



## The pycnogonid (*Endeis mollis* Carpenter, 1904) associated with hydroids from the inshore waters of Visakhapatnam, India

S. Veena, P. Kaladharan\*, Prathibha Rohit and G. Syda Rao

Visakhapatnam Regional Centre of CMFRI, Pandurangapuram,  
Visakhapatnam - 530 003, Andhra Pradesh, India. E-mail : \*kaladharanep@gmail.com

### Abstract

The sea spider or pycnogonid, identified as *Endeis mollis* Carpenter, 1904 were isolated from hydroids colonized for over 45 days on a large floating cage installed at Visakhapatnam inshore area at a depth of 10-12 m. More than 50% of the population consisted of males carrying egg mass. Occurrence of *E. mollis* off Visakhapatnam as well as their association with hydroids in Indian waters is reported for the first time.

**Keywords:** Pycnogonids, sea spiders, *Endeis mollis*, hydroids, floating cage, off Visakhapatnam

### Introduction

Pycnogonids are a strange group of marine arthropods belonging to the phylum Arthropoda and class Pycnogonida (Gr. pyknos = crowded; gony = knee), which means 'knobby knees'. These sea spiders resemble the terrestrial spiders but have a skinny body. They are rarely observed as they are small and cryptic, or hidden amongst other organisms, moving slowly over seaweeds, corals, sponges or hydroids. Pycnogonids are usually white or else cryptically coloured in relationship to the colonies of the animals they feed on (Bamber, 1992); Earth-Life, 2007). Most pycnogonids are small, but a few deep-sea forms reach up to 70 cm diameter across the legs. Larvae of pycnogonid species are reported as internal parasites of cnidarians but adults are solitary and free living but often live in close association with invertebrate food hosts or seaweeds, bryozoans, hydroids, and in sediment that is on the surface of stones (Ronald, 2003).

Vizhinjam coast is known to harbor a rich diversity of pycnogonid species with three species of *Pallenopsis*, two species of *Anoplodactylus* and *Parapallene kemp*i (Kurien, 1948). Occurrence of *Nymphopsis acinacispinatus* and *Anoplodactylus sexatilis* is also reported from the Arabian Sea

(Kurien, 1953) and *Anoplodactylus sandromagni* from Trivandrum (Krapp, 1996). Four species of pycnogonids *Endeis ghaziei*, *E. meridionalis*, *E. flaccidus*, *E. mollis* and *Anoplodactylus investigatoris* were reported from Madras waters by Rajagopal (1963) and Daniel and Sen (1975). Among the phytal fauna associated with the littoral algae off Visakhapatnam, pycnogonids *Anoplodactylus* sp., *Amothea* sp. and *Pycnogonum indicum* were recorded during 1967-1968 (Sarma, 1972). *Propallene kemp*i Calman is a widely distributed form in tropical and temperate waters and is also reported from the east coast of India (Daniel and Sen, 1975). In this paper, we report the occurrence of a pycnogonid *Endeis mollis* Carpenter, 1904 in association with hydroids seen infested on a HDPP net mesh of large floating cage installed in Visakhapatnam inshore waters.

### Material and methods

The specimens of pycnogonids were collected from a large floating net cage stocked with the fry of the Asian seabass (*Lates calcarifer*) off Visakhapatnam (17°422' N lat. and 83°192' E long.) at a depth of 10-12 m. The sample size of *E. mollis* collected from the floating cage was 5-7 adults on an average from each hydroid colony. Around 360-400 adult spiders were counted from a 100

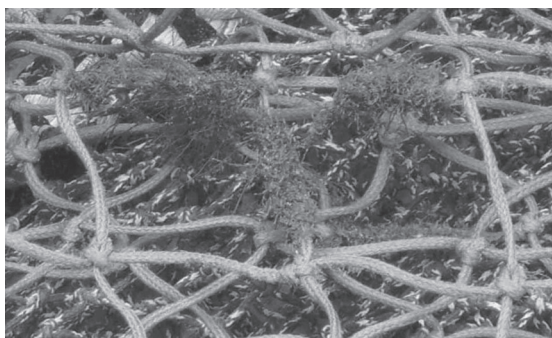


Fig. 1. Hydroids infested on HDPP ropes of net cage

cm<sup>2</sup> area of the net stage. The cage was moored in the sea for more than 45 days. The HDPP ropes of the net cage were fully infested with hydroids (Fig. 1) and a few bryozoans, polychaetes, juvenile crabs, barnacles and goose barnacles. The foulants attached to the net from three sides of area 100 cm<sup>2</sup> were handpicked and preserved in containers with 70% (v/v) ethanol. Examination of hydroids under the stereomicroscope revealed the adherence of pycnogonids on hydroids (Fig. 2). For photographic documentation, an Olympus Canon Ixus 400 camera fitted on Olympus stereomicroscope was used. The identification of the specimens was made using the taxonomic key prepared by Stock (1968).



Fig. 2. Pycnogonid-hydrozoan association

### Description of the specimen

All the pycnogonids belonged to a single species and were identified as *Endeis mollis* Carpenter. The taxonomic position of the sea spider is as follows:

Kingdom	-	Animalia
Phylum	-	Arthropoda
Subphylum	-	Chelicerata
Class	-	Pycnogonida
Order	-	Pantopoda
Family	-	Endeidae
Genus	-	<i>Endeis</i>
Species	-	<i>mollis</i> (Carpenter, 1904)

The body was long, narrow and the colour was pale green to brownish. The proboscis was as long as the body. The specimens had 4 pairs of legs, leg span being nearly about three times the length of body (Figs. 3 and 4), two pairs of eyes and moderately long proboscis about half the length of body. The abdomen was a small extension at the posterior side. Legs were slender without strong spines and with isolated spinules or setae. The longer segment being at least 4 times as long as wide, tibia-2 was at most 1/4<sup>th</sup> times as long as tibia-1. Propodus was curved and not apically produced. Auxiliary claws were at least 1/3<sup>rd</sup> of the main claw (Fig. 5). Femur was straight and without a distal spur. Femoral cement gland pores were present in one row. Collar was well developed. The body was translucent. The ovigerous legs, present only in the males of this group, arose at the ventral side and wrapped around the egg mass. The size of



Fig. 3. *Endeis mollis*

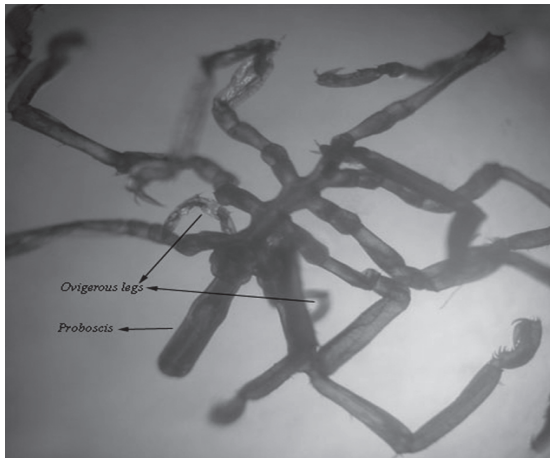


Fig. 4. *Endeis mollis* showing proboscis and ovigerous legs



Fig. 5. One of the legs magnified to show the main and auxiliary claws

the specimens from proboscis to anus ranged from 10-192 $\mu$ . Chelifores and palps were absent which are characteristic to the families Pycnogonidae and Endeidae. However, in the Endeidae family members, the chelifores are present in the juvenile stages but absent in the adults.

The samples consisted of brooder males carrying egg mass (>50%), females (40%) and the rest were juveniles. Though pycnogonid-hydrozoan associations have been previously described from other countries, this is the first report from the Indian waters. The species *Endeis mollis* is also being reported for the first time from Visakhapatnam waters. During identification of the present specimens, the possibility of the previous recorded

species was ruled out due to morphological dissimilarities. A list of pycnogonid species reported so far from Indian waters is presented in Table 1.

### Discussion

Pycnogonids, also known as whip scorpions are most commonly placed as a sister taxon to the remaining extant arthropods. There are more than 1,300 species of pycnogonids described, including one fossil species from the Jurassic Period and it is believed that there are many more species to be discovered mainly from remote deep sea habitats (Encyclopædia Britannica, 2007). The known species are traditionally distributed in 80 genera in eight or nine families - Ammotheidae, Austrodecidae, Callipallenidae, Colossendeidae, Nymphonidae, Phoxichilidiidae, Pycnogonidae, Rhynchothoracidae and Endeidae, a monogeneric family sometimes included in Phoxichilidiidae. However, phylogenetic studies are challenging the monophyly of these families (Arango and Wheeler, 2007).

The most prominent external feature of pycnogonids is the proboscis. It is a moveable organ and shows wide variation in size and shape among families. The shape and internal structure has been related to specialized feeding habits, sometimes specific to a particular host among parasitic species (Fry, 1965; Staples and Watson, 1987). Adult pycnogonids either suck the juices through the long proboscis from soft-bodied invertebrates or browse on hydroids and bryozoans. A few pycnogonids feed on algae but most are carnivorous, using the cuticular teeth present at the tip of proboscis to pierce the host's skin before sucking out body fluids (Myers, 2001).

The sex organs are found in the long joints of legs. Males and females can be easily differentiated by the absence of ovigers in females of the families Phoxichilidiidae and most Pycnogonidae species. The presence of cement glands on the femora indicates a male (Arango, 2001). Hermaphrodites of *Aschorhynchus corderoi* are also reported to occur (Miyazaki and Makioka, 1993).

The observed species is able to tolerate the

Table 1. List of pycnogonid species reported from the Indian coast

Species	Distribution	Reference
<i>Achelia boschi</i>	Arabian Sea	Stock, 1992
<i>Ammothella omanensis</i>	Arabian Sea	Stock, 1992
<i>Amothea</i> sp.	Visakhapatnam	Sarma, 1972
<i>Anoplodactylus</i> sp.	Visakhapatnam	Sarma, 1972
<i>Anoplodactylus cribellatus</i>	Vizhinjam, Andaman Sea, Arabian Sea	Kurien, 1948, 1953 Daniel & Sen, 1975
<i>Anoplodactylus sexatilis</i>	Arabian Sea	Kurien, 1953
<i>Anoplodactylus petiolatus</i>	Vizhinjam	Kurien, 1948
<i>Anoplodactylus eroticus</i>	Gulf of Mannar	Stock, 1968
<i>Anoplodactylus investigatoris</i>	Madras	Daniel & Sen, 1975
<i>Anoplodactylus sandromagni</i>	Trivandrum	Krapp, 1996
<i>Callipallene pectinata</i> / <i>Pallene pectinata</i>	Arabian Sea	Calman, 1938
<i>Callipallene(?) echinata</i>	Arabian Sea	Calman, 1938
<i>Colossendeis colossea</i>	Andaman Sea	Daniel & Sen, 1975
<i>Colossea macerrima</i>	Arabian Sea, Andaman Sea, Laccadive Sea	Daniel & Sen, 1975
<i>Endeis flaccidus</i>	Madras	Daniel & Sen, 1975
<i>Endeis meridionalis</i>	Madras	Daniel & Sen, 1975
<i>Endeis mollis</i>	Madras, Gulf of Mannar, Nicobar, Visakhapatnam	Daniel & Sen, 1975; Calman, 1938; Present Authors
<i>Endeis ghaziei</i>	Madras	Rajagopal, 1963
<i>Eurycyde flagella</i>	Andaman Sea	Nakamura & Chullasorn, 2000
<i>Nymphopsis acinacispinatus</i>	Arabian Sea	Kurien, 1953
<i>Nymphon andamanense</i>	Arabian Sea, Andaman Sea	Calman, 1938; Daniel & Sen, 1975
<i>Nymphon foxi</i>	Arabian Sea	Calman, 1938
<i>Nymphon arabicum</i>	Arabian Sea	Calman, 1938
<i>Nymphon longicaudatum</i>	Gulf of Mannar	Daniel & Sen, 1975
<i>Pallenopsis (Bathypallenopsis) annandalei</i>	Laccadive Sea	Daniel & Sen, 1975
<i>Pallenopsis (Bathypallenopsis) safari</i>	Gulf of Mannar	Stock, 1984
<i>Pallenopsis alcocki</i>	Vizhinjam, Andaman Sea	Kurien, 1948; Daniel & Sen, 1975
<i>Pallenopsis crosslandi</i>	Vizhinjam	Kurien, 1948
<i>Pallenopsis ovalis</i>	Andaman Sea	Daniel & Sen, 1975
<i>Parapallene kemp</i>	Bay of Bengal, Waltair, Orissa, Gulf of Mannar, Vizhinjam, Arabian Sea	Kurien, 1948; Kurien, 1953
<i>Propallene kemp</i>	All along the east coast of India	Daniel & Sen, 1975
<i>Pycnogonum indicum</i>	Gulf of Mannar	Daniel & Sen, 1975
<i>Pycnogonum moolenbeeki</i>	Arabian Sea	Stock, 1992
<i>Pycnogonum tessellatum</i>	Arabian Sea	Stock, 1968
<i>Rhopalorhynchus kroeyeri</i>	Arabian Sea, Andaman Sea	Calman, 1938
<i>Seguapallene echinata</i>	Arabian Sea	Calman, 1938

extreme wave currents in this area. It is not clear at the moment as to the depth of habitat of these species in these waters, since we found them attached to hydroids on the floating cage (10-12m). Of the six species of pycnogonids observed within a depth of 30m at Vizhinjam, *Parapallene kempfi* Calman was the only common species and the other 5 (*Pallenopsis* sp., *Pallenopsis alcocki* Calman, *Pallenopsis crosslandi* Carpenter, *Anoplodactylus cribellatus* Calman, *Anoplodactylus petiolatus*, Krøyer) were either rare or casual visitors to the locality (Kurien, 1948). Thus far, at Visakhapatnam Bay there have been two records of the presence of pycnogonids (Kurien, 1948; Sarma, 1972). The present report is intended to supplement previous information on these species along the Indian waters.

Since the pycnogonids colonize extensively on hydroids and other primary settlers, they may be browsed by some reef fishes as well as the fish farmed in the cage. Their metabolic exudates can attract many types of microflora and fauna. In the pycnogonids, 20-hydroxyecdysone, 20-hydroxyecdysone-2-acetate and other ecdysteroids have been identified at high levels in cuticular glands (Tomaschko, 1994). Upon mechanical disturbance these animals secrete ecdysteroids from the gland to the environment and, since these compounds have a strong antifeedant effect, the pycnogonids avoid being consumed by crabs.

These animals are not necessarily rare in the wild, but are cryptic, small and easily overlooked. The current species and the list shown in this paper give only a glimpse of the pycnogonid species diversity in the Indian waters. Much more work remains to be done and several new species of this uncommon genus are awaiting to be added to the list of pycnogonids from the Indian waters.

#### Acknowledgements

The authors thank the Director, CMFRI for his encouragements. Help rendered by Dr. Roger Bamber, Consultancy Leader Environment: Coastal & Marine, The Natural History Museum, London for identification of the pycnogonid specimens is gratefully acknowledged.

#### References

- Arango, C. P. 2001. Sea spiders (Pycnogonida) from the Great Barrier Reef, Australia, feed on fire corals and zoanthids. *Mem. Queensland Mus.*, 46: 656-661.
- Arango, C. P. and W. C. Wheeler. 2007. Phylogeny of the sea spiders (Arthropoda; Pycnogonida) based on direct optimization of six loci and morphology. *Cladistics, International Journal of the Willi Hennig Society*, 23: 255-293.
- Bamber, N. R. 1992. Some pycnogonids from the South China Sea. *Asian Marine Biology*, 9: 193-203.
- Calman, W. T. 1938. Pycnogonida. *Scientific Reports. The John Murray Expedition, 1933-34*, 5(6): 147-166.
- Carpenter, G. H. 1904. Report on the Pantopoda collected by Prof. Herdman at Ceylon in 1902. *Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Mannar, 2, Supplementary Report XIII*: 182-183.
- Daniel, A. and J. K. Sen. 1975. Studies on the pycnogonids from the collections of the Zoological Survey of India, Calcutta, together with notes on their distribution in the Indian Ocean. *J. Mar. Biol. Ass. India*, 17(2): 160-167.
- Earth-Life. 2007. Pycnogonida (Sea Spiders). <http://www.earthlife.net/chelicerata/pycnogonida.html>. Accessed on 02.07.07.
- Encyclopædia Britannica, 2007. "Sea spider". Online. 27, Nov 2007 <<http://www.britannica.com/eb/article-9066457>>. Accessed on 27.11.07.
- Fry, W. G. 1965. The feeding mechanisms and preferred foods of three species of Pycnogonida. *Bulletin of the British Museum of Natural History, Zoology*, 12: 195-233.
- Krapp, F. 1996. *Anoplodactylus sandromagni* n. sp. from Kerala, South India (Pycnogonida, Arthropoda). *Bollettino del Museo civico di Storia naturale di Verona*, 20: 521-529.
- Kurien, C.V. 1948. A collection of pycnogonids from the Vizhinjam coast. *Proceedings of the 35th Indian Science Congress 3*. (Abstract) p. 195.
- Kurien, C.V. 1953. A preliminary survey of the bottom fauna and bottom deposits of the Travancore coast within the 15-fathom line. *Proceedings of the National Institute of Sciences of India*, 19(6): 746-775.
- Miyazaki, K. and T. Makioka. 1993. A case of intersexuality in the sea spider, *Cilunculus armatus*. *Zoological Science Tokyo*, 10: 127-132.
- Myers, P. 2001. "Pycnogonida" (On-line), Animal Diversity Web. <http://animaldiversity.ummz.umich.edu/site/>

- accounts/information/Pycnogonida.html*. Accessed on 30.06.07.
- Nakamura, K. and S. Chullasorn. 2000. *Eurycyde flagella*, a new pycnogonid species from Phuket Island, Thailand. *Publications of the Seto Marine Biological Laboratory*, 39(1): 1-7.
- Rajagopal, A. 1963. On a new species of pycnogonid *Endeis ghaziei* from Ennore. *Proc. Indian Acad. Sci.*, 57(4B): 235-238.
- Ronald, L. S. 2003. Spineless column. In: Reefkeeping Magazine. Reef Central, LLC-Copyright © 2007 <http://reefkeeping.net/issues/2003-01/rs/index.php>. Accessed on 02.07.07.
- Sarma, A. L. N. 1972. *The phytal fauna of littoral algae off Visakhapatnam coast (Bay of Bengal)*. Ph.D Thesis submitted to Andhra University, Waltair, 150 pp.
- Staples, D. A. and J. E. Watson. 1987. Associations between pycnogonids and hydroids. – In: Bouillon, J., F. Boero, F. Cicogna and P. F. S. Cornelius (Eds.): *Modern trends in the Systematics, Ecology and Evolution of Hydroids and Hydromedusae*. – Oxford University Press, p. 215-226.
- Stock, J. H. 1968. Pycnogonida collected by the Galathea and Anton Bruun in the Indian and Pacific Oceans. *Vikenskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjøbenhavn*, 131.1: 7-65.
- Stock, J. H. 1984. The deep-water Pycnogonida of the Safari cruises to the Indian Ocean. *Bulletin du Muséum national d'Histoire naturelle*, Paris, 4e série, 6.section A, 3: 701-709.
- Stock, J. H. 1992. Pycnogonida from Southern Brazil. *Tijdschrift voor Entomologie*, 135: 113-140.
- Tomaschko, K. H. 1994. Ecdysteroids from *Pycnogonum littorale* (Arthropoda, Pantopoda) act as chemical defense against *Carcinus maenas* (Crustacea, Decapoda). *J. Chem. Ecol.*, 20: 1445-1455.

Received: 27 December 2007

Accepted: 15 April 2008