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MYSID (CRUSTACEA: MYSIDACEA) DISTRIBUTION IN THE BOLGODA ESTUARINE SYSTEM AND LUNAWA LAGOON, SRI LANKA

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Abstract

Mysids are one of the most abundant and important fauna in estuarine hyperbenthic communities. They form important links in estuarine food chains and play a critical role in the cycling of energy within estuarine systems. Therefore, it is important to recognize the distribution of estuarine mysids in Sri Lanka. The present study was undertaken in Bolgoda estuarine system and Lunawa lagoon, in order to find out the distribution of mysids in these brackish water systems. Reconnaissance surveys were conducted, in Bolgoda North Lake, Panadura estuary of the Bolgoda estuarine system and the Lunawa lagoon from April 2012 to February 2013. The samples were collected using a hand held dip net, during day time at low tide along an eighty meter transect at the boundary of the estuarine waters. *Mesopodopsis zeylanica* was the only mysid species observed from the low water areas of the lagoon along the boundary of the stream. In each collection, it was recorded, higher percentages of females than the males. Mysids were recoded only from unpolluted areas and they were absent, where *Eichhornia crassipes* (water hyacinth) was widespread. The findings of this analysis could be used to establish the fact that boundary condition and polluted condition are having a great effect on presence of mysids. It may be due to their specific niche requirements and specialized habitats. Accordingly, mysids serve as pollution indicator species in estuarine ecosystems. An immediate management strategy is required in protecting the Bolgoda estuarine systems from dumping household pollutants as well as other pollutants and complete elimination of the invader plants like *E. crassipes*, in order to protect estuarine biodiversity.

Key words: mysids, estuarine waters, pollutants, indicator species, boundary

Introduction

Mysids are small, transparent crustaceans and shrimp-like in appearance. They belong to the Superorder Peracarida and the Order Mysidacea, although a recent classification (Melland & Willassen, 2007) places them in the Order Mysida. This reflected better evolutionary history.

Mysids are one of the most abundant and important fauna in estuarine hyperbenthic communities. They form important links in estuarine food chains and play a critical role in the cycling of energy within estuarine systems (Webb, 1973). Throughout the world, mysids serve as an important food source for ecologically and commercially important marine fish (Mauchline, 1980). Due to their potential importance in toxicity testing they serve as an indicator species among the wide range of crustaceans in estuarine ecosystems (Nipper & Williams, 1997; Martin *et al*., 1989).

Although there are mysids in Sri Lankan estuarine waters, few studies have been undertaken on their distribution. The study on mysids in Sri Lanka was initiated in 1906, with the discovery of *Siriella paulsoni* Czerniavsky,1880 (Tattersall, 1906) from the Pearl banks, Cheval Paar and 13 species from the northern end of the Gulf of Mannar (Tattersall, 1922). However, these collections were not made around estuarine areas. Subsequently, Nouvel (1954) recorded an estuarine mysid species, *Mesopodopsis zeylanica* Nouvel,1954 from Bolgoda Lagoon as a new species. The finding from the Bolgoda Lagoon (Nouvel,1954) seems to be the only studies carried out on the estuarine mysids in Sri Lanka.

Therefore, the present study is an attempt to find out information on estuarine mysids mainly focusing on Bolgoda estuarine system and Lunawa lagoon. Thus, it is important to carry out a survey of mysid species in esturine areas to gather up to date information on the distribution and abundance of mysids of Sri Lanka which has not been subjected to an in-depth studies.

The main objective of this study was to identify the mysid species inhabiting in the Bolgoda estuarine system and Lunawa Lagoon and to identify the factors influencing their distribution.

Methodology

Present study was conducted from April 2012 to February 2013 in Bolgoda North Lake and Panadura estuary of the Bolgoda estuarine system and the Lunawa lagoon. Reconnaissance surveys were carried out, during day time at low tide. The samples were taken using a hand held dip net, along an eighty meter transect at the edge of the estuarine waters. In each sampling, salinity, pH, dissolved oxygen, and temperature were analyzed. Reconnaissance surveys for mysids in estuarine systems were conducted at randomly selected sites, in Bolgoda North Lake (seven sites), Panadura estuary (six sites) and the Lunawa lagoon (six sites), along the boundary of the water body (Fig. 2). At each site four replicate surveys were

undertaken. In order to find out the distribution of mysids, the selected sites were under survey twice only; in Panadura Estuary in April 2012 and, February 2013; Bolgoda North lake and Lunawa Lagoon in August 2012 and February 2013. The general characteristics of each site are described in Table 1. The boundary of Bolgoda North Lake covered by patchily distributed of mangroves, reed beds and extensively distributed of *Eichornia crassipes* (water hyacinth) (Fig. 1a). The boundary of the Panadura estuary also consisted of patchily distributed mangroves and reed beds. Other than that, due to human invasion of the estuary, in some sites boundary vegetation was removed by concrete edges. The important thing to consider in this area was the boundary condition mainly seen as dumping sites of household pollutants (Fig. 1b). The boundary of Lunawa lagoon also consist of some magrove plants, reed beds and man made concrete edges. This was a highly polluted lagoon when sampling was coducted and also seen as house hold pollutants dumping area (Fig. 1c). Pollution level was not measured, but colour of water was black. Total body length and sex of each mysid captured from each site was recorded. Broods of gravid females were investigated to determine the brood sizes (number of eggs or larvae) of each gravid female.

Table 1: General characteristics of each site

Study site	Location	Ecological profile of the stream	Availability of pollutants
Bolgoda North Lake	6.779576N,79.904981E 6.77737N,79.91228E 6.774292N,79.91395E 6.776763N,79.912641E 6.770946N,79.915409E 6.774444N,79.90077E 6.762508N,79.903307E	Patchily distributed mangroves Reed beds *Eichornia crassipes* *Eichornia crassipes* Reed beds *Eichornia crassipes* Patchily distributed mangroves	No No No No No No No
Panadura estuary	6.7170N,79.90224E 6.7161N,79.9047E 6.724578N,9.902384E 6.719591N,9.905238E 6.722361N,9.903114E 6.724194N, 9.904187E	Reed beds Patchily distributed mangroves Man-made concrete edges Patchily distributed mangroves Reed beds Man-made concrete edge	Yes Yes Yes Yes Yes Yes
Lunawa lagoon	6.7929279N,79.87787E 6.78916N,79.87975E 6.78825N,79.87975E 6.785308N,9.881077E 6.782325N,79.882364E 6.795535N,79.874554E	Reed beds Man-made concrete edges Reed beds Man-made concrete edges Reed beds *Eichornia crassipes*	Yes Yes Yes Yes Yes Yes

(a). Bolgoda North Lake (b). Panadura estuary (c). Lunawa lagoon

Figure 1: Selected survey locations of Bolgoda lagoon, Panadura estuary and Lunawa lagoon where mysids were not found

Results

From this study *Mesopodopsis zeylanica* was the only mysid species collected from the low water areas of the lagoon, along the boundary of the Bolgoda North Lake. Within this area, out of seven survey sites mysids were recorded only from four sites. In these sites, mangroves and the reed beds are the main marginal vegetation types. The other three sites of the lake were invaded by the invasive floating plant *Eichornia crassipes* (water hyacinth) and mysids were not found from these sites. During the 2nd sampling event in February *E. crassipes* was distributed in all of the seven sites and no any mysids were found. Mysids were not recorded from any one of the sites at Panadura estuary and Lunawa lagoon (Fig.2 and Fig. 3).

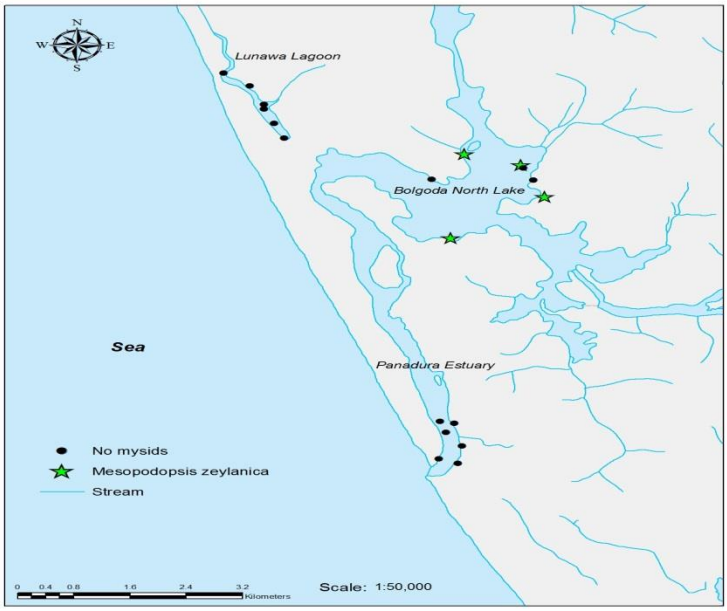

Figure 2: Sampling locations and the distribution of mysids within the Bolgoda lagoon, Panadura estuary and Lunawa lagoon.

Mysids were found only in unpolluted areas (Fig. 3). Further to that mysids were not recorded from the sites in which *E. crassipes* was widespread. Mysds were recorded from the sites where mangroves and reed beds cover the boundary of the stream and sites were not polluted (Fig. 4).

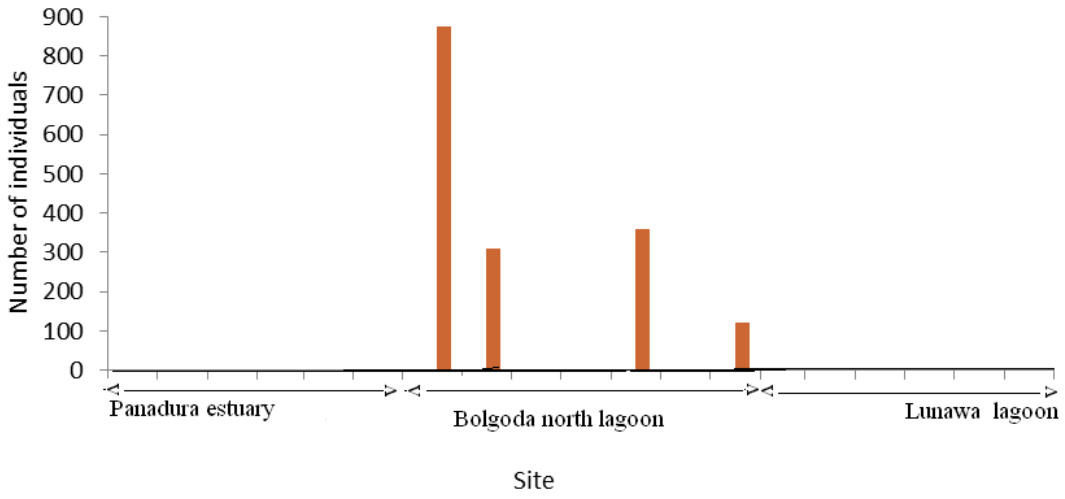

Figure 3: Mysid abundance in each brackish water system.

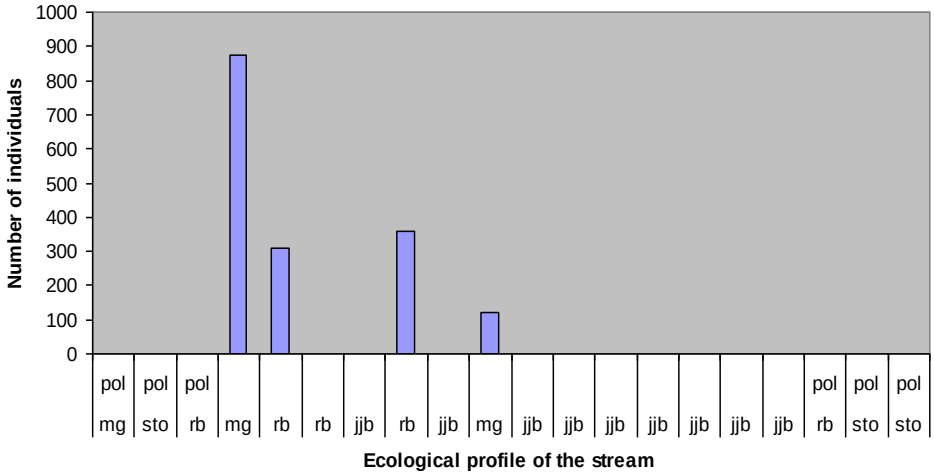

Figure 4: **Ecological profile of the stream edge and the mysid abundance**
(mg: mangroves, sto: stony edges, rb: reed beds, jjb: *E. crassipes*, Pol: polluted)

Table 2: **Pearson correlation coefficients (r) of bivariate analysis of the environmental parameters, stream edge condition, and the pollution on mysid availability.**

	pH	Do mg L^{-1}	Salinity ‰	Water temperature ^0C	Pollution	Stream edge condition
Mysid availability	0.018	0.383	-0.212	-0.454	-0.707	0.574
Significance	NS	NS	NS	NS	S**	S*

*significant at P≤ 0.05, ** significant at P≤ 0.01

The correlation among the environmental parameters, condition of the boundary, and avalability of household pollutants/polluted water on presense of mysids is shown in Table 2. It indicates that *M. zeylanica* is highly correlated with the boundary condition (P ≤ 0.05), avalability of household pollutants/polluted water (P≤ 0.01) and does not correlate with any of the environmental parameters. Presense of mysids showed positive correlation with the boundry condition and negative correlation with avalability of household pollutants/polluted water.

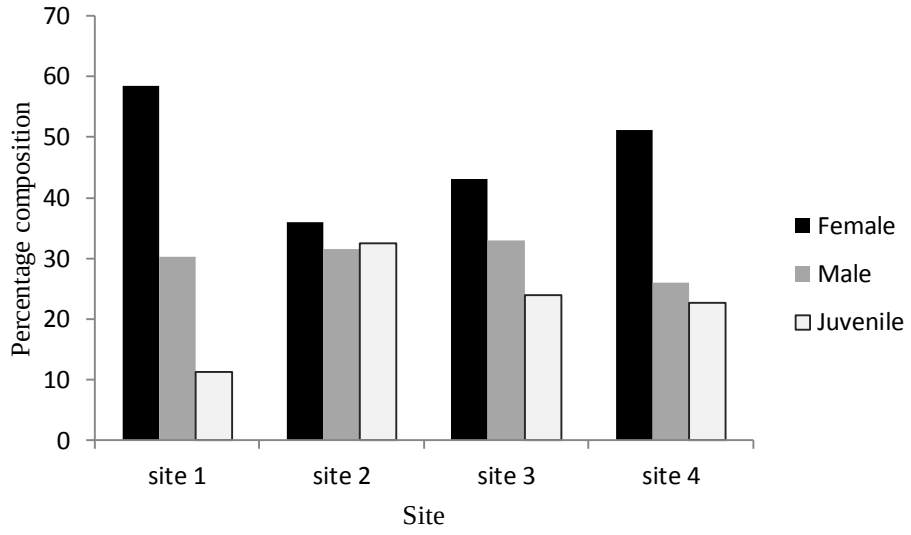

Figure 5: **Percentage composition of male, female and juveniles in each site.**

According to the percentage composition of male, female and juveniles captured in each site (Fig. 5) the female composition was always higher than males. The total length of the female

and male was ranged between 4.5–7.9 mm and 4.7–7.2 mm respectively. Brood size of *M. zeylanica* recorded as 2–11(eggs or larvae).

Discussion

Among the three estuarine areas surveyed, Lunawa lagoon is exceptional due to its highly polluted condition and it is a cause for concern that mysids were not recorded from this Lagoon. During the survey, it was noted that this lagoon was separated from the sea by a sand bar which in turn resulted in the accumulation of most of the pollutants received from the channels. Mysids were not found from any site of the Lunawa lagoon and it might be due to the polluted condition of water.

In the Panadura estuary, it was noticed that the people had dumped domestic garbage along the boundray of the estuary and mysids were not found from this estuarine area also.

However, mysids were recorded from Bolgoda north lagoon. The *Mesopodopsis zeylanica* was the only mysid species recorded from the Bolgoda north lagoon similar to the previous studies (Nouvel, 1954). *Mesopodopsis zeylanica* was observed in the shallow areas of the lagoon along the edge of the stream. Considering the areas where mysids were recorded, mysid habitats found for the Bolgoda lagoon, were associated with reed beds and mangrove habitats. Mysids were not found from the areas (boundary) with household pollutants, prevalence of water hyacinth (*Eichornia crassipes*– Japan jabara) and/or areas without mangroves.

Estuarine mysids serve as an indicator species among the crustaceans in estuarine systems (Nipper & Williams, 1997; Martin *et al*., 1989). The present study also clearly indicated that mysids were only found in the unpolluted localities.Other than that even if *E. crassipes* was widespread mysids were absent. Due to deforestation of mangroves the minute and the important crustacean will disappear in future, result in loss of biodiversity. It is alarming us that the clearing of stable boundary (riparian) vegetation, constructed edges with concrete and accumulation of pollutants resulted in the loss of mysid habitats. Indeed, it is obvious that the condition of the estuarine boundary is important for mysid occurrence.

Conclusion

The findings of this analysis could be used to establish the fact that boundary condition and polluted condition are having a great effect on presence of mysids. It may be due to their specific niche requirements and specilazed habitats. It can be concluded that mysids serve as pollution indicator species in estuarine ecosystems.

Acknowledgment

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