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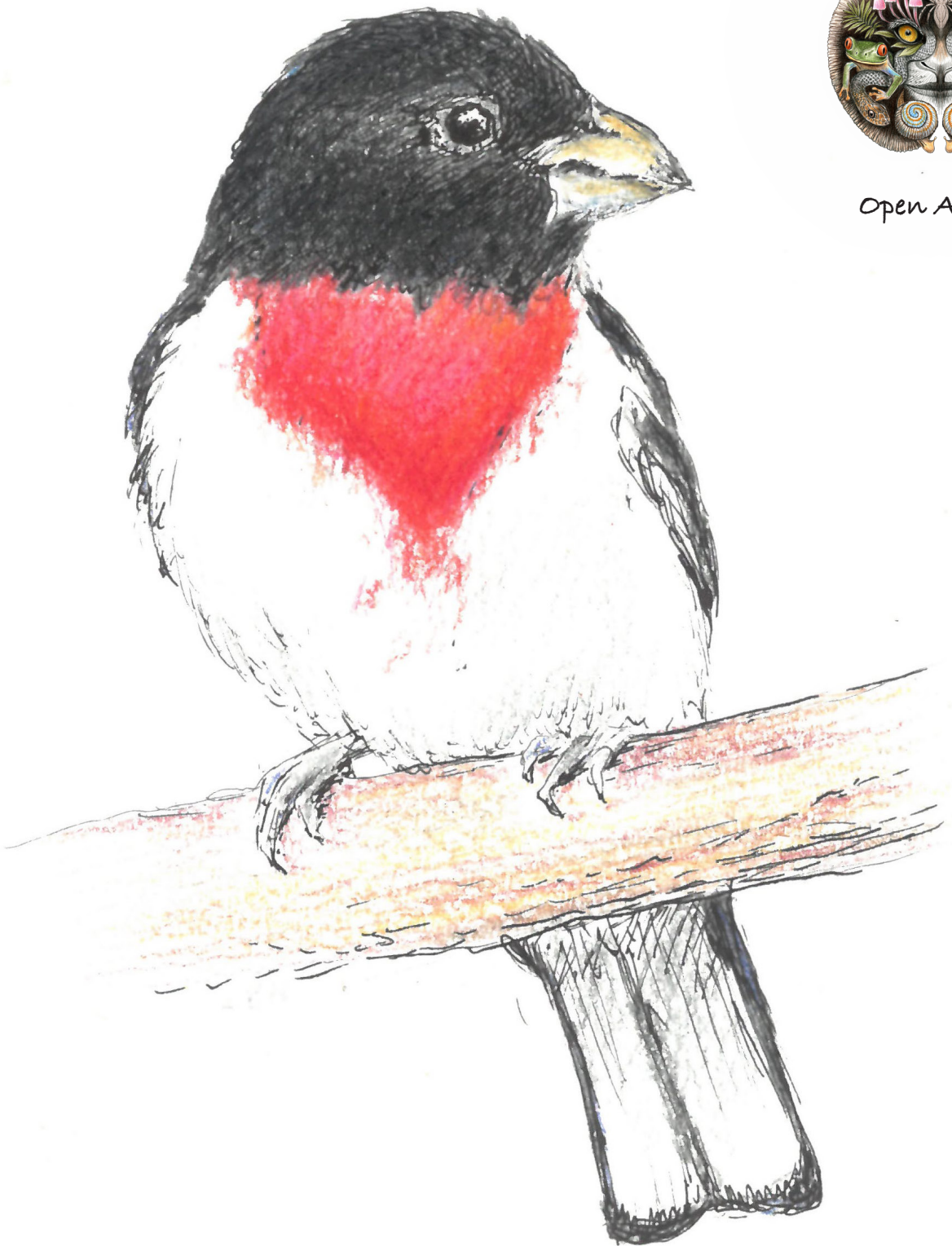
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Cover: Rose-breasted Grosbeak *Pheucticus ludovicianus*, pen & ink with colour pencil. © Lucille Betti-Nash.



A preliminary checklist of Copepoda in the mangrove areas of Munroe Island, adjacent to Ashtamudi estuary, Kerala, India

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Abstract: The present investigation was conducted to assess the species composition of Copepoda in Munroe Island from October 2020 to September 2022. As the information about the species composition of Copepoda is scarce in the mangrove habitats of the southern part of Kerala, their appraisal assumes greater significance. Copepod samples collected from the mangrove habitats of Munroe Island of Kerala (southern India) revealed 31 species belonging to 18 genera and 15 families. The order Calanoida was recognized as the most dominant taxa with 23 species, followed by Harpacticoida (five species) and Cyclopoida (three species). Among the 15 families encountered, Acartiidae, Centropagidae, Harpacticidae, Paracalanidae and Pseudodiaptomidae were the most diverse. Species such as *Acartia bilobata*, *Paracalanus parvus*, *Pseudodiaptomus aurivillii*, *Pseudocalanus elongatus*, *Microsetella norvegica*, and *Oithona similis* were found to be perennial. The investigation calls for intensive copepod surveys to reveal their ecology and diversity in the hitherto less-studied region in southern India.

Keywords: Copepod, diversity, ecology, mangrove habitats, species, survey.

Copepods are considered one of the major planktonic taxa due to their unique tactical position in the aquatic food webs. Their sheer abundance and diversity make them dominant in a wide variety of aquatic habitats. Furthermore, they play a pivotal role in the energy transfer of freshwater as well as marine ecosystems (Hani & Jayalakshmi 2023). Taxonomic investigations on Copepoda from Indian brackish waters began more than

a century ago (Sewell 1914; Gurney 1916; Sewell 1924).

The Indian literature shows a scarcity of research on the faunal diversity of Copepoda from the mangrove areas. The relevant works from southern India are limited to reports from the Pichavaram mangroves, Muthupet mangroves, Ayiramthengu mangroves and the Ashtamudi estuary of Kerala (Kathiresan 2000; Santhanam et al. 2013; Ranjana & Amina 2019; Rajan 2020). On the other hand, Copepoda inhabiting mangrove areas in various parts of southern India are yet to be exposed. Hence, the present investigation on the diversity of copepods of the mangrove areas of Munroe Island, Kerala assumes a great significance from both taxonomical and conservation perspectives. Identified species from Munroe Island are listed in this paper. The preliminary data obtained on the 31 species of copepods in the study area will be an asset for future environmental monitoring investigations.

MATERIALS AND METHODS

Study area: The Munroe Island (8.9911°N & 76.6097°E) (Image 1) is situated at the confluence of the Ashtamudi estuary and the Kallada River in the Kollam district of Kerala. Munroe Island comprises a significant geological portion of the South Indian peninsula, crystalline rocks

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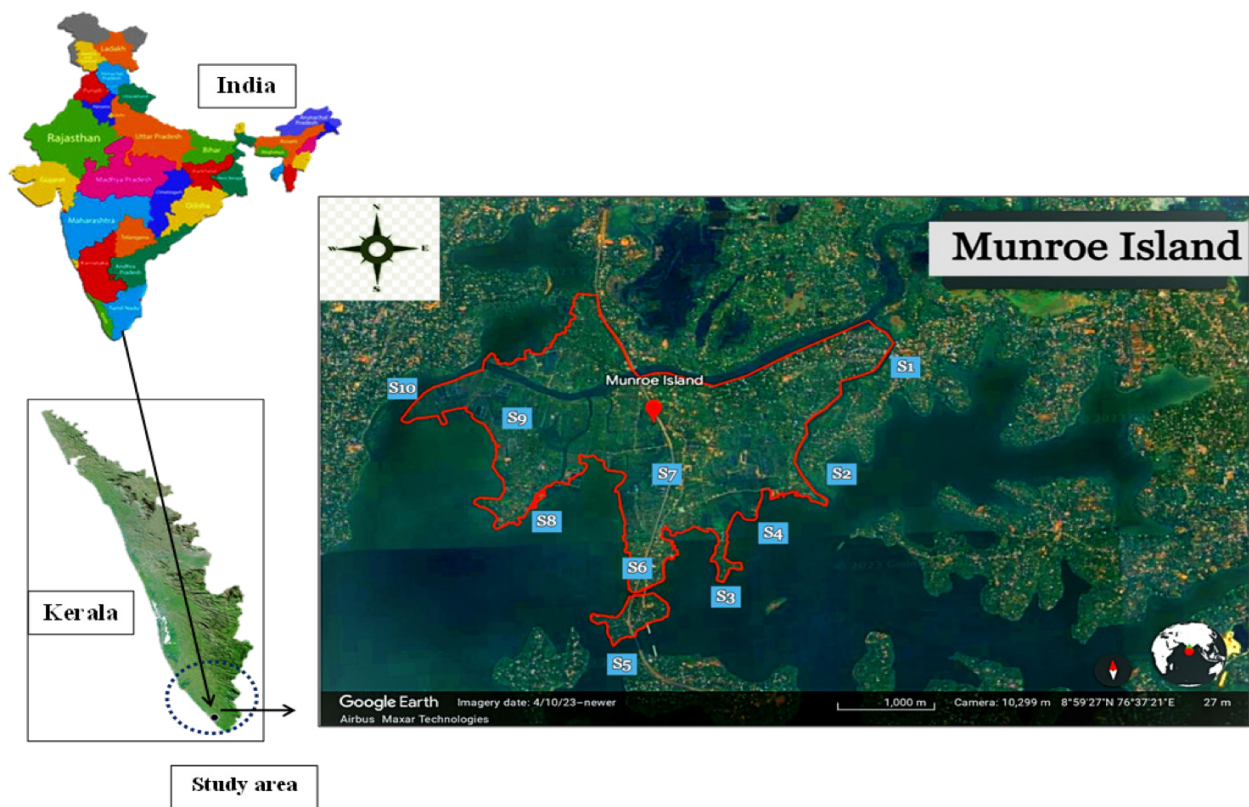


Image 1. Study area with sampling sites.

and tertiary sediments being the major components of the estuary. The annual rainfall and mean temperature of Munroe Island are 270 cm and 25–32 °C, respectively. Additionally, 75% of the annual rainfall occurs during the southwest monsoon (June–September) and northeast monsoon (October–November). The land use pattern mainly consists of coconut gardens and mixed crops. The study area is also characterized by 11 mangrove species and numerous tidal creeks.

Methods of study: Copepod samples were collected using working party plankton net with a mouth area of 200 µm, 60 cm diameter, and a length of 2 m, equipped with a flow meter (Norinco). The net was hauled for 10 minutes at the surface using a boat traveling at a speed of approximately 2 knots. The samples were transferred to a pre-cleaned bottle and 10% buffered formaldehyde solution was used for fixation (Goswami 2004). Subsequently, the samples were transported to the Zoology Research Centre, St. Stephen's College, Pathanapuram for further analysis.

All the samples were screened using a trinocular compound microscope (Weswox MHL-46TR). Taxonomic keys were referred for copepod species identification (Davis 1955; Kasturirangan 1963; Sebastian 1966;

Wimpenny 1966; Newell & Newell 1986; Santhanam & Perumal 2008).

RESULTS AND DISCUSSION

This pioneering study on the copepod diversity of Munroe Island records 31 species (Table 1). Species such as *Acartia bilobata*, *Paracalanus parvus*, *Pseudodiaptomus aurivillii*, *Pseudocalanus elongatus*, *Microsetella norvegica*, and *Oithona similis* occurred in all sampled sites. Conversely, species such as *Heliodyptomus cinctus*, *Mesocyclops aspericornis*, and *Mesocyclops leuckarti* occurred exclusively in stations with strong freshwater influence. On the other hand, the remaining copepod communities were exclusively found in the stations adjacent to the Ashtamudi estuary.

This report raises the number of copepod species known from southern Kerala to 61 species. The number of copepod genera in Munroe Island was marginally higher than the 14 genera noticed at the Ashtamudi estuary by Rajan (2020), but lesser than the 104 species from Coleroon estuary by Rajkumar et al. (2014) and 112 species from Rushikulya estuary by Srichandan et al. (2015).

Few reports are available on zooplankton species-

Table 1. Systematic list of the examined species.

	Phylum: Arthropoda von Siebold, 1848
	Class: Copepoda Milne Edwards, 1840
	Order: Calanoida Sars G.O., 1903
	Family Acartiidae Sars G.O., 1903
1	<i>Acartia bilobata</i> Abraham, 1970
2	<i>Acartia centrua</i> Giesbrecht, 1889
3	<i>Acartia southwelli</i> Sewell, 1914
4	<i>Acartia spinicauda</i> Giesbrecht, 1889
5	<i>Acartiella major</i> Sewell, 1919
	Paracalanidae Giesbrecht, 1893
6	<i>Acrocalanus gibber</i> Giesbrecht, 1888
7	<i>Acrocalanus gracilis</i> Giesbrecht, 1888
8	<i>Acrocalanus longicornis</i> Giesbrecht, 1888
9	<i>Paracalanus parvus</i> (Claus, 1863)
	Pontellidae Dana, 1852–1853
10	<i>Calanopia aurivilli</i> Cleve, 1901
	Centropagidae Giesbrecht, 1892
11	<i>Centropages alcocki</i> Sewell, 1912
12	<i>Centropages furcatus</i> (Dana, 1849)
13	<i>Centropages trispinosus</i> Sewell, 1914
	Diaptomidae Baird, 1850
14	<i>Diaptomus glacialis</i> Lilljeborg, 1889
15	<i>Heliodiaptomus cinctus</i> (Gurney, 1907)
	Euchaetidae Giesbrecht, 1893
16	<i>Euchaeta marina</i> (Prestandrea, 1833)

17	Pseudodiaptomidae Sars G.O., 1902
	<i>Pseudodiaptomus annandalei</i> Sewell, 1919
18	<i>Pseudodiaptomus aurivillii</i> Cleve, 1901
19	<i>Pseudodiaptomus binghami</i> Sewell, 1912
20	<i>Pseudodiaptomus serricaudatus</i> Scott T., 1894
	Clausocalanidae Giesbrecht, 1893
21	<i>Pseudocalanus elongatus</i> (Brady, 1865)
	Temoridae (Giesbrecht, 1893)
22	<i>Temora stylifera</i> (Dana, 1849)
	Calanidae Dana, 1849
23	<i>Undinula vulgaris</i> (Dana, 1849)
	Order Harpacticoida Sars G.O., 1903
	Tachidiidae Sars G.O., 1909
24	<i>Euterpina acutifrons</i> (Dana, 1847)
	Harpacticidae Dana, 1846
25	<i>Harpacticus clausi</i> Scott A., 1909
26	<i>Harpacticus gracilis</i> Claus, 1863
27	<i>Harpacticus littoralis</i> Sars G.O., 1910
	Ectinosomatidae Sars G.O., 1903
28	<i>Microsetella norvegica</i> (Boeck, 1865)
	Order Cyclopoida Burmeister, 1834
	Cyclopidae Rafinesque, 1815
29	<i>Mesocyclops aspericornis</i> (Daday, 1906)
30	<i>Mesocyclops leuckarti</i> (Claus, 1857)
	Oithonidae Dana, 1853
31	<i>Oithona similis</i> Claus, 1866

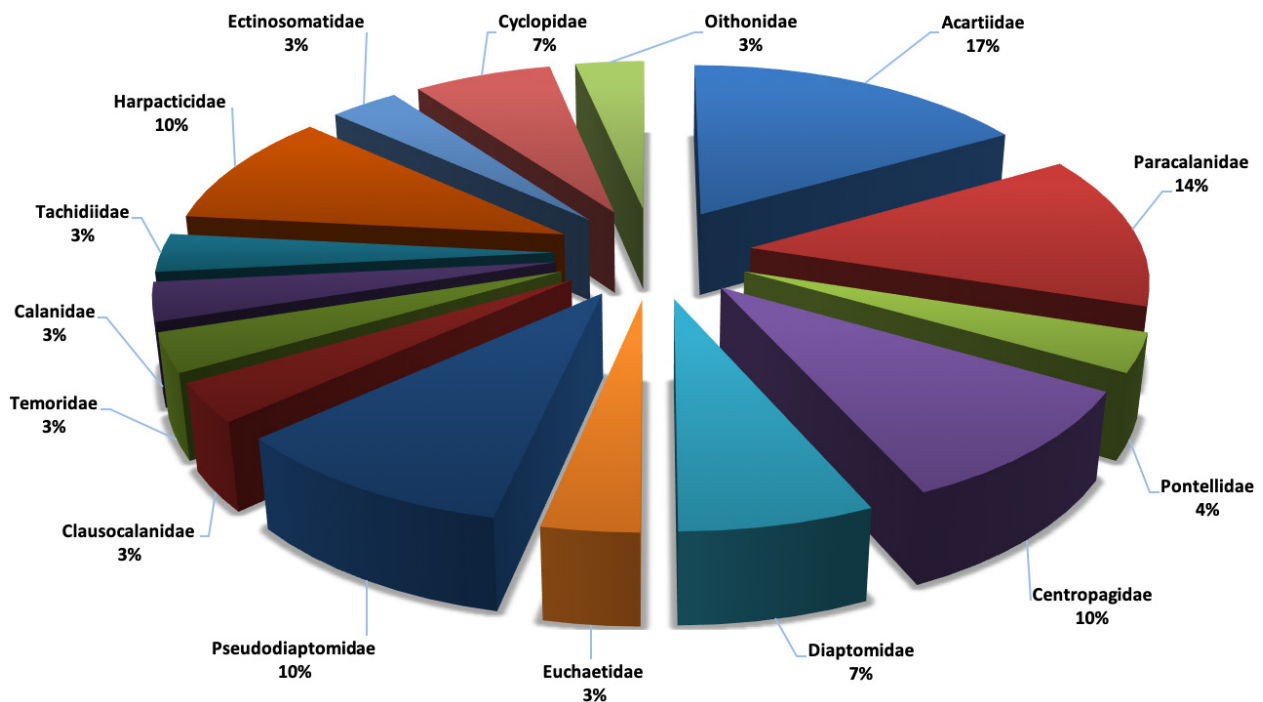


Figure 1. Percentage composition (%) of recorded copepod communities on Munroe Island.

level distribution in the adjacent estuaries in Kerala. In the case of Ashtamudi estuary, Arunachalam & Nair (1988) collected a total of 19 species representing eight families of harpacticoid copepods; Rajan (2020) collected 14 genera of copepods; Hani & Jayalakshmi (2023) collected a total of 53 copepod species under 31 genera belonging to 20 families.

In the present investigation, Calanoida was the most dominant taxa in terms of species richness (23 species) (Figure 1). Also, these findings support the reports of Gaonkar et al. (2010) from Mumbai ports; Pillai et al. (2014) from the Andaman Islands; Srichandan et al. (2015) from Rushikulya estuary. According to the existing literature on copepod diversity in most cases, calanoids stood foremost while the richness of other copepod taxa varied due to environmental changes.

CONCLUSION

This study recorded a total of 31 copepod species, belonging to 15 families and three orders. They were in the following order of dominance: Calanoida > Harpacticoida > Cyclopoida. These findings reveal the copepod diversity in Munroe Island which could be potentially used as a repository for further environmental monitoring of Munroe Island.

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