The science behind an urbanized ocean: a literature review of the Metro Vancouver ocean

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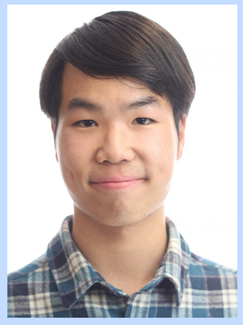


Introduction

Coastal marine ecosystems have been transformed by rising resource use and large-scale urban development from rapid human population growth. Emerging and recurring challenges rooted in spatial-temporal changes of land-sea connections in urbanized regions need to be critically examined to ensure the long-term co-existence and sustainability of people and wildlife in the coastal interface.

A scoping and literature review was performed in this study to characterize the current ecological and biological state-of-knowledge of the urban ocean around Metro Vancouver.

Methods

We examined published scientific literature (1921-2025) on Metro Vancouver's marine ecosystems.

The literature was examined through an inductive qualitative approach for categorization and thematic coding analysis by (1) study discipline, (2) time, (3) location, and (4) other criteria of interest.

Map of researched sites and density in Metro Vancouver

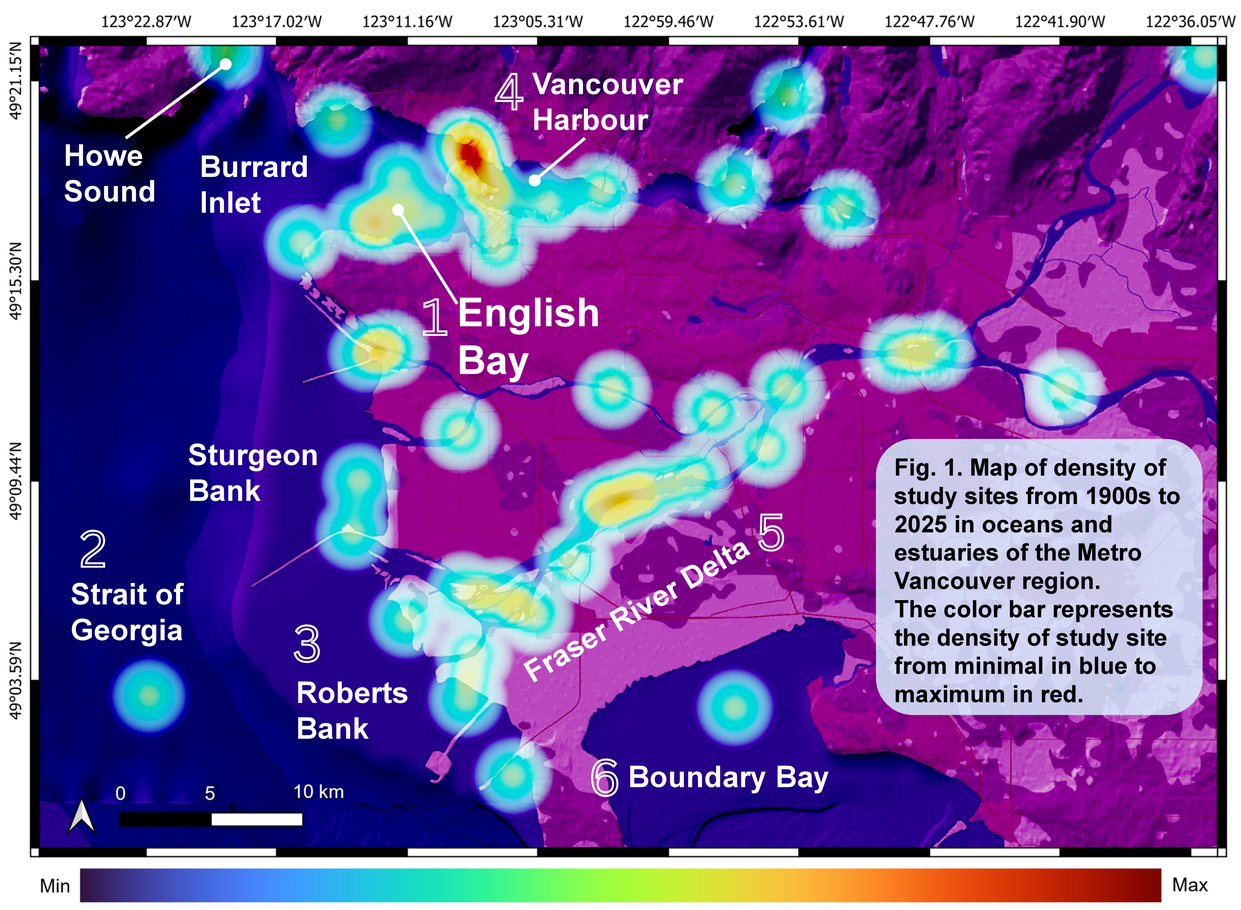


Fig. 1. Map of density of study sites from 1900s to 2025 in oceans and estuaries of the Metro Vancouver region. The color bar represents the density of study site from minimal in blue to maximum in red.

Key Findings - Science focus areas in Metro Vancouver (1921-2025):

Link to Project Website

Ecosystem topics studied

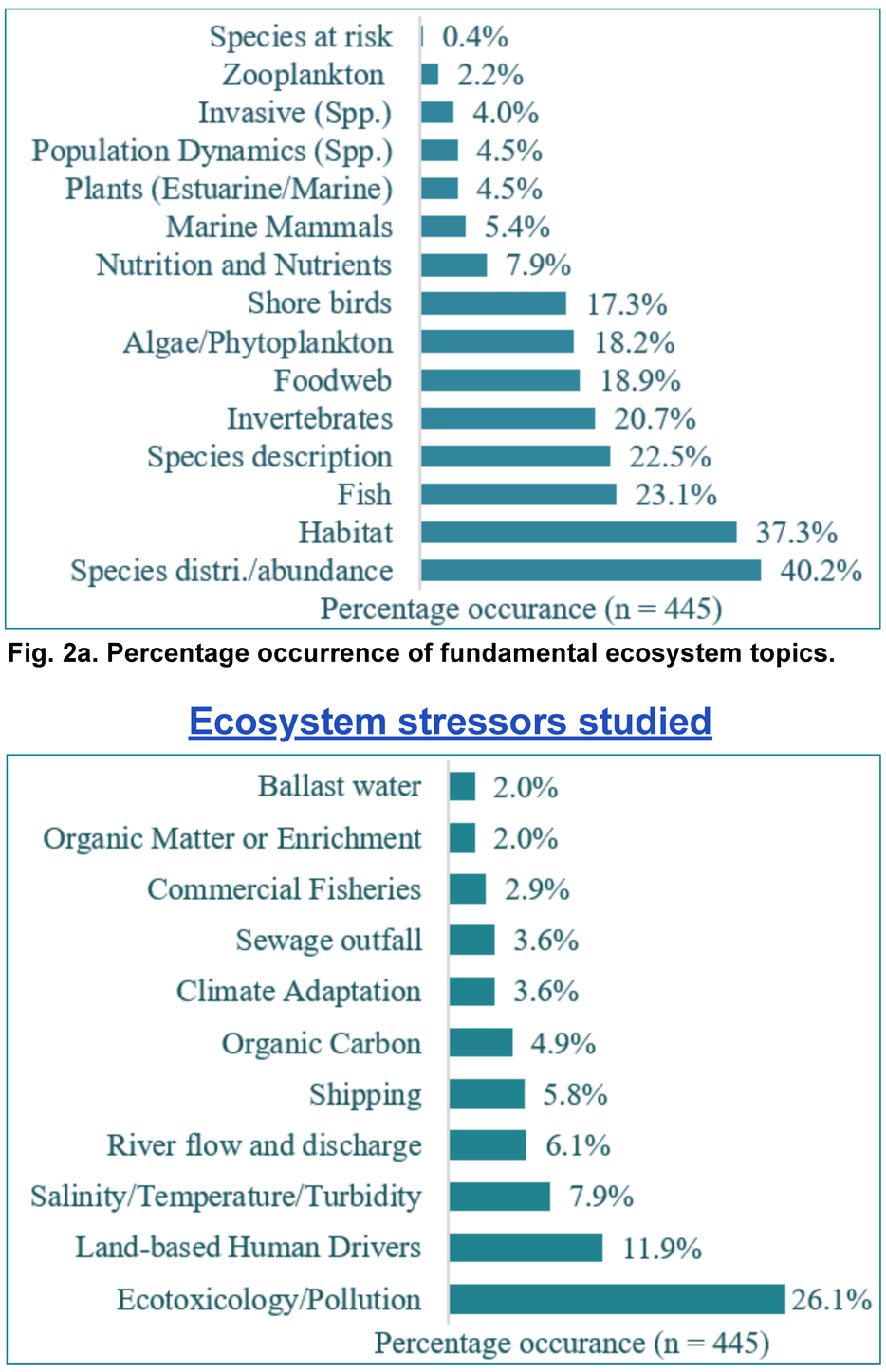


Fig. 2a. Percentage occurrence of fundamental ecosystem topics.

Ecosystem stressors studied

Fig. 2b. Percentage occurrence of studies within the discipline of key ecosystem stressors from human and the environment.

Key areas of study in Metro Vancouver





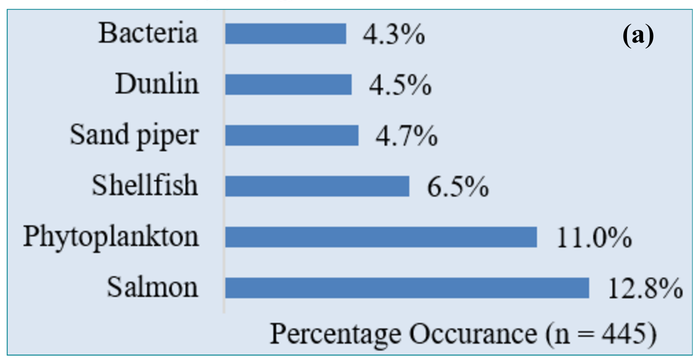








Key organisms studied



Key habitats studied

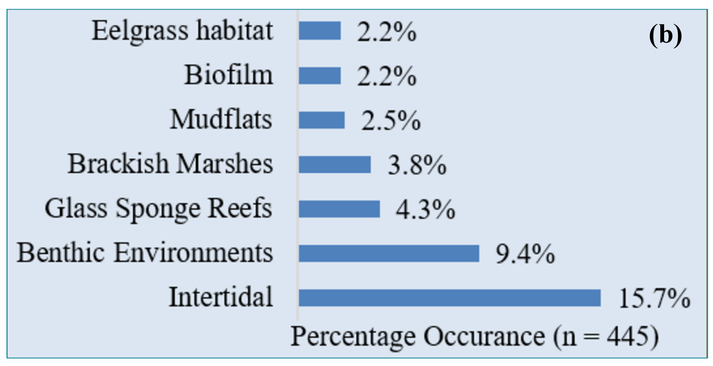


Fig. 3. (a) Key organisms and (b) key habitats studied the most from 1900s to 2025 (n = 445).

Field of study distribution

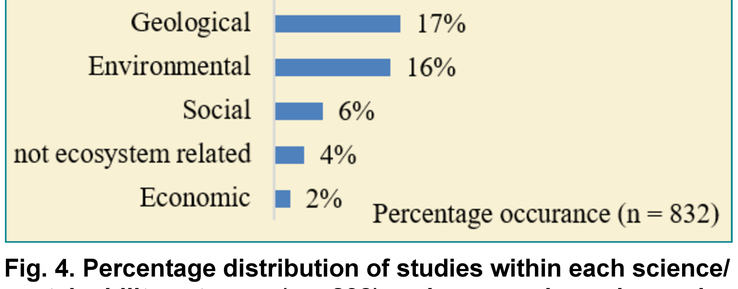


Fig. 4. Percentage distribution of studies within each science/ sustainability category (n = 832) under general scoping review. Interdisciplinary studies may occur in more than one category.

Limitations

- The scope of this research extends to surrounding spaces of Salish Sea.
- These spaces are stewarded by local indigenous communities with important knowledge bases.
- We acknowledge the limitations of western-based knowledge.
- We support the reconciliation of the ongoing dispossession and destruction of indigenous rights, ideas, and resources.

Discussions & Future Directions

1) History and path dependencies of research:
   - Emphasis on species distribution/abundance
   - Low on ecological outcomes from urbanization
   - Discipline studied linked to hyperlocal habitats, species found within micro-ecosystems, and urban development projects

2.1) Expand research on climate adaptation
   - Effects of extreme heat/precipitation
   - Sea level rise and waterfront development

2.2) Share findings and connect with researchers, practitioners, and stewards working in the region

2.3) Explore effects of emerging environmental impact in relation to urban growth trajectory
   - Marine vessel traffic + dredging of inlets
   - Oil spill risks + shift in industrial pollutant

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