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World Ocean Science Congress - 2026
23 - 26 February 2026

**CSIR-National Institute of Oceanography,
Dona Paula – 403 004,
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at CSIR-National Institute of Oceanography, Dona Paula, Goa, India

Eco-immunological diversity of sea stars of West Bengal coasts

Sriparna Purkait^{1,2}, Arunodaya Gautam^{1*}

¹ Estuarine and Coastal Studies Foundation, Howrah, West Bengal-711101

² Scottish Church College, Urquhart Square, Kolkata, West Bengal, 700006 *Corresponding Author - arunodayagautam@ecsfindia.org #Presenting Author – sripamaramani2069@gmail.com

ABSTRACT

The origin, diversity, cellular lineage, and fate of echinoderm coelomocytes remain unresolved despite their functional parallels with vertebrate myeloid cells and their value as biomarkers in ecotoxicology. Although the pharynx and axial organs of echinoids have been proposed as hematopoietic analogues, the precise sites of coelomocyte production in asteroids are still unknown. Sea stars rely entirely on an innate immune system mediated by free-circulating coelomocytes within the coelomic fluid; however, the morphology, ultrastructure, and functional specialization of these cells are insufficiently characterized, particularly in tropical species. India hosts twelve known species of sea stars, including several occurring along the West Bengal coast, yet detailed immunobiological studies from this region are scarce. Our previous work on *Astropecten indicus* demonstrated distinct antioxidant and cytotoxic capacities in its coelomocytes, highlighting the importance of species-specific immune traits. A review of global literature further indicates that morpho-functional diversity among sea star immune cells and their relationships with habitat characteristics and environmental stressors remain poorly understood. The present study aims to advance knowledge of asteroid ecoimmunology by examining the ultrastructure, cellular differentiation patterns, and functional attributes of coelomocytes extruded from sea stars collected along the West Bengal coast. Special emphasis will be placed on antioxidant and pro-oxidant responses, which are central to innate immune defence and sensitive to environmental perturbations. By integrating morphological, ultrastructural, and functional immune assays, this study will provide new insights into the diversity, plasticity, and ecological significance of coelomocytes, contributing to a more comprehensive understanding of innate immunity and environmental adaptation in tropical echinoderms.

Keywords: Immunobiology, Evolutionary immunology, Echinoderms, Seastars

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