Malaysian Journal of Science 32 (2): 59-66 (2013)

A PRELIMINARY STUDY OF SMALL SCAVENGING CRUSTACEANS COLLECTED BY BAITED TRAPS IN A CORAL REEF OF BIDONG ISLAND, MALAYSIA

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Abstract In order to examine small invertebrate scavenging fauna of tropical coral reef waters, baited traps were deployed in a coral reef of Bidong Island, Malaysia. The samples taken by the traps constituted only a single species of isopods (Cirolana sp.) and ostracods from three families (Cypridinidae, Cylindroleberididae, and Paradoxostomatidae). Cirolanid isopods were never collected in net-samples suggesting they are hyperbenthic scavenging species. Judging from its sheer numbers in the bait-attracted community (86.1-98.6%), cirolanid isopods are one of the most important small invertebrate scavengers in coral reef waters of Bidong Island.

Abstrak Di dalam mengetahui kehadiran fauna invertebrat pemangsa di kawasan terumbu karang di perairan tropika beberapa perangkap berumpan telah diletakkan di sekitar kawasan terumbu karang di Pulau Bidong. Perangkap berumpan tersebut telah berjaya memerangkap hanya satu spesies tunggal isopod (Cirolana sp) dan juga tiga famili ostrakod (Cypridinidae, Cylindroleberididae, dan Paradoxostomatidae). Didapati, isopod cirolanid tidak pernah direkodkan kehadirannya di dalam mana-mana persampelan yang menggunakan net, menunjukkan bahawa

kumpulan organisma ini adalah sebagai spesies pemangsa hiperbentik. Merujuk kepada kehadirannya yg amat tinggi di dalam komuniti perangkap-berumpan tersebut (86.1-98.6%), didapati isopod cirolanid ini merupakan salah satu kumpulan invertebrate pemangsa kecil yang penting di kawasan terumbu karang di Pulau Bidong.

(**Keywords:** Bait-trap, *Cirolana* isopods, Coral reef, Ostracods, Scavenger)

INTRODUCTION

Predation has been thought to be a primary cause of fish mortality in coral reef ecosystems [1, 2]. However, substantial mortality is still observed in the absence of fish predators [3], probably due to disease and atrophy. Such death would produce carrion or carcass, which is almost never observed on coral reefs (Britton and Morton, 1994). Recently it has been demonstrated that removal of the carrion through large vertebrate scavengers (i.e., scavenging fish) is very rapid, and consequently it leaves little evidence of carrion on reefs [4]. However, although large vertebrates are often the most noticeable carrion feeders at a carcass, small invertebrates such as amphipods and isopods find and consume carcasses that vertebrates do not detect [5]. These small invertebrates also may make a significant contribution to coral reef ecosystems as scavengers for recycling carcasses within reef systems.

To date, most investigations on composition of small scavenging fauna have been conducted in temperate and boreal regions [e.g., 6, 7, 8, 9, 10, 11, 12, 13] and very few researches have been done in tropical and subtropical regions [5], with little information for species composition of small invertebrate scavengers in tropical coral reef waters. This paper presents the preliminary results on the composition of scavenging fauna collected by baited traps in a tropical coral reef water of Bidong Island, Malaysia in order to examine potentially important scavengers for material cycling in the reef ecosystems.

MATERIALS AND METHODS

The scavengers were collected in a coral reef at Bidong Island (5°36,785'N; 103°3,527'E), off the northeast coast of Peninsular Malaysia on 7-8 June 2010 with baited traps similar to the method described in [13]. Ten 500 ml cylindrical plastic bottles (diameter, 7 cm; height, 9 cm) were used as traps. The top of each bottle was sealed with a plastic screw cap through which either large (diameter, 2 mm) or small (1 mm) pores have

been drilled. Five bottles were prepared for each pore size and the number of pores was 6 in the 2 mm pore traps and 25 in the 1 mm pore traps, resulting in total pore areas of 18.8 mm^2 and 19.6 mm^2, respectively. Fresh bigeye scads (*Selar crumenophthalmus*) were used as bait. Whole bigeye scads were cut into round slices of ca. 1 cm thickness, which were wrapped in a bag of nylon gauze (mesh size, 100 μm). A bag containing ca. 30 g (wet wt) of bait was placed in 3 of the 5 traps for both large and small pore traps. The six bottles with bait were bound together and a diving weight (2 kg) was attached on the bottom side of the bottles.

Similarly, the 4 bottles without bait were bound together with a diving weight of 2 kg. Before setting the traps, all bottles were filled with filtered (Whatman GF/F) seawater. The traps with and without bait were placed on the sea-bottom by SCUBA, keeping a distance of 2 m away between each other. The placed depth was ca. 2.5-3 m. The traps were deployed ca. 1 hour before sunset (1800 h). During the night (2000 h), net-zooplankton was collected by horizontal towing (5 min) of a plankton net (mouth diameter, 50 cm; mesh size, 180 μm) in the layer ca. 1 m above the bottom close the traps for compare net-collected zooplankton with the bait samples.

The traps were retrieved the next day (1200 h). Before retrieving the traps, each bottle was placed in a plastic bag to prevent possible loss of collected animals during transportation. Immediately upon arrival at the field laboratory, all samples were fixed in 5% buffered formalin seawater. Specimens from all traps were sorted, enumerated and identified to the lowest taxonomic level whenever possible. For the net-zooplankton samples, large or rare species were first sorted out, then the remaining was split (1/10) of which all zooplankton were identified and counted. For isopods from the trap samples, the body length of randomly sampled 10 specimens from each trap were measured under a stereomicroscope (Wild, M10) using an eyepiece micrometer.

RESULTS AND DISCUSSION

No animals were observed in the traps without bait, while the baited traps constituted high density of isopods and ostracods. Isopods were overwhelmingly dominant (222-580 inds. $trap^{-1}$) constituting 86.1-98.6% of the total abundance, followed by ostracods, which were much less abundant (6-69 inds. $trap^{-1}$) (Table 1). The isopods consisted of a single species (species not determined) belonging to *Cirolana* "parva" complex (Fig. 1). The body length of the *Cirolana* isopods ranged from 1.9 to 5.5 mm for all traps

(average ± SD = 4.2 ± 1.0 mm). There was no significant difference in body length with different pore size (Mann-Whitney *U*-test, P = 0.44). The ostracods from the traps consisted of three species from the families Cypridinidae (*Vargula* sp.), Cylindroleberididae (*Xenoleberis* sp.), and Paradoxostomatidae (*Cytherois* sp.). The ostracods *Xenoleberis* sp. and *Cytherois* sp. were collected only in the traps with 1 mm pore size. There was no considerable difference in the total number of isopods and ostracods collected between traps of different pore sizes (Mann-Whitney *U*-test, P = 0.827 for isopods and P = 0.275 for ostracods).

Most of the isopods were actively moving/swimming in the traps with 2 mm pores at the time of recovery but most of them were dead in the 1 mm pore traps probably due to the lack of oxygen. Traps with 2 mm pores could have provided a set of live animals for experimental studies, although they were fixed immediately in the present study.The sample from the plankton net towed near the bottom contained 15 taxonomic groups (Table 1). The absence or negligible occurrence from the traps of most of taxonomic groups that were collected in the plankton net suggests that the present bait was less or not attractive to them. The net samples included 2 individuals of isopods but the species (*Gnorimosphaeroma* sp.) was different from that collected in the traps. The net samples contained 61 individuals of ostracods, of which only 2 individuals were also observed in the traps (*Vargula* sp. and *Xenoleberis* sp., respectively). The net collected ostracods were dominated by *Euconchoecia* sp., which accounted for 91.8% of the total net ostracods. It is evident that the *Cirolana* isopods and three ostracod species (*Vargula* sp., *Cytherois* sp. and *Xenoleberis* sp.) were attracted to the bait, considering their high abundance in the traps and their total absence from the traps without bait. Attraction of large number of isopods and ostracods, because of their sensitive chemoreceptive adaptation, to baited traps has been reported [14, 15].

The specialized mouthpart setae, presumed to be chemosensory, in the cirolanid isopods as well as ostracods are assumed to function in detecting chemicals from the baits. *Cirolana* isopods (and probably *Cytherois* ostracods) would be hyperbenthic scavengers considering their non-occurrence in the plankton net towed just above the sea-bottom. Although we towed the plankton net only once in the present study, previous studies of net-zooplankton conducted in the same sampling location acknowledged no occurrence of cirolanid isopods in the net-samples throughout the year (Nakatomi unpubli.).

Table 1. Individual numbers of organisms collected by traps with bait (#1-6) and without bait (#7-10) and by one-benthopelagic tow of plankton net over a coral reef at Bidong Island, Malaysia. Pore sizes (mm) indicate pore diamters that have been drilled on the traps.

Taxon	Trap sample										Net sample
	With bait						Without bait				
	2 mm pore			1 mm pore			2 mm pore		1 mm pore		
	Trap #1	Trap #2	Trap #3	Trap #4	Trap #5	Trap #6	Trap #7	Trap #8	Trap #9	Trap #10	
Fish larvae	0	0	0	0	0	0	0	0	0	0	70
Fish eggs	0	0	0	0	0	0	0	0	0	0	64
Gastropods	0	0	0	0	0	0	0	0	0	0	651
Bivalve larvae	0	0	0	0	0	0	0	0	0	0	150
Polychaete larvae	0	0	0	0	0	0	0	0	0	0	71
Chaetognaths	0	0	0	0	0	0	0	0	0	0	71
Echinoderm larvae	0	0	0	0	0	0	0	0	0	0	220
Appendicularians	0	0	0	0	0	0	0	0	0	0	80
Mysids	0	0	0	0	0	0	0	0	0	0	97
Decapods (crab zoea)	0	0	0	0	0	0	0	0	0	0	234
Decapods (shrimp)	0	0	0	0	0	0	0	0	0	0	121
Tanais	0	0	0	0	0	0	0	0	0	0	10
Copepods	0	0	0	0	0	0	0	0	0	0	3,705
Isopods											
Sphaeromatidae											
Gnorimosphaeroma sp.	0	0	0	0	0	0	0	0	0	0	2
Cirolanidae											
Cirolana sp.	580	408	415	427	222	449	0	0	0	0	0
Ostracods											
Cypridinidae											
Vargula sp.	24	18	6	66	13	62	0	0	0	0	1
Philomedes sp.	0	0	0	0	0	0	0	0	0	0	3
Cylindroleberididae											
Xenoleberis sp.	0	0	0	1	0	2	0	0	0	0	1
Paradoxostomatidae											
Cytherois sp.	0	0	0	2	0	2	0	0	0	0	0
Halocyprididae											
Euconchoecia sp.	0	0	0	0	0	0	0	0	0	0	56

Although the abundances were low, the two ostracod species collected in the traps (*Vargula* sp. and *Xenoleberis* sp.) were also found in the net-samples suggesting they may be free-swimming scavengers distributed throughout the water column.

This study first shows that cirolanid isopods are the most important small invertebrate scavenger in the shallow tropical coral reef in Malaysia. As cirolanid isopods constituted a significantly high percentage in scavenging community, studies on their feeding rates, biomass and production would be important to better understand material recycling in coral reef waters of Malaysia.

ACKNOWLEDGEMENTS

We thank L. P. Foong, K. Tsuchiya, F. Konno, V. S. Kuwahara (Soka University), T. C. Segaran, B. M. Anderi, B. M. M. Ariff (UMT) and Captain B. Y. Hassan for their filed assistance; Y. Nakagawa for help in sample enumerations; and S. Suzuki (University of the Ryukyus) for identification of the baited fish. This study was partially supported by the Asian CORE program of Japan Society for the Promotion of Science (JSPS), by the UKM Research Grant UKM-GUP-ASPL-08-04-231, and by the Environment Research and Technology Development Fund (S9) of the Ministry of Environment, Japan.

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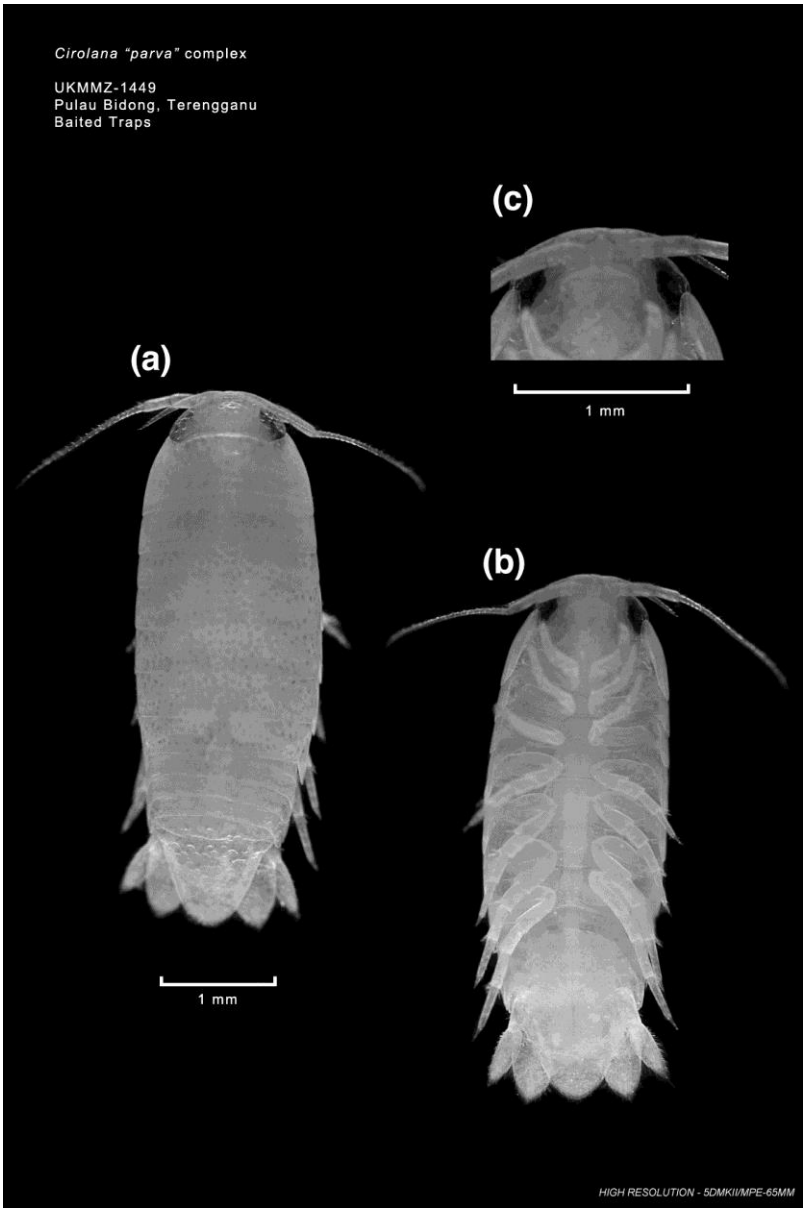

Figure 1. *Cirolana* isopods collected by baited trap at Bidong Island, Malaysia. (a) front view, (b) back view, and (c) enlarged cephalonic part.

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