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An account on the deepsea shrimp *Aristaeopsis edwardsiana* (Johnson, 1867) from the Indian EEZ

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ABSTRACT

Aristaeopsis edwardsiana (Johnson,1867) is a deepsea shrimp of the continental slope that has not yet been reported in the targeted deepsea crustacean fishery along the Indian coast. An exploratory survey on-board FORV *Sagar Sampada* in the Arabian sea at a depth of 950 m off Trivandrum (lat. 8 ^{0} 28' N and long. 76 ^{0}14' E) yielded a catch of *A. edwardsiana* at a high catch per unit effort (CPUE) of 14 kg h^{-1}. The biological aspects of this less known deepsea shrimp species such as length frequency distribution, morphometric relations, sex ratio and the additional sexual dimorphism manifested in the antennal scale of males are reported.

Keywords: *Aristaeopsis edwardsiana*, Aristeidae, Deepsea shrimp, Indian EEZ

Introduction

The aristeid shrimp *Aristaeopsis edwardsiana* (Johnson, 1867) popularly known as the scarlet shrimp (formerly *Plesiopenaeus edwardsianus*) was reported in the Indian EEZ by Alcock (1910) and its occurrence off Trivandrum (lat. 8 ^{0} 28' N and long. 76 ^{0}14' E) at depths > 800 m, based on four specimens caught was confirmed by Suseelan and George (1990). In the present study, during an exploratory survey in the same region (lat. 8 ^{0}24' N and long. 76 ^{0} 07' E) the CPUE of *A. edwardsiana* was 14 kg h^{-1} which was quite high in comparison to reports of catch rates of 2 kg h^{-1} off the Portugal continental slope (Figueiredo *et al*., 2001) and 3.7 – 10 kg h $^{-1}$ reported off Brazilian coast where a sustainable targeted deep-sea fishing for aristaeid shrimps is prevalent (Pezzuto *et al*., 2006).

A. edwardsiana is characterised by features like the absence of exopods on the first to fifth pereopods, first and second pereopod without distal meral spine and the absence of hepatic spine (Farfante and Kensley, 1997). Molecular phylogenetic analysis has established that *Aristaeopsis* is distinct from the *Plesiopenaeus* but closely related to *Aristaeomorpha*, another important genus in the family aristeidae (Ma *et al*., 2009). Considering the fact that deepsea shrimps in general have biological traits such as slow growth, late maturity and low fecundity making them especially vulnerable to over-exploitation as compared to coastal shrimp species (Nandakumar *et al*., 2001), detailed studies on the biology of the species are necessary before its exploitation by commercial vessels are allowed. The present study therefore explores a sample of *A. edwardsiana* caught during the exploratory deep-water fish survey for biological details.

Materials and methods

Samples were collected during an exploratory deepwater research survey (FORV *Sagar Sampada* cruise No.281) using High Speed Demersal Trawl - Crustacean Version (HSDT CV) net at a depth of 950 m. The species appeared in a catch mix consisting of finfish, crustacean and chondrichthyans and was identified based on distinguishing characters as given by Farfante and Kensley (1997) and Poore and Ahyong (2004). Standard morphometric measurements of the sample included total length (TL) as measured (in mm) from tip of rostrum to tip of telson; and carapace length (CL) from posterior margin of the orbit to posterior dorsal margin of carapace (Dall *et al*., 1990). The specimens (n = 224) were differentiated among sexes using the characters of presence of petasma (males) or thelycum (females) and the relationship between TL and CL was derived using the linear relationship, Y= a + bX for males and females separately. Besides this, sexual dimorphism manifested as appearance of antennal scales in males in certain aristeid shrimps is described for this species in Indian waters for the first time.

Results

Length Frequency distribution and sex ratio

The total length (TL) varied from 168 to 295 mm and carapace length (CL) from 51 - 95 mm. The minimum and

maximum TL were 168 and 246 mm (males) and 190 and 295 mm (females) respectively with mean TL of 195 and 254 mm for males and females respectively (Fig. 1). Significant correlation between CL and TL was observed as TL = 0.1284 + 3.39 CL (R^2 =0.933) in males and TL = 6.123 + 2.45 CL (R^2 = 0.946) in females (Fig. 2).

Among a total 224 specimens of *A. edwardsiana* studied, 163 were females and 61 were males indicating a male: female sex ratio of 1:2.7 which was significantly different (l^2 = 23.22, p < 0.001).

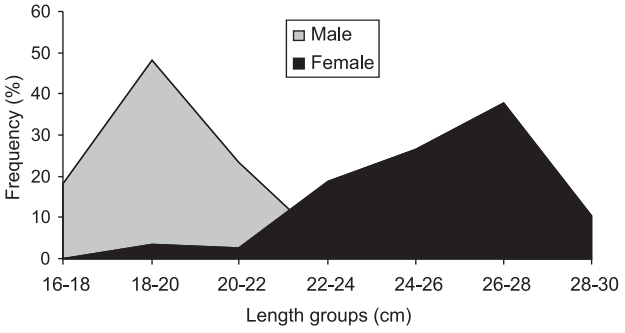

Fig. 1. Length frequency distribution of *A. edwardsiana*

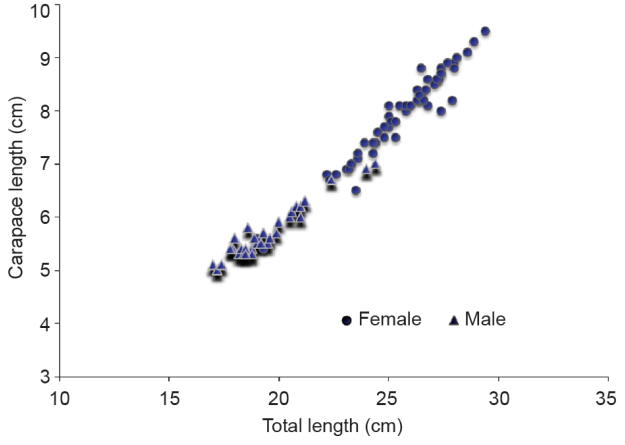

Fig. 2. Relationship between carapace length (CL) and total length (TL) for male and female *A. edwardsiana*

Sexual dimorphism

The species exhibits an additional sexually dimorphic characteristic in that the scaphocerite (antennal scale) has an elongate acuminate tip in the males as compared to females (Fig. 3). The rostrum was found to be moderately elongate in females and juvenile males, reaching beyond apex of scaphocerite and somewhat shorter in adult males.

Fig. 3. Shape of scaphocerite in male (A) and female (B) *A. edwardsiana*

Discussion

The present study conducted in October 2010 which covered transects between 8^0- 21^0 N latitudes in the Arabian Sea observed occurrence of *A. edwardsiana* only at 8^0 N latitude at 900 m depth, indicating a very geographically and bathymetrically limited stock. Exploratory surveys in Brazil and French Guiana also report that the species is highly concentrated in the vicinity of the 800 m isobath (Gueguen, 1998; Pezzuto *et al*., 2006). While Suseelan and George (1990) reported four female specimens in length range of 20.7 - 24.5 cm TL, a relatively high CPUE of about 14 kg h^1 was observed in the present study which yielded information on length frequency distribution, sex ratio and morphometric relations. However, the present study was also limited by a pre-defined sampling programme wherein trawling operations at various depths in the same ground were not possible. Spatial (depth-wise, canyons, open slope) and temporal segregation of sizes and sexes have been widely reported in aristeid shrimps (Sarda *et al*., 1997; Guegen, 1998; Figueiredo *et al*., 2001 and Pezzuto *et al*., 2006) probably as a result of factors related to seasonal reproductive pattern (Sarda *et al*., 2003). This has important implications regarding the capacity of the species to withstand high or uncontrolled fishing pressure and therefore more detailed surveys are required in the fishing ground identified.

Among aristeid shrimp, this particular genus is distinguished by an additional sexually dimorphic character in the antennal scale (Farfante and Kensley, 1997; Poore and Ahyong, 2004) which is described in the present study. Females were found to dominate the catch and similar observations of females dominating the landings of aristeid shrimps irrespective of season and depth have been reported (Guegen, 1998). A thorough understanding of the reproductive potential of the species can be achieved only by dedicated surveys of the fishing ground identified at various depths to arrive at reasonable estimates of population structure including depth-wise abundance, length distribution, sex ratio and maturity stages.

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