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A NEW SPECIES OF REED FROG (AMPHIBIA: HYPEROLIIDAE) FROM THE COASTAL LOWLANDS OF NATAL, SOUTH AFRICA

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ABSTRACT

A new species of the reed frog genus *Hyperolius* is described, which shows marked sexual dimorphism in both size and colouration. Sonagrams are provided of the call as well as a scanning electron micrograph of the tadpole mouthparts. In addition, information on the geographic distribution, habitat and reproduction of the new species is given.

INTRODUCTION

The amphibian fauna of the coastal lowlands of Natal is relatively well-known (Passmore & Carruthers, 1979; Poynton, 1964; Wager, 1965) with some thirty-six quarter degree squares out of approximately forty-three having had collections made within them by the early 1960s. Of these some seven squares had been relatively well collected through having been repeatedly visited or by having a collector stationed within them (Poynton, 1964, p. 258, map 1). Consequently, it was surprising when Mr Martin Pickersgill, a keen student of amphibians, collected an unidentifiable specimen of *Hyperolius* at Mount Edgecombe on the north coast of Natal towards the end of August, 1977. Subsequently, additional specimens were collected at Mount Edgecombe, at Richards Bay, and later at various other localities. As more information became available it was obvious that this was not only a new species for South Africa but also new to science. In view of Mr Pickersgill's efforts relating to the discovery of this new reed frog it is a pleasure to name it after him.

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Materials and methods

Specimens used in the preparation of this paper are housed in or will be deposited in the following collections:
LR — Comparative & Systematic Herpetology Collection (Private Collection of L. R. G. Raw), Merrivale, Natal, South Africa.
MP — Private Collection of M. Pickersgill, Rosetta, Natal, South Africa.
NM — Natal Museum, Pietermaritzburg, Natal, South Africa.
SAM — South African Museum, Cape Town, Cape Province, South Africa.
TM — Transvaal Museum, Pretoria, Transvaal, South Africa.
UM — Umtali Museum, now housed at the National Museum, Bulawayo, Zimbabwe.

Certain other material which is currently on loan to Dr J. C. Poynton, was also examined through his courtesy. This material is housed as follows:
MCZ — Museum of Comparative Zoology, Harvard, Massachusetts, U.S.A.
Sonagrams illustrated were prepared in collaboration with Dr J. C. Poynton, Associate Professor at the Department of Biological Sciences, University of Natal, Durban. Scanning electron micrographs for study were prepared at the Zoology Department, University of Durban-Westville, in collaboration with Mr F. L. Farquharson and Miss M. Harris. X-ray radiographs were also taken by Dr D. E. van Dijk, Associate Professor at the Department of Zoology, University of Natal, Pietermaritzburg. Iso-electric focusing of blood serum proteins was performed at the Department of Biochemistry, University of Natal, Pietermaritzburg, by Mr R. Berry through the courtesy of Dr C. Dennison and Professor G. V. Quick. Terminology used is based on that of Poynton (1964), Peters (1964), Schiøtz (1967 and 1975), and Van Dijk (1966), while nomenclatural procedures are in accordance with Mayr (1969).

Hyperolius pickersgilli, sp.nov.

Holotype: Avoca, north of Durban, Natal, South Africa (29° 46′ S., 31° 1′ E.). Adult ♂ collected by L. R. G. Raw and G. A. Setaro on the night of 27 January, 1981. In the collection of the Natal Museum, Reg. No. NM 6657.

Allotype: Adult ♀. Same data as Holotype. In the Natal Museum, Reg. No. NM 6658.

Paratypes: Mount Edgecombe — LR 978 - 981, LR 1018 - 1034, LR 1036 - 1037, LR 1039 - 1041, MP 270, MP 344 - 345, MP 471 - 472;
Richards Bay — MP 278;
Warner Beach — MP 47, MP 343;

Avoca — LR 1135 - 1139, LR 1546 - 1547;
"Twinstreams", Mtunzini — TM 55468 - 55469, SAM (to be deposited), LR 1544 - 1545;
Monzi — LR 1035;
St Lucia Estuary — UM 31486.

Diagnosis: A small secretive *Hyperolius* showing marked sexual dimorphism in size and colouration in which it most resembles *H.cinnamomeoventris* Bocage, 1866, but differs from that species in its reproduction call, a quiet slow creak as opposed to a succession of brief, rather high pitched distinct clicks, and in that its eggs are deposited in a clear gelatinous mass rather than in the milky "eggslime" of *cinnamomeoventris* (Schiøtz, 1975). Males and juvenile patterned females of *pickersgilli* could be confused with the following species (diagnostic differences are given in parenthesis): *H.balfouri* (Werner), 1907 (lacks sexual dimorphism in colour pattern), *H.puncticulatus* (Pfeffer), 1893 (dorsum in males with asperities, female pattern with dorso-lateral stripes, or with dorsum spotted or vermiculated), *H.mitchelli* Loveridge, 1953 (differences in voice and female pattern with dorso-lateral stripes), *H.argus* Peters, 1854 (much larger, female pattern with dark edged light canthal stripe, dorsum spotted all over or dorsolaterally), *H.parkeri* Loveridge, 1953 (longer snout, males with black spinosities on hindfeet, males larger than females). Diagnostic features used for the above species from Schiøtz (1975).

Description: A small to moderately sized reed frog showing marked sexual dimorphism in size (males usually less than 22, largest females approaching 30 mm snout-vent length) and in colouration (see below). Snout acutely pointed (ca. 77°) but not projecting much beyond nostrils or mouth. Eyes not protruding; pupils horizontal; tympanum concealed; vomerine teeth absent; digits with intercalary cartilages; adpressed hindlimb with tibio-tarsal joint reaching posterior border of eye, and tarso-metatarsal articulation reaching the tip of the snout. Males have a well-developed protective flap over the gular sac. Feet are well webbed with the following webbing formula: 1(1½ - 2), 2i (2 - 2⅔), 2e (1 - 1⅓), 3i (2 - 2½), 3e (1⅓ - 1⅔), 4i (3), 4e(2 - 2½), 5 (1 - 1⅔).

Measurements: Holotype (NM 6657): snout-vent length 19, tibia length 8,9, foot length 7,7, head width 6,2, interorbital distance 2,7, eye-snout length 2,9, internarial distance 1,7 and eye-nare distance 2,2 mm.

Allotype (NM 6658): snout-vent length 25,8, tibia length 11,8, foot length 10,4, head width 8,3, interorbital distance 3,4, eye-snout length 3,9, internarial distance 2,0 and eye-nare distance 2,6 mm.

Largest male (UM 31486): snout-vent length 22,3, tibia length 10,9, foot length 9,3, head width 7,7, interorbital distance 3,2, eye-snout length 3,6, internarial distance 2,1 and eye-nare distance 2,4 mm.

PLATE 1

Hyperolius pickersgilli Raw

Upper figure: Pattern of adult male of *H. pickersgilli*.

Lower figure: Pattern of adult female of same.

Largest female (MP 472): snout-vent length 28,5, tibia length 12,8, foot length 10,9, head width 9,3, interorbital distance 3,3, eye-snout length 4,1, internarial distance 2,1 and eye-nare distance 2,9 mm.

Colouration in life: Juveniles and males (Phase J) have the dorsum varying from light to dark brown with a dark-edged white to silver canthal stripe passing round the snout, above the eyes, then continuing dorso-laterally to the groin. The outer surface of the tibia is the same basic colour as the dorsum, sometimes with a white spot at the heel (tibio-tarsal articulation). The feet and those parts of the limbs which are normally concealed are yellow, while the throat and ventrum are yellowish to white (see colour plate).

Females begin to acquire the female pattern (Phase F) when they reach a snout-length of 20 - 22 mm, their original phase J brown dorsum becoming green while the dorso-lateral stripes become indistinct and eventually disappear. When fully developed, the female pattern has a brilliant light to yellowish green dorsum, separated from the light yellow to white ventrum by a distinct irregular margin. Sometimes a dark canthal streak is present from nare to eye. The feet and concealed surfaces of the limbs are yellowish, while the outer surfaces of the forearm and tibia have the same colouration as the dorsum (see colour plate).

Colour in alcohol: Both sexes fade rapidly in preservative, the green of the females becoming a pale blue-grey to darker grey, while the browns of most of the males and juveniles become pale grey-brown, with the dorso-lateral stripes tending to be indistinct in some. The undersides and feet become a pale brown-tinged yellow to almost white. In some specimens a trace of darker spotting is just discernible on the dorsum and tibias. In UM 31486 this spotting is very distinct.

Distribution and habitat: Apparently endemic to the Natal and Zululand coastal lowlands (veld type: Coastal Forest and Thornveld (Acocks, 1975)), where it occurs amongst dense stands of the razor-edge-leafed sedge *Cyperus immensus* C.B. Cl. (det. Hilliard), growing in more or less stagnant water of about half a metre in depth. The species has been recorded from Warner Beach in the south, to St Lucia Estuary in the north. In between these distribution extremes it has been found at Avoca and Mount Edgecombe, just north of Durban, at Mtunzini and Richards Bay north of the Tugela River, and at Monzi, just south of St Lucia Estuary. All these localities also fall within Bioclimatic Group 1 (Coast Lowlands) and subregion 1a (Forest and Thicket) (Phillips, 1973). This bioclimatic group includes some nine and a half thousand square kilometres of Natal. Of this total area only an infinitesimal amount would actually be suitable habitat for this species. Other anurans noted as occurring in the same localities are: *Hyperolius tuberilinguis* Smith, *Afrixalus fornasinii* (Bianconi), *Afrixalus brachycnemis* (Boulenger), *Leptopelis natalensis* (Smith), *Cacosternum nanum* Boulenger and *Phrynobatrachus natalensis* (Smith)

while *Hemisus guttatum* (Rapp) and *Bufo gutturalis* Power have been heard and seen nearby. For some reason, *Hyperolius marmoratus* Rapp appears to avoid the areas preferred by *H. pickersgilli*. It is interesting to speculate on whether this is due to *H. marmoratus* laying its eggs submerged in water, while the other Hyperoliids mentioned deposit their eggs out of water. With such stagnant water available, there may not be sufficient oxygen for developing eggs, while tadpoles can at least swim to the surface for their oxygen requirements.

Reproduction: Males commence calling towards the end of August and continue through to, at least, early March. It is not known if breeding takes place throughout this period as the only egglaying recorded took place in mid-October while emerging froglets were collected at the end of January at Avoca (LR 1136 and 1138) and in early March at Warner Beach (Pickersgill, pers.comm.). Tadpoles have not yet been collected in the wild despite several attempts. The metamorphosing froglets mentioned above have snout-vent lengths in the range 11 - 12 mm. Although amplexus and egg-laying has not yet been observed in the wild it seems probable that mating and egg-laying take place several centimetres above the surface of the water with the eggs being laid in a gelatinous mass attached to a sedge leaf above the water. A pair collected at Mount Edgecombe on the 10 October, 1978, were found to have laid eggs on the 19 October, 1978. The pair had been kept in a plastic container with about 2,5 to 3 cm of water in the bottom. The eggs were not laid in this water but instead were attached to the top of one of the sides of the container several centimetres above the water. Both male and female sat next to the eggmass until disturbed. The eggs were laid in a clear transparent jelly-like mass enclosing some fifty or more off-white eggs of about 1 mm diameter and with a brown animal pole on one hemisphere. The eggs take approximately one week to hatch when the pallid tadpoles begin to move about in the jelly as they gain in size and mobility. They gradually gravitate to the bottom of the mass which starts to become more liquid until they eventually drop into the water below. It seems possible that some parental assistance may be necessary at this stage as it was found that squirting a little water on the gelatinous mass assisted the emergence of the tadpoles. These tadpoles were kept for several weeks before they died as a result of accidental contamination of their water. A second pair also laid in captivity in a similar container. In this instance a sedge leaf in the container was used as the oviposition site which, once again, was out of water. Unfortunately the eggs were attacked by a fungal infection and did not hatch.

Tadpole mouthparts: One of the tadpoles mentioned above was killed and prepared 31 days after oviposition. Photographs were taken using the scanning electron microscope at the University of Durban-Westville. Fig. 1 is a general ventral view of the mouth parts and head showing a distinct oral disc with papillae, a wide rostral gap, no mental

gap, supra- and infrarostrodonts present, a single wide row of supra-angular keratodonts, three rows of infra-angular keratodonts with the adoral row longest and the mental row less than one third the length of the adoral row, a second interior row of oral papillae divided mesially by the mental row of infra-angular keratodonts and a pair of enlarged papillae on each side at the oral angle.

Labial formula (Main, 1957 from Peters, 1964) of tadpole (= tooth formula of Schiøtz, 1967) is as follows: $\frac{1}{1+1}$ with only a slight gap in the adoral row of infra-angular keratodonts. This is similar to the usual formula found in *Hyperolius* (Schiøtz 1967, 1975; Wager, 1965).

FIG. 1
Hyperolius pickersgilli Raw
Ventral view of mouthparts and head of tadpole of *H. pickersgilli*.

Voice: The voice of this species is probably one of the main reasons for the species not having been found earlier. It is a quiet slow creak, does not carry far, and could be mistaken for an insect call. The call is uttered while the male sits on a horizontal portion of *Cyperus* leaf, usually deep within a dense stand of the sedge where its ventriloquial quality makes it very difficult to locate. The call comprises single creaks (100 pulses per second, frequency intensity at 3 KHz) which have a duration of about 0,7 seconds (Fig. 2). Occasionally, usually at

the beginning of a sequence of calls, a shorter call is given which has a duration of only about 0,3 seconds (Fig. 3).

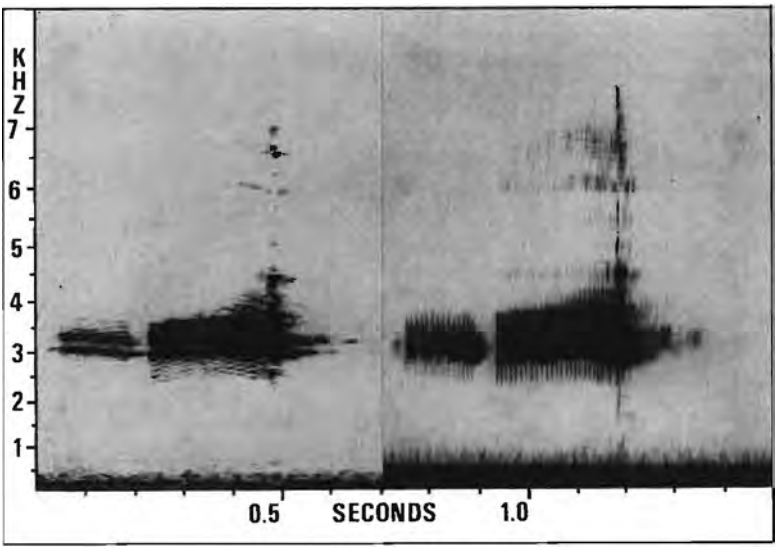

FIG. 2
Hyperolius pickersgilli Raw
Sonagram of longer call of *H.pickersgilli*, narrow band at left, wide band at right.

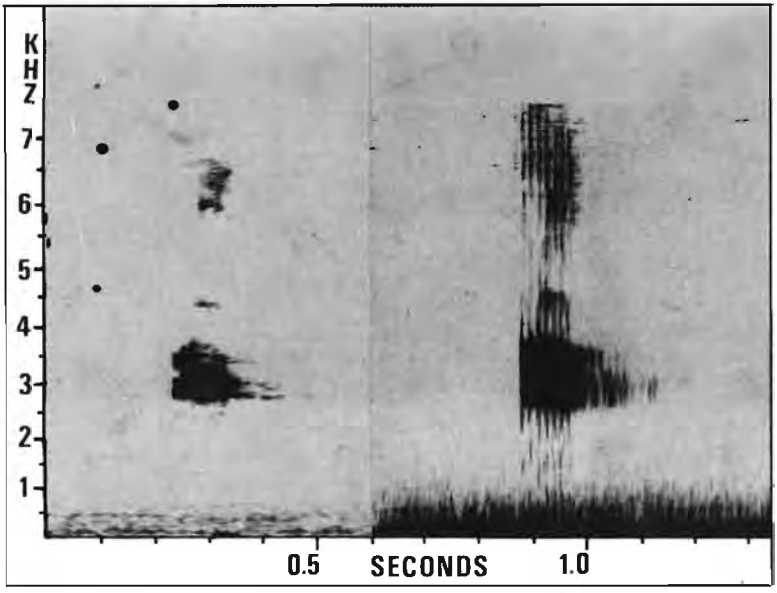

FIG. 3
Hyperolius pickergilli Raw
Sonagram of shorter call of *H.pickersgilli*, narrow band at left, wide band at right.

Blood serum proteins: An attempt was made to analyse blood serum proteins using an iso-electric focusing technique. Sera from the following Hyperoliids were included for comparison: *Afrixalus fornasinii, Hyperolius semidiscus, H.argus, H.pusillus, H.tuberilinguis, H.marmoratus* and *Leptopelis natalensis*. Although this trial run was far from satisfactory it was possible to demonstrate that there are distinct differences between *H.pickersgilli* and other species tested. Samples of blood collected from *H.pusillus* and a male *H.argus* were unusual in that the serum after centrifugation was green in colour rather than clear or yellowish as in the other species tested as well as a female *H.argus*. After iso-electric focusing of these green samples a blue band was found at 5,2 cm from the cathode, while a yellow band was found at 6,1 cm from the cathode. These bands disappeared during the fixing and staining process apparently as a result of not entering the gel plate. In *pickersgilli* the first faint bands appear at about 0,6 cm (PI 3,9) from the cathode, a vaguely defined broad deeply staining band from about 1,7 (PI 4,7) to about 2,5 cm (PI 5,2), some fainter bands to 3,6 cm (PI 5,9), a gap then about five narrow bands to about 4,4 cm (PI 6,5), another gap until about 5,2 cm (PI 7,0) then a series of about six more or less evenly spaced bands to about 5,9 cm (PI 7,5), a small gap then four lesser bands at 6,1 (PI 7,6), 6,2 (PI 7,8), 6,5 (PI 7,9) and 6,9 cm (PI 8,2) respectively. (PI = iso-electric point.)

Additional comparative material: The following species and specimens were examined during the preparation of this description: *Hyperolius mitchelli* - UM 6267 (2 specimens), MCZ 17162, MCZ 27273-4, (Paratypes); *H.semidiscus* - LR 1075 - 7, LR 1079 - 82; *H.argus* - LR 208 - 210; *H.horstockii* - LR 1083; *H.tuberilinguis - LR 1003, LR 1019, LR 1060 - 64, LR 1073; H.castaneus* - TM 35929 - 31, TM 38123 - 4, TM 35845 - 6; *H.lateralis pleurospilus* - TM 38121 - 2; *H.cinnamomeoventris* - TM 38106 - 7.

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