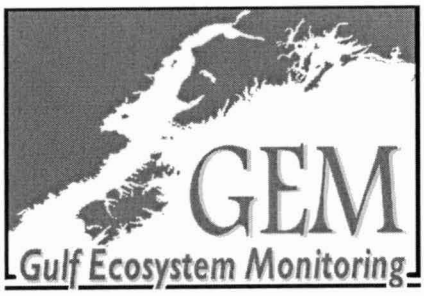
22.02.04

# Gulf Ecosystem Monitoring



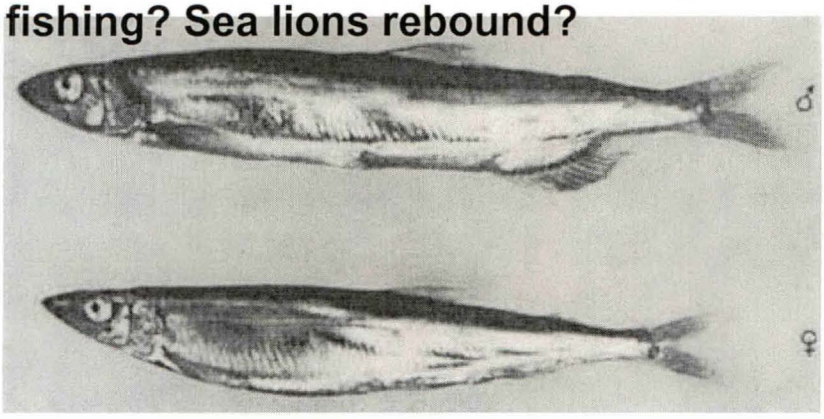

## Introduction to the GEM Monitoring and Research Workshop

October 12, 2000

**Some Current Issues**
**What Information Gaps**
**Cloud the Issues**
**How Themes Close Gaps**
**Ecological Questions of the**
**Conceptual Foundation**
**Themes + Questions + Gaps**
**What We Need From You**

too busy -
hard to read
need bullets
or line ~~of~~ finish
left
or something.

**Current Issues: Are the capelin back? Are the capelin the ~~bellwether~~ of a major regime shift? Long-term declines in salmon catches? Return of shrimp fishing? Sea lions rebound?**




**Mature male and female capelin ( *Mallotus villosus*) in spawning season.** (From: *Bulletin of the Newfoundland Government Laboratory No. 17 Research.* Templeman, W. St. John's 1948.)

http://www.coastalsafari.com/CAPELIN.htm

Issues

Contemporary Issues

Do the apparent increases this year in capelin stocks in the gulf forecast long-term changes in other species such as sea lions, shrimp, cod and seabirds?

When will the red king crab fisheries return to the Gulf of Alaska?

How many hatchery salmon should be released each year?

Are recent failures of some salmon runs indicative of long-term downward trend in statewide salmon production?

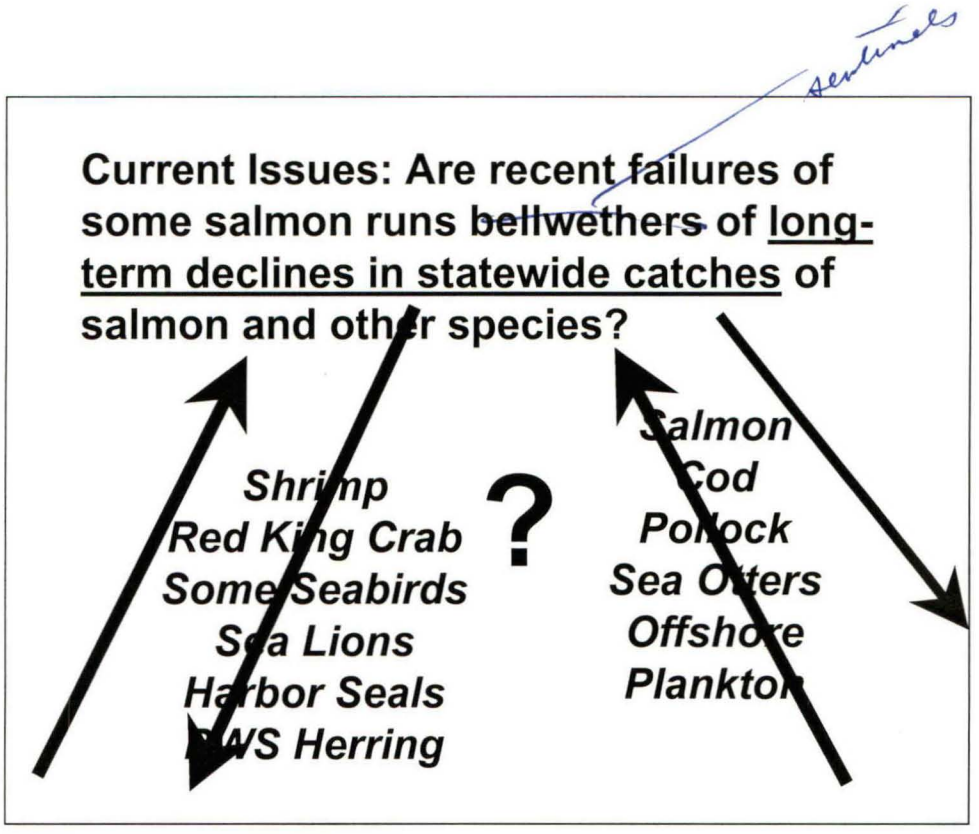
Long-standing questions (similar to contemporary)

.What natural and human factors caused declines in kittiwakes, herring, harbor seals, and sea otters in PWS?

.What combination of natural and human factors caused the loss of red king crab fisheries in the gulf?

.Why are western Alaskan chum salmon stocks in decline?

.Are the same natural and human factors responsible for increases in cod populations also responsible for the decreases in shrimp in the gulf?

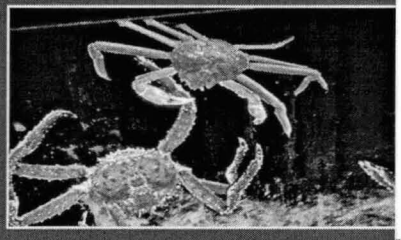

Current Issues: Are recent failures of some salmon runs bellwethers of long-term declines in statewide catches of salmon and other species?
Shrimp
Red King Crab
Some Seabirds
Sea Lions
Harbor Seals
PWS Herring
?
Salmon
Cod
Pollock
Sea Otters
Offshore
Plankton

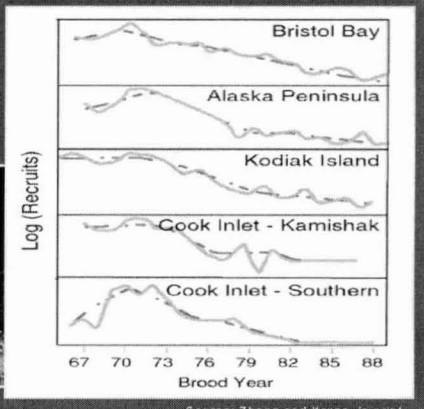
## Current issues: Return of red king crab fishing in the Gulf of Alaska?

## What is driving recruitment of red king crab?

*Recruitment of red king crab*

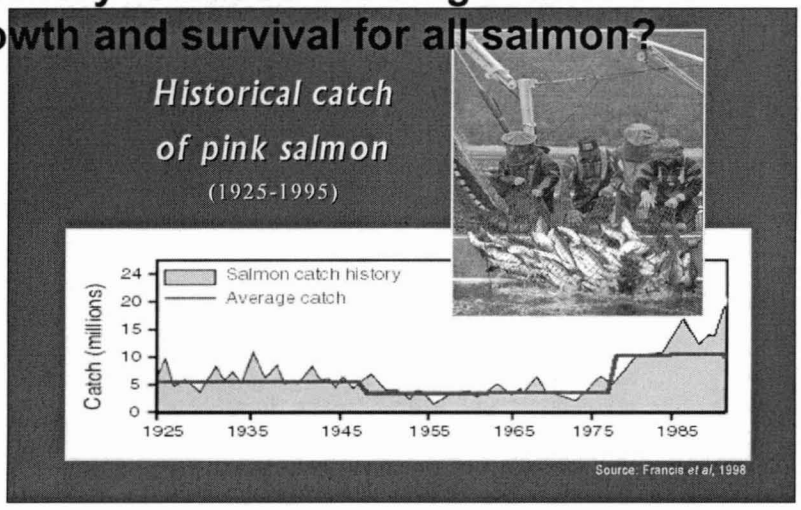
(1967-1988)






Source: Zheng and Kruse, in print

**Current Issues: <u>How many hatchery salmon should be released?</u> Are hatchery releases causing reductions in growth and survival for all salmon?**




Francis, R.C., S.R. Hare, A.B. Hollowed, and W.S. Wooster. 1998. Effects of interdecadal climate variability on the oceanic ecosystems of the northeast Pacific. Fisheries Oceanography. 7(1):1-21.

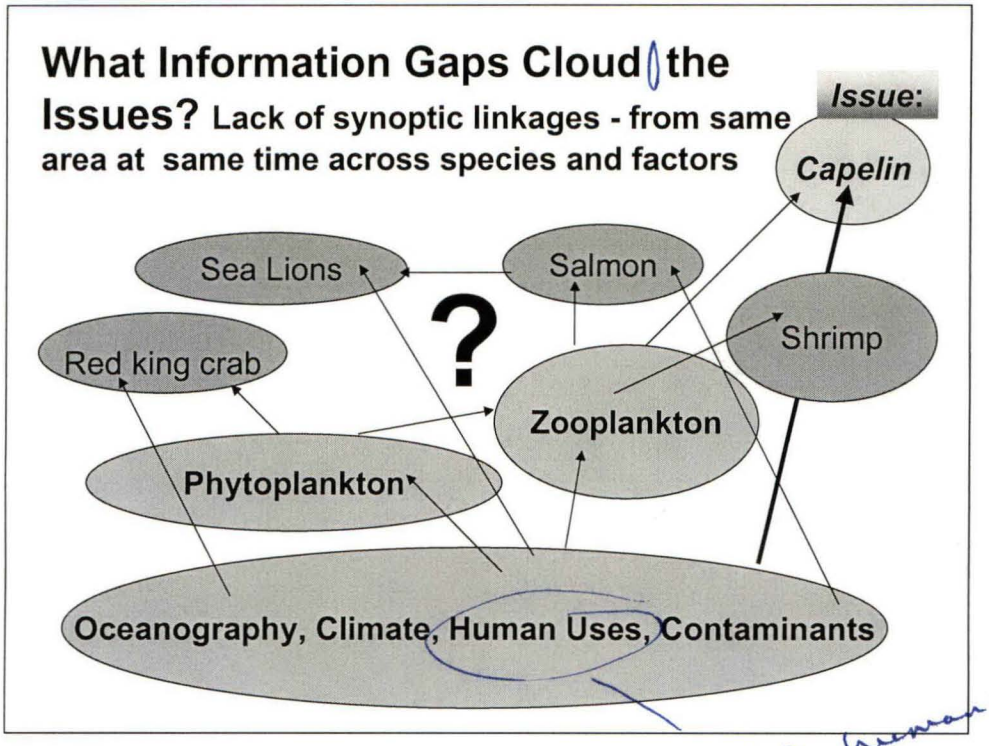
# Issues and Questions Are Increasing with Time

How do changes in human uses impact watersheds and the marine environment?

Are contaminants accumulating in the food supply?

How do watersheds depend on the flow of marine nutrients?

How do nearshore marine environments depend on watersheds?




Oceano are gaps

phyto are gaps

zoopl are gaps

we count: salmon crab, sea lions, some capelin

need to fill the gaps

.Information Gaps

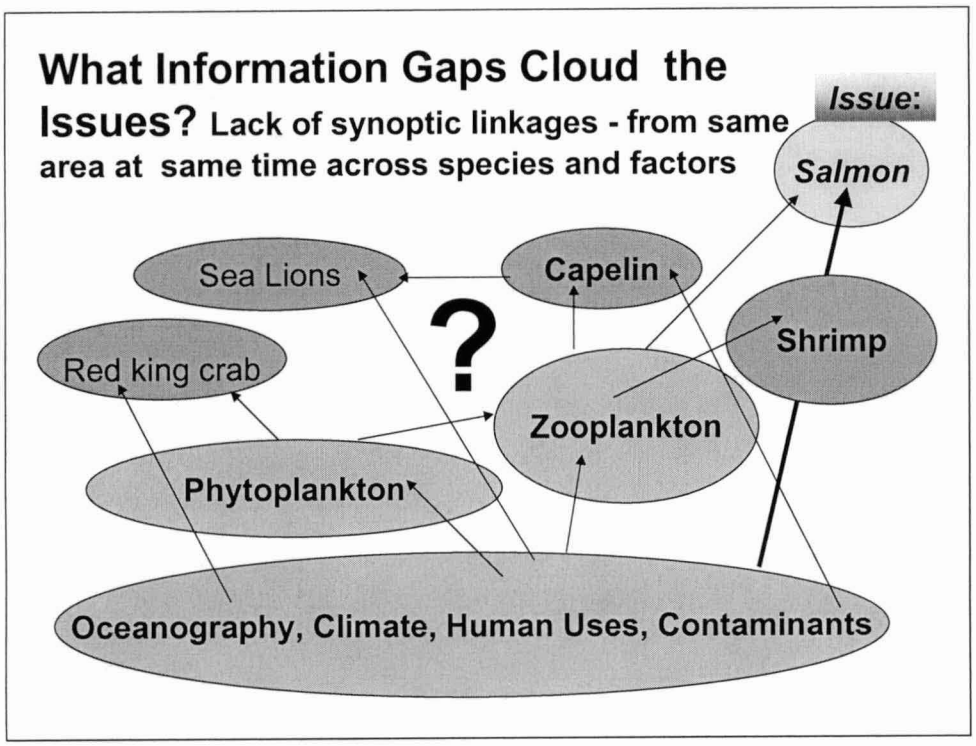
(Are the programs needed to answer these questions in place?)

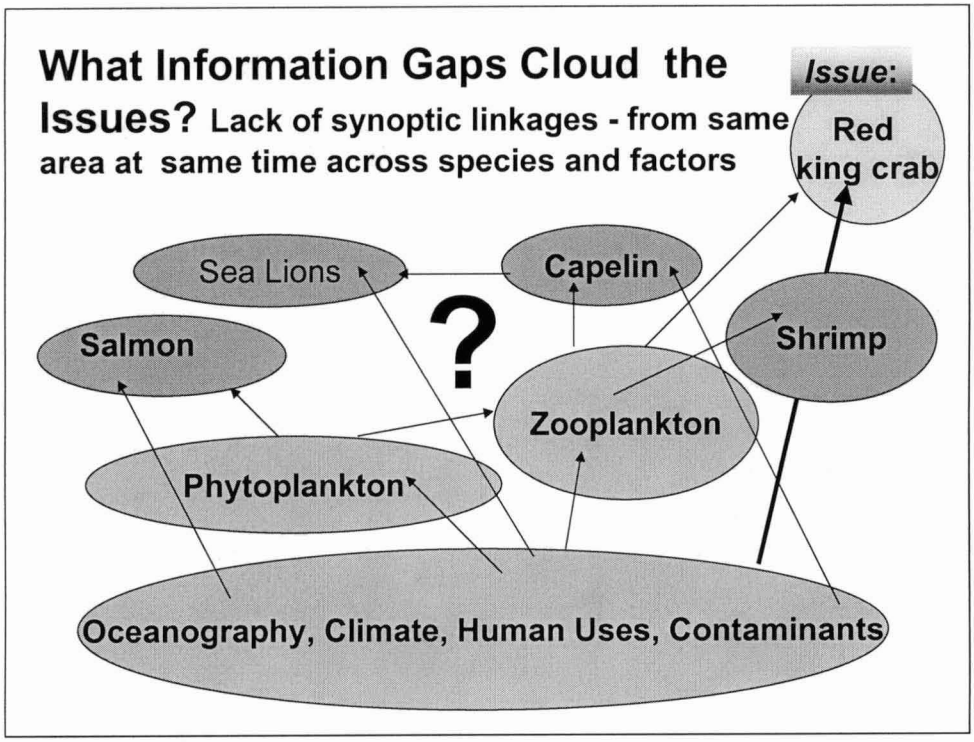
No. The concept that capelin stocks are increasing in the gulf is often based on anecdotal information. Programs to measure increases in capelin and other forage fish species in conjunction with changes in species such as sea lions, shrimp, cod and seabirds over a range of oceanographic conditions do not exist.

Recently reported high recruitment of juvenile red king crab to the waters near Kodiak may be positively related to changes in ocean conditions perhaps creating increased primary productivity in the Gulf of Alaska, but data needed to determine if trends may be sustained are lacking.

Since tens of millions of hatchery and wild salmon from Asia and North America feed together in the Gulf of Alaska each winter, it is troubling that programs to understand how competition for food may change marine survival are not in place.

A program to determine if apparent changes in ocean conditions could bring about long-term downward trends in statewide salmon catches to levels experienced prior to 1977 that spans species and regions is not in place.


What Information Gaps Cloud the Issues? Lack of synoptic linkages - from same area at same time across species and factors
Issue:
Salmon
Sea Lions
Capelin
?
Shrimp
Red king crab
Zooplankton
Phytoplankton
Oceanography, Climate, Human Uses, Contaminants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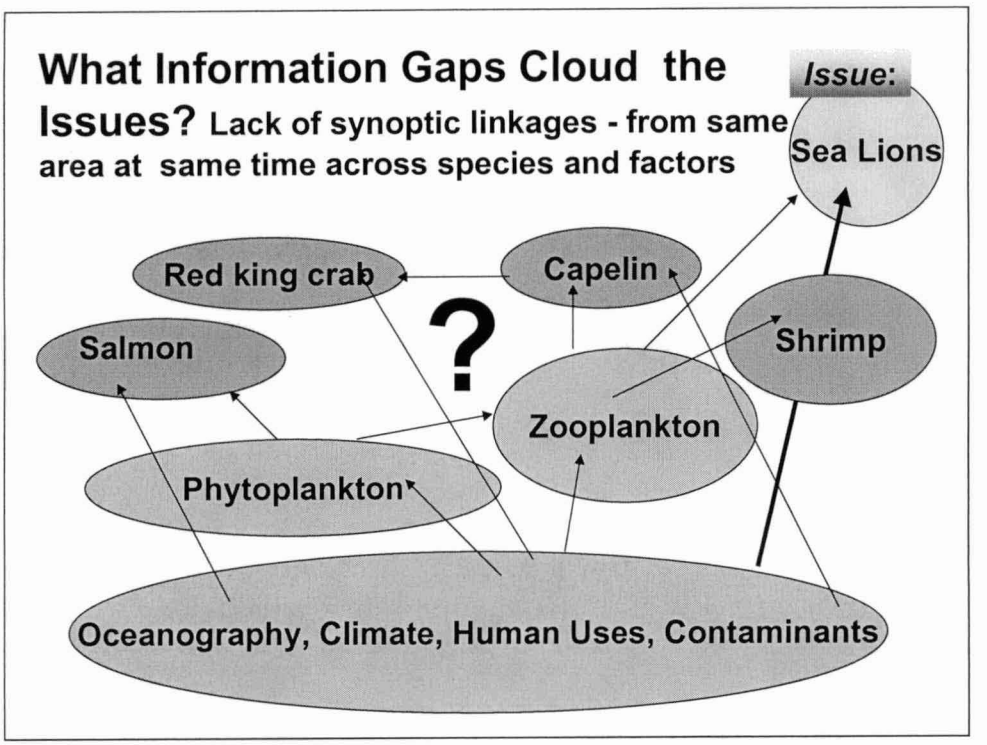
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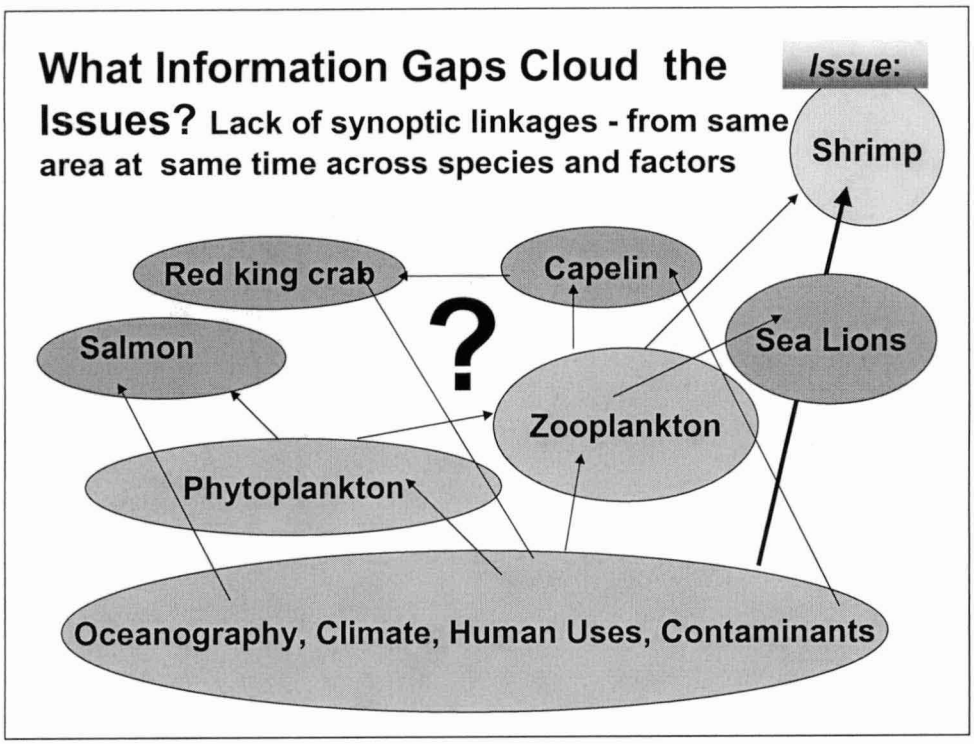
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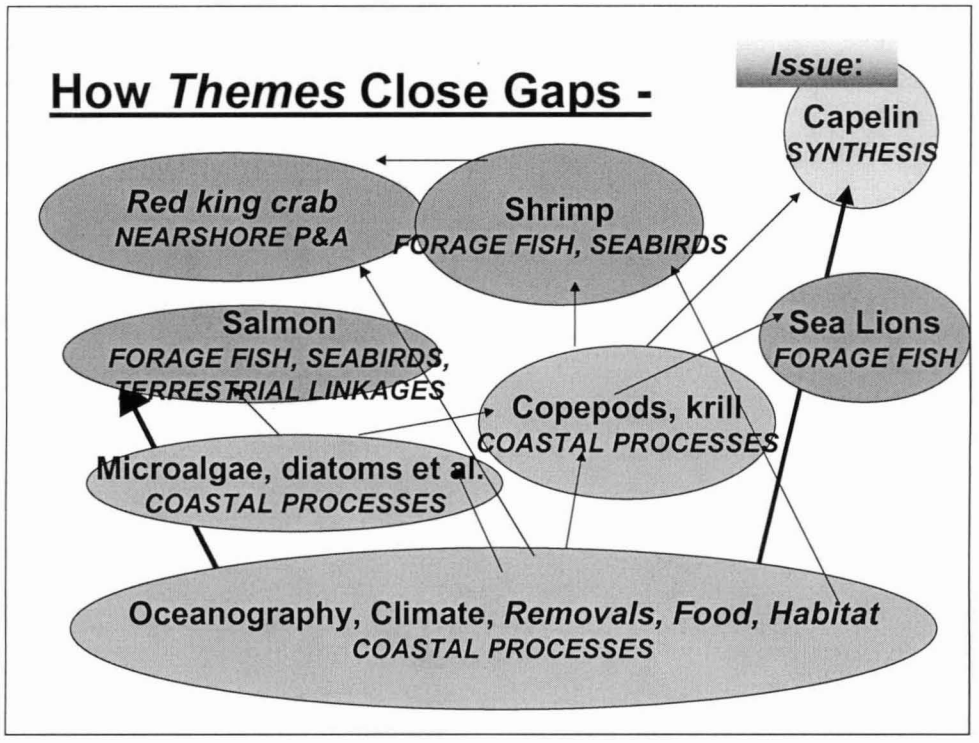



How the Themes Address Issues

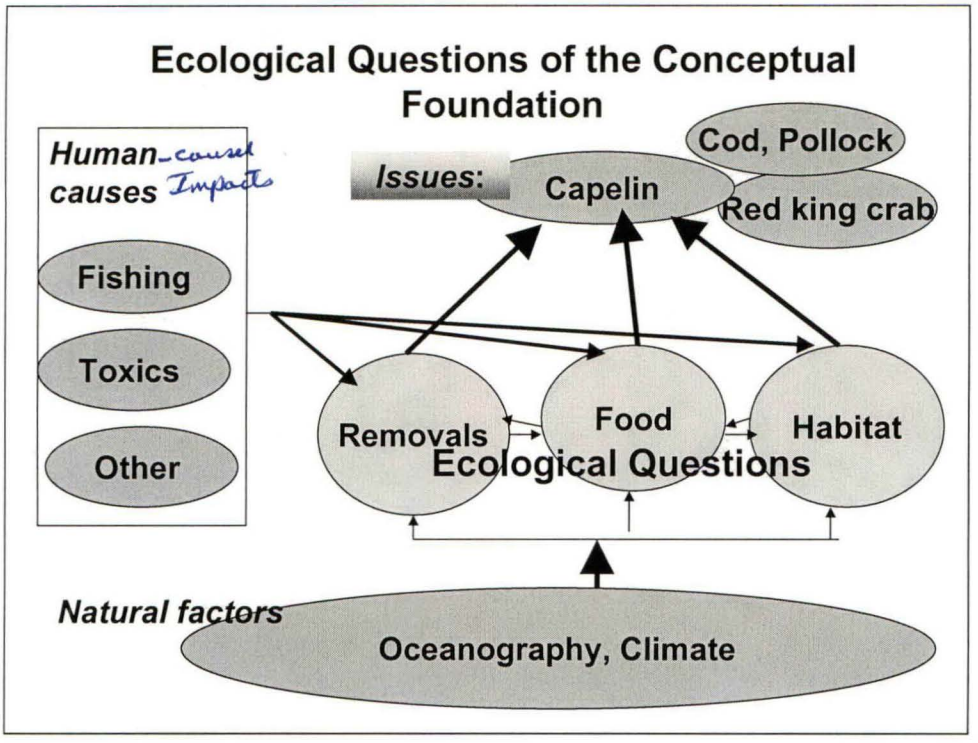
How many hatchery salmon should be released each year

Understanding if and how hatchery salmon limit the survival of each other and of wild salmon requires investigation of early marine survival (Forage Fish, Seabirds, Nearshore) and the factors responsible for later marine survival (Coastal Processes) in relation to overall survival (Synthesis).

Do the apparent increases this year in capelin stocks in the gulf forecast long-term changes in other species such as sea lions, shrimp, cod and seabirds?

Changes in abundance of capelin (Forage Fish, Seabirds) may enhance the productivities of seabirds by providing more food energy (Seabirds). Changes in abundance of capelin may be associated with changes in species composition and productivity of phytoplankton, and favorable physical conditions during and after the time of spawning (Coastal Processes).

When will the red king crab fisheries return to the Gulf of Alaska? Recruitment of red king crab depends on the conjunction of physical conditions providing favorable larval drift and production of appropriate phytoplankton species near the time of spawning (Coastal Processes). Increases in juvenile red king crab in nearshore areas (Nearshore Plants and Animals) may be the result of the conjunction of appropriate physical conditions offshore and inshore, and the abundance of juveniles inshore may be related to recruitment to fisheries in future years (Synthesis).




Climate controls the total amount of food available

The apparent increases this year in capelin stocks are important because capelin virtually disappeared from the northern GOA continental shelf waters just after the oceanic regime shift of 1977. Changes in other species such as sea lions, shrimp, cod and seabirds also occurred or started at this time, but the causes are unknown.

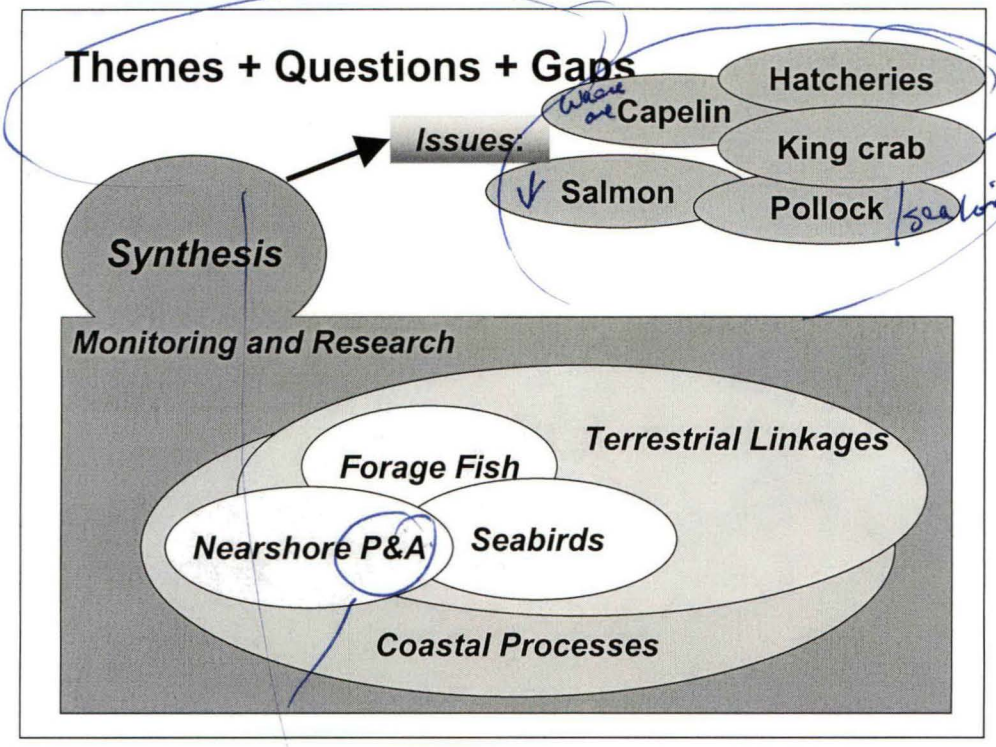
.Removals, such as fisheries, control the total amount of food available

Declines in sea lions, shrimp and to some extent seabirds may have been caused in part by fisheries, but to what extent were these declines also cause by reductions in the availability of all types of food, and by losses of habitat for forage species due to changes in climate.

.Climate controls the amount of habitat available

Increases in cod after 1977 may have been due to changes in water temperature in nearshore waters, as well as to increases in the amount of food available to young cod.

But what has negative impact on habitat? Fishing practices, noise destruction, pollution?


Themes + Questions + Gaps
Issues:
Capelin
Hatcheries
King crab
Salmon
Pollock
Synthesis
Monitoring and Research
Terrestrial Linkages
Forage Fish
Nearshore P&A
Seabirds
Coastal Processes

## What We Need From You

1 What to do, and what to do first next 5 - 10 years

2 Partners Agencies, Communities, NGO's

3 Gap analysis Agencies, projects, future plans