Ocean, Fishery and Society
Interconnections Among Systems in Change

Lawrence Hamilton
University of New Hampshire
http://pubpages.unh.edu/~lch/
PICES, Dalian, China, October 2008
FUTURE research questions:

1) How do ecosystems respond to natural and anthropogenic forcing?

2) What determines an ecosystem’s resilience and vulnerability to natural and anthropogenic forcing?

3) How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems?

Also: forging partnerships with social scientists
Case studies of ocean, fishery and society interactions

- Iceland herring towns
- Northwest Newfoundland cod
- Faroe Islands fisheries crisis
- Greenland’s transition from seal hunting to cod fishing, and from cod fishing to shrimp fishing
- New work on western Alaska


To download individual papers, see: [http://pubpages.unh.edu/~lch/](http://pubpages.unh.edu/~lch/)
Rise and fall of two Iceland “herring towns”

- Herring fishery grew in early 20th century
- Labor-intensive, near-shore fishery benefited North Iceland (e.g., Siglufjordur) until 1950s
- As stocks declined, a capital-intensive offshore fishery benefited East Iceland (e.g. Neskaupstadur) until 1960s
- Combination of overfishing & environmental change led to collapse
- Human population of herring towns reflects details of fishery and ecosystem change
Rise and fall of two Iceland “herring towns”

Siglunes section salinity at 0-200m, 34.5 - 35.0

Fish catch in 1000 tons

Population in 1000s

Siglufjordur population

Neskaupstadur population

Herring catch

Cod catch
http://pubpages.unh.edu/~lch/Herring_Capital.pdf

http://pubpages.unh.edu/~lch/HamiltonCh04.pdf
Cod collapse and Northwest Newfoundland

- Cod fishery supported Newfoundland outports for centuries
- In 1960s and 70s, overfishing reduced groundfish stocks
- Overfishing & environmental conditions led to decline in late 80s and multi-species collapse in early 90s
- Human population of NW Newfoundland reduced, became older
- Smaller families, more emphasis on education
Codfish collapse and Northwest Newfoundland

- **Min. CIL temp.**
- **Max. ice area**
- **N. Gulf cod catch total and Canada**
- **Mean weight per fish, 8 indicator species**
- **N Peninsula population**

- Numbers:
  - 22,000
  - 24,000
  - 26,000

- Years:
  - 1965
  - 1970
  - 1975
  - 1980
  - 1985
  - 1990
  - 1995
  - 2000
http://www.docurights.com/drmaker.cgi?vid=3899&objid=271121

http://www.humanecologyreview.org/pastissues/her82/82hamiltonbutler.pdf
Faroe Islands fisheries crisis

- Fishing pressure & environmental variations led to cod and other fisheries decline in 1980s
- Many young people left the islands due to economic crisis
- The population rapidly became smaller and older
- Young adults moved away, so there were fewer children
- Some Faroese moved back as economy improved in 1990s
Faroe Islands fisheries crisis

[Graph showing the total cod catch and net migration from 1980 to 2000, with significant declines in both metrics around the year 1990.]

Faroe Islands fisheries crisis
This population pyramid for 2006 shows the number of males (blue) and females (red) at each age from 0 to 101 years.
Outmigration during the Faroe Islands’ fisheries crisis noticeably reduced younger cohorts born after about 1965, and left older cohorts proportionally more dominant.
Hamilton et al. (2004) “Migration from resource depletion: The case of the Faroe Islands.” Society and Natural Resources.
Greenland’s transitions from seal hunting to cod (1920–1980), and from cod fishing to shrimp (1980–2000)
Greenland’s *Demographic Transition*: high birth/high death rates to lower birth/low death rates—and outmigration
Shifting sex ratios reflect changing Greenland livelihoods, from hunting to post-industrial.

Pre-1940: Excess of females due to higher male death rates

Post-1960: excess of males due to higher female outmigration
Environment, resources and society through Greenland’s seal hunting to cod fishing transition, 1910–1940.
1977–2006 transition from high-birth rate, young structure with relatively few elders to a lower-birthrate, postindustrial society. 1960s birth cohort is dominant.
In the 1970s, Greenland’s elsewhere-born population consisted largely of young men. By 2006 the profile had changed dramatically.
http://pubpages.unh.edu/~lch/Greenland_Arctic.pdf
Kodiak Island, Alaska hosts significant groundfish, salmon, crab and halibut fisheries.
In the late 1970s a climatic “regime shift” occurred in the northern Pacific and Bering Sea. A second regime shift, marked biologically by a greater abundance of groundfish, occurred around 1989.
Alaska fisheries value (adjusted USD) by type, 1950–2006

1989 regime shift

Value in millions of USD (2006)

- Salmon
- Groundfish
- Shellfish
- Halibut
- Herring
Kodiak Island-based fisheries, including groundfish, salmon, halibut and crab fisheries, have been losing value since 1989.
The population of Kodiak Island Borough has declined due to net outmigration after 1995.
Kodiak City, the main port of Kodiak Island, has lost population since 1994 despite a strong pressures for natural increase (an excess of births over deaths).

From “Population dynamics of Arctic Alaska” website: http://www.carseyinstitute.unh.edu/alaska-indicators.htm