Meiofauna Biodiversity and Ecology-A Review

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Abstract: **In the present research work an attempt was made to highlight the importance of meiofauna in ecology. Meiofauna are small aquatic organisms ranging 30–500 μm in body size, and are amongst the most abundant and highly diversified metazoans on Earth including 22 over 35 known animal Phyla and accounting for more than 2/3 of the abundance of metazoan organisms. The biodiversity of this component in marine ecosystems is far from being accurately estimated, but this would be a new challenge given the importance that meiofaunal components may play in marine ecosystem functioning and processes.**

Index Terms: **Biodiversity; ecology; taxonomy; biological traits; bioindicators; meiofauna paradox.**

Meiofauna are small organisms (body size range: 30–500 μm) that inhabit seabeds all over the world, even the most extreme ones [1–3]. . They live in and on all types of marine substrata as well as on other living organisms from invertebrates to vertebrates. Twenty-four of the 35 animal phyla have at least one representative within meiofauna. We can find many different meiofaunal species in a very small handful of sediment, with the most varied and curious shapes, that share peculiar lifestyles, ecological relationships, and evolutionary traits. They contribute significantly to the processes and functioning of aquatic ecosystems, They are known for high abundance and taxonomical diversity, fast turnover and metabolic rates. Some meiofaunal taxa have also revealed their considerable utility in the evaluation of the ecological quality of coastal marine sediments in accordance with European Directives. Meiofauna play a key role in the functioning of the food webs and sustain important ecological processes. Therefore, understanding the distribution patterns of their biodiversity and identifying the factors that control it at a global level and in different types of habitats is of great importance.

Current estimates of the meiofaunal biodiversity level are significantly lacking. There are authors who even hypothesize that some meiobenthic phyla could have the same level of biodiversity magnitude as insects in terrestrial habitats [7]. Unfortunately, the minute morphological characterizations utilized for the taxonomical identification of these taxa, the suite of necessary classification skills, and the general increase in taxonomic crisis that still discourages many young researchers from field taxonomy have notably hampered advances in this field of interest. this benthic species could represent an important tool not only for the monitoring and conservation of marine ecosystems, but also as a hidden treasure trove of new natural products that could represent an advance in the biomedical sector.

The occurrence of meiofaunal taxa in a wide spatial range is often a mystery because they do not have pelagic larvae. Some hypotheses have been formulated in the past see [1] and references therein, but Ingels and co-authors raise some new and interesting insights to explain the so-called “meiofauna paradox” thanks to a study on the meiofaunal epibionts of loggerhead sea turtles [14]. However, meiofaunal organisms may be themselves a substratum for other smaller benthic groups (i.e., bacteria or ciliates); in simple terms, biodiversity within biodiversity! In this respect, an extensive review is included on the ciliate and nematode epibiosis phenomenon with a description of three new epibiont species and an updated distribution of all the records of nematode-suctoria association around the world [15]. As reported above, it is fundamental to identify the factors that control meiofaunal distribution patterns in marine ecosystems under both natural and anthropogenic gradients. Indeed, the relationship between organic matter, prokaryotes, and meiofauna across a river-lagoon-sea gradient is investigated in [16]. The role of habitat on the diversity patterns of nematodes in the Cuban archipelago is also evaluated, taking into consideration not only β-diversity but also biological traits [17]. Biological traits, if adequately addressed, could

represent an additional approach for the detection of environmental changes [18]. Hard substrata may host a highly diversified meiobenthic community, but overall, a limited number of papers are present on this habitat.[19]. Gallucci et al [20] further demonstrate, based on work in south-eastern Brazil, that substrate identity and the surrounding environment are important in structuring smaller meiofauna, particularly the nematodes. In the Mekong delta system (Vietnam), biochemical component changes due to dam construction have been investigated revealing a nematode assemblage that has adapted well to organic enrichment, heavy metal accumulation, and oxygen depletion, but the dam located in the Ba Lai estuary may potentially continue to drive this ecosystem to its tipping point, underlining the need for further investigations [21]. Foraminifera may become a consistent part of meiobenthic communities in marine and transitional environments [22]. Al-Enezi et al [23] documented for the first time the biodiversity pattern of benthic foraminifera from Kuwait Bay and the northern islands in this area.

ACKNOWLEDGEMENT

The author wishes to acknowledge BARTI, Pune for financial assistance and Head of the Department of Zoology, Mrs. Kesharbai Sonajirao Kshirsagar Alias Kaku Arts, Commerce and Science college Beed, for providing all the facilities to carry out the study

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