

Introducing Exotics

Introducing exotics into marine
ecosystems
in the traditional territory of the
Heiltsuk First Nation

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Introduction

Introducing exotic species—either intentionally or accidentally—poses certain threats, some substantial, to both terrestrial and marine ecosystems.

The Heiltsuk Nation is currently monitoring and informing the Central Coast Local Resource Management Planning process. Here we report on the potential risks of introducing exotic species into the traditional marine waters of the Heiltsuk. This report, the first in a series, is a contribution to both the Central Coast discussion, and to reasserting the Heiltsuk's interest in maintaining healthy marine ecosystems.

In an effort to make it more widely useful, we focused on presenting general, ecologic principles, supported by specific examples of what others have learned.

Exotic Introductions: General

The U.S. Congressional Office of Technology Assessment says the U.S. now has a minimum of 4500 “Non Indigenous Species”. Of those exotics, approximately 15% are considered nuisance species having significant ecological and/or economic impacts.

The Office of Technology Assessment further states that “the significance of non-indigenous species in marine environments (including bays, estuaries, and open coasts) has received relatively little attention compared to terrestrial and freshwater habitats,” and that the main “vector” (or cause) of such introductions is humans.

Exotic Introductions: Marine

According to conservation biologists who study exotic species, there are some general principles that govern introductions of exotic species into marine ecosystems. Certain of those relate to an ecosystem's susceptibility to invasion.

For instance, scientists have found that:

- Estuaries are more vulnerable to invasion than rocky or sandy shores
- Already heavily-invaded estuaries are still being invaded, and at high rates
- Initial invasions lower an estuary's resistance to subsequent invasion
- Some invasions take root instantly, while others require years to decades.

Those scientists also provided some sobering examples:

- The Pacific, Atlantic and Gulf coasts have a total of 400 non-indigenous species (NIS)
- There are 234 NIS in San Francisco Bay, and 160 in Chesapeake Bay

Exotic Introductions: Pathways and support systems

A recent bulletin from the Smithsonian Environmental Research Center recently listed the most common pathways for exotic invaders. Those pathways include:

- Aquaculture
- Aquarium Trade
- Boats and Ships
- Channels, canals, locks
- Live bait
- Nursery industry
- Scientific research, schools

➤ Fisheries enhancement

For world-wide marine ecosystems, ballast water from tankers remains the main vector for exotic introductions. Every year, 16 billion tonnes of ballast water is shipped around the globe. Fully 3,000 exotic species are in inter-continental transit—daily.

Scientists also tell us that aquaculture is a perfect host for non-indigenous species. Aquaculture activities add nutrients to water, fuelling eutrophication and red tides, which kill fish and mammals.

The aquaculture industry has also introduced a species of salmon that is exotic to the West Coast—the Atlantic salmon.

The Atlantic salmon is favoured over Pacific salmon because Atlantics grow faster. Atlantic salmon now constitute about 80% of B.C.'s total farm-fish production.

The potential impacts of Atlantic salmon on native salmon remain unclear. We do know, however, that many Atlantic salmon escape each year from fish farms, including nearly 100,000 between 1988 and 1995. We also know that (despite salmon farming industry assurances that it couldn't happen) Atlantic salmon reproduced the last 2 years in Vancouver Island's Tsitika River, that Atlantics eat food otherwise eaten by native fish, and that it costs us \$35,000/year to (inadequately) monitor Atlantics in a few Vancouver Island rivers.

Exotic Introductions: Economic Consequences

We are still largely unable to account for the economic and biological damage wreaked by exotic invaders. Marine conservation biologists have reported that:

- A North American ctenophore is blamed for a \$250 million loss in Azov and Black seas fisheries
- The cost for controlling the Zebra mussel invasion in the Great Lakes is predicted to reach \$1.8-3.4 billion (U.S.) by the year 2,000
- Exotics contributed to the collapse of the Chesapeake Bay oyster

fishery

- We'd better start preparing for an invasion of green crabs.

Exotic Introductions: Green Crab

Green crabs in ballast water first reached San Francisco Bay, CA, in 1989. By 1997, they had reached Coos Bay, WA, and just this year was found in Vancouver Island's Barkley Sound. Green crabs are a potential threat to BC oysters and clams, and may prey on young Dungeness and red rock crabs.

Conservation biologists also had this to say about green crabs: "The introduction and spread of *Carcinus maenas* has the potential to change coastal communities over much of western North America."

Exotic Introductions: Health Consequences

We're also woefully ignorant about the potential health consequences of introduced species. In general:

- Non-indigenous species increase toxic threats to marine environments, and stimulate red tides
- Other dinoflagellates and cysts originating in ships' ballast pose other threats
- There are 61 species of toxic dinoflagellates worldwide.

Summary

- ❖ Introduced or exotic species represent a serious threat to the integrity and sustainability of natural ecosystems, including the traditional territory of the Heiltsuk Nation
- ❖ Next to habitat loss, the spread of exotic species is the single greatest threat to biodiversity
- ❖ Our knowledge of the impacts of NIS in marine ecosystems is particularly poor, and thus limits our ability to predict the effects and to assess the risks.

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About the Author and Series

Dr. Craig Orr is a behavioural ecologist who has worked on salmon conservation issues in B.C. for more than a decade. Orr, who has also worked as a seabird ecologist, currently provides advice on selective fishing and water flow issues to the BC Aboriginal Fisheries Commission, and is a member of the board of the Habitat Conservation Trust Fund and Grizzly Bear Trust Fund. He is also president of Watershed Watch Salmon Society.

This paper is the first in a series commissioned by the Heiltsuk for the Central Coast Resource Management planning process. A companion paper on the risks of offshore oil exploration will soon be available.