

**COMMUNITY STRUCTURE AND SYSTEMATICS OF ARROW WORMS (PHYLUM: CHAETOGNATHA) FROM THE LAGOONS OF LAKSHADWEEP ARCHIPELAGO, INDIA**

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**Abstract**

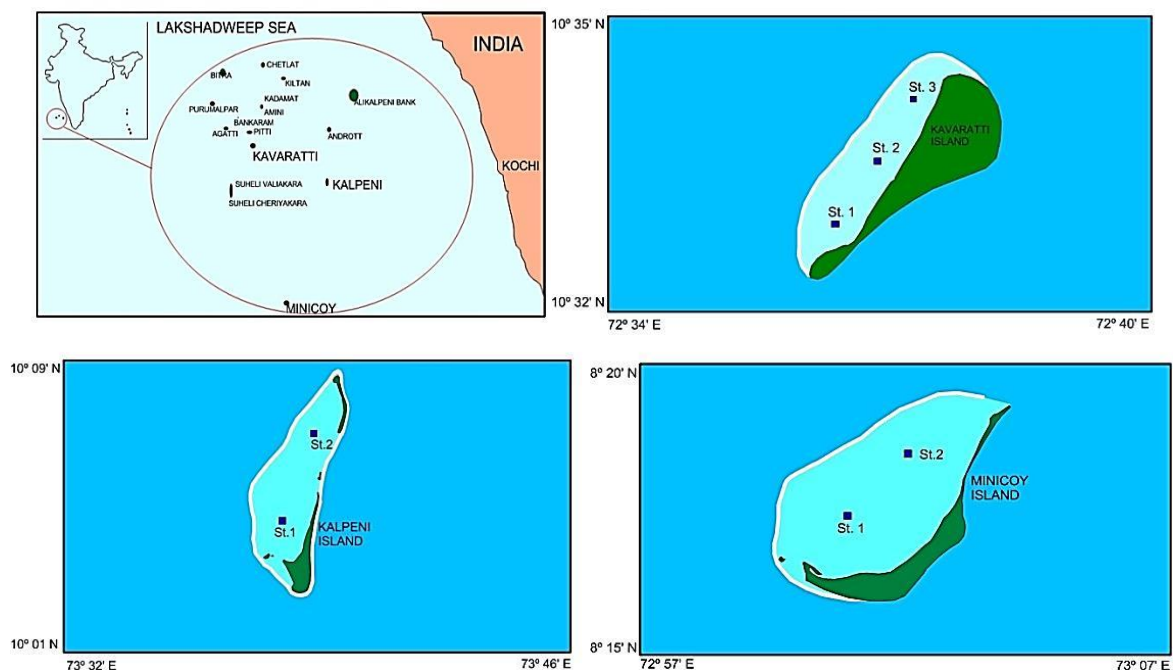
The Phylum Chaetognatha also known as arrow worm represents nearly 295 species that are mostly holoplanktonic. They perform an important role in the marine food web. Due to the geographical isolation of Lakshadweep islands, limited information on chaetognaths are available from this region. In this context, the present study on arrow worms (chaetognaths) in the coral lagoons of Lakshadweep is important and relevant. Eight species of chaetognaths were collected from the selected lagoons of Lakshadweep islands (Kavaratti, Kalpeni and Minicoy) they were *Sagitta enflata*, *S.robusta*, *S. regularis*, *S.bedoti*, *S.madhupratapi*, *S.bipunctata*, *S.decepiens* and *Aidanosagitta neglecta*. The present study emphasizes the importance of long term monitoring of this important holoplanktonic group for understanding the trophic condition of the lagoon ecosystem.

**Keywords:** Chaetognatha, Sagitta, Lakshadweep archipelago, Lagoon, Arrow worm

**Introduction**

The term chaetognath originated from two Greek words; “*Chaeto*” meaning bristle and “*gnathos*” meaning jaws. The Phylum Chaetognatha, also known as arrow worms, contains nearly 295 species [1] of mostly planktonic and 15 benthic, bilaterally symmetrical, coelomate, worm-like organisms (1 mm to 12 cm long). They are typically transparent, although some deepwater species may be orange in color, and some may be opaque, due to their musculature. Chaetognaths are hermaphroditic. Many species within this phylum are known to undergo a daily vertical migration, which provides protection from predators. Chaetognaths are often regarded as valuable indicators of water masses along different parts of the global ocean [2-4]. Chaetognaths are primary carnivores in the pelagic realm, except for the genera *Spadella*, *Bathyspadella* and *Krohnitella*. They feed on a number of crustacean (mainly copepods) and fish (mainly larvae) species, which they track through daily vertical migrations in the water column. Chaetognaths in turn form the important prey organisms. Thus they have a vital role in the marine ecosystem as an important mediator between primary consumers and organisms at higher trophic levels.

**Materials and Methods**



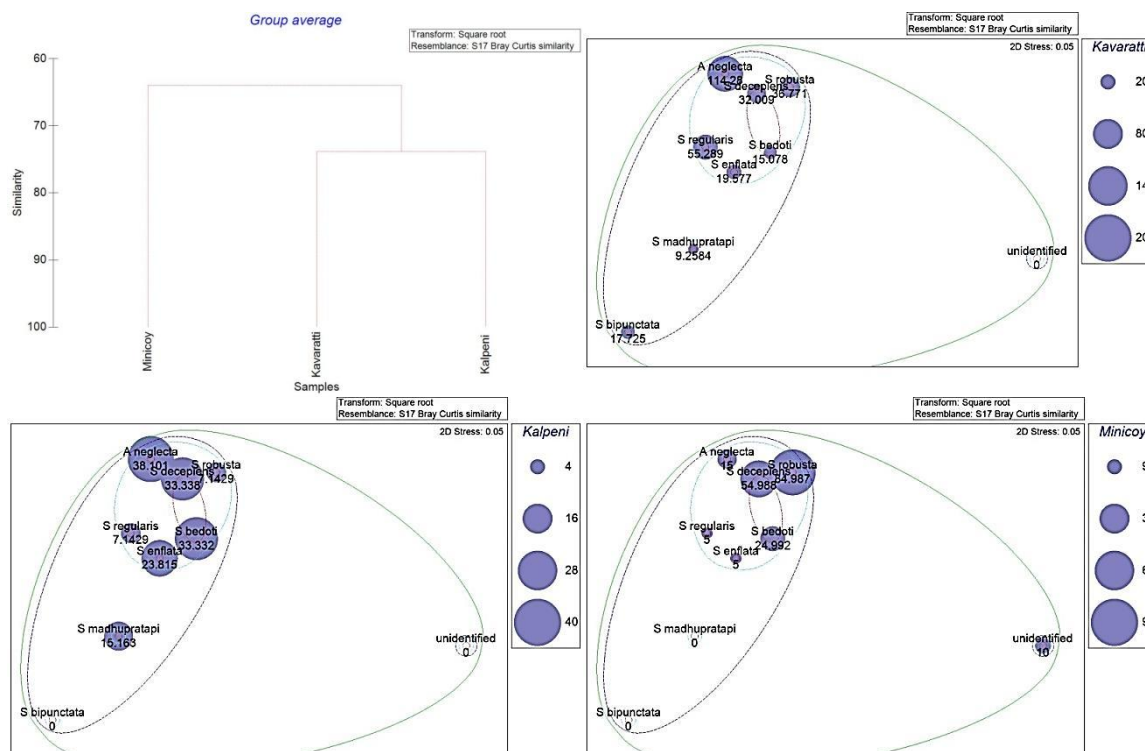
**FIG.1a: Map showing study islands of (1b.Kavaratti Island 1c.Kalpeni Island, 1d.Minicoy Island) Lakshadweep archipelago, India**

In the present study, representative samples of different seasons (pre monsoon, monsoon, post monsoon) were collected from three islands of Lakshadweep archipelago (Kavarathi, Kalpeni and Minicoy). The Field sampling for the collection and analysis of various parameters were conducted during May 2013 to January 2014 period (Fig.1a-d). Mesozooplankton samples were collected using a plankton net (Make: General Oceanics) having mesh size 200µm attached with a flow meter [5]. The collected samples were preserved in 4% formalin and kept in high quality polythene bottles. 8% Magnesium chloride was used as narcotizing agent. Sorting was done in laboratory under Stereo Microscope (Model: Lawrence & Mayo NSZ606). Depending on the size of the sample, subsampling was done using Folsom plankton splitter. Analysis of zooplankton was done by group wise sorting. Detailed identification of chaetognaths were done using standard references [6] in Compound Microscope (Model: Leica DM500).

**Statistical Analysis:** The software programmes *PRIMER v6* were used for univariate and multivariate analyses of data [7].

**Results and Discussion**

Chaetognaths belong to the Class-Sagittoidea, Subclass-Synogonata, Order-Aphragmophora, Family-Sagittidae and Genus-*Sagitta*. Eight species of chaetognaths were represented in the collection during the pre-monsoon, monsoon and post monsoon seasons from the islands of Kavaratti, Kalpeni and Minicoy. The species were *Sagitta enflata*, *Sagitta decepiens*, *Sagitta bedoti*, *Sagitta regularis*, *Sagitta robusta*, *Sagitta bipunctata*, *Sagitta madhupratapi* and *Aidanosagitta neglecta*. *A. neglecta* with 31.63% dominated the Kavaratti Island and *S. madhupratapi* (3.8%) the least. In the island of Kalpeni *A. neglecta* dominated by (25.15%) and the least by *S. robusta* (6.16%). The island of Minicoy was dominated by *S.regularis* (34.21%) and with minimum number by the species *S. enflata* (6.51%). Shannon - Wiener diversity showed maximum at Kalpeni Island (2.58) and minimum in Minicoy Island (2.17).Through Simpson index, the dominance of chaetognaths was found in Kalpeni Island (0.82) and lower dominance in Minicoy Island (0.72).The Margalef’s richness index of chaetognaths was maximum at the Island of Kavaratti (1.23) and minimum at Minicoy (1.13).The Pielou’s evenness index was maximum at Kalpeni Island (0.9196) and minimum at Minicoy Island (0.77).



**FIG.2a: Dendrogram of chaetognath density showing the seasonal similarities in the three stations during 2013-2014. Fig. 2.b, c & d. Non-metric Multi-Dimensional Scaling (MDS) ordination plot (stress = 0.05) of three islands (b.Kavaratti, c.Kalpeni, d.Minicoy ).**

The islands Kavaratti and Kalpeni showed 73.86% similarity in composition and diversity of chaetognaths. The island Minicoy with Kavaratti and Kalpeni gave similarity of 64.03% (Fig.2a), could be due to geographical isolation of Minicoy Island from the islands of Kavaratti and Kalpeni. Non-metric Multi-

Dimensional Scaling (MDS) plots revealed a clear separation of the species of *S. madhupratapi* and *S. bipunctata* in all the three islands (Fig.2 b, c & d). This could be due to the influx of fresh water into the lagoons, where these species could exist in high saline condition. The present study depicted lower percentage abundance (0.19%) as compared to earlier works by Robin, et al. [8] (3%) and Girijavallabhan, et al. [9] (6.62%) from the Kavaratti waters. The lower abundance pattern could be due to changes in the water mass and upwelling phenomenon. In the Minicoy lagoon, chaetognaths contributed only 0.1% during the present study, however Sarada [10] reported 3.13% of the total Mesozooplankton abundance. This might be due to the changes in the lagoon and species composition that happened during the time. Minicoy ecosystem is very fragile in nature and any drastic change in the ecological parameters may lead to the entire ecosystem transformation. The chaetognath composition and distribution pattern in the Lakshadweep waters has not been found to be stable [11]. *S. decepiens* observed for the present study in all the three islands of Kavaratti, Kalpeni and Minicoy. It has earlier been reported from upwelling areas only [4]. This signifies that these lagoons are upwelling zone of the Southern Arabian Sea. On comparison with earlier studies it is clear that the abundance of chaetognaths is decreasing drastically due to the influence of climatic changes and anthropogenic aspects.

### Acknowledgements

This work forms part of the major research project entitled “*Taxonomy and genetic characterization of pelagic copepods (Crustacea) from the marine waters of the southwest coast of India*” being funded by Department of Biotechnology, Government of India and the authors are thankful for their financial assistance. Authors are also thankful to The Head, Department of Marine Biology, Microbiology and Biochemistry, School of Marine Sciences, Cochin University of Science and Technology for providing necessary facilities

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