics, *L. biakensis* cannot be affiliated definitely with one of the species groups postulated by either Tyler & Davies (1978) or Menzies (1993). But all available evidence indicates a possible relationship with those members of the *L. nigropunctata* group that live in lowland swamps and lay relatively small eggs with poles of different colours.

## Conservation problems

Following a personal communication received from S. Richards (Adelaide), who has for fifteen years been conducting intense herpetological field work in New Guinea, he has not encountered the new species in either Papua New Guinea or in the northern central parts of the Papua Province of Indonesia. I have also not found this species in northwestern Papua or on Yapen Island. It is of course impossible at this stage to state with confidence that *L. biakensis* does not occur beyond the island of Biak considering the brief periods of fieldwork done so far. Biak has suffered from extensive habitat degradations and most of its forests were destroyed in the recent past. Certainly, populations of *L. biakensis* have also been decimated by this habitat destructions and the species seems to be restricted to a few swamp areas today. If the new species is really an endemic to the island, it would rank amongst the species of frogs with the smallest number of individuals and the most localized geographical distributions in the world, and should be classified as "endangered" in compliance with the "IUCN Red List Categories and Criteria, Version 3.1 (as approved by the 51st meeting of the IUCN Council at Gland, Switzerland on 9 February 2000)".

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