Proceedings of the Nature Reserves Survey Seminar.
Gardens' Bulletin Singapore ***49*** *(1997) 267–272.*

The Conservation Status of Freshwater Prawns and Crabs in Singapore with Emphasis on the Nature Reserves

PETER K.L. NG

Raffles Museum of Biodiversity Research
Department of Biological Sciences
National University of Singapore
Kent Ridge, Singapore 119260

Abstract

The freshwater prawn and crab fauna of Singapore are well studied, and 23 species have been reported. Seven species of freshwater crabs are present, of which three species, *Parathelphusa reticulata* (Parathelphusidae), *Irmengardia johnsoni* (Parathelphusidae), and *Johora singaporensis* (Potamidae) are endemic to Singapore. Sixteen species of freshwater prawns are known, but two species, *Macrobrachium scabriculum* and *M. rosenbergii* (Palaemonidae) are now believed to be extinct. Eight species had originally been described from Singapore. The possibility of species entering the catchment area through the import of raw water into Singapore from Malaysia is discussed.

Introduction

The freshwater decapod prawns and crabs (Decapoda, Crustacea) of Singapore have been studied intensely over the last 30 years, and are well known by any standard (Ng, 1990). In a recent appraisal of the state of freshwater biodiversity in Asia, Singapore was singled out as one country in which its freshwater fauna was very well known and studied in depth (Kottelat & Whitten, 1996).

The present paper is intended to review and provide a synopsis of the extant and extinct freshwater decapod crustacean fauna of Singapore with particular reference to the Nature Reserves. It will also examine how the continued conservation of the remaining forests in the centre of the island (i.e., the Nature Reserves) is critical for the long-term survival of the majority of the extant decapod crustacean fauna.

State of the Prawn Fauna

The freshwater prawn and crab fauna of Singapore were recently reviewed by Ng (1990), who recognised 24 species, of which 22 were regarded as indigenous. Since then, three new species have been added to the fauna. Choy and Ng (1991) described *Caridina temasek*, a species that was only

identified as *Caridina* sp. by Ng (1990). Ou and Yeo (1995) showed that specimens which had been identified as *Macrobrachium pilimanus* by Johnson (1961a) and Ng (1990) were actually new to science and named it *M. platycheles*. Most recently, Yeo and Ng (1997) added *Potamalpheops amnicus*, the first record of a freshwater snapping prawn (Alpheidae) from Singapore. A total of 23 native species of freshwater decapod crustaceans are thus now known from Singapore (Tables 1, 2).

Table 1. Extant Native Freshwater Decapod Crustaceans.
(EN = Endangered, CO = Common, FO = Forest waters, OP = Open waters, NSS = Nee Soon Swamp Forest, BTNR = Bukit Timah Nature Reserve, NR = Nature Reserves (excluding NSS & BTNR), OA = Open areas, + = present, - = absent)

	Species	Status	Habitat	NSS	BTNR	NR	OA
	Family **POTAMIDAE**						
1.	*Johora singaporensis*	EN	FO	-	+	-	-
	Family **PARATHELPHUSIDAE**						
2.	*Parathelphusa maculata*	CO	FO/OP	+	-	+	+
3.	*Parathelphusa reticulata*	EN	FO	+	-	-	-
4.	*Irmengardia johnsoni*	EN	FO	+	+	+	-
	Family **GRAPSIDAE**						
5.	*Varuna yui*	CO	OP	-	-	-	+
6.	*Geosesarma peraccae*	EN	FO	+	+	+	-
7.	*Geosesarma nemesis*	EN	FO	-	+	-	-
	Family **PALAEMONIDAE**						
8.	*Macrobrachium malayanum*	CO	FO	+	+	+	-
9.	*Macrobrachium platycheles*	EN	FO	+	-	-	-
10.	*Macrobrachium trompii*	EN	FO	+	-	+	-
11.	*Macrobrachium sintangense*	CO	OP/FO	-	-	+	+
12.	*Macrobrachium neglectum*	EN	FO	+	-	-	-
13.	*Macrobrachium idae*	EN	OP	+	-	+	-
14.	*Macrobrachium equidens*	CO	OP	-	-	-	+
	Family **ATYIDAE**						
15.	*Caridina temasek*	EN	FO	-	-	+	-
16.	*Caridina gracilirostris*	EN	FO/OP	+	-	-	-
17.	*Caridina propinqua*	CO	FO/OP	-	-	+	+
18.	*Caridina simoni peninsularis*	EN	FO/OP	-	-	+	+
19.	*Caridina tonkinensis*	EN	FO/OP	-	-	+	+
20.	*Caridina weberi sumatrensis*	EN	FO/OP	-	-	+	+
	Family **ALPHEIDAE**						
21.	*Potamalpheops amnicus*	EN	FO	-	-	+	-

Two of the species (both palaemonids) are now regarded as extinct (Table 2), representing about 9% of the total known native fauna. *Macrobrachium scabriculum* has not been reported since early this century and must be regarded as extinct (Johnson, 1961a). The specimens on which this record was based were recently re-examined and their identity was confirmed (Y. Cai, *pers. comm.*). The extinction of the well known Giant Prawn or Udang Galah, *M. rosenbergii*, is a more recent phenomenon, as juveniles were still seen as late as 1985 in the streams draining into Nee Soon (Ng, 1990). This area is now very disturbed, with the lower stretches highly polluted. No individuals have, however, been seen or recorded since, and the species is now regarded as extinct. Both these species have small eggs and pelagic larvae that develop in estuarine and coastal areas, with the young prawns having to swim upstream to their adult habitats. Pollution, concretisation and changes in almost all estuarine areas in Singapore mean that the survival of these species is doubtful. The same problems are also faced by two other species, *Macrobrachium neglectum* and *M. idae*. Both species were still relatively common in the early 1980s in streams outside the Nee Soon Swamp Forest, but they have become very rare in recent years. Both species have small eggs and pelagic larvae that must develop downstream. The loss and/or modification of downstream habitats have apparently contributed to their population decrease, and both species are likely to become extinct in the near future, regardless of how much of our forests are conserved.

Table 2. Extinct Freshwater Decapod Crustaceans of Singapore.
(FO = Forest waters, OP = Open waters, LRF = large river fauna, + = present, - = absent)

	Species	Habitat	LRF
	Family **PALAEMONIDAE**		
1.	*Macrobrachium scabriculum*	OP/FO	-
2.	*Macrobrachium rosenbergii*	OP/FO	+

For the three atyid shrimps, *Caridina simoni peninsularis*, *C. tonkinensis* and *C. weberi sumatrensis*, none has been collected from Singapore waters since the reports by Johnson (1961a, b) and they might no longer be extant. If they are present, they should be regarded as highly endangered. All three are freshwater species that have their larval development linked to estuarine areas as well.

Of the extant shrimp species, most of the endangered species have direct or semi-abbreviated larval developments, that is, they can complete their development within the waters of the catchment area. Of these, the two most vulnerable species are *Macrobrachium platycheles* and *M. trompii*. *Macrobrachium platycheles* is known only from the forested, faster flowing streams in the Nee Soon Swamp Forest, whilst *M. trompii* only occurs in the more acidic waters of the same swamp.

State of the Crab Fauna

Of the freshwater crabs, *Varuna yui* is a eurytopic species that is essentially a marine crab that can live in freshwater. Of the true freshwater crabs (i.e., species that have semi- to completely abbreviated larval development), all species are threatened to various degrees by ongoing and potential habitat loss.

Of the six extant wholly freshwater species, three (*Parathelphusa maculata*, *Geosesarma peraccae* and *G. nemesis*) are also common in Peninsular Malaysia, with *P. maculata* and *G. peraccae* still relatively common in Singapore in some areas at the edge of the catchment area. Three species, *I. johnsoni*, *P. reticulata* and *J. singaporensis*, are endemic to Singapore (Ng, 1988, 1989). Studies of neighbouring areas (e.g., southern Malaysia and Riau Archipelago) have revealed allied but clearly different species that strongly support the consensus that these three species are true Singapore endemics.

The most vulnerable of these three is *P. reticulata*, which is known only from a small patch of swamp in the Nee Soon Swamp Forest (Ng & Lim, 1992). *Johora singaporensis* is known only from Bukit Timah Nature Reserve and a small stream at the edge of the catchment area (near Bukit Batok Nature Park). The main population is in Bukit Timah Nature Reserve, where it is now threatened by the gradual drying up of the streams there (Ng, 1995). Although no freshwater crab species is yet known to have become extinct in Singapore, *P. reticulata* and *J. singaporensis* are the most likely candidates in the decades ahead due to their stenotopic habitat requirements and restricted ranges.

Note on Introductions

There are some problems with a few species that are now still regarded as native. The shrimps *Caridina temasek* and *Potamalpheops amnicus* are known only from one stretch of Sime Road in the Central Catchment Nature Reserve, an area in which raw, untreated water from Johor is

regularly pumped in to supplement the water stock in the reservoirs. It is possible that these two shrimps may have entered Singapore this way. It is pertinent to note that both shrimps are small species (up to 10 mm in length) and the adults or young could have easily crossed the filters normally placed in water pipes. The two shrimps had not been listed in any of the earlier works on Singapore shrimps by Johnson (1960, 1961a, b), and both species can be common in parts of western Johor (Yeo & Ng, 1997), from where much of Singapore's water comes.

There is as yet, however, no compelling evidence that the two species are definitely not part of Singapore's original fauna, as the habitats for both taxa are not very specific. In addition, *P. amnicus* is a very difficult species to collect by normal methods as it is not only very small (and therefore easily mistaken for the young of other common prawns) but it also lives deep in burrows in eroded banks (Yeo & Ng, 1997). This species could thus have been missed by earlier workers. For the moment, it seems best to regard them as part of Singapore's extant native fauna.

With regards to introduced crustacean species in Singapore, there appears to be no obvious problems for the native fauna at present. This is probably due to the fact that the majority of the extant native species are forest inhabitants living in softer and more acidic waters, while successful introductions have mainly been more open-country and hard water species (Ng *et al.*, 1993).

References

Choy, S.C. & P.K.L. Ng. 1991. A new species of freshwater atyid shrimp, *Caridina temasek* (Decapoda: Caridea: Atyidae) from Singapore. *Raffles Bulletin of Zoology*. **39**: 265–277.

Johnson, D.S. 1960. Sub-specific and infra-specific variation in some freshwater prawns of the Indo-Pacific region. *Proceedings of the Centenary and bicentenary Congress of Biology, Singapore*. pp. 170–181.

Johnson, D.S. 1961a. A synopsis of the Decapoda Caridea and Stenopodidea of Singapore, with notes on their distribution and a key to the genera of Caridea occuring in Malayan waters. *Bulletin of the National Museum, Singapore*. **30**: 44–79.

Johnson, D.S. 1961b. Notes on the freshwater Crustacea of Malaya. I. The Atyidae. *Bulletin of the National Museum, Singapore*. **26**: 120–153.

Kottelat, M. & A.J. Whitten. 1996. *Freshwater Biodiversity in Asia with special reference to Fish*. World Bank Technical Paper No. 343. pp. 59.

Ng, P.K.L. 1988. *The Freshwater Crabs of Peninsular Malaysia and Singapore*. Department of Zoology, National University of Singapore.

Ng, P.K.L. 1989. Endemic freshwater crabs in Singapore: discovery, speciation and conservation. *Singapore Institute of Biology Bulletin*. **13**: 45–51.

Ng, P.K.L. 1990. The freshwater crabs and prawns of Singapore. In: L.M. Chou & P.K.L. Ng (eds.). *Essays in Zoology*. Department of Zoology, National University of Singapore. pp. 189–204.

Ng, P.K.L. 1995. Freshwater decapod crustaceans. In: S.C. Chin, R.T. Corlett, Y.C. Wee & S.Y. Geh (eds.). *Rain Forest in the City: Bukit Timah Nature Reserve, Singapore. Gardens' Bulletin Singapore. Suppl.* **3**: 151–157.

Ng, P.K.L. & K.K.P. Lim. 1992. The conservation status of the Nee Soon Freshwater Swamp Forest of Singapore. *Aquatic Conservation: Marine and Freshwater Ecosystems*. **2**: 255–266.

Ng, P.K.L, L.M. Chou & T.J. Lam. 1993. The status and impact of introduced freshwater animals in Singapore. *Biological Conservation*. **64**: 19–24.

Ou, A.C.T. & D.C.J. Yeo. 1995. A new species of freshwater prawn, *Macrobrachium platycheles* (Decapoda: Caridea: Palaemonidae) from Singapore and Peninsular Malaysia. *Raffles Bulletin of Zoology*. **43**: 299–308.

Yeo, D.C.J. & P.K.L. Ng. 1997. The alpheid shrimp genus *Potamalpheops* Powell, 1979 (Crustacea: Decapoda: Caridea: Alpheidae) from Southeast Asia, with descriptions of three new species. *Journal of Natural History*. **31**: 163–190.