

Emerging concerns regarding marine species interaction and ecosystem sustainability

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AUTHORS' CONTRIBUTION: (A) Study Design · (B) Data Collection · (C) Statistical Analysis · (D) Data Interpretation · (E) Manuscript Preparation · (F) Literature Search · (G) No Fund Collection

ABSTRACT

The Marine Species interface is important for understanding the interconnection of terrestrial and marine ecosystems, providing ecosystem services to humans. Both ecosystems have been studied, but knowledge of their interactions remains limited. Although research interest in Marine Species interactions has grown in the last decade, other types of knowledge systems, such as local and indigenous knowledge, have not yet been included. The purpose of this study is to review the literature on Marine Species interactions in the context of ecosystem services frameworks to facilitate the taxonomy of existing research. A systematic review of the literature was performed by searching for peer-reviewed publications on the Web of Science using keywords related to Marine Species interactions. Overall, 166 publications were identified. This result suggests that the main field to study Marine Species interactions is biogeochemistry and ecology, with an emphasis on nutrients and interactions. From the perspective of ecosystem services, urbanization and agricultural and forest runoff have been studied as the main drivers, with service support and regulation being the most commonly studied. The results indicate the need for a more comprehensive examination of Marine Species interactions that recognizes the important role that social factors play in shaping the sustainability of these systems. It is a future challenge, therefore, to use a more holistic approach to study and manage Marine Species interactions.

Keywords: Land–sea interface; Coastal margins; Social ecology; Knowledge systems; Trans-ecosystem interactions; Local knowledge

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Word count: 1186 **Tables:** 00 **Figures:** 00 **References:** 10

Received: 01.07.2023, Manuscript No. ipfs-23-13824; **Editor assigned:** 06.07.2023, PreQC No. P-13824; **Reviewed:** 20.07.2023, QC No. Q-13824; **Revised:** 24.07.2023, Manuscript No. R-13824; **Published:** 31.07.2023

INTRODUCTION

The Marine Species interface is an important area in understanding the interconnectivity of terrestrial and marine ecosystems. Recognizing the different processes and scales of Marine Species interactions is important for identifying and solving problems that affect the ecosystem services provided by both ecosystems [1]. Terrestrial and marine ecosystems provide a range of benefits to humans through ecosystem services such as: B. Food supply, coastal protection, climate regulation, cultural experience. Both ecosystems are well studied from many perspectives [2]. However, these ecosystems are not independent and information on their interactions is still lacking. Indeed, coastal margins are characterized by strong bidirectional connections between land and sea environments, and Marine Species interactions are therefore of great importance for understanding the processes occurring at this interface [3]. Ecosystem services provided on land or at sea can be affected by a variety of factors, which can adversely affect communities living on these coastal margins. Conservation and management of marine ecosystems may be ineffective if land-to-sea impacts are ignored. Therefore, there is a need to identify the processes that connect land and sea boundaries. These interactions are ecological in nature and occur through interactions between species. Social through resource management and decision making biophysical or biogeochemical processes then take place through the transfer of matter, and these processes may act synergistically [4]. Recognizing the different processes and scales of Marine Species interactions can help identify problems and allow us to think about integrated solutions [5]. Rivers are considered the main source of fresh water in coastal seas. This not only affects the physical environment through effects on upwelling cycles and stratification, but also on biogeochemical cycles through the transport of large quantities of nutrients and organic matter from terrestrial activities such as agriculture, forestry and urban runoff [6]. Make an impact. Fluxes of inorganic macronutrients (NO₃⁻, PO₄³⁻, Si(OH)₄), which are known to limit primary production in coastal areas, can also fluctuate, and coastal systems already undergoing seasonal variation must be considered in relation to High levels indicate nutrient concentrations due to coastal upwelling. Nonetheless, sediment transport in rivers influences flow across and along the shelf, driving small- to medium-scale oceanographic features such as upwelling, eddies and fronts, thereby contributing to coastal sediment transport [7].

DISCUSSION

Our results indicated that land-sea interactions are a new

research area leading to new investigations in recent years. The main areas of study of land-sea interactions were biogeochemistry and ecology, with a particular emphasis on the study of nutrients [8]. This is likely related to international efforts such as the Land-Ocean Interaction Study (LOIS) and Land-Ocean Interactions in Coastal Zones (LOICZ). These efforts were focused on the UK. The main purpose of these projects was to study river nutrient flows and sediments associated with cities, industry and agriculture [9]. This accounts for the large number of papers in biogeochemistry in general and in the UK in particular. China, another developed country, is also a country with a lot of publications, and also focused on biogeochemistry due to the number of industries. A related aspect is the source and direction of interaction. Given that nutrient flux, pollutant, and sediment studies aim to understand the impact of human activity on rivers and biogeochemical cycles, rivers are a major source of interaction. Yes, and the main direction of interaction is from land to sea [10]. Research on land-sea interactions with a focus on management is relatively new. The first article was published in 2007, and since 2014 there have been an increasing number of publications in the field. His work on governance in this interface also began in 2007. However, most publications do not deal with management approaches. The management approach basically focuses on ecosystem-based management and integrated management. Our review failed to find this approach, despite the novel approach of explicitly considering interactions between both ecosystems in land-sea protection plans. A land-sea protection plan maximizes protection benefits and reduces costs, including the various knowledge systems and actors

needed to improve decision-making at this interface. Further research needs to be done to include this new approach.

CONCLUSION

Although our results provide an approximation of studies on Marine Species interactions, challenges remain in extending this study to include all the limitations encountered in the study. Despite significant advances in biogeochemical and ecological research, our synthesis reveals significant gaps in our understanding of these interactions. This prejudice highlights the urgent need to conduct research that encompasses a broader view of socio-ecological Marine Species interactions, including social participation and the incorporation of other knowledge systems. In future research, it is important to prioritize the integration of various knowledge systems and promote the co-creation of new knowledge. This approach will promote a clear link between ecosystems and human well-being, ultimately leading to improved human livelihoods. One possible way to achieve this goal is to incorporate this explicit relationship into Marine Species conservation planning. Our systematic review highlights the challenges of a more holistic approach to research and management of Marine Species interactions and suggests that social factors play an important role in shaping the sustainability of these systems. Prioritize the integration of different knowledge systems and encourage the co-creation of new knowledge to improve our understanding of these interactions and design more effective conservation strategies that benefit both people and the environment.

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