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A new species of *Cacosternum* (Amphibia: Anura; Ranidae) from Natal

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A new species of *Cacosternum* from Pietermaritzburg, Natal, is described. It is a small, slender, smooth-skinned form, immediately distinguishable from all previously described taxa by the bold brown and yellow reticulations dorsally and ventrally.

'n Nuwe soort *Cacosternum* van Pietermaritzburg, Natal, word beskryf. Dit is 'n klein, skraal, gladde vorm, dadelik onderskeibaar van alle voorheen beskryfde soorte deur die prominente bruin en geel dorsale en ventrale netvormige velpatroon.

A single small frog collected in Pietermaritzburg in 1954, and deposited in the Natal Museum, clearly belongs to the genus *Cacosternum* Boulenger but cannot be referred to any previously described species (Schmidt & Inger 1959; Poynton 1964). Careful searching by the author at and around the original locality, and elsewhere in the Pietermaritzburg district, has failed to produce further specimens of this frog; and the circulation of 200 pamphlets to residents in the Town Bush Valley area, illustrating the frog, with notes on its probable habitat and behaviour, and appeals for more specimens, have also been fruitless. The area in which the frog was found has become so disturbed by the encroachment of thick bush and the effective obliteration of a nearby reservoir, that it seems reasonable to believe that a population no longer exists in this area and that description should not be further delayed.

Cacosternum poyntoni sp. nov. (Figures 1–5)

Holotype

An adult male, collected at Carter's Nursery, Town Bush Valley, Pietermaritzburg, Natal, South Africa (29°33'30"S / 30°20'18"E), at an altitude of 800 m, by Mr Trevor Schofield on 20 April 1954; and deposited in the Natal Museum, Pietermaritzburg (NM 1036, Type No. 3828).

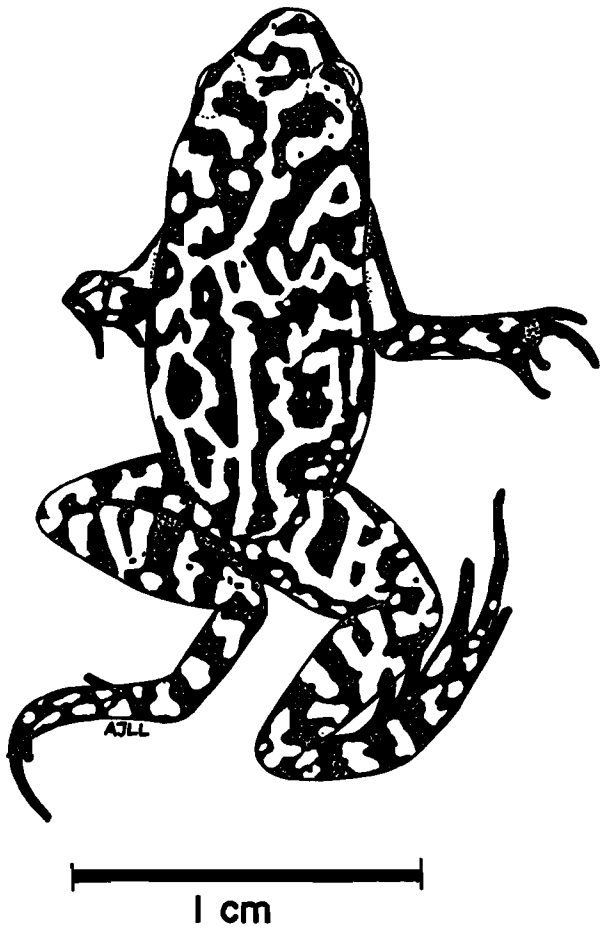

Figure 1 Dorsal view of *Cacosternum poyntoni.* Holotype, NM 1036.

Figure 2 Ventral view of *Cacosternum poyntoni.* Holotype, NM 1036.

Diagnosis

A small-sized, smooth-skinned *Cacosternum* of slender build, immediately distinguishable from all other members of the genus by the bold reticulated pattern formed by dark brown blotches on a yellow ground colour, dorsally and ventrally.

Description

Known only from the holotype.

Measurements (in millimetres): Snout-vent length 15,00; internarial distance 1,25; rostronarial distanoe 0,70; orbitonarial distance 1,00; diameter of eye 1,65; interorbital distance 1,65; width of upper eyelid 1,35; length of fore-arm 4,35; length of hand 4,40; length of tibia 7,00; length of foot 8,65 mm.

Habitus slender, although the hind limbs are, relatively, somewhat robust. Skin smooth, without any evidence of warts or enlarged glandular patches, or of a transverse pectoral fold.

Markings (in alcohol): Dark brown, roughly rounded to elongate blotches on a light yellow ground, forming a more or less symmetrical pattern dorsally, of which the most conspicuous features are a pair of dark interorbital blotches and a rather irregular mid-dorsal yellow line (Figure 1).

Ventrally, the brown blotches on the throat and chest

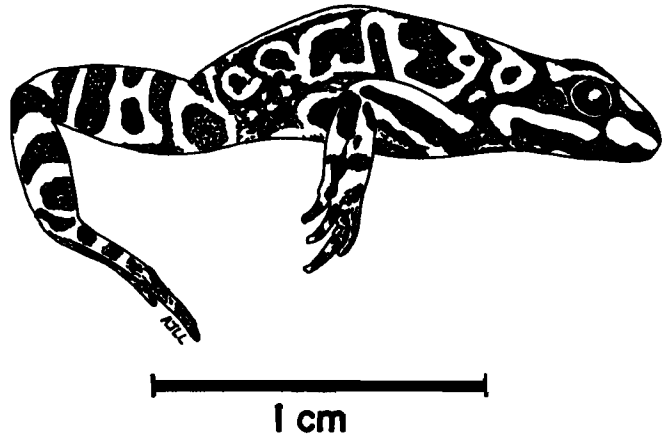

Figure 3 Right lateral view of *Cacosternum poyntoni.* Holotype, NM 1036.

are reduced in size, the yellow ground colour forming the most conspicuous element of the relatively more regular portion of the ventral pattern; the abdominal blotches are much paler but more extensive, and the pattern here is much more irregular. The markings on the ventral surface of the hind limbs are much darker and more boldly contrasted than those of the abdomen, the change in intensity being abrupt and sharply defined (Figure 2).

Figure 4 Right hand of *Cacosternum poyntoni*, ventral view. Holotype, NM 1036.

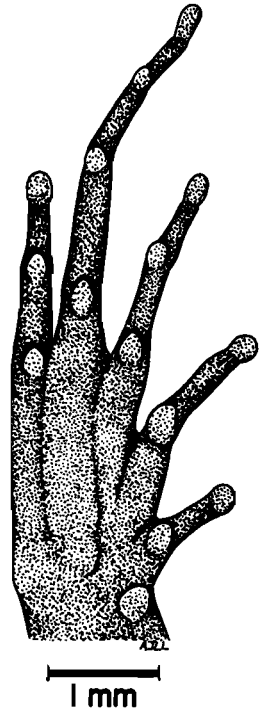

Figure 5 Right foot of *Cacosternum poyntoni*, ventral view. Holotype, NM 1036.

In lateral view, the most prominent features of the markings are a yellow stripe along the upper lip and longitudinal stripes on the antedorsal surface of the arm (Figure 3).

A pencilled note in the Natal Museum catalogue, written in an unidentified hand different from that of the main entry, describes the colouration, presumably in life, or shortly after preservation, as follows: 'Colour. Background above cream yellow with golden brown blotching, a rather broken yellow median stripe. Limbs also with dark markings. Golden brown vermiculations becoming black at the sides & below quite black'.

Hand: Palmar tubercles smaller than the proximal subarticular tubercles; inner, middle and outer metacarpal tubercles larger than the proximal subarticular tubercles. First and second digits with a proximal subarticular tubercle only; third and fourth digits with a smaller middle subarticular tubercle also. All tubercles conspicuous, prominent, and single. Terminal phalanges slightly bulbous (Figure 4).

Foot: Inner metatarsal tubercle well developed. Outer metatarsal tubercle absent. Subarticular tubercles well develcped, conical, single. Terminal phalanges slightly bulbous. Webbing absent (Figure 5).

Habitat

According to the collector, Mr Schofield, the frog was found in an empty beer bottle (one of a number that had been laid aside for covering citrus tree grafts), near natural woodland with short grass. The area, near a small water reservoir, is now thickly overgrown with closed woodland and tall, dense grass.

Discussion

The genus *Cacosternum* is represented by six currently recognized forms — *C. boettgeri* (Boulenger, 1882); *C. nanum nanum* Boulenger, 1887; *C. nanum parvum* Poynton, 1963; *C. namaquense* Werner, 1910; *C. capense* Hewitt, 1925; and *C. leleupi* Laurent, 1950.

The frog here described undoubtedly belongs to the genus *Cacosternum,* possessing a horizontal pupil, a moderately broad but short bony metasternum, and lacking omosternum, procoracoid bar, vomerine teeth and webbing.

It is similar to *C. boettgeri* and to *C. nanum* in its small size and smooth skin, but differs from both in the degree of development of subarticular, palmar and metacarpal tubercles — in *C. boettgeri* they are all feebly developed; in *C. nanum* the subarticular tubercles and, to a somewhat lesser extent, the palmar tubercles are well developed but the metacarpal tubercles are large though not especially prominent; and in *C. poyntoni* all are well developed and prominent, though the metacarpal tubercles are not much larger than the palmar tubercles and could be mistaken for such at first glance.

C. namaquense, a slightly larger and much more robust species than the former taxa, has a more warty skin and less prominently developed tubercles under the hand, although the metacarpal tubercles are rather large. The light triangular patch on the snout and the mid-dorsal blotch are also characteristic of this western form.

There is no resemblance whatever to the large (34 mm), heavily built *C. capense,* with its distinctive large, egg-shaped glands on the flanks and in the sacral region, and almost non-existent tubercles under the hand.

Cacosternum leleupi is said (Schmidt & Inger 1959: 135) to have a lateral black band, a distinct pectoral fold, conspicuous subarticular tubercles, and (in contrast to other members of the genus) the third, fourth and fifth toes webbed to the basal tubercles. *C. poyntoni*

possesses none of these features.

It would therefore appear that this frog is sufficiently different from any other known member of the genus to warrant its description as a distinct species, and it is hoped that this paper will prompt further searches elsewhere for specimens.

Etymology

I have pleasure in naming this frog for Professor John Poynton in recognition of the many years of friendly help and guidance he has given me.

Acknowledgements

I thank Professor J.C. Poynton for drawing my attention to this frog, and for comments on a draft of this paper; Dr Brian Stuckenberg, Director of the Natal Museum, for allowing me access to material in his care and for providing research facilities for work on amphibians; and Mr John Geddes Page, Director of the Natal Parks Board, for permission to publish this paper, which forms part of an on-going study of the amphibians of Natal.

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Notes on the biology of juvenile *Sparodon durbanensis* (Pisces : Sparidae) from tidal pools in the Eastern Cape, South Africa

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The length/frequency distribution, length/mass relationship, seasonal occurrence, growth and diet of *Sparodon durbanensis* from tidal pools in the Eastern Cape was investigated over a two-year period. The fish were predominantly small (mean length of 53 mm TL) with the smallest specimens being found in summer. Juveniles were found to be omnivorous, consuming algae, crustaceans and polychaetes, although, with the acquisition of adult dentition (i.e. crushing molars), hard-shelled molluscs became important in the diet.

Die lengte/frekwensie-verspreiding, lengte/massa-verhouding, seisoenale voorkoms, groei en dieet van *Sparodon durbanensis* in getypoele in die Oos-Kaap is oor twee jaar ondersoek. Die visse was hoofsaaklik klein (gemiddelde lengte 53 mm TL) en die kleinste vissies is die somer gevind. Hul dieet het uit alge, Crustacea en Polychaeta bestaan, alhoewel, met die verkryging van maaltande het hardskulpige Mollusca belangriker geword in die dieet.

The musselcracker *Sparodon durbanensis* (Castelnau, 1861) is an endemic sparid found from the Western Cape to Natal (van der Elst 1981). It is a much sought after inshore angling fish and as little is known of its biology, it has been designated a priority species in terms of South African marine linefish research (Wallace & van der Elst 1983).

Small brightly coloured juvenile *S. durbanensis* occur in tidal pools along the Cape coast (Christensen 1978a; Brownell 1979; Beckley 1985a,b; Smith & Heemstra 1986). Studies on tidal pool fish along the Cape coast have mainly dealt with the biology of resident species such as clinids, gobies and suckerfish (e.g. Christensen 1978b; Veith 1979; Stobbs 1980; Butler 1982; Bennett, Griffiths & Penrith 1983) although Christensen (1978a) has examined trophic relationships between the juveniles of three transient sparids namely, *Diplodus sargus capensis, Diplodus cervinus hottentottus* and *Sarpa salpa.*

For this short communication the small *S. durbanensis* specimens collected in tidal pools near Port Elizabeth by Beckley (1985a,b) have been examined further to provide biological information on a size range of fish poorly represented in a current study on the biology of musselcracker in the Eastern Cape (J. Clarke & C. Buxton pers. comm.). Information is presented on the length/frequency distribution, length/mass relationship, seasonal occurrence, growth and feeding of juvenile musselcracker.

Small musselcracker were collected monthly from March 1980 to May 1982 by rotenone poisoning of lower balanoid zone tidal pools along a 10 km stretch of rocky coast west of Port Elizabeth. Sampling localities were at Chelsea Point, Blue Hole, Willows and Skoenmakerskop (see Beckley 1985a for details of the study area).

Poisoned fish were removed from the tidal pools by hand net, taken fresh to the laboratory and their total length and mass measured to the nearest 1 mm and 0,01 g respectively. Specimens collected at the Blue Hole locality were dissected to remove the digestive tracts, which were individually preserved in 10% formalin, and at a later date examined for contents. The stomach and hindgut from each specimen were opened in water in a petri dish under a dissecting microscope, the contents removed and prey items identified. The frequency of occurrence method (i.e. proportion of digestive tracts containing a particular item) was used to express results.

A total of 233 musselcracker, ranging from 15 mm to 169 mm in total length and 0,05 g to 72,84 g in mass, was collected. The mean length was 53 mm and the mean mass 3,34 g. Figure 1 gives the length frequency distribution of the total catch, of which 95% were < 100 mm in length.

The length/mass relationship for *S. durbanensis* was calculated to be:

$$\text{Mass (g)} = 29{,}45 \times 10^{-6} \times \text{Length (TL mm)}^{2{,}8286}$$
$$(r^2 = 0{,}9913).$$

Length frequency distributions for each month are given in Figure 2 and these show that the smallest fish occurred during summer with no fish < 45 mm recorded from July

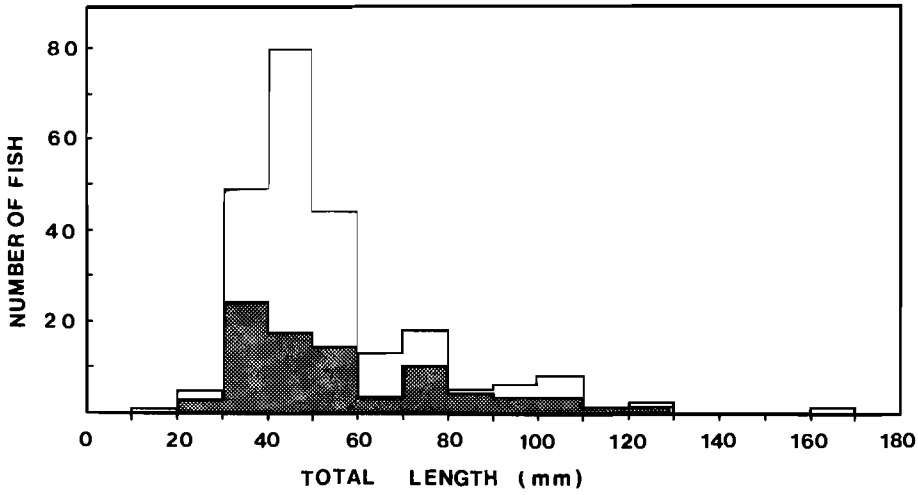

Figure 1 Length/frequency distribution of *S. durbanensis* juveniles collected from tidal pools in the Eastern Cape (n = 233). The shaded section indicates specimens from the Blue Hole locality used in the diet analysis (n = 83).

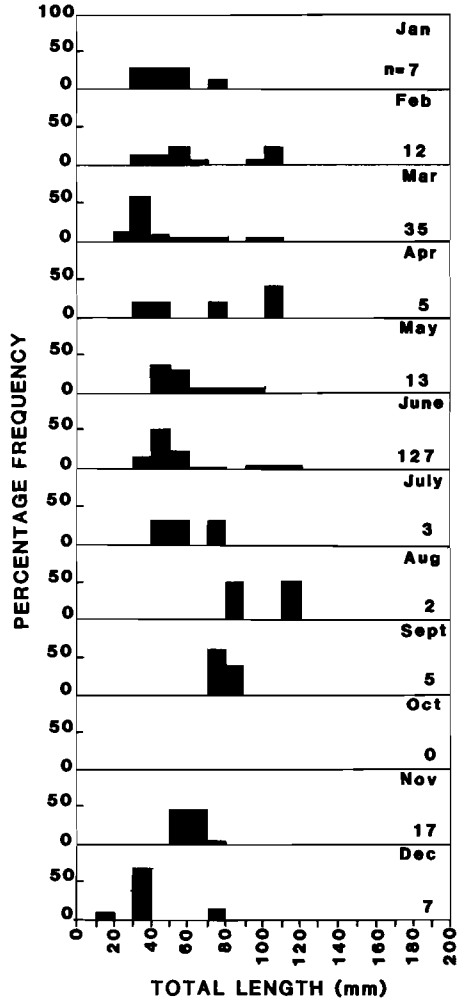

Figure 2 Monthly length/frequency distributions for *S. durbanensis* juveniles collected from tidal pools in the Eastern Cape during the period March 1980 to May 1982.

to November. Growth is difficult to assess due to a lengthy recruitment period and low numbers in some months but it appears that *S. durbanensis* can grow to a length of about 80 mm in their first year.

Table 1 Diet of *S. durbanensis* from tidal pools at Blue Hole in the Eastern Cape (n = 83 and TL range = 26–122 mm)

Prey item	Frequency of occurrence %
Algae	88
Harpacticoid Copepoda	75
Polychaeta	45
Amphipoda	36
Isopoda	27
Gastropoda	12
Ostracoda	11
Hydrozoa	7
Mysidacea	3
Bivalvia	2
Nauplii larvae	2
Insect larvae	1
Decapoda	1

The length frequency distribution of the 83 specimens from Blue Hole used in the diet analysis is indicated by shading in Figure 1. Table 1 lists the prey items recorded and their frequency of occurrence in the diet. Algal fragments were found in the digestive tracts of all size classes of musselcracker examined, harpacticoid copepods occurred in the smaller size classes whilst gastropods were restricted to the larger size classes. Polychaetes, amphipods and isopods occurred most frequently in the diets of specimens from the middle of the size range examined.

The egg and larval stages of *S. durbanensis* are unknown, but Brownell (1979) has described a 13,3 mm SL specimen collected from a tidal pool in False Bay and suggested a breeding season from August through to January. Preliminary results of monthly gonadosomatic index determinations on adults (FL > 400 mm) by

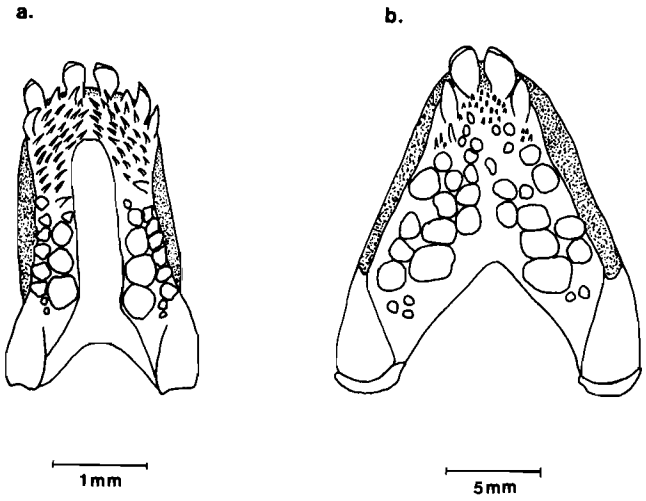

Figure 3 Dorsal view of dentition in the lower jaw of (a) 41 mm TL and (b) 160 mm TL *S. durbanensis* specimens.

Clarke & Buxton (pers. comm.) indicates a prolonged breeding season with a peak in November. The presence of the smallest fish in the Eastern Cape tidal pools during summer and the fact that lengthy larval and post-larval stages are not a feature of the family Sparidae (Brownell 1979) suggests that the *S. durbanenesis* occurring in the tidal pools are predominantly 0+ juveniles.

Christensen (1978a) noted that juvenile *S. durbanensis* fed mainly on harpacticoid copepods and van der Elst (1983) stated that juveniles feed on copepods, amphipods and mysids whilst adults favour mussels. Within the limitations of the frequency of occurrence method of analysis used in the present study (see Hyslop 1980) it is clear that small *S. durbanensis* are omnivorous. With an increase in size, small gastropods became more important in the diet and the largest specimens examined appeared to have acquired the carnivorous habits of the adults. The dentition of the juveniles was found to change progressively with an increase in size (Figure 3) and reflects the change from omnivorous browsing to the crushing of hard-shelled prey. Small juveniles have numerous anterior incisiform and villiform teeth, whereas both the upper and lower jaws of larger specimens are characterized by four incisors and many large molars, a similar dentition pattern to that found in adults (Smith & Heemstra 1986).

Acknowledgements

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