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STUDIES ON THE PYCNOGONIDS FROM THE COLLECTIONS OF THE ZOOLOGICAL SURVEY OF INDIA, CALCUTTA, TOGETHER WITH NOTES ON THEIR DISTRIBUTION IN THE INDIAN OCEAN*

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ABSTRACT

Studies of the Pycnogonida of the Indian Ocean available in the collections of the Zoological Survey of India, Calcutta have been made. These studies revealed the existence of 23 species belonging to 13 genera and 6 families. In this paper, the systematic, ecology and distribution of the 23 species are dealt with. The distribution pattern of all the valid species recorded from the Indian Ocean are also presented based on the earlier records as well as the present study. An attempt has been made to explain the distribution taking into consideration the prevailing oceanic currents and bottom topography.

INTRODUCTION

THE PYCNOGONIDA remotely related to the Arachnida on the one side and the Crustacea on the other, but distinct from both comprise about five hundred known species included in fifty genera divided into ten families. Although, the Pycnogonida have formed the subject of several comprehensive papers and a few elaborate monographs (Hedgepeth, 1950) these are not so well known in the Indian Ocean. Therefore, this study was made. In Table 1, the 69 valid as well as the doubtful species reported from the Indian Ocean with their geographical and bathymetrical distribution is presented, based on the earlier records and materials studied. Remarks on the species available in the Zoological Survey of India collections are also given. An attempt has also been made to explain the distribution of deep water forms taking into consideration the oceanic currents and bottom topography.

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TABLE 1. *Distribution of Pycnogonida found in the Indian Ocean*

Species	Distribution	
	Geographical	Bathymetrical (m)
FAMILY NYMPHONIDAE Wilson, 1878		
Genus *Nymphon* Fabricius, 1794		
N. andamanense Calman, 1923	Andamans & Saudi Arabian Coast	0–40
N. arabicum Calman, 1938	Saudi Arabian Coast	29–83
N. comes Barnard, 1954	S. African Coast	
N. crenatiunguis Barnard, 1946	Off east London, S. Africa	156
N. distensum Mobius, 1902	S. African Coast	
N. foxi Calman, 1927	Saudi Arabian Coast, Suez Canal	40

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WEAR, R. G. 1964 a. Larvae of *Petrolisthes novaezelandiae* Filhol, 1885 (Crustacea, Decapoda, Anomura). *Trans. roy. Soc. N.Z.*, **4** (18): 229–244.

———— 1964 b. Larvae of *Petrolisthes elongatus* (Milne Edwards, 1837) (Crustacea, Decapoda, Anomura). *Ibid*, **5** (2): 39–53.

———— 1965 a. Breeding cycles and Pre-zoea larva of *Petrolisthes elongatus* (Milne Edwards, 1837) (Crustacea, Decapoda). *Ibid.*, **5** (13): 169–175.

———— 1965 b. Pre-zoea larva of *Petrolisthes novaezealandiae* Filhol, 1885 (Crustacea, Decapoda, Anomura). *Ibid.*, **6** (13): 127–137.

TABLE 1 Continud

Species	Distribution Geographical	Bathymetricat (m)
N. hamatum Hock, 1881	South of Madagascar Challenger Stn. 146–147	from deepwater
N. longicaudatum Carpenter, 1904	Gulf of Mannar	15–23
N. maculatum Carpenter, 1910	Red Sea, east Coast of Africa	Intertidal
N. microctenatus Barnard, 1946	East London, S. Africa	356
N. pilosum Barnard, 1954	S. African Coast	
S. setimanus Barnard, 1946	S. African Coast-Algoa Bay East London; Natal	18-59
N. signatum Barnard, 1954	S. African Coast	
FAMILY PALLENIDAE Wilson, 1878		
Genus *Pallenopsis* Wilson, 1881		
**P. alcocki* Calman, 1923	Andaman Sea	97
**P. annandalei* Calman, 1923	Laccadive Sea	1164
P. brevidigitata Mobius, 1902	Off Zanzibar, off Dar-es-Salaam, Natal, S. Africa	84–457
P. capensis Barnard, 1946	Off Cape point & Cape St. Blaize, S. Africa	156–348
P. crosslandi Carpenter, 1910	East African Coast	18
P. intermedia Barnard, 1946	Off S. Africa	
P. oscitans (Hoek) 1881	Challenger Stn - off South Africa	
**P. ovalis* Loman, 1908	Off Andamans and off Ceylon	shallow water
P. virgatus Loman, 1908	Siboga Stn. 310-at 8°30′ S and 119°7′E	
Genus *Propallene*		
P. algoae (Barnard) 1946	Agulhas Bank, S. Africa	55–159
P. calmani Barnard, 1954	Off S. Africa	
P. hodgsoni (Barnard) 1946	East London and Hood Point S. Africa	86 to 95
**P. hospitalis* (Loman) 1908	Siboga Stn.	
**P. kempi* (Calman), 1923	East Coast of India	Intertidal
P. longipes Calmen, 1938	Zanzibar, S. Africa	183–194
P. spinosus Barnard, 1954	Off S. Africa	
Genus *Callipallene* Flynn, 1929		
C. echinata (Calman) 1938	Saudi Arabian Coast	40
**C. pectinata* Calman, 1923	Exact locality unknown	
Genus *Pallenoides* Barnard, 1946		
P. magnicollis Barnard, 1954	Off S. Africa	
Genus *Metapallene* Barnard, 1946		
M. dubitans Barnard, 1954	Off S. Africa	
FAMILY PHOXICHILIDIIDAE SARS, 1891		
Genus *Anoplodactylus* Wilson, 1878		
**A. cribellatus* Calman, 1923	Andaman region	Shallow water
**A. investigatoris* Calman, 1923	Off Madras harbour	Intertidal
**A. petiolatus* (Kroyer) 1844	Off Burma	Littoral
**A. saxatilis* Calman, 1923	Marble Rocks, Merjue Archip.	
FAMILY AMMOTHEIDAE Dohrn, 1881		
Genus *Achelia* Hodge, 1864		
A. echinata Hodge, 1863	Red Sea, Gulf of Aden	26–91
A. quadridentata Barnard, 1954	Off South Africa	
Genus *Ascorhynchus* Sars, 1877		
**A. latus* Calman, 1923	Gulf of Mannar	Shallow water
Genus *Euryede* Loman, 1908		
E. extenuata Calman, 1938	Zanzibar, S. Africa	925–2926
Genus *Nymphonopsis* Loman, 1908		
N. cuspidata Barnard, 1954	Off. S. Africa	

* Present in Z. S. I. collection.

TABLE 1 Continued

Species	Distribution Geographical	Bathymetrical (m)
Genus *Ainigma* Barnard, 1954		
A. ornatum Barnard, 1954	Off S. Africa	
A. pelagicus Barnard, 1954	Off S. Africa	
Genus *Austroraptus* Hodgson, 1907		
A. thermophilus Barnard, 1946	False Bay & Agulhas Bank—S. Africa	32–115
Genus *Boehmia* Hoek, 1881		
B. chelata Hoek, 1881	Challenger Stn., off S. Africa	
B. tuberosa Barnard, 1954	Off S. Africa	
Genus *Discoarachne* Hoek, 1881		
D. bravipes Hoek, 1881	Off S. Africa	
Genus *Cilunculus* Loman, 1908		
G. sewelli Calman, 1938	Zanzibar, S. Africa	1789
Genus *Endeis* Philippi		
E. clypeatus (Mobius) 1902	Off S. African Coast	
**E.* flaccidus Calman, 1923	Madras Harbour	Intertidal
**E. meridionalis* (Bohm) 1879	Off Madras & Christmas Island.	Intertidal & Shallo wwater.
**E. mollis* (Carpenter) 1904	Muscat, Arabia, Maldives, Gulf of Mannar, Sri Lanka Madras, Nicobars, Christmas Is.	Shore
Genus *Ammothella* Verrill, 1900		
A. biunquiculata (Dohrn) 1881	Western Australia	Littoral
Family Colossendeidae Hoek, 1881		
Genus *Colossendeis* Jarzynsky, 1870.		
**C. angusta* Sars	East coast of Africa, Gulf of Aden	2000
**C. colossea* Wilson, 1881	Andaman Sea	1687
**C. macerrima* Wilson, 1881	Laccadive Sea, Andaman Sea and Arabian Sea	1041–1687
Genus *Rhopalorhyncus* Wood Mason, 1873		
**R. kroyeri* Wood Mason, 1873	Andamans, Sri Lanka, Maldives, Muscat, Red Sea, Gulf of Aden, S. Arabian Coast	29–158
FAMILY PYCNOGONIDAE Wilson, 1878		
Genus *Pycnogonum* Brunnich, 1764		
P. africanum Calman, 1938	Zanzibar, S. Africa	183–1228
P. forte Barnard, 1954	Off S. Africa	
**P. indicum* Sundara Raj, 1930	Gulf of Mannar	Intertidal
P. madagascariensis Bouvier, 1911	Off Madagascar	
P. portus Barnard 1946	Port Elizabeth, S. Africa	Littoral
P. pussillum Dohrn, 1881	Off S. Africa	
Genus *Quebus* Barnard, 1946		
Q. jamesanus Barnard, 1946	False Bay, Cape Peninsula, S. Africa	Intertidal
The following species also have been reported form the South African Coast and Java Sea.		
Pipetta capensis Barnard, 1946	Off Cape point, S. Africa	842
Hannonia typica Barnard, 1954	Off S. Africa	
Kyphomia setacea Barnard, 1954	Off S. Africa.	
Hemichela micrasterias Stock, 1954	Java Sea.	

REMARKS ON SPECIES FROM INDIAN OCEAN IN Z S I COLLECTIONS

*Nymphon andamanense Calman

Nymphon andamanense Calman, 1923, p. 273, text fig. 4.

The cephalic segment bears three pairs of appendages anteriorly and in addition to the first pair of legs; the chelophores in which the hand is shorter than

scape, and the fingers are only feebly curved with widely spaced teeth. The palpi flank the proboscis and the second segment is almost of the same width as the third. The body and legs are slender and the neck is elongated as described in detail by Calman. This species was collected from the intertidal region in the Andamans and from a depth of 40 metres in the Saudi Arabian Coast.

Pallenopsis alcocki Calman

Pallenopsis alcocki Calman 1923, p. 282.

The specimens examined agree with the detailed descriptions given by Calman (1923). This species can be distinguished by the exoskeleton being reduced to a framework of rods; short unsegmented body, chelophores with slender scape showing no trace of joint, and spinose palm which is more than twice as long, as wide, and the movable fingers with a spinose cushion for more than half its length; the ovigers of male with ten distinct segment and of female with last four segments coalesced and legs bearing finger like processes each bearing a long apical spine. This species is known only from bathypelagic region of the Andaman Sea.

Pallenopsis annandalei Calman

Pallenopsis annandalei Calman, 1923, p. 280 text figs. 7 & 8.

This species can be distinguished by the slender chelophores; scape with two segments, the first nearly as long as second; slender and curved fingers which are longer than palm and gaping when closed. The proboscis is hardly longer than first segment of scape which is twice as long as second. This species is based on a single male specimen and has not been recorded subsequently. This appears to be deepwater species of the tropical waters.

Pallenopsis ovalis Loman

Pallenopsis (Rigona) ovalis Loman, 1908, p. 68, pl. x, figs. 137, 138.

This species has been described in detail by Loman and supplementary descriptions have been added by Calman (1923). It appears to be widely distributed in the shallow waters of the coral reefs of the Andamans and Sri Lanka. The genus *Pallenopsis* appears to include predominently warm water species.

Propallene hospitalis (Loman)

Parapallene hospitalis Loman, 1908, p. 45, pl. viii.

This species is distinguished by the outline of the proboscis, large claw on the oviger and the form of the cheliphores which lack spurs at their bases.

Propallene kempi (Calman)

Parapallene kempi Calman 1923, p. 277, text fig. 6.

The specimens examined resemble the description given by Calman and agree very closely with the syntypes(C728/1&C 730/1) of the ZSI collections. This is a very common pycnogonid in the intertidal zone among weeds all along the east coast of India.

Callipallene pectinata (Calman)

Pallene pectinata Calman, 1923, p. 275, text fig. 5.

This species was described from a single male specimen without indicating the exact locality. Subsequent to this, there has been no record of this species.

Anoplodactylus cribellatus Calman

Anoplodactylus cribellatus Calman, 1923, p. 285–287, text. fig. 12.

This species is known only from the shallow waters of the Andaman region.

Anoplodactylus investigatoris Calman

Anoplodactylus investigatoris Calman, 1923, p. 288, text fig. 14

This species is known only from the intertidal region off Madras Harbour. This species can be distinguished by the cylindrical and slightly recurved proboscis, with a group of four papillae on the ventral surface about one third of its length from the base; the hinder pair of papillae larger than those infront, all of them inclined forwards.

Anoplodactylus petiolatus (KrΦyer)

Anoplodactylus petiolatus krΦyer, 1844, p. 108; Norman, 1908, p. 202.

A single specimen from Burma is assigned to this species because of its close resemblance to it. This appears to be a variable littoral species having an extensive distribution.

Anoplodactylus saxatilis Calman

Anoplodactylus saxatilis Calman, 1923 p. 287, text fig. 13.

This species based on a single male example from Marble Rocks, Merugi Archipelago has not been subsequently collected although it is readily distinguished by the distinct short and stout claw with very minute auxillary claws.

Ascorhyncus latus Calman

Ascorhyncus latus Calman 1923, p. 270, text figs. 2, 3.

This species can be distinguished by the rather elongated body, lateral processes separated by about their own diameter, proboscis little more than one fourth of total length, fusiform; abdomen slender swollen at tip, as long as proboscis. Chelophores widely separated, less than 2/5 long proboscis, distant segment minute.

Endeis flaccidus Calman

Endeis flaccidus Calman, 1923, p. 295, text fig.17

This species appears to be a common pycnogonid in the intertidal zone inside the Madras Harbour. The specimens examined closely agree with the syntypes (C 748/1 & C 750/1) available in the Z S I collections and the descriptions given by Calman.

Endeis meridionalis (Bohm)

Phoxichilus meridionalis Bohm, 1879, p. 189, pl. ii, figs. 4, 4b.

There are six examples in ZSI collection one from Madras (C 740/1) and five from Christmas Islands (C 741/1). Detailed description of the material has been given by Calman (1923).

Endeis mollis (Carpenter)

Phoxichilus mollis Carpenter, 1904, p. 182, figs. 1 - 7.

Material from Muscat Arabia (C 743/1); Kilakarai, Gulf of Mannar (C 745/1); Lat. 6°0′N, long. 81° 16′ E (3283/9); in lagoon of Northern Maldive Atoll (C 742/1), Madras (7925/10); Sri Lanka, N. Cheval paar (C 744/1); Christmas Island (C 747/1) and Tongatobu (3269/7) available in the ZSI collections have been examined. This appears to be a widely distributed species occurring on the shores of tropical and temperate regions.

Colossendeis angusta Sars

Colossendeis angusta Sars, 1877, pp. 268, 269.

This well known species is widely distributed and is a cosmopolitan deep water species. In the Pacific its known vertical range is from 487-1142 metres whereas in the Indian Ocean it is known only from a depth of 2000 metres.

Colossendeis colossea Wilson

Colossendeis colossea Wilson, 1881, p. 244, fig. 1-3.

In the single male specimen examined the genital pores are clearly discernible although very minute on the last two pairs of legs. The authentic record of this species in the Indian Ocean is at 1687 metres and it is known up to 1788 m in the Pacific Ocean (Kei and Aru Islands — Siboga Expedition). As pointed out by previous workers this is an ubiquitous deep water species.

Colossea macerrima Wilson

Colossea macerrima Wilson, 1881, p. 246, pl. 1, fig. 2.

This species appears to include two forms, the one distinguished by the tip of the proboscis being distinctly narrower than the base and the 4th segment of the palp being two thirds longer than the second. In the other form the proboscis is of equal width throughout and the 4th segment of the palp is more than twice as long as the second. The first form is from the Arabian Sea and Lcacadive Sea and the other is known from the Andaman Sea. Like *C. colossea* this is evidently a cosmopolitan deep water species.

Rhopalorhyneus kroyeri Wood-Mason

Rhopalorhyncus kroyeri Wood Mason, 1873, p. 171. pl. xiii.

Material from north east of Sri Lanka (C 719/1); between Muscat and Mutha Harbours (C 720/1) available in the ZSI collections have been examined.

This species is characterised by the presence of a small teeth on the dorsal surface of the proboscis, the subchelate termination of the oviger and the short scoop shaped terminal claw with a deep notch on one side. This species is widely distributed in the coastal waters north of the equator.

Pycnogonidum indicum Sundara Raj

Pycnogonum indicum Sundara Raj, 1930, p. 73, text fig. 1.

It occurs between tide marks on Shingle Island, Gulf of Mannar.

REMARKS ON DISTRIBUTION

In the Indian Ocean, of the 69 species (valid and doubtful) that have been reported so far, many species are known from single specimens or on a few specimens from a single locality. How far the data that has been presented in Table I could be utilized for generalisation on distribution of Pycnogonids in the Indian Ocean can be doubted. For a proper understanding of the distribution pattern, considerable work has yet to be done on these forms, especially in the Indian region. However, from the present data some broad conclusions can be drawn.

An analysis of Table 1 reveals a concentration of species along the South African Coast including Madagascar and south east coast of Africa (39 species being known exclusively from this region). Of these, 8 species are bathypelagic and 4 are deep water forms. The remaining species are intertidal, or shallow water or coastal forms. This concentration of species is probably due to (1) the extesive study made by scientists in this region, (2) the results of several oceanographic Antarctic expeditions that have traversed these areas, (3) the deep sea cold water forms entering the Indian Ocean through the Antarctic bottom drift between the east coast of Africa and the Seychelles Mauritius Ridge and (4) some deep Atlantic water species entering the Indian Ocean around the Cape of Good Hope.

In the other regions of the Indian Ocean, 3 species each from the Andamans, Gulf of Mannar and Saudi Arabian Coast 4 from the Madras coast and 1 each from the Mergui Archipelago and Java Sea occur at the intertidal or upper bathypelagic zones. 2 species *Endeis mollis* and *Rhopalorhynchus Kroyeri* are widely distributed in the shallow water zone of the Indian Ocean. *R. kroyeri* appears to be restricted to the regions north of the equator. Regarding the western Australian Coast, literature is not readily available for comparison.

In the Indian Ocean, 7 species are deep water forms. They are: *Pallenopsis annandalei, Euryede extenuata, Nymphon hamatum, Cilunculus sewelli, Colossendeis angusta, C. colossea, C. macerrima* and *Pycnogonum africanum.* Some species like *Colossendeis angusta* have a wide range of vertical distribution 487-1142 m in the Pacific and 200 m in the Indian Ocean.

Although these generalizations are based solely on the existing state of our knowledge on the distribution of the Pycnogonids, they confirm that the Indian Ocean fauna is only 14% of the known species occurring in the world oceans, underlining the need for detailed scientific studies of this group.

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