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Editorial

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Limited Ecological Information on Structure and Function of Deep-Sea Ecosystems

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Introduction

Trophic structure of the Arctic benthic deep-sea communities is poorly studied, though feeding habits influence energy flow, nutrient cycling, secondary production, organic matter decomposition, and nutrient regeneration. We do know that the major food source is organic detritus originating mostly from the upper productive zone. This organic material often undergoes strong transformation while sinking, decreasing nutritional value and particle size [1]. The paradigm that deposit feeding is among the best strategies to collect and process this organic detritus efficiently has indeed been supported for both macro-faunal and mega-faunal deep-sea communities. The deposit feeders were also common yet not dominant in our study area, only partly confirming our hypothesis [2]. Predators and suspension-feeders, however, were more common among our epi-faunal taxa. This is contrary to a trend of decreasing proportions of predatory asteroid and gastropod species with depth. Our findings, however, are in agreement with other studies that found that predation is in fact common in oligotrophic seas or in areas with little food input, and are supported by high nitrogen isotope values in certain taxa of our study area. One theory states that prey can be more easily detected in the deep sea compared to shallow water environments, as flow in the benthic boundary layer is slow and thus chemical gradients and pressure waves produced by prey should be more persistent and provide better information for prey location. Facultative predation is even known for specific deep-sea species of, for example, sponges, and bivalves, suggesting feeding modes may be unusual, highly plastic and require more study [3]. A stable isotope-based assessment for the study area is on-going and will provide more clarification of the species' feeding modes and trophic levels [4]. The high occurrence of suspension feeding taxa among the Chukchi Borderland epi-fauna was initially surprising. Higher current and particle fluxes, proving food for suspension feeders, tend to occur on elevations and slopes including the Chukchi Slope Current in the Chukchi Borderland and were suggested to provide food for suspension feeders from the nearby Chukchi shelf to the North-wind Ridge. In addition, suspension feeders on the above-mentioned drop stones can extend above the substrate and into the benthic boundary layer, where the currents are slightly faster and carry food particles [5]. Besides on stones, some taxa were elevated above the seafloor in other ways, namely either on stalks of crinoids or poly-chaete tubes or, in the case of most hormathiid anemones on gastropod shells. Scavengers were also represented in the study area, although not as highly occurring as reported in some deep-sea areas including the Eurasian Arctic [6]. It is unsurprising that parasites were the least occurring feeding type in the study area given our study focused on epi-faunal mega-fauna of which few are parasitic. Smaller external and internal parasites are in fact occurring in Arctic mega-fauna, especially in demersal fish, but were invisible on the remotely operated vehicle images [7]. We did encountered taxa such as ribbon worms, isopods and sea leeches, which generally contain parasitic forms on fishes and arthropods, but we did not observe them on a potential host. Commensalism was encountered for some hormatiid anemones attached to shells of gastropods, a widespread strategy increasing probability of contact with food particles, while providing protection to the host. Similar commensal relationships were observed for other anthozoans and the amphipod amathillopsis spinigera that were often found in association with sessile tubeworms and stalked crinoids [8]. Clearly, more research is needed on parasitic and commensal biotic interactions in the deep-sea. Little is known about larval development in the Arctic Ocean in general. Recent molecular studies, however, have documented the presence of pelagic larvae of more species than previously acknowledged for the Arctic and the deep sea, and detailed studies in the deep sea have added species-specific observations [9]. This trait is important for ecological functions such as dispersal, re-colonization, recovery, tolerance to stress, and link between pelagic and benthic realms [10].

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Conflict of Interest

None

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