Short Communications

Collections of freshwater shrimps along the southern coast of South Africa

D.J. Coetzee
Chief Directorate Nature and Environmental Conservation, Jonkershoek Nature Conservation Station, Private Bag 5014, Stellenbosch, 7600 Republic of South Africa

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During the period February 1983 to November 1986 a total of 38 rivers along the south-western, southern and eastern Cape coasts and Ciskei were investigated for the occurrence of freshwater shrimps. Five species were found, namely *Palaemon capensis* (de Man), *Macrobrachium petersii* (Hilgendorf), *M. rude* (Heller), *Caridina nilotica* (Roux) and *C. typus* H. Milne-Edwards. The known distribution range of *P. capensis* was extended eastwards to the Keiskamma River in the Ciskei, and it appears to be the only freshwater shrimp occurring in the often very acid dark brown ('black') waters of the south-western and southern Cape rivers. *M. petersii* and *C. nilotica* occurred south-westwards as far as the Gamtoos River, whereas *M. rude* was found only in the Gqunube River, the easternmost river in the study area, and *C. typus* only in the Nahoon River, about 15 km further south-westwards. An estuarine/marine shrimp species, *Palaemon pacificus,* was often found in the estuarine sections of rivers, and *P. concinnus,* another estuarine/marine species, was collected in the Gqunube River. As far as is known this is the first published record of *P. concinnus* in the Cape Province.

Gedurende die periode Februarie 1983 tot November 1986 is 38 riviere langs die Suidwes-, Suid- en Oos-Kaapse kus en Ciskei vir die voorkoms van varswatergarnale ondersoek. Vyf spesies is gevind, nl. *Palaemon capensis* (de Man), *Macrobrachium petersii* (Hilgendorf), *M. rude* (Heller), *Caridina nilotica* (Roux) en *C. typus* H. Milne-Edwards. *P. capensis* se bekende verspreidingsgebied is ooswaarts tot by die Keiskammarivier in die Ciskei uitgebrei, en dit skyn die enigste varswatergarnaal in die dikwels baie suur water van die Suidwes- en Suid-Kaapse donkerbruin ('swart') riviere te wees. *M. petersii* en *C. nilotica* het suidweswaarts tot sover as die Gamtoosrivier voorgekom, terwyl *M. rude* slegs in die Gqunuberivier, die mees oostelike rivier in die studiegebied, en *C. typus* slegs in die Nahoonrivier, ongeveer 15 km suidwes daarvan, gevind is. 'n Riviermond/mariene garnaalspesie, *Palaemon pacificus,* is dikwels in die mondgedeeltes van riviere aangetref, en *P. concinnus,* ook 'n riviermond/mariene spesie, is in die Gqunuberivier gevind. Sover bekend is dit die eerste gepubliseerde optekening van *P. concinnus* in die Kaapprovinsie.

Most of South Africa has a semi-arid climate, and its mean annual rainfall is only 475 mm compared with the world mean of 860 mm (Noble & Hemens 1978). Continued urban, industrial, agricultural and recreational development is placing increasing pressure on the country's water resources, often resulting in the degradation of rivers and estuaries with their associated plant and animal life.

In view of this the then Cape Department of Nature and Environmental Conservation started to investigate the present status and distribution of freshwater decapods in the Cape Province, concentrating initially on the occurrence of freshwater shrimps in selected rivers along the south-western, southern and eastern Cape coasts and Ciskei. Apart from the work done on *Macrobrachium petersii* in the Keiskamma River (Read 1982, 1983, 1985), freshwater shrimps have received little attention in the Cape Province and Ciskei since Barnard's (1950) major work, and the need for further collecting is stressed by Kensley (1981).

During February 1983 trial surveys to test sampling equipment were carried out in five southern and eastern Cape rivers. These were followed by one or two day visits to 37 rivers along the south-western to eastern Cape coast during the period September 1984 to November 1986 (Figure 1). The present paper lists the occurrence of the various freshwater shrimp species collected during these visits, and provides some information on the environmental conditions under which they were found. Most of the data on the Gamtoos River have already been published (Coetzee 1986), but will be included for the sake of completeness.

Material and Methods

The 38 rivers visited during the study were sampled at a number of sites along their middle and lower reaches, including the upper parts of their estuaries. Fine-mesh scoop-nets and, if the terrain allowed it, a 10 m long seine net with a stretched mesh size of 8 mm were used to sample each site. When no shrimps were caught, shrimp traps baited with pieces of fish were usually set and left overnight. Notes were taken on the features of each site, the temperature and pH of the water were measured (the latter with a Beckman Chem-Mate pH meter), and a water sample for the determination of conductivity was taken.

Temperature, pH and conductivity samples were again taken when the traps were collected the following morning. Freshwater decapod and fish specimens caught in the traps or nets were preserved in 70% alcohol and all other organisms were noted. Conductivity was measured at 25°C with a YSI Model 33 S-C-T meter at the laboratory. Shrimps were identified following Barnard (1950) and Kensley (1972).

Two types of shrimp trap were used. Both were cylindrical with a length of 45 cm and diameter of 20 cm, and consisted of a galvanized wire (4 mm in diameter) frame covered by green shade cloth (38% shade, i.e. 2 × 3 mm mesh size)(Figure 2). The first type had two funnel-shaped ends, one removable, with openings of 3,5 cm in diameter, whereas the second type had one removable funnel-shaped end with an opening of 6,5 cm in diameter. Two of the former and one of the latter were set at each trapping site during the period September 1984 to November 1986, but during the trial surveys in February 1983 only the former type was used, and only one was set per station.

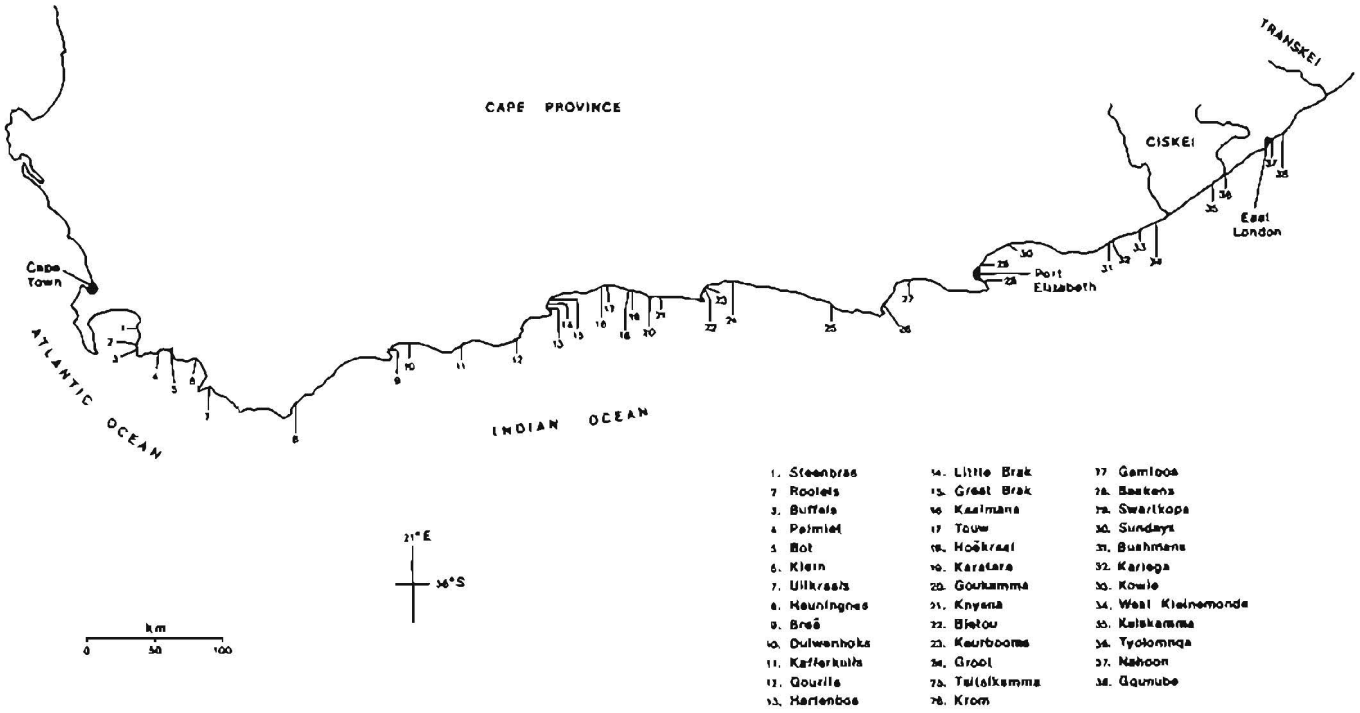

Figure 1 The study area.

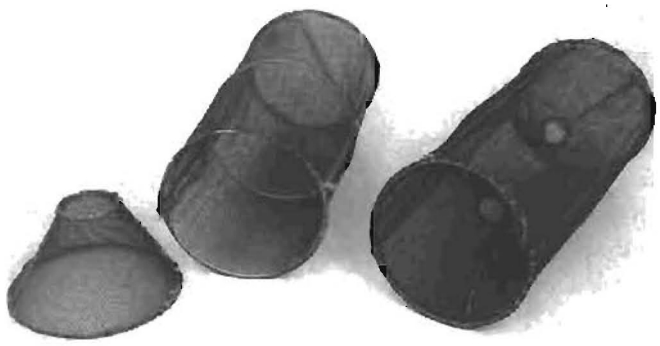

Figure 2 Shrimp traps used during the study.

Results and Discussion

Five species of freshwater shrimp were collected during the river surveys, namely *Palaemon capensis* (de Man), *Macrobrachium petersii* (Hilgendorf), *M. rude* (Heller), *Caridina nilotica* (Roux) and *C. typus* H. Milne-Edwards (Table 1).

Palaemon capensis

According to Barnard (1950) *P. capensis* occurs from the Palmiet River in the south-western Cape to the Baakens River in the eastern Cape (Figure 1). Its type locality is about halfway between these two rivers, namely the Knysna River (de Man 1897). Within this distribution range Barnard (1950) also recorded it in the Breë River system (Riviersonderend and Buffeljags River), Duiwenhoks River, Great Brak River and Gamtoos River.

The results of the present study show that *P. capensis* still occurs in all these river systems, as well as further eastwards in the Swartkops, Sundays, Kariega, Kowie and Keiskamma rivers (Table 1). Further records have also been added to the Palmiet/Baakens region, namely the Kafferkuils, Gourits, Little Brak, Kaaimans, Touw and Keurbooms rivers. *P. capensis* undoubtedly also occurs in some of the other rivers in the Palmiet/Keiskamma region that were not sampled, and possibly even in some that were sampled, e.g. the Bushmans River. The latter was visited on 12 August 1986 when conditions were fairly dry and the river not flowing, but forming a number of separate pools along its middle reaches. No shrimps were obtained, although at least *Caridina nilotica* is known to occur in this river (Hart 1983).

Barnard (1950) gives the maximum length of male *P. capensis* as 48 mm and that of females as 66 mm. During the present study the largest male was obtained in the Palmiet River and measured 56 mm in total length (from the tip of the rostrum to the tip of the telson), whereas the largest female was from the Keiskamma River and measured 75 mm in total length. Maximum total lengths recorded at the type locality (Knysna River) were 52 and 70 mm for males and females respectively.

P. capensis was collected at temperatures from 14 to 26°C in a variety of aquatic habitats: in the dark brown ('black') humic stained and often very acid rivers of the south-western and southern Cape, the highly turbid yellow water (owing to suspended clay particles) of the Gourits and Keiskamma rivers, the clear water of the Gamtoos, Baakens, Swartkops and Kowie rivers, and the eutrophic green water of the Sundays River at the time of sampling. It was found at pH values ranging from 4,2 (Kaaimans River) to 8,35 (Gamtoos River). Barnard (1950) recorded it from 4,5 (Palmiet River) to 8,5 (Gamtoos River).

Table 1 Occurrence of freshwater shrimps collected in rivers along the south-western, southern and eastern Cape coasts and Ciskei during the period February 1983 to November 1986 (* = new record)

River	Date sampled	Species obtained	Distance of locality from river mouth (to nearest km)	Water colour	Substrate	Temperature °C	Conductivity mS m^{-1}	pH
Palmiet	23–24/2/86	*Palaemon capensis*	2	dark brown ('black')	rocky with sand pockets	19–21,5	10–14	4,9–5,6
Breë	12–13/11/84	*Palaemon capensis*	27	–	sand	–	39	–
	12–13/11/84	*Palaemon capensis*	37	–	sand	–	–	–
Duiwenhoks	12–13/9/85	*Palaemon capensis*	36	dark brown ('black')	loose stones	16–17	112–115	7,5–7,7
	12–13/9/85	*Palaemon capensis*	18	dark brown	sand	15–16	88–96	7,4
Kafferkuils	18/11/86	*Palaemon capensis**	16	dark brown ('black')	loose stones	22	37	6,3
Gourits	18–19/11/85	*Palaemon capensis**	21	turbid yellow	sticky mud	20,5–24	140–147	7,6–7,75
Little Brak	18–19/2/86	*Palaemon capensis**	5	brown	muddy sand and stones	26	312–1200	6,7–6,9
Great Brak	19/2/86	*Palaemon capensis*	6	dark brown ('black')	sand and gravel	24	35	6,6
Kaaimans	20/2/86	*Palaemon capensis**	2	dark brown ('black')	sand	22	144	4,8
	20/2/86	*Palaemon capensis*	2	dark brown ('black')	loose stones	22	16	4,2
Touw	20/2/86	*Palaemon capensis**	6	dark brown ('black')	loose stones	21,5	16	5,05
Knysna	21–22/2/86	*Palaemon capensis*	17	dark brown ('black')	loose stones	22–22,5	15	5,3
	21–22/2/86	*Palaemon capensis*	18	dark brown ('black')	loose stones	21,5–22	22	5,3–5,4
Keurbooms	25–26/2/83	*Palaemon capensis**	15	dark brown ('black')	loose stones	–	–	–
Gamtoos (Coetzee 1986)	22–23/2/83	*Macrobrachium petersii** *Caridina nilotica**	20	clear	sand	–	–	–
	7–8/11/84	*Palaemon capensis* *Macrobrachium petersii*	24	clear	sand	20–26	293–304	7,9–8,35
Baakens	6/11/84	*Palaemon capensis*	1	clear	loose stones on concrete	22,5	171	7,5
Swartkops	9/4/86	*Palaemon capensis** *Macrobrachium petersii**	16	clear	loose stones	22	353	7,0
Sundays	8–9/4/86	*Palaemon capensis** *Macrobrachium petersii**	24	turbid green	sand	20,5–22	455–460	7,7
Kariega	13/8/86	*Palaemon capensis**	19	brown	stones in sticky mud	14	1150	6,85
Kowie	13/8/86	*Palaemon capensis** *Macrobrachium petersii* *Caridina nilotica**	21	clear	loose stones	18	1000	6,9
Keiskamma (Ciskei)	14/10/86	*Palaemon capensis** *Macrobrachium petersii* *Caridina nilotica*	20	turbid yellow	muddy sand	19	70	6,9
Tyolomnqa	14/10/86	*Caridina nilotica**	15	turbid yellow	sand	20	94	6,9
Nahoon	14/10/86	*Palaemon* larva *Caridina nilotica** *Caridina typus**	5	turbid yellow	loose stones	20	73	6,7
Gqunube	15/10/86	*Macrobrachium petersii** *Caridina nilotica** *Macrobrachium rude**	9	turbid yellow	loose stones	19	80	6,7

Although considered a freshwater shrimp, *P. capensis* was sometimes collected in relatively saline water in the upper reaches of estuaries, e.g. the Little Brak, Kariega and Kowie rivers. It has also previously been found at the head of the Great Brak River estuary (Day 1981). It occurred over a variety of substrata at conductivity values from 10 (Palmiet River) to 1 200 mS m^{-1} (Little Brak River).

P. capensis appears to be the only freshwater shrimp inhabiting the dark brown ('black') acid streams of the south-western and southern Cape, and therefore occurs further south and south-west than any other freshwater shrimp in Africa. From the Gamtoos River eastwards it may share its habitat with *Macrobrachium petersii* and *Caridina nilotica*. Apart from these two species, it was also found together with the estuarine/marine shrimp *Palaemon pacificus* (Stimpson) in the Kowie River. *P. pacificus* was common in the estuarine sections of most rivers during the study.

In the Gqunube River four specimens of another species of *Palaemon* were found at the same locality as *Macrobrachium petersii, M. rude* and *Caridina nilotica*, namely *P. concinnus* Dana. Kensley (1981) describes it as an estuarine/marine species, although it may also occur in freshwater (Holthuis 1980). *P. concinnus* is found from East Africa to Hong Kong, the Philippines and Polynesia (Holthuis 1980), and is common in Natal estuaries (Begg 1984). The present record is, as far as is known, the furthest south that it has ever been collected in Africa and the first published record of its occurrence in the Cape Province.

Macrobrachium petersii

Whereas little is known about *Palaemon capensis, M. petersii* has been intensively studied in the Keiskamma River (Read 1982, 1983, 1985). Read has shown that estuaries play an essential role in the life cycle of this species because its larvae require saline water for growth and development.

According to Barnard (1950) *M. petersii* occurs between the Zambesi River and the Illovo River (Natal). Read (1982, 1983) collected it further south in the Keiskamma, Great Fish (the south-western border of Ciskei) and Kowie rivers. During the present study it was again found in the Keiskamma and Kowie rivers, but also further south-west in the Sundays, Swartkops and Gamtoos rivers, as well as in the Gqunube River at East London (Table 1). It occurred at temperatures from 18 to 26°C, conductivity values from 70 to 1 000 mS m^{-1}, and pH values from 6,7 to 8,35.

Macrobrachium rude

M. rude occurs in East Africa, Madagascar, India and Bangladesh (Holthuis 1980). During the present study it was only found in the Gqunube River where it occurred in turbid yellow water over loose stones at a temperature of 19°C, conductivity of 80 mS m^{-1} and pH of 6,7. The 14 specimens found resemble Barnard's (1950) *Palaemon (Eupalaemon),* cf. *sundaicus* Heller, which had been collected in Natal, Transkei (Port St Johns) and the eastern Cape (Buffalo River at East London, about 15 km south-west of the Gqunube River), and which is considered by Johnson (1973) to be synonymous with *Macrobrachium rude.* According to Johnson (1973) many shrimps identified as *M. equidens* in southern Africa are actually *M. rude* because he maintains that *M. equidens* does not occur in Africa. Kensley (1981), however, still lists *M. equidens* under southern African decapods. Various authors (Barnard 1950; Johnson 1973; Kensley 1981; Bickerton *in litt.)* agree that certain members of the genus *Macrobrachium* are taxonomically problematic in southern Africa. This is largely because insufficient specimens from this region have been adequately described and classified.

Caridina nilotica

C. nilotica occurs in North and East Africa, Madagascar, India, China, the East Indies and Australia (Kensley 1981). In South Africa it is distributed over the Transvaal, Natal, Orange Free State, the northern Cape as far westwards as 1 km from the mouth of the Orange River (Cambray 1984), and the eastern Cape as far south-westwards as the Gamtoos River (Coetzee 1986). This species has been intensively studied in Lake Sibaya, Natal (Hart 1980a, 1980b, 1981, 1983; Hart & Allanson 1981).

During the present study it was collected in the Gamtoos (reported in Coetzee 1986), Kowie, Keiskamma, Tyolomnqa, Nahoon and Gqunube rivers. It occurred at temperatures from 18 to 20°C, conductivity values from 70 to 1 000 mS m^{-1} and pH values from 6,7 to 6,9.

Caridina typus

According to Kensley (1981) *C. typus* occurs on several Indian Ocean islands, in the western Pacific and Queensland (Australia), as well as several rivers in Natal. It was also recently collected above the ebb and flow of the Keiskamma River, Ciskei (Hart 1983). The present record in the Nahoon River therefore falls within its known distribution range. Only two specimens were collected in the turbid yellow waters over loose stones at a temperature of 20°C, a conductivity value of 73 mS m^{-1} and a pH of 6,7.

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

A.J.L. Larnbiris
Natal Parks Board, P.O. Box 662, Pietermaritzburg, 3200 Republic of South Africa

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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).