



A CHECKLIST OF FREE-LIVING MARINE ISOPODS OF INDIAN COAST

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Author AU designed the study, wrote the protocol and first draft of the manuscript. Author RSB managed the analyses of the study. Author SSA participated in the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Isopods are the “marsupial or pouched crustaceans”, coming under the superorder Peracarida. Even though aquatic and free-living isopods contribute the majority to the whole number of isopod species, they are largely neglected in taxonomical field of our country. The number of free-living marine isopods reported from Indian coasts is not even reaching hundred. The present paper is a checklist about the known free-living marine isopods identified from our coasts in all these years. The largest contribution is done by the so called ‘parasitic’ suborder Cymothoida. Other significant suborders present are Sphaeromatidea, Valvifera, Limnoriidea and Asellota.

Keywords: Marine; free-living; isopod; India.

1. INTRODUCTION

Isopods are a group of diverse organisms, coming under the crustacean order Isopoda, one of the nine orders coming under the superorder peracarida. Members of this order are given this name because they are having similarly oriented, same sized pereopods in the thoracic region. Isopods are widely distributed in both terrestrial and aquatic habitats and it is one of the most morphologically diverse group of

crustaceans. There are around 10,300 species of isopods around the World. Marine isopods occur in littoral to abyssal zones (Naylor, 1972) (Poore and Bruce, 2012) [1]. And they contribute the maximum to the number of whole isopod species. These crustaceans also inhabit estuaries and freshwater ecosystems. Only one group that has become completely adapted to the terrestrial life is Oniscoidea.

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Life span of isopods varies within a range of less than one year to few years and generally seen that the life span of males is extended than females in many species. Adaptive radiation seen in the order is dramatic, ranging from Microcerberidae species of just 0.3mm length (Wägele et al., 1995) [2] to the deep-sea giant isopod, *Bathynomus* spp of nearly 50cm (Lowry and Dempsey, 2006) [3]. The order encloses not only the free-living organisms, but also parasitic varieties which affect fishes, crabs, etc. The free-living ones are having various food habits of their own. Some are opportunistic feeders which turn to be scavengers and feed on detritus and decayed biological matter. Some are carnivorous and lead a predatory life, the third category feeds on plant parts and algae or become wood borers. Their feeding habits are responsible for their economic importance to an extent. Keeping aside the fact that they serve as an important link in the food chain, they bring a vast range of negative impacts on the fishing (parasitism) and timber (wood boring) industries. Aquatic genera like *Limnoria* and *Sphaeroma* are responsible for the damage of pilings and wooden boats.

As adults, many isopods show extreme sexual dimorphism and developmental stages of some (gnathiids and epicarideans) are entirely different forms of their adult body. Examination of the second pleopods, presence of oostegites in females and penes on last pereonite of males help to distinguish between the two sexes.

Even though isopods are common in our beaches and their presence is noteworthy, they are less studied in India and when compared to amphipods, they receive less attention in ecological and taxonomical studies (Guerra-García et al., 2009) [4]. The parasitic groups are studied more frequently than the free-living isopods, since they exert a pressure on other marine lives, thus affecting the economy. The published and available studies done on the free-living isopods till date in Indian coasts are referred to make this checklist of free-living marine isopods of India. The major objective of our study is to highlight the taxonomic gap existing in the data of free-living marine isopods of Indian Coasts and to remind our taxonomists that many areas have received no sustained taxonomic attention and remain very poorly known. We believe it would be helpful for the future researchers who will be working in this area, to

have a single manuscript, which describes all the marine free-living isopods reported yet from India.

2. MATERIALS AND METHODS

The checklist is prepared through the conventional method of literature reviewing like Ravinesh and Bijukumar (2015) [5]. It is a compilation, made by reviewing the available publications, biodiversity assessment data, doctoral theses and catalogues regarding the free-living isopod fauna of Indian coasts. The scientific names and systematic positions that are changed over time were updated with the help of World Register of Marine Species.

3. RESULTS AND DISCUSSION

The data collected are arranged in a table [Table 1], which shows the taxonomic status of the organism studied. The 66 species reported from the Indian Coasts are belonging to five different suborders; Valvifera, Cymothoida, Sphaeromatidea, Limnoriidea and Asellota.

By observing the collected data, it is clear that the maximum reported superorder is Cymothoida. There are 2,700 described species, in this suborder and they are divided in to four superfamilies. Members of the 'cymothoida' are characterised by their specialized mouthparts for cutting and slicing, which include a mandible with a tooth-like process. Dr. N. Krishna Pillai (1954 and 1958) contributed most of the data about these organisms from South Indian coasts, in his work named "Tanaidacea and Isopoda of Travancore". Even though Cymothoida is the group of isopods known for the parasitic isopods, it includes the free-living varieties too. The families such as Bopyridae, Cryptoniscidae, Cymothoidae, Dajidae, Entoniscidae, Gnathiidae and Tridentellidae are the strictly parasitic ones within the 95 known cymothoid families (Smit. N. J et al., 2014) [31]. Out of the 30 free-living cymothoids, 13 belonged to the family Cirolanidae. Members of Corallanidae and Anthuridae are also reported frequently. Sphaeromatidea is the second largest suborder identified from Indian coasts. Other major suborders reported from our Coasts are Valvifera, Limnoriidea and Asellota.

Table 1. Checklist of free-living marine isopods of Indian Coast

Systematic position:			
Phylum : Arthropoda; von Siebold, 1848			
Superclass : Multicrustacea; Regier, 2010			
Class : Malacostraca; Latreille, 1802			
Subclass : Eumalacostraca; Grobben, 1892			
Superorder : Peracarida; Calman, 1904			
Order : Isopoda; Latreille, 1817			
Sl. No	Species name	Reference	Location
Suborder: Valvifera; Sars, 1882			
Family: Idoteidae; Samouelle, 1819			
1.	<i>Synidotea variegata</i> Collinge, 1917	Collinge, 1917[6] Pillai, 1958 [7]	Kilakarai, Gulf of Mannar Littoral region at cape comorin Thankasseri, Kollam
2.	<i>Synidotea fluviatilis</i> Pillai, 1954	Nair, 1987[8]	Oil tanker berth off Cochin.
3.	<i>Synidotea worliensis</i> Joshi & Bal, 1959	Joshi and Bal, 1959[9]	Worli Village, Maharashtra
Family: Arcturidae; Dana, 1849			
4	<i>Astacilla gibbosa</i> Pillai, 1954	Pillai, 1954 [10]	Kerala
5	<i>Astacilla amblyura</i> Stebbing, 1905	Pillai, 1958 [7]	Thankasseri, Kollam
6	<i>Astacilla gibbosa</i> Pillai, 1954	Pillai, 1958 [7]	Thankasseri, Kollam
7	<i>Arcturina cylindralis</i> Pillai, 1963	Pillai, 1958 [7]	Thankasseri, Kollam
8	<i>Amesopous richardsonae</i> Stebbing, 1905	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
Suborder: Cymothoida			
Family: Aegidae; White, 1850			
9	<i>Alitropus dimorphus</i> Pillai, 1954	Pillai, 1954 [10]	Kerala
10	<i>Aegiochus vigilans</i> (Haswell, 1881)	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
11	<i>Rocinela orientalis</i> Schioedte & Meinert, 1879	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
Family: Gnathiidae; Leach, 1814			
12	<i>Elaphognathia insolita</i> Stebbing, 1905	Pillai, 1958 [7]	Thankasseri, Kollam
Family: Anthuridae Leach, 1814			
13	<i>Cyathura pusilla</i> Stebbing, 1904	Pillai, 1958 [7]	Thankasseri, Kollam
14	<i>Mesanthura maculata</i> Haswell, 1881	Pillai, 1958 [7] Nair, 1987[8]	Thankasseri, Kollam Littoral region at cape comorin Rocky shore of Kovalam
15	<i>Cyathura indica</i> Barnard, 1925	Pillai, 1958 [7]	Littoral region at cape comorin

16	<i>Apanthura sandalensis</i> Stebbing, 1900	Pillai, 1958 [7]	Shanghu mugham
17	<i>Haliophasma poorei</i> Kensley, 1980	Kensley, 1980[12]	Bombay, India
Family: Leptanthuridae; Poore, 2001			
18	<i>Accalathura borradalei</i> Stebbing, 1904	Pillai, 1958 [7]	Thankasseri, Kollam
Family: Corallanidae Hansen, 1890			
19	<i>Lanocira gardineri</i> Stebbing, 1904	Pillai, 1958 [7]	Thankasseri, Kollam
20	<i>Lanocira rotundicauda</i> Stebbing, 1904	Pillai, 1958 [7]	Thankasseri, Kollam
21	<i>Lanocira zeylanica</i> Stebbing, 1905	Pillai, 1958 [7]	Thankasseri, Kollam
22	<i>Argathona hirsuta</i> Hobbs & Jones, 1993	Pillai, 1958 [7]	Littoral region at cape comorin
23	<i>Corallana nodosa</i> Schioedte & Meinert, 1879	Nair, 1987[8]	Akathumuri and Ashtamudi Lakes.
24	<i>Argathona normani</i> Stebbing, 1905	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
Family: Cirolanidae; Dana, 1852			
25	<i>Eurydice inermis</i> Hansen, 1890	Pillai, 1958 [7]	Shanghu mugham
26	<i>Eurydice pulchra</i> Leach, 1815	Pillai, 1958 [7]	Shanghu mugham
27	<i>Eurydice peratidis</i> Jones, 1974	Elefthriou and Jones, 1976[13]	Sandy beaches in the west coast of India
28	<i>Cirolana bovina</i> Barnard, 1940	Pillai, 1958 [7] Nair, 1987 [8]	Kovalam
29	<i>Cirolana fluviatilis</i> Stebbing, 1904	Vallabhan, 1982[14] Nair, 1987[8]	Madras, India (brackish waters) Cochin
30	<i>Cirolana willeyi</i> Stebbing, 1904	Nair et.al., 1987[15], 1989[16] Nair, 1987[8]	South west coast of India, Akathumuri backwaters Akathumuri and cochin backwaters
31	<i>Bathynomus giganteus</i> A. Milne-Edwards, 1879	Nayak et.al., 2006[17]	Mangalore coast
32	<i>Bathynomus kensleyi</i> Lowry & Dempsey, 2006	Sankar et. al.,2010[18]	Parangipettai coast
33	<i>Bathynomus decemspinus</i> Shih, 1972	Sankar et. al.,2010[18]	Parangipettai coast
34	<i>Bathynomus doederleinii</i> Ortmann, 1894	Sankar et. al.,2010[18]	Parangipettai coast
35	<i>Excirrolana orientalis</i> (Dana, 1853)	Joshi and Bal, 1962[19]	Mumbai
36	<i>Cirolana parva</i> Hansen, 1890	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
37	<i>Conilorpheus herdmanni</i> Stebbing, 1905	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
Family: Paranthuridae Menzies & Glynn, 1968			
38	<i>Paranthura plumosa</i> Pillai, 1966	Nair, 1987[8]	Littoral region of Kovalam
Suborder: Sphaeromatidea; Wägele, 1989			
Family: Sphaeromatidae; Latreille, 1825			
39	<i>Sphaeroma walkeri</i> Stebbing, 1905	Pillai, 1958 [7] Nair, 1964[20]	Thankasseri, Kollam Vishakhapattanam Madras coast Cochin Bombay

40	<i>Cymodoce longistylis</i> Miers, 1884	Pillai, 1958 [7] Nair, 1987[8]	Thankasseri, Kollam Kavarathi Islands
41	<i>Cymodoce mammifera</i> Haswell, 1881	Pillai, 1958 [7]	Thankasseri, Kollam
42	<i>Dynoides amblysinus</i> Pillai, 1954	Pillai, 1958 [7] Nair, 1987[7]	Littoral region at cape comorin Vizhinjam
43	<i>Sphaeroma terebrans</i> Bate, 1866	Pillai, 1958 [7] Nair, 1964[20] John, 1964[21] Tiwari et.al.,1980[22] Venkatakrishnan and Nair, 1972[23]	Shanghu mugham Vishakhapattanam Madras coast Cochin Cochin Andaman and Nicobar Islands Cochin Habrour and from several other localities both along the West and East coasts of India
44	<i>Sphaeroma annandalei</i> Stebbing, 1911	Pillai, 1958 [7] Nair, 1964[20] Nair et al., 1989[16] Nair, 1987[8] Venkatakrishnan and Nair, 1972[23]	Shanghu mugham Madras coast Cochin Mumbai Akathumuri backwaters Kadinamkulam and Akathumuri Lakes Cochin Habrour and from several other localities both along the West and East coasts of India
45	<i>Cerceis granulata</i> Pillai, 1954	Pillai, 1958 [7]	Shanghu mugham
46	<i>Cassidina extenda</i> Joshi & Bal, 1962	Joshi and Bal, 1962[24]	Bandra, Mumbai
47	<i>Cassidinidea quadricarinata</i> Pillai, 1954	Nair, 1987[8]	From Akathumuri and Ashtamudi Lakes
48	<i>Dynamenella quilonensis</i> Pillai, 1954	Nair, 1987[8]	Kovalam
49	<i>Sphaeroma triste</i> Heller, 1865	George, 1963 [25] Nair, 1968[24] Nair and Salim, 1994[26] Venkatakrishnan and Nair, 1972[23]	Pamban Thoothukkudi Lakshadweep Pamban Thoothukkudi
50	<i>Cilicæa beddardi</i> Stebbing, 1905	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
51	<i>Cilicæa latreillei</i> Leach, 1818	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
52	<i>Cilicæopsis whiteleggei</i> (Stebbing, 1905)	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
53	<i>Cymodoce bicarinata</i> Stebbing, 1904	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
54	<i>Cymodoce inornata</i> Whitelegge, 1902	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
55	<i>Sphaeroma annandalei travancorensis</i> Pillai, 1955	Venkatakrishnan and Nair, 1972[23]	Cochin Habrour and from several other localities both along the West and East coasts of India.

Suborder: Limnoriidea Brandt & Poore, 2002**Family: Limnoriidae; White, 1850**

56	<i>Limnoria bombayensis</i> Pillai, 1961	Nair, 1964[20]	Mumbai
57	<i>Limnoria indica</i> Becker & Kampf, 1958	Nair, 1964[20]	Madras coast
58	<i>Limnoria tripunctata</i> Menzies, 1951	Nair, 1964[20]	Madras coast
59	<i>Limnoria platycauda</i> Menzies, 1957	Swamy and Udhaykumar, 1997 [27]	Andamans
60	<i>Limnoria andamanensis</i> Rao & Ganapati, 1969	Rao and Ganapati 1969[28]	Andamans
61	<i>Limnoria insulae</i> Menzies, 1957	Ganapati and Rao, 1960[29]	Andamans
62	<i>Limnoria pfefferi</i> Stebbing, 1904	Ganapati and Rao, 1960[29]	Andaman islands.
		Purushotham and Rao, 1971[30]	Madras
63	<i>Limnoria unicornis</i> Menzies, 1957	Ganapati and Rao, 1960[29]	Andaman islands.

Suborder: Asellota; Latreille, 1802**Family: Janiridae; Sars, 1897**

64	<i>Bagatus longimanus</i> Pillai, 1954	Pillai, 1958 [7]	Thankasseri, Kollam Littoral region at cape comorin Kovalam
		Nair, 1987[8]	Kovalam and Vizhinjam
65	<i>Iais pubescens</i> Dana, 1853	Pillai, 1958 [7]	Shanghumugham

Family: Joeropsididae Nordenstam, 1933

66	<i>Joeropsis curvicornis</i> (Nicolet, 1849)	Gopalakrishnan. et al., 2012[11]	Gulf of Mannar
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4. CONCLUSIONS

The study reveals that the number of free-living isopod species reported or studied from our coastline is limited for a biodiversity-rich country like India. Europe and Scandinavia (Naylor, 1972) [32], eastern and western North America (Richardson, 1905) [33], Antarctica (Wägele, 1991) [34], Caribbean Sea (Kensley and Schotte, 1989) [35], and the Australian Great Barrier Reef (Poore, 1987) [36], (Bruce, 1997) [37] are some regions that have received considerable attention and may be considered well understood with few species remaining to be discovered (Poore and Bruce, 2012) [1]. Our country has a coastline of 7516.6 km, which touches nine states and two union territories, which are blessed with a wide variety of climatic conditions. Besides having all the suitable living conditions for isopods to live and flourish in the marine habitats, the Country has not reported even a hundred species. The scientific community has always been biased towards those species, which has a direct impact on the economy and this attitude might be the reason behind the lesser number of studies on the organisms which are not 'economically important'. If the taxonomy studies are done more widely in the marine habitats of the Country, a greater number of free-living isopod species can be reported from India.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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