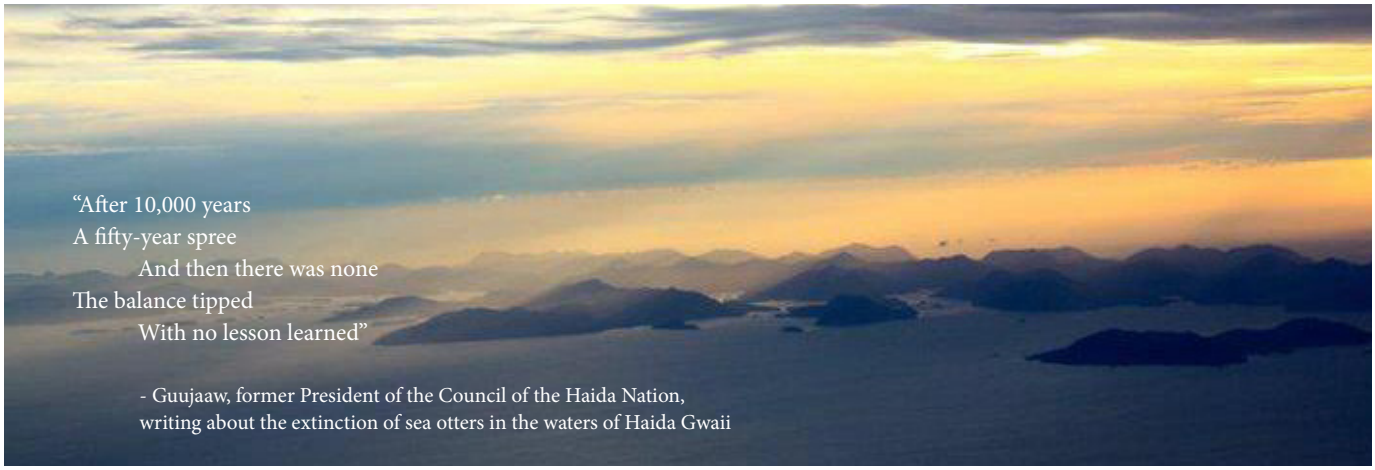
Ocean Tipping Points

Through research and practical application we are discovering when, where, and how ocean tipping points occur and developing tools to help managers make decisions based on this knowledge. For more, visit www.oceantippingpoints.org

Ecosystem-based management in Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site



What is an ocean tipping point?

- When a small change in environmental conditions or human use results in a large, often abrupt, change in ecosystem structure, function and benefits to people.

Why study tipping points in Haida Gwaii?

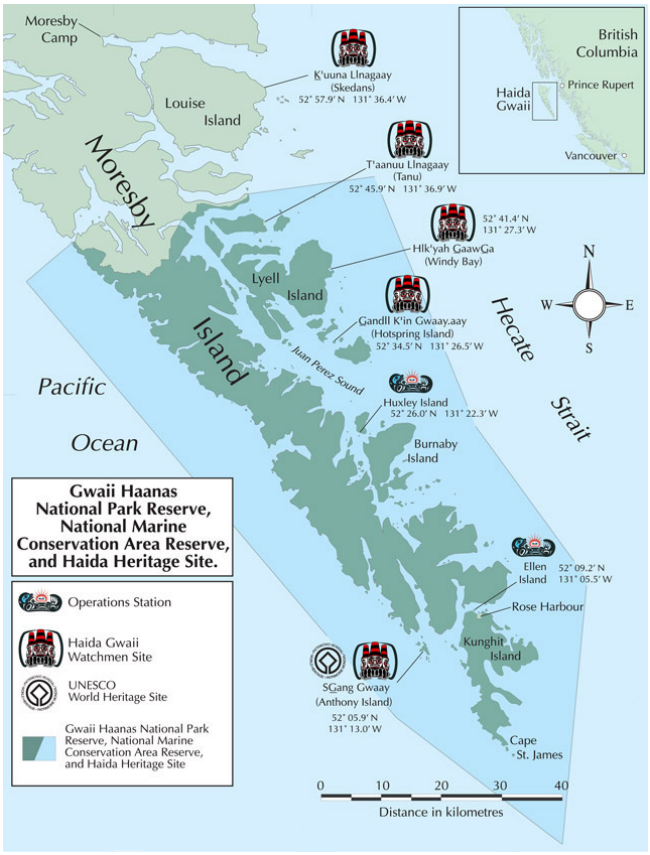
- Changes in ocean climate and pressure from human activities have led to significant changes in the marine ecosystems of Haida Gwaii in the past.
- The people of Haida Gwaii depend upon healthy nearshore ecosystems for food, clean water, commerce and culture. Rapid or dramatic changes to the nearshore environment can disrupt these benefits, sometimes irreversibly.
- Resource managers need to know when, where and why tipping points may be crossed for successful ecosystem based management.

What are we trying to achieve?

- In collaboration with local management partners in Haida Gwaii we are working to understand what pushes a marine ecosystem past a tipping point.
- With a focus on the nearshore ecosystem with Pacific herring at its core, we are characterizing the current state of the ecosystem, testing alternative hypotheses for what led to past ecosystem shifts, and evaluating potential outcomes of future management.
- This approach will help us to identify the most important indicators to monitor, better understand historical changes, and evaluate the effects of alternative management strategies on the coupled social-ecological system.

How will this be useful to managers?

- This work will support ecosystem based management and fisheries management decisions by deepening our understanding of why the herring-centered coastal ecosystem experiences dramatic shifts.
- We will provide new analyses to inform herring management and evaluate actionable strategies to improve ecosystem health and resilience to benefit society (e.g., food security, cultural practices, livelihoods and biodiversity conservation).



Big Picture

Haida Gwaii ("Islands of the People" in the Haida language) is a remote island archipelago located 70 kilometers off the northwest coast of British Columbia, Canada, just south of Alaska. Nearly 5,000 square kilometers of the land and sea of Haida Gwaii are protected through the Gwaii Haanas National Park, Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site. This landmark reserve is one of the first in the world to formally integrate protection across land and sea. While much effort has been dedicated to the preservation of Haida Gwaii's local cultural and natural treasures, abrupt shifts in the state of the ecosystem have occurred historically in the region (e.g., removal of sea otters and resulting changes in kelp forests; sharp declines in abalone and herring stocks). These shifts have had significant consequences for ecological and human communities. In response, Gwaii Haanas' cooperative Archipelago Management Board, comprised of representatives from the Council of the Haida Nation, Parks Canada and Fisheries and Oceans, Canada, has implemented an interim management plan for restoration and protection of these valuable ecosystems. We are working with the management board and other managers, scientists and community members to develop a better understanding of the drivers, dynamics and trade-offs associated with past and potential ecosystem shifts in Gwaii Haanas and the tools necessary to apply an ecosystem approach to management.

How are we doing it

Our team is working closely with partners to understand how marine species, processes and the human communities that depend upon them respond to a suite of pressures, and how we can best predict tipping points in the ecosystem. We are focusing our work on Pacific herring, which are key species in the coastal ocean food web and are central to Haida Gwaii's marine economy and Haida culture. We are examining why this once-abundant forage fish has failed to recover from a population decline in the 1990s, and how this has affected the species and human uses that depend upon it.

Key Deliverables

1. Characterization of expert perceptions of the role of herring in Haida Gwaii food webs and consequences of those perceptions for future scenarios
2. Theoretical modeling to explore expectations for herring recovery with and without high predator densities
3. Analysis of the spatial population dynamics of herring in Haida Gwaii since 1950, especially as associated with commercial fisheries catch, Steller sea lion predation, and Haida traditional use
4. Evaluation of potential ecosystem indicators to inform the Gwaii Haanas monitoring plan
5. Analysis of how alternative harvest strategies affect herring fisheries yield and closures, stock size, and the availability of herring for dependent predators
6. Identification and prioritization of key social values to inform the Gwaii Haanas management plan, with a focus on Haida and non-Haida youth.
7. Locally-defined conceptual models of sustainability and health in the context of the marine environment
8. Preferences for different socio-ecological conditions related to different management and environmental scenarios

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Management Partners
Council of the Haida Nation
Fisheries and Oceans Canada
Gwaii Haanas Archipelago Management Board
Parks Canada

Institutional Affiliations
1. NOAA's Northwest Fisheries Science Center
2. Stanford University's Center for Ocean Solutions
3. National Center for Ecological Analysis and Synthesis, UC Santa Barbara
4. Hakai Network for Coastal People, Ecosystems and Management
5. Simon Fraser University

Anticipated completion
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