CHONe
CANADIAN HEALTHY OCEANS NETWORK

Canada's Ocean Ecosystems Thrive with Robust Foundation Species

SEC 01

WHAT IS CHONe?

A strategic partnership of Canadian university researchers and government scientists, the Canadian Healthy Oceans Network (CHONe) has brought together researchers from universities and federal research labs from coast to coast in Canada since 2008. The Natural Sciences and Engineering Research Council of Canada (NSERC), Fisheries and Oceans Canada (DFO), Northern Institute for Research in Environment and Occupational Health and Safety (INREST) and other interested partners1 provided major funding for the Network which has trained over 100 interdisciplinary undergraduate and graduate students, as well as postdoctoral researchers.

CHONe's research explores the characteristics that define how Canada's oceans will respond to management strategies such as networks of Marine Protected Areas (MPAs), spatial closures, and restoration efforts. Our research also addresses how ocean stressors such as pollution, climate change, and fishing - individually and collectively - alter ocean life and how ocean environments work, including intensively used coastal environments that provide food and other resources.

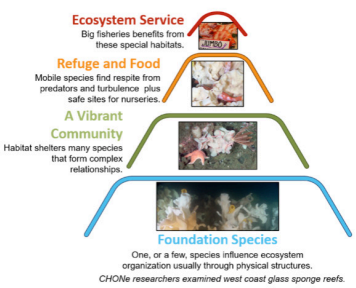
1 Major funding was provided by the Natural Sciences and Engineering Research Council of Canada (NSERC), Fisheries and Oceans Canada, Northern Institute for Research in Environment and Occupational Health and Safety (INREST) and its partners, the Port and City of Sept-Iles. Memorial University, Dalhousie University, and World Wildlife Fund provided additional funding.

SEC 02

WHY THIS SCIENCE BRIEF?

Foundation species are those that play a major role in biological communities, especially in controlling biodiversity and regulating critical ecological processes. CHONe researchers studied a variety of foundation species from Canadian waters: coastal kelp, eelgrass and rockweed; sponges, mussels and sea squirts of hardgrounds; sea pens and sea whips in sediments; deep-sea corals and hot vent tubeworms.

The key role of most foundation species is the formation of critical habitat for other species. They provide shelter, nursery grounds, better access to food, and/or extensive colonization surfaces. Augmentation of local diversity is a key function. Foundation species often form the basis for defining Vulnerable Marine Ecosystems. Loss of these species can reduce ecosystem services.



SEC 03

OUR RECOMMENDATIONS

These suggestions emerge from the collective work across CHONe:

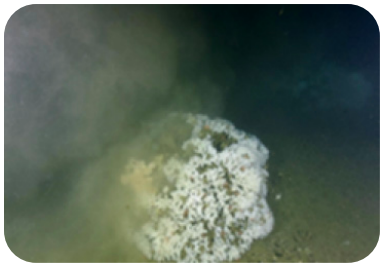
- For a study location, ascertain whether foundation species are present.
- Assess the role of these species in the ecosystem.
- If the area of interest contains species of particular commercial or cultural significance, determine the extent to which foundation species play a role in their life cycle.
- Assess the threats to foundation species and develop mitigation measures.
- Develop a strategy to monitor their condition, distribution and abundance.

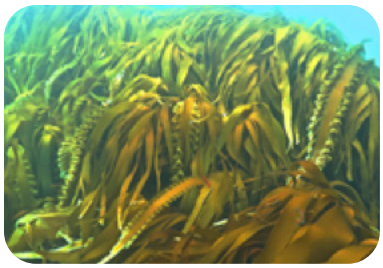
SEC 04

THE CHALLENGE, NEED, AND OPPORTUNITY

The abundance and variety of foundation species in Canadian oceans highlight the substantial contributions they make to marine ecosystems. However, many foundation species are fragile and complex living structures that face a suite of human-induced stressors including:

- coastal development,
- bottom-contact fishing gear,
- seabed mining,
- climate change.





Damage or loss of these foundation species has consequences that extend beyond the species itself by affecting the associated community. Reduction of nursery grounds can affect commercial species, habitat damage reduces food web stability, and coastline ecosystem health can suffer.

The elevated importance of these species in sustaining healthy marine ecosystems points to a need to develop conservation tools and strategies tailored to the specific ecosystem settings.

- Sponge reefs and deep-water corals need protection strategies such as fisheries closures and marine protected areas that exclude damaging activities.
- Some rockweed, seagrasses and kelp habitat are in decline on our coastlines; corrective actions on land can reduce excessive pollution or sediment loading.
- Some foundation species face multiple threats from stressors, including climate change, requiring special strategies to mitigate against loss, even if complete avoidance of impact is not possible.

But these findings create an opportunity to expedite and simplify some conservation efforts: protecting foundation species increases the likelihood of sustaining dependent species, as well as associated ecosystem processes.

SEC 05

OUR APPROACH

Understanding the responses of foundation species to stressors better positions us to predict how the larger ecosystem will respond; these species act as proxies for species that depend on them and are easier to monitor. Sustaining foundation species confers a degree of resilience for these associated species: maintaining their “living habitat” increases the probability that associated species can cope with other stressors.

Over the last decade, researchers in CHONe have worked to: (1) identify foundation species; (2) characterize their roles in ocean health; (3) evaluate threats to them, and; (4) develop monitoring and conservation strategies to inform ocean managers and advance scientific understanding. We provide examples of CHONe key research outcomes and outputs to illustrate the importance and utility of foundation species.

SEC 06

CHONe EXAMPLES

Research on eelgrass habitats on the Atlantic and Pacific coasts demonstrates their multiple roles as foundation species, largely by providing habitat for other species. Juvenile cod specifically utilize eelgrass habitat in order to avoid their predators, which do not typically move through eelgrass. Other fish species also utilize eelgrass, and our work shows reduced fish biodiversity in eelgrass beds close to high coastal land alteration. Strong seasonality in eelgrass-associated species complicates monitoring and other assessments but reiterates the importance of eelgrass as a foundation species. Further information on our eelgrass work can be found here.

Research on Pacific coast sea whips and Atlantic sea pens shows that like eelgrass but in much deeper water, these species provide habitat for other species. The sea whips appear to provide cover from predators for shrimp; when oxygen loss decimated the sea whips, the associated shrimp population nearly disappeared. In the Atlantic, enhanced diversity of invertebrates in sea pen fields relative to adjacent habitat also indicates a habitat enhancement role, though the mechanism requires further study. Further information on this work is available here.

CHONe research has addressed foundation species that include other shallow-water species such as kelp, glass sponges, sea squirts, and horse mussel, as well as deep-sea species from hot vent tubeworms (read more) to cold-water coral.

SEC 07

CONCLUSION

By identifying and quantifying foundation species in Canada’s oceans, we can catalyze a more holistic and simplified conservation effort for some components of marine biodiversity and thus help Canada to meet its conservation targets. Foundation species, by definition, contribute in multiple ways to ocean health; by conserving these species, we not only enhance ocean health objectives but also help to sustain the species and processes associated with those foundation species, even in the absence of complete knowledge.

SEC 08

ANTICIPATED BENEFITS

Prioritizing foundation species supports a clean, healthy, productive, sustainable and predicted ocean. These outcomes benefit Canadians and support United Nations Sustainable Development Goals 14 and the United Nations Decade of Ocean Science. The likelihood of successful outcomes, however, significantly increases only by engaging coastal communities, Indigenous groups, industry, and other ocean stakeholders.

SEC 09

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