The Hidden Story:
What are the Potential Genetic Effects of Different Types of Fisheries Management?

Ingrid Spies[1,2] and André E. Punt[3]

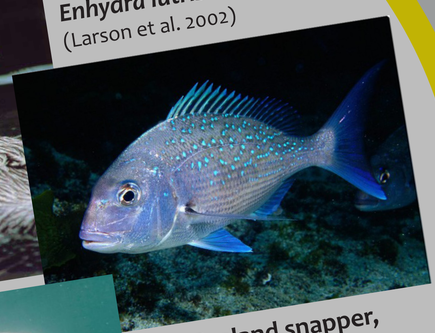
[1]Alaska Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration
7600 Sand Point Way NE, Seattle, WA 98115. Phone: (206) 526-4786, Fax: (206) 526-6723, Email: Ingrid.Spies@noaa.gov
[2] Quantitative Ecology and Resource Management, University of Washington, Seattle, WA
[3] School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA

WHY

Loss of genetic diversity and genetic structure have been documented in several marine species.

LOSS OF GENETIC DIVERSITY

Sea otter, *Enhydra lutris* (Larson et al. 2002)



New Zealand snapper, *Pagrus auratus* (Hauser et al. 2002)

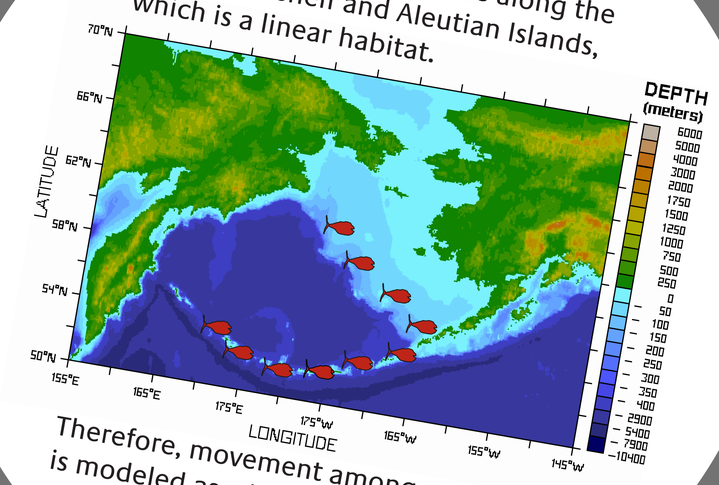
Hector's dolphin, *Cephalorhynchus hectori* (Pichler and Baker 2000)

GENETIC POPULATION STRUCTURE

Pacific cod, *Gadus macrocephalus* (Spies In Press; Canino et al. 2010; Cunningham et al. 2009)

The effects of managing populations without information on genetic population structure are not known.

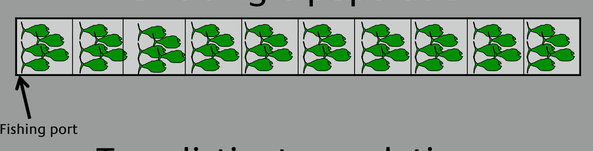
Many groundfish species, including Pacific cod, reside along the Bering Sea shelf and Aleutian Islands, which is a linear habitat.



Therefore, movement among populations is modeled as a linear array. Each array consists of 10 spatial areas.

This study integrates genetics and fisheries management in a single analysis.

One single population



Two distinct populations

The fishing port is to the left and effort is proportional to fish density and distance to the port.

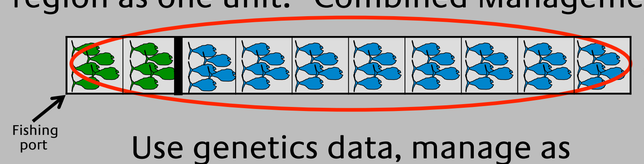
HOW

Simulate genetic data for one or two populations.

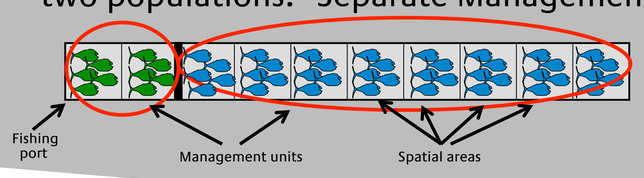
Age-structured population growth model, and an individual-based model with a genotype for each fish.

Simulate fishing pressure for 100 years (based on assessments and control rules).

Ignore genetics data and manage whole region as one unit: "Combined Management"



Use genetics data, manage as two populations: "Separate Management"

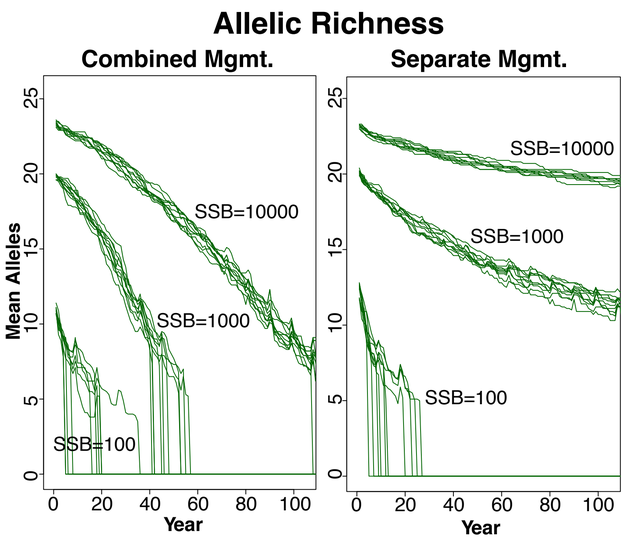


Compare performance measures:

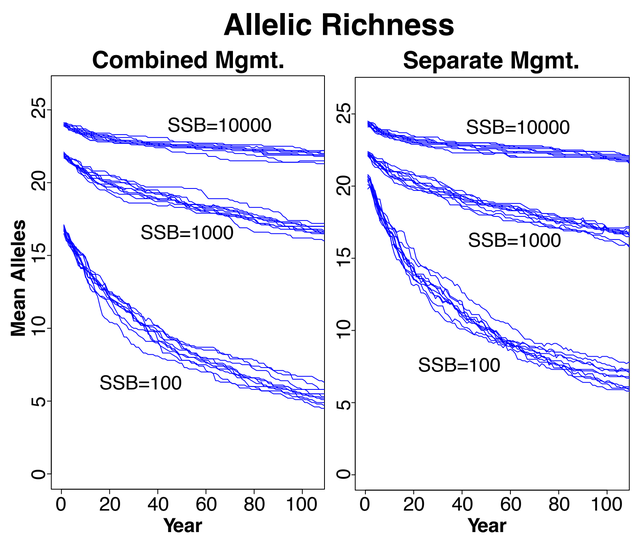
- total catch
- genetic diversity
- stock size*

* Stock size equals spawning stock biomass (SSB) relative to initial value.

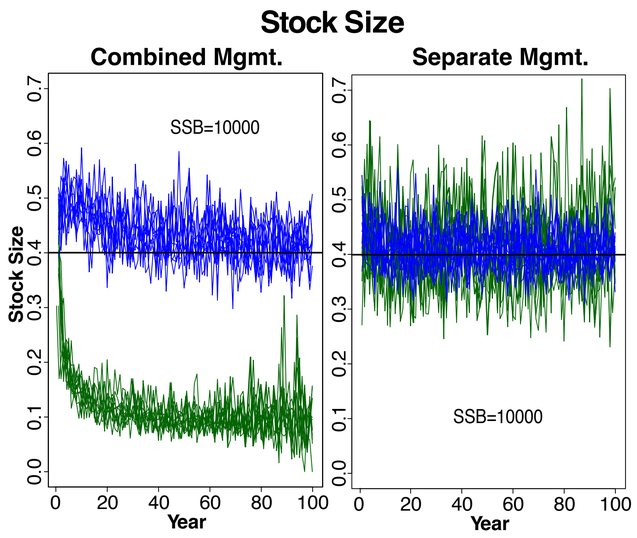
WHAT



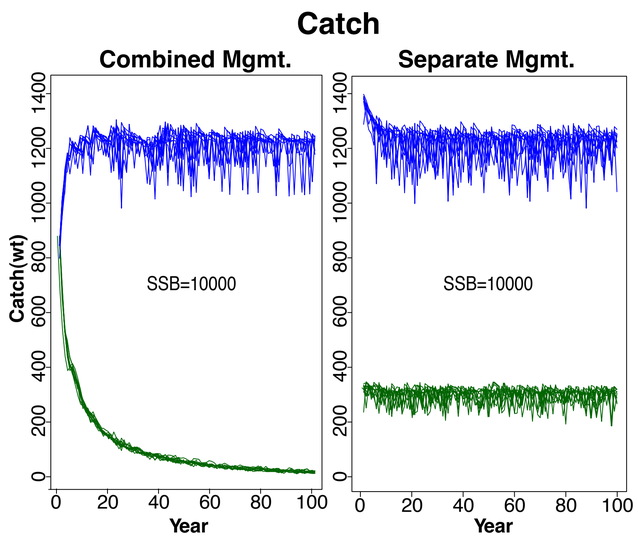
Genetic diversity declines faster in the smaller population under combined management.



Genetic diversity declines more slowly in larger population sizes.

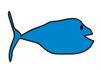


Population nearest fishing port is depleted more than intended under combined management.



Catch goes down in the population near the fishing port as the population declines.

Population 1 (Green)



Population 2 (Blue)

The recommendations and general content presented in this poster do not necessarily represent the views or position of the Department of Commerce, the National Oceanic and Atmospheric Administration, or the National Marine Fisheries Service.

ACKNOWLEDGEMENTS: We thank Grant Thompson and Robin Waples for their help.
Poster designed by Rebecca White, AFSC Graphics.