



NOAA
FISHERIES

Studies to understand Chinook salmon
distribution in the pollock fishery:
Evaluating impacts and developing
measures to reduce bycatch
ADFG Chinook Salmon Workshop

Anchorage.

October 2012

James Ianelli

Alaska Fishery Science Center

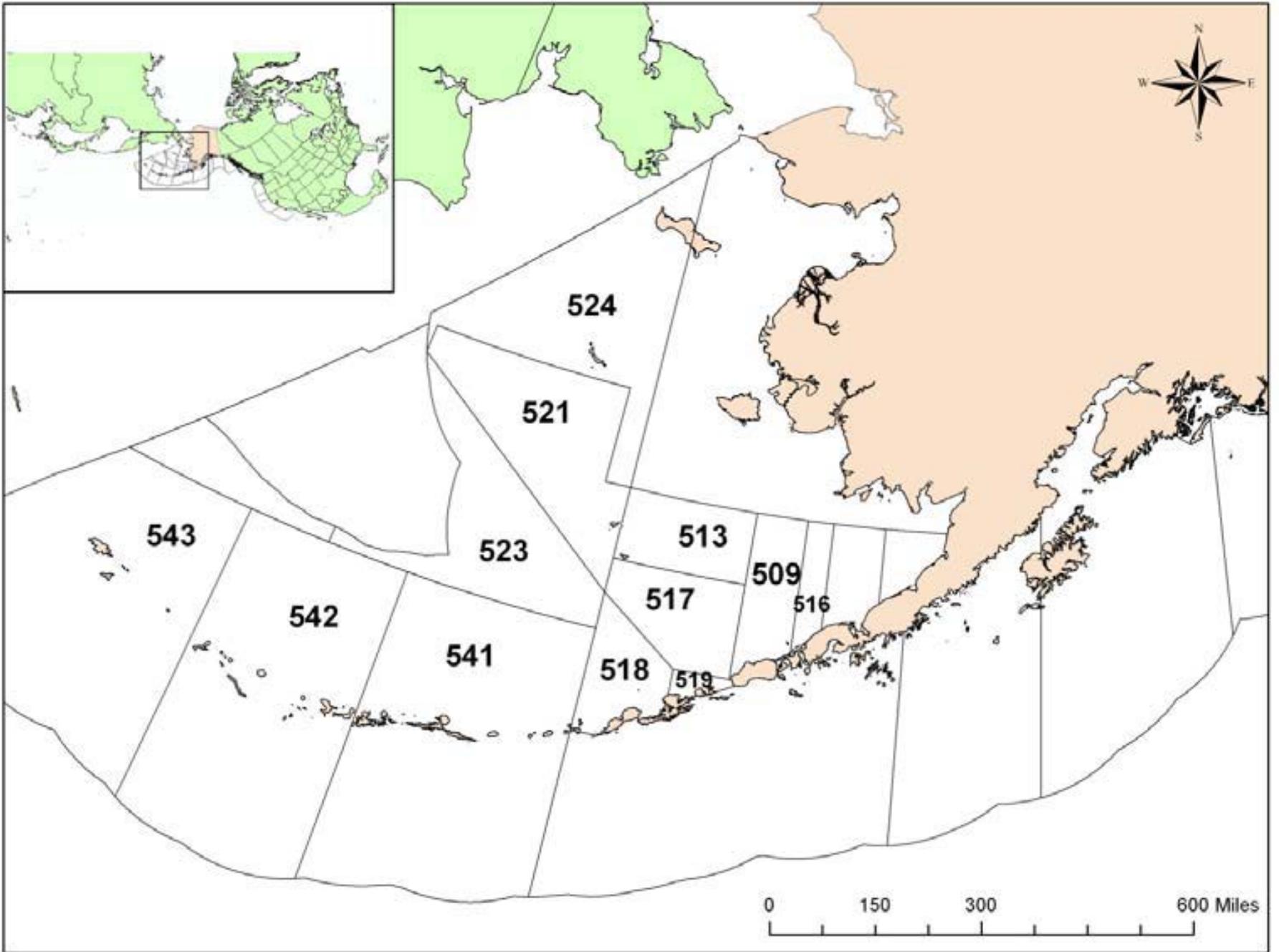
Diana Stram

North Pacific Fishery Management Council



Salmon bycatch in groundfish fisheries





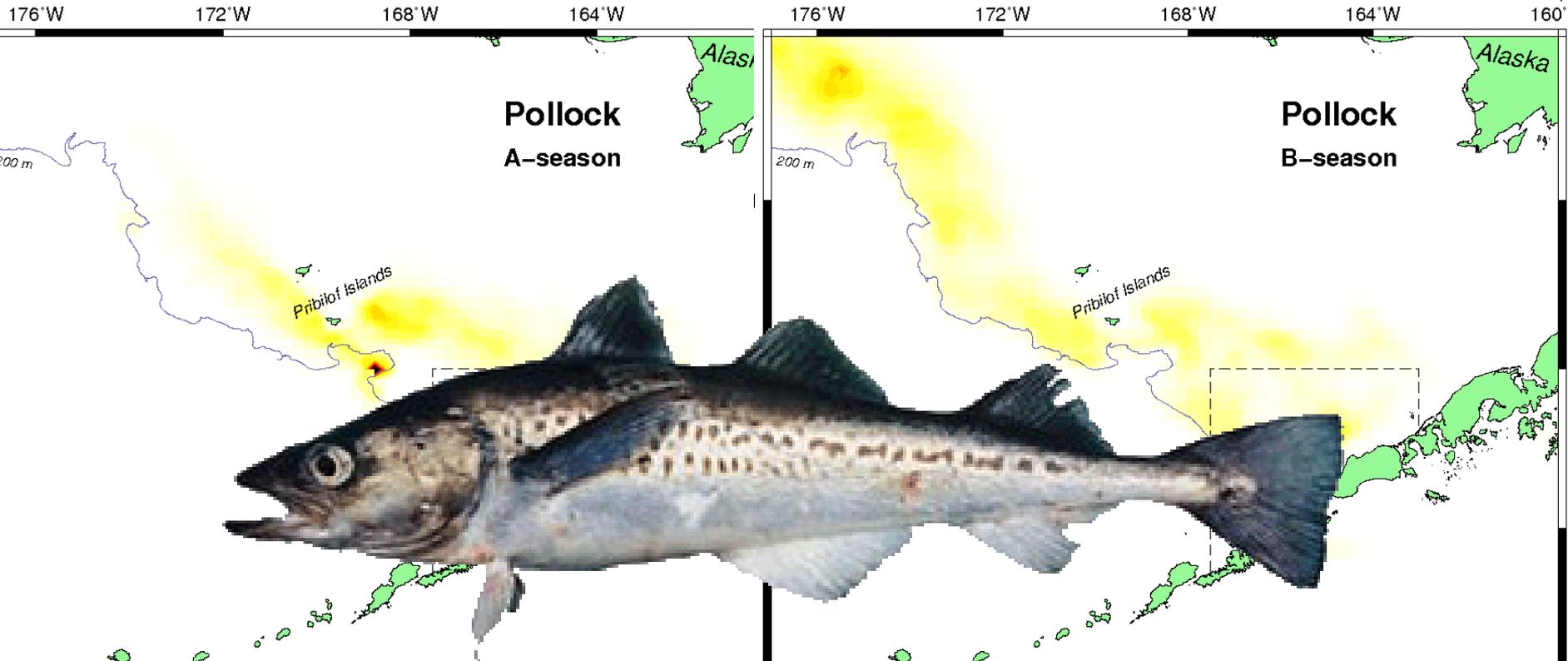
Bering Sea Pollock fishery

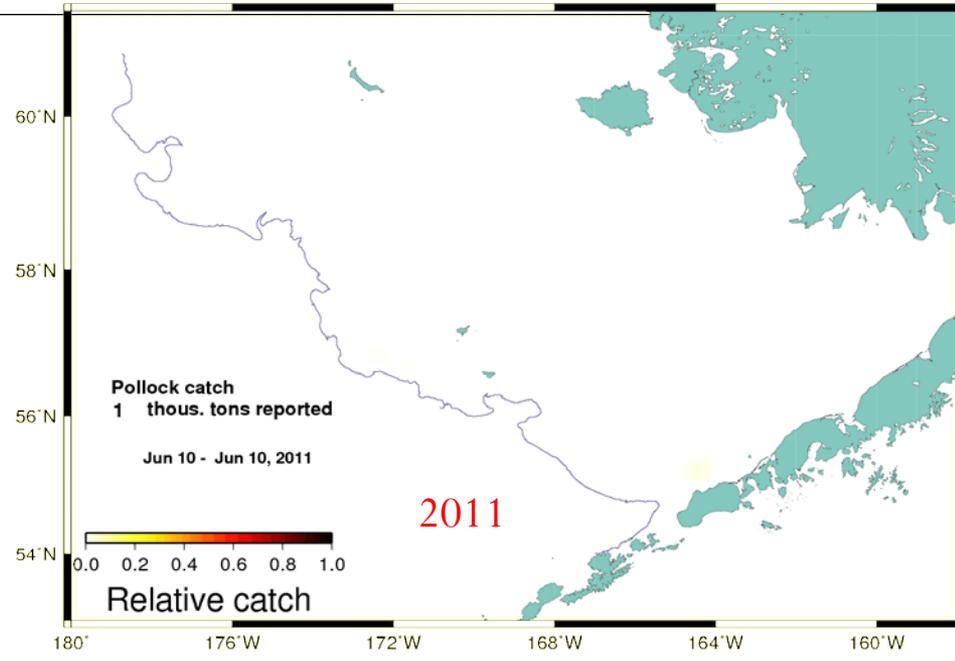
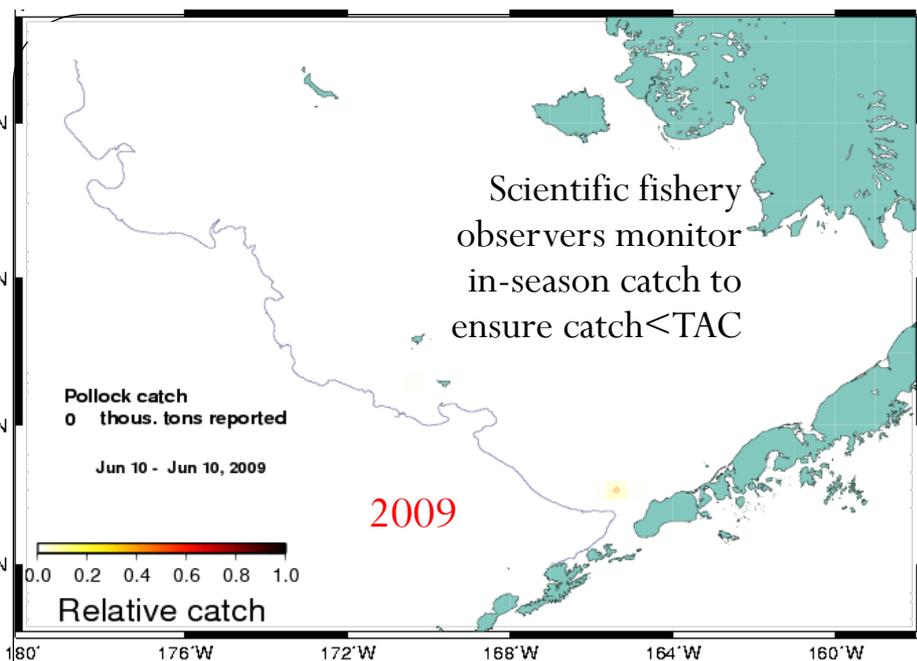
Sectors in pollock fishery:

- 1) Catcher processors
- 2) Shore-based catcher vessels
- 3) Motherships
- 4) Community development quotas

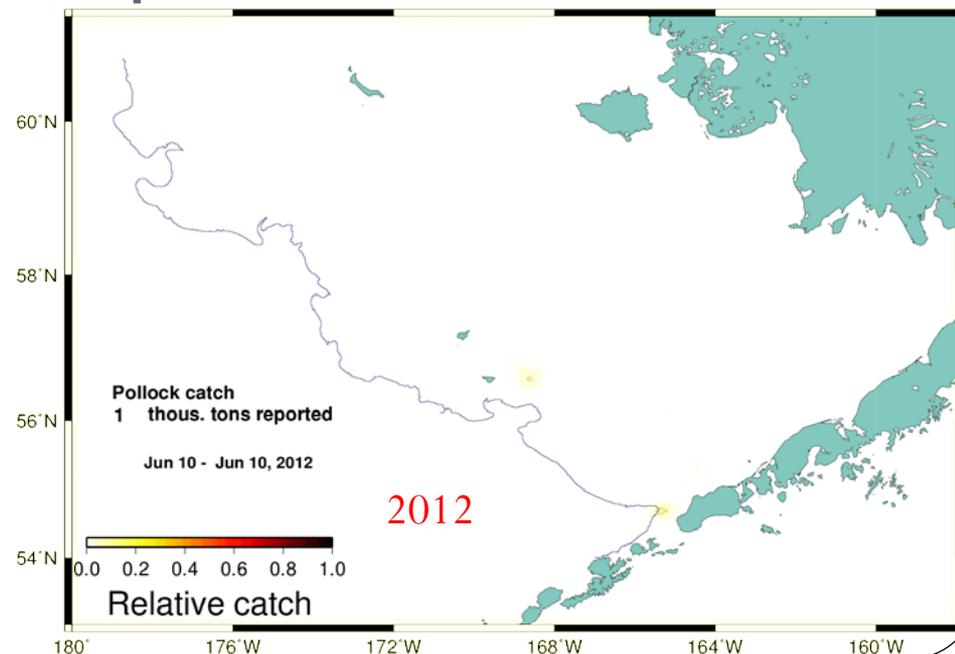
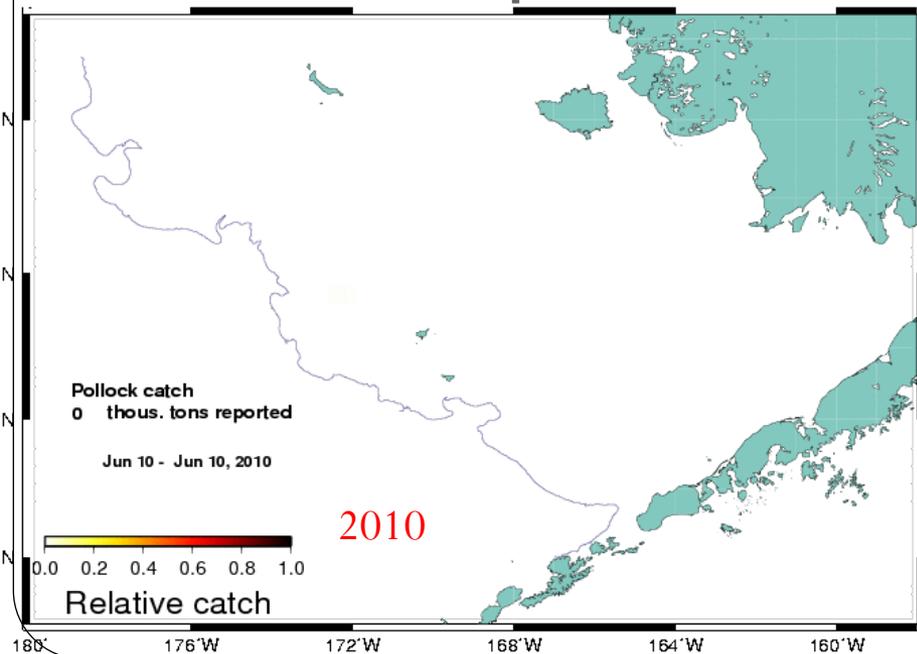
Winter season:
late Jan-mid April

Summer season:
Mid June –early mid October

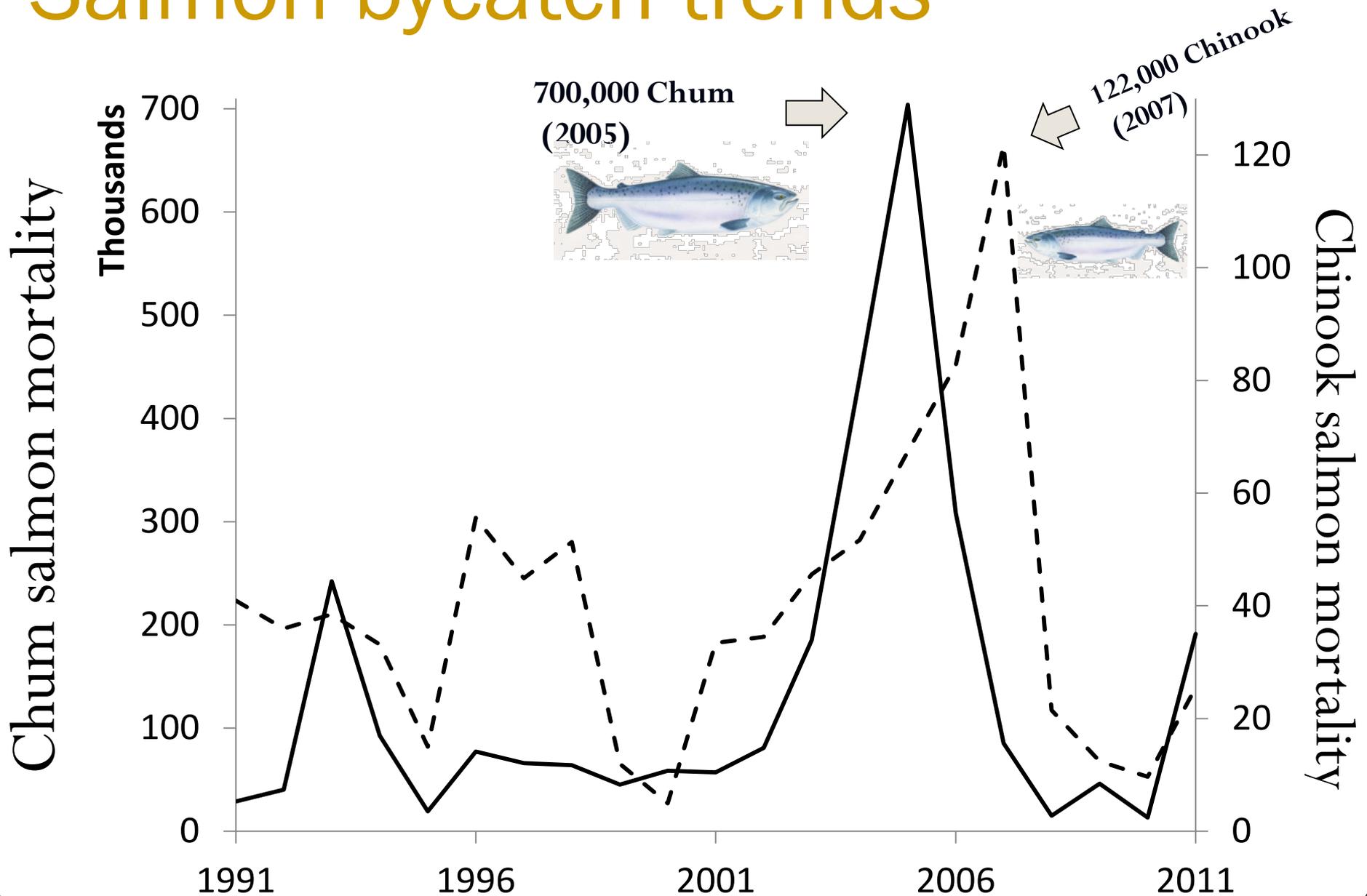


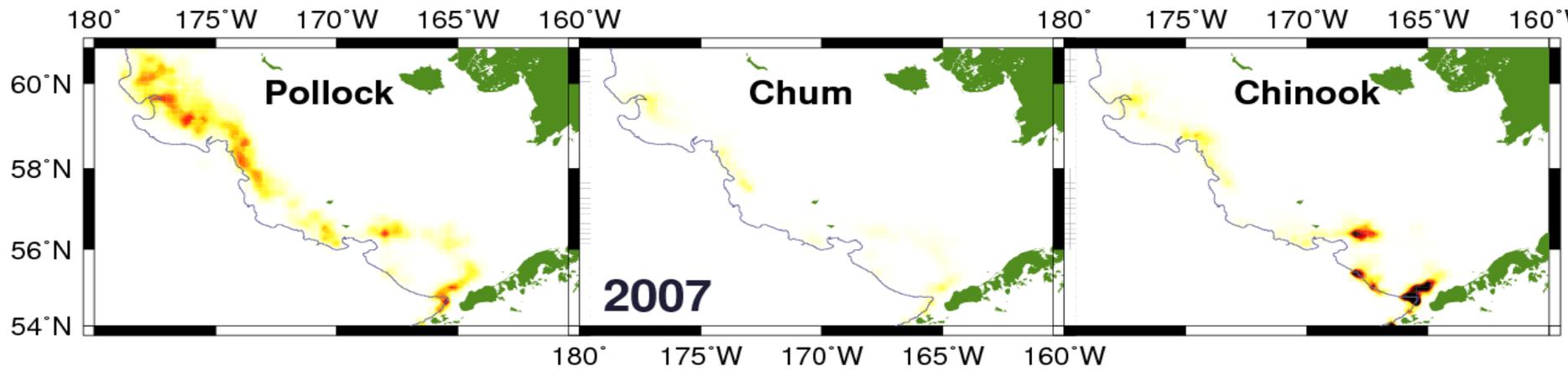
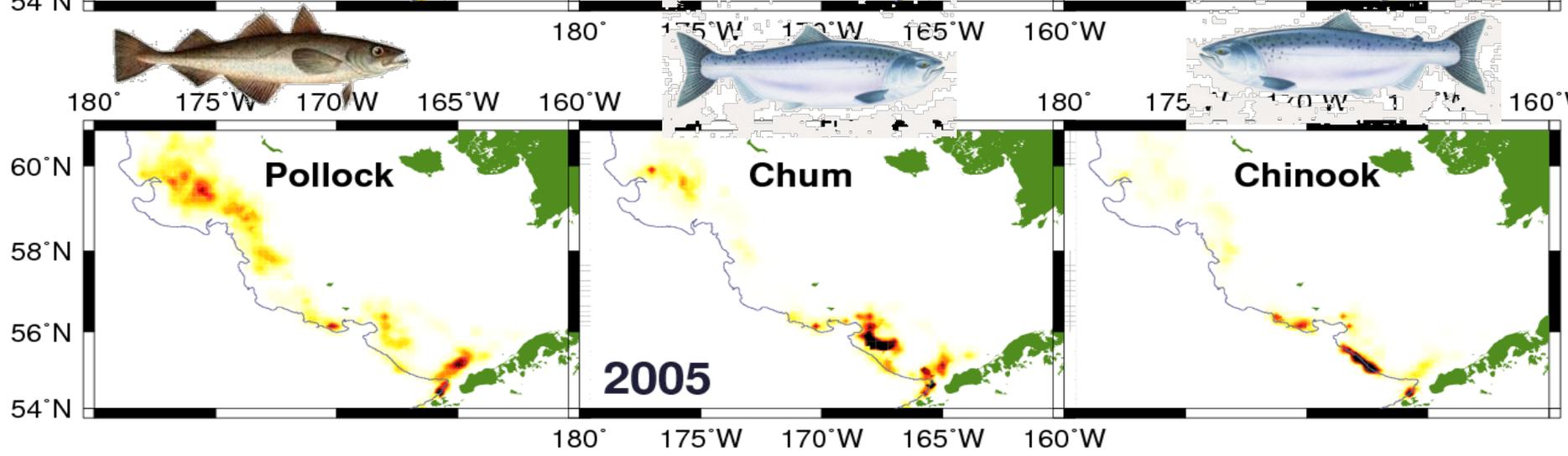
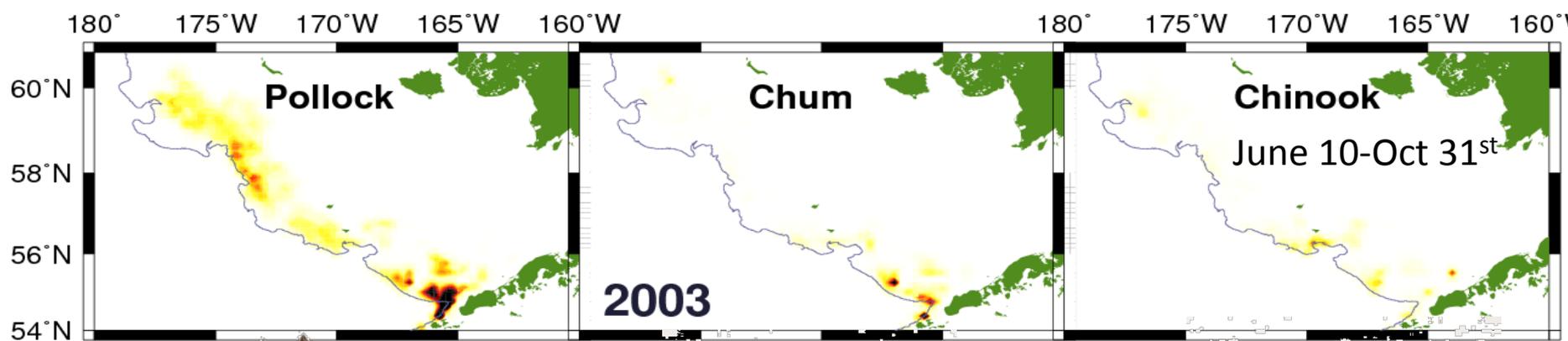


Observed pollock catch patterns—summer



Salmon bycatch trends





Chinook salmon

Chinook salmon bycatch impacts

Data and analysis:

Combine genetics with age estimates of bycatch to determine impact on returns

Chinook salmon in pollock fishery

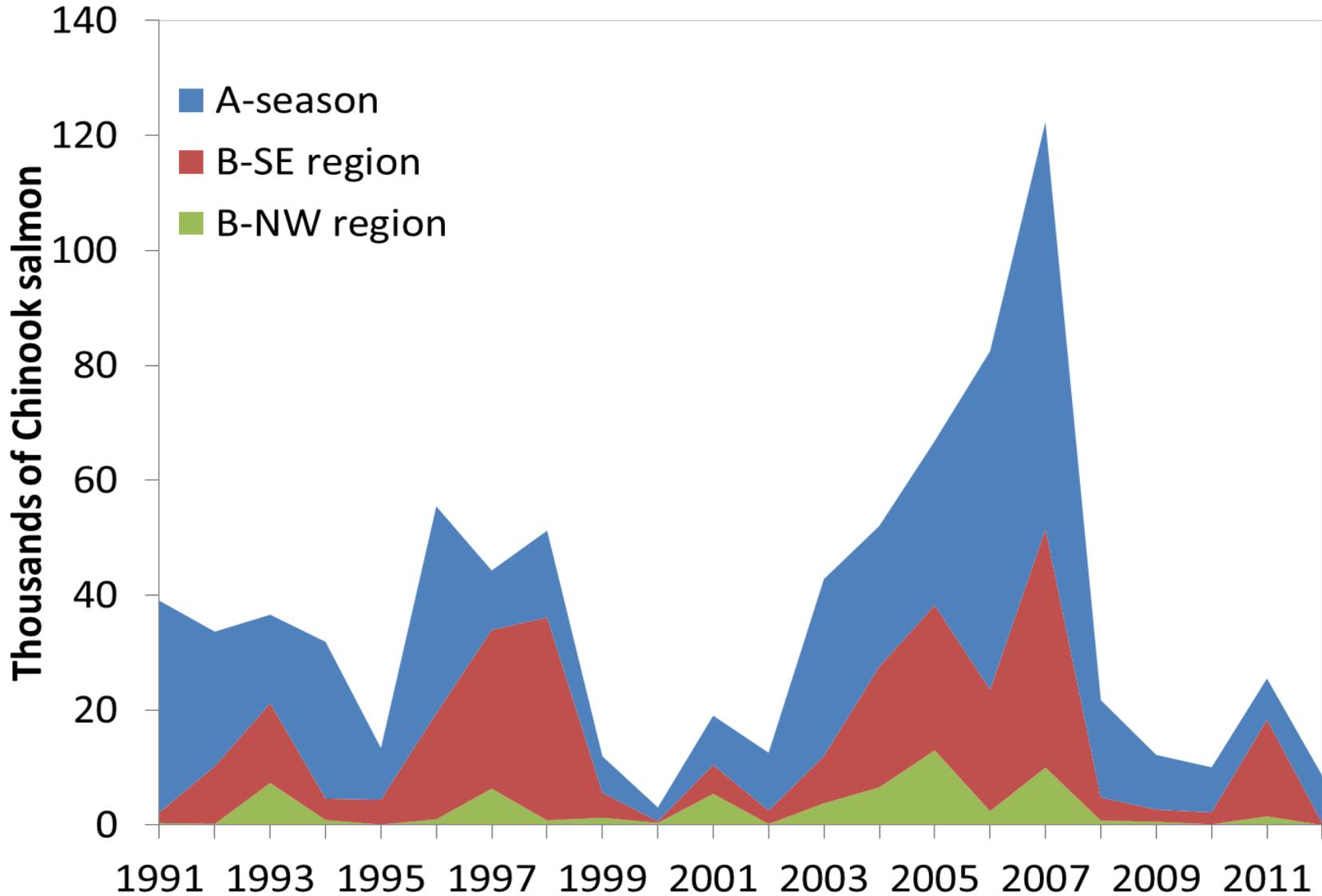
Salmon bycatch comprises

juveniles and **adults**

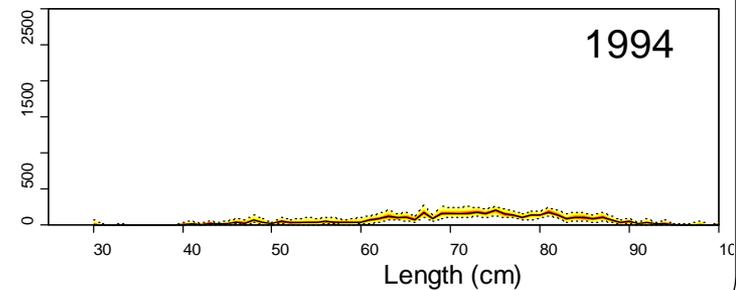
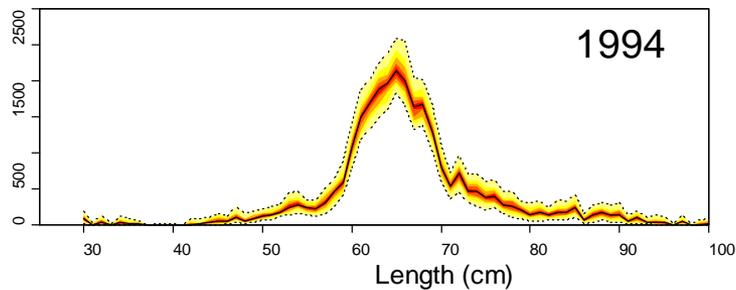
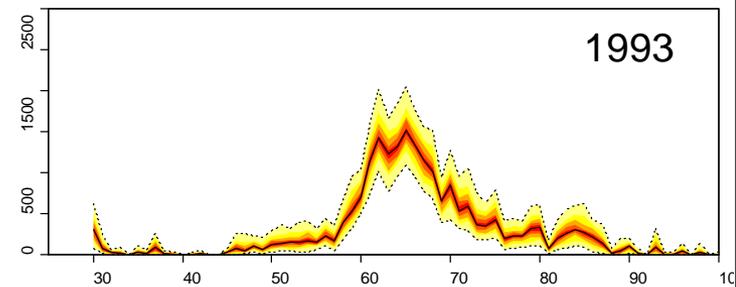
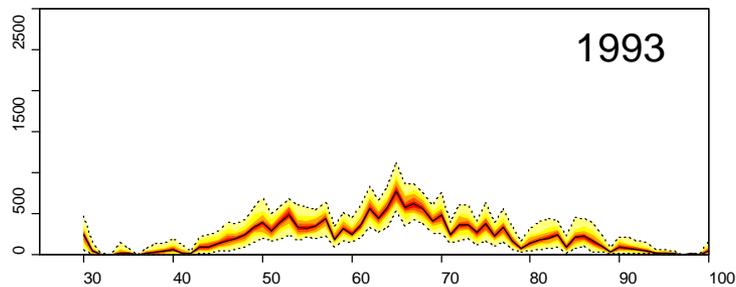
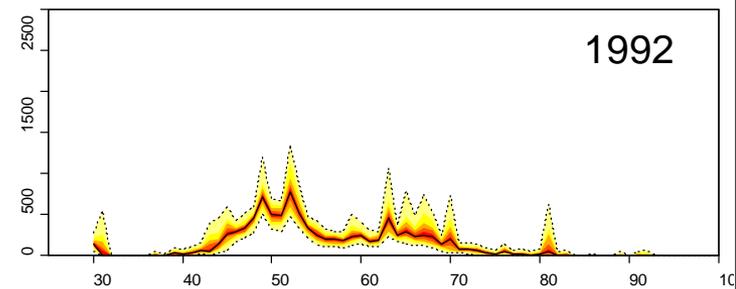
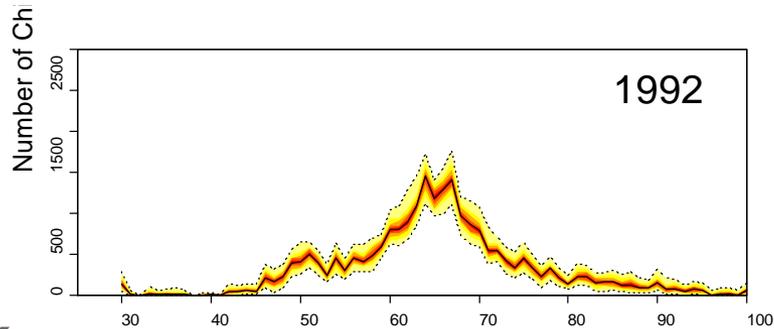
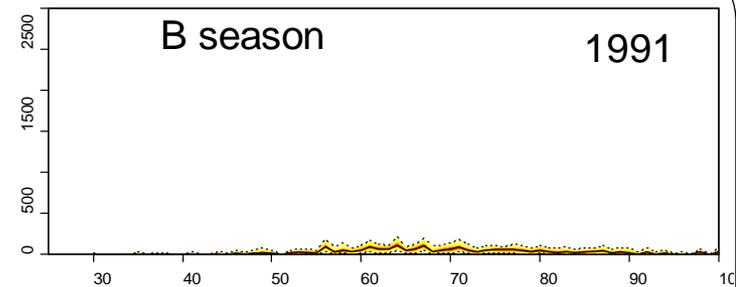
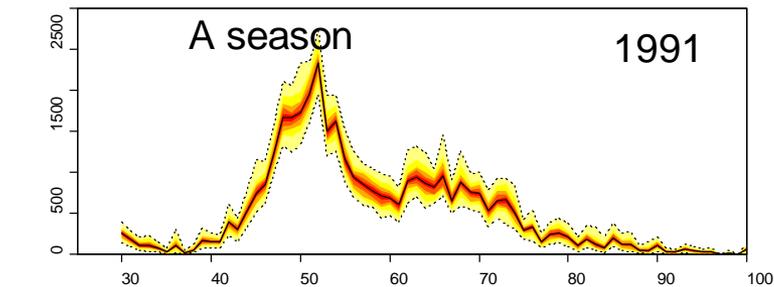
Some fraction would have returned to spawn in that year

Chinook salmon bycatch patterns

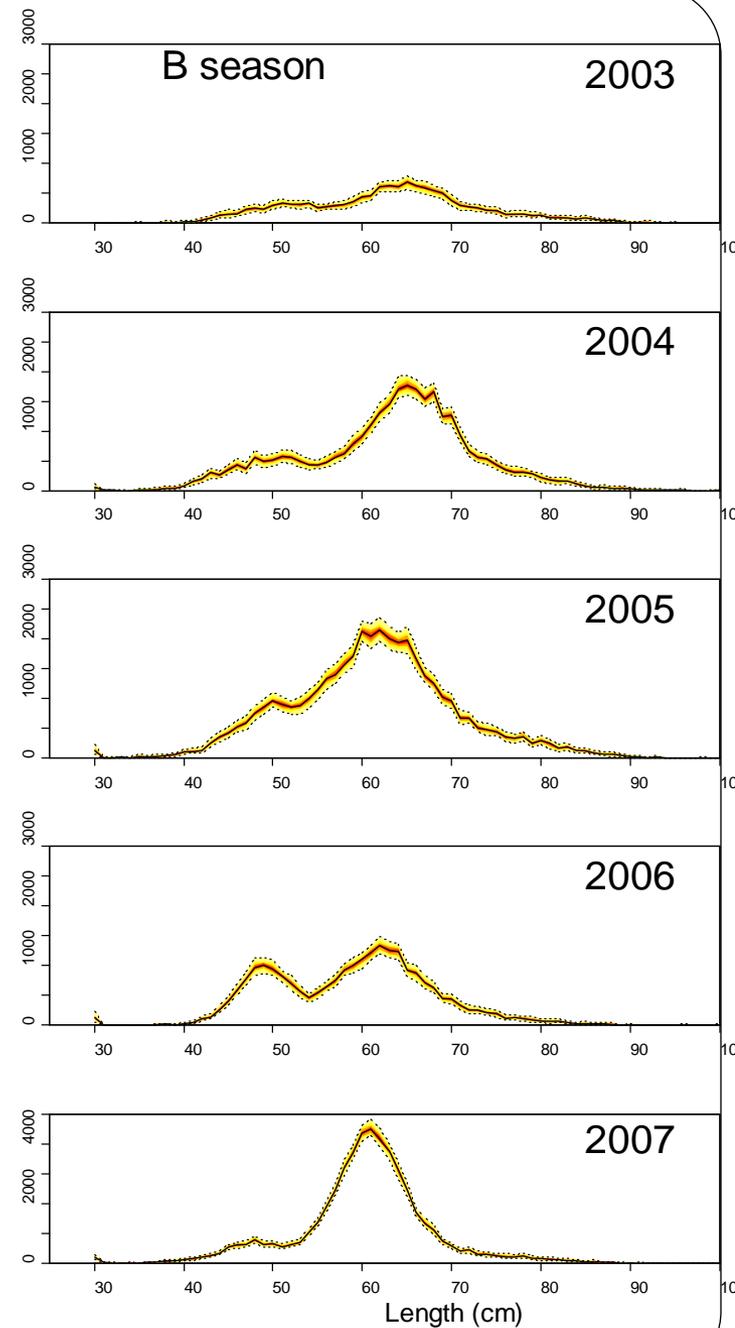
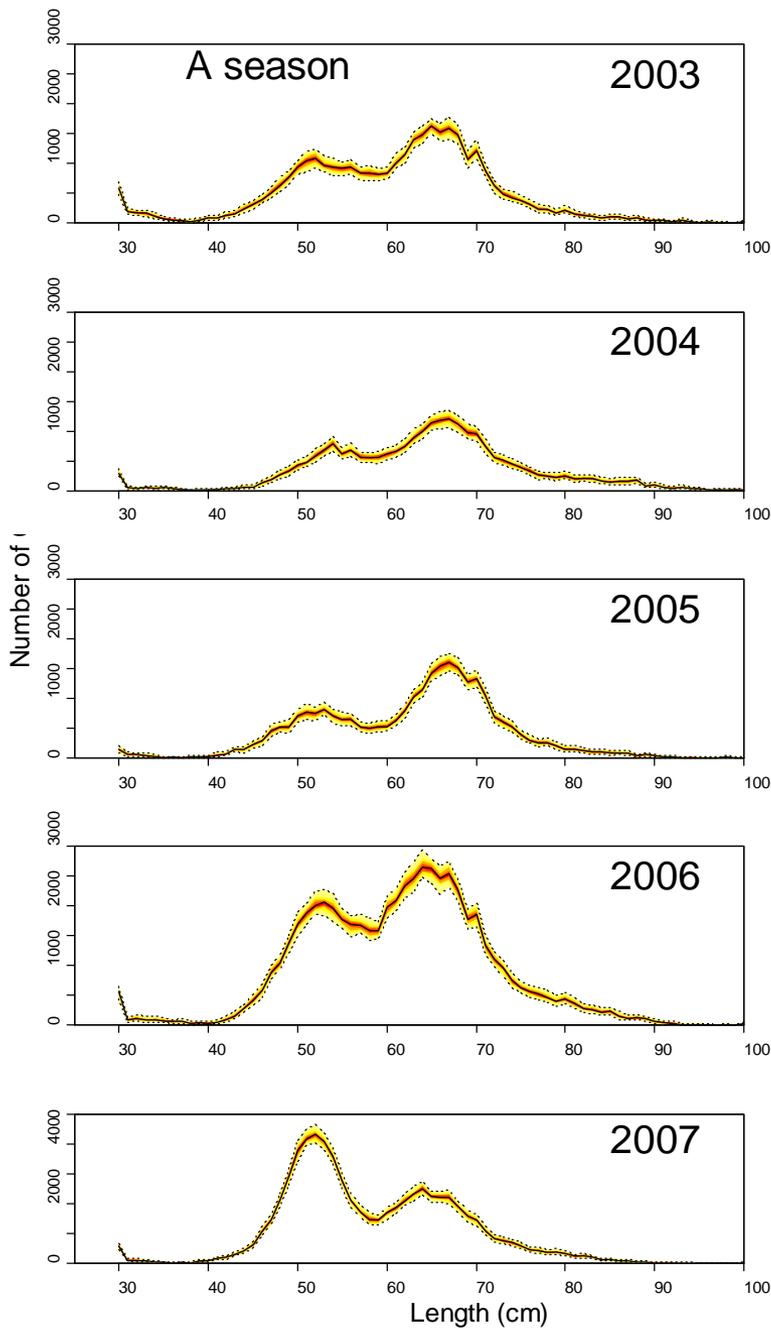
By year and season/region



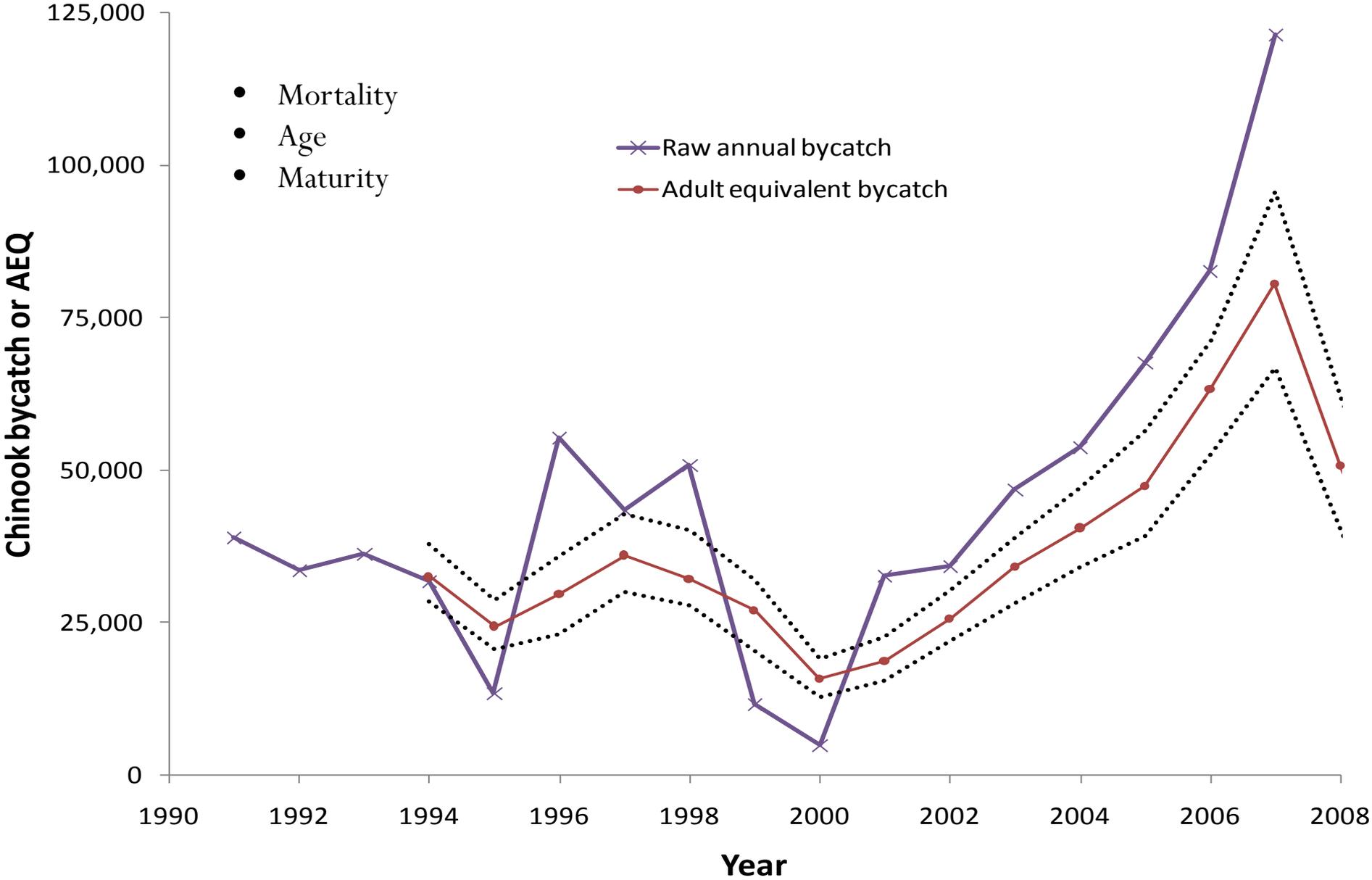
Chinook lengths in bycatch



Chinook lengths in bycatch

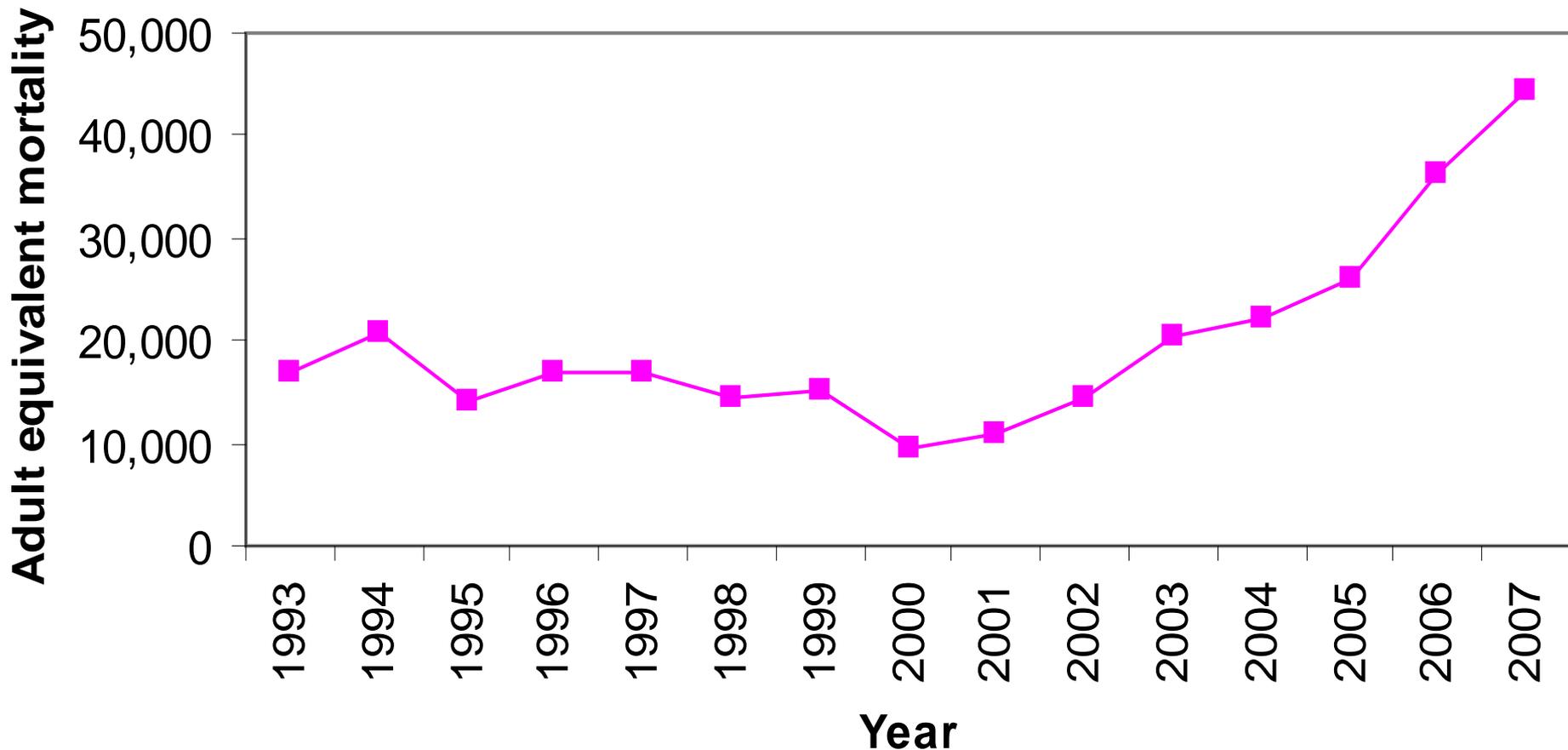


Chinook Adult Equivalency analysis (AEQ)

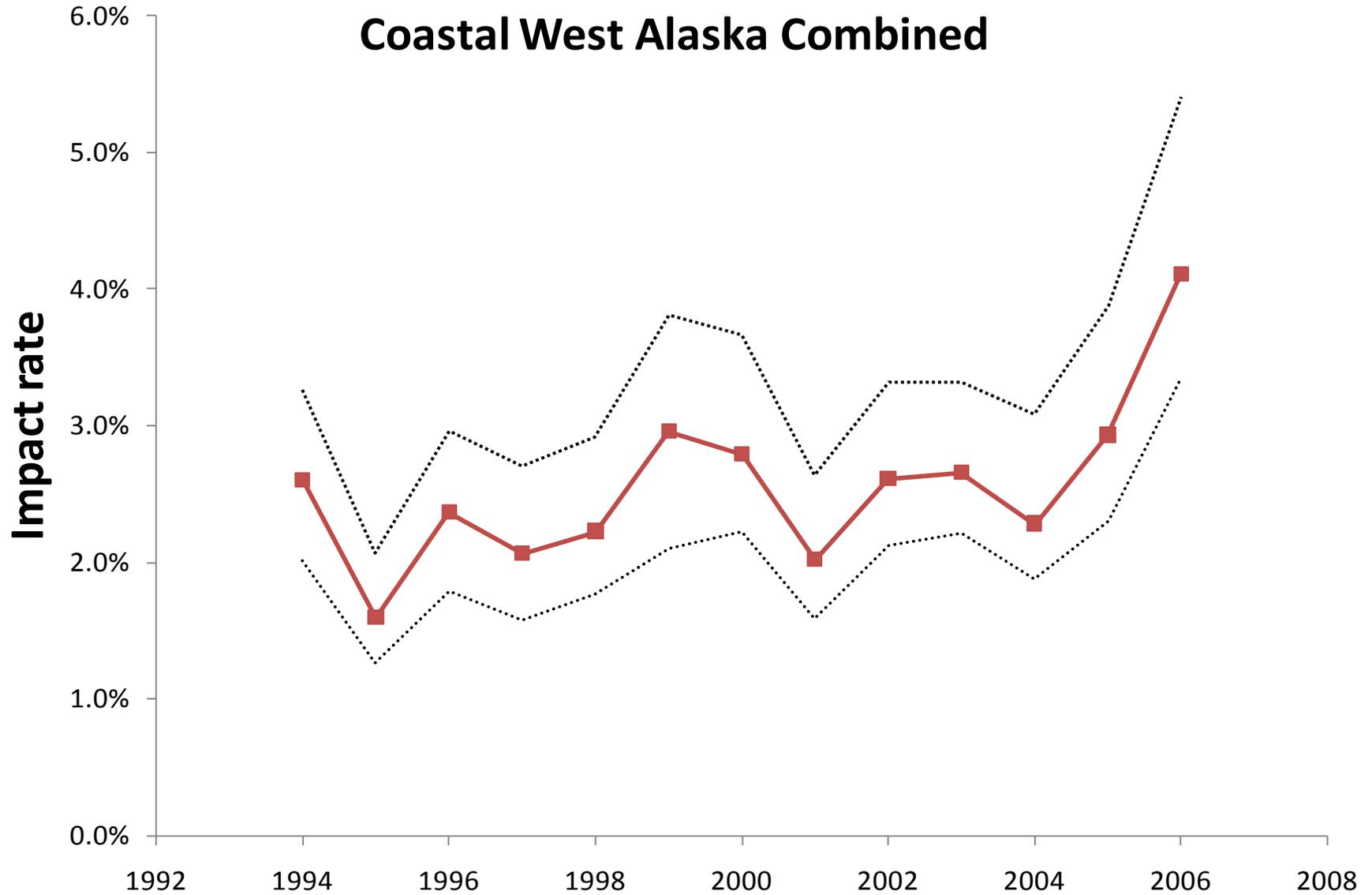


Annual (and season) AEQ applied to genetic data

Coastal Western Alaska stocks

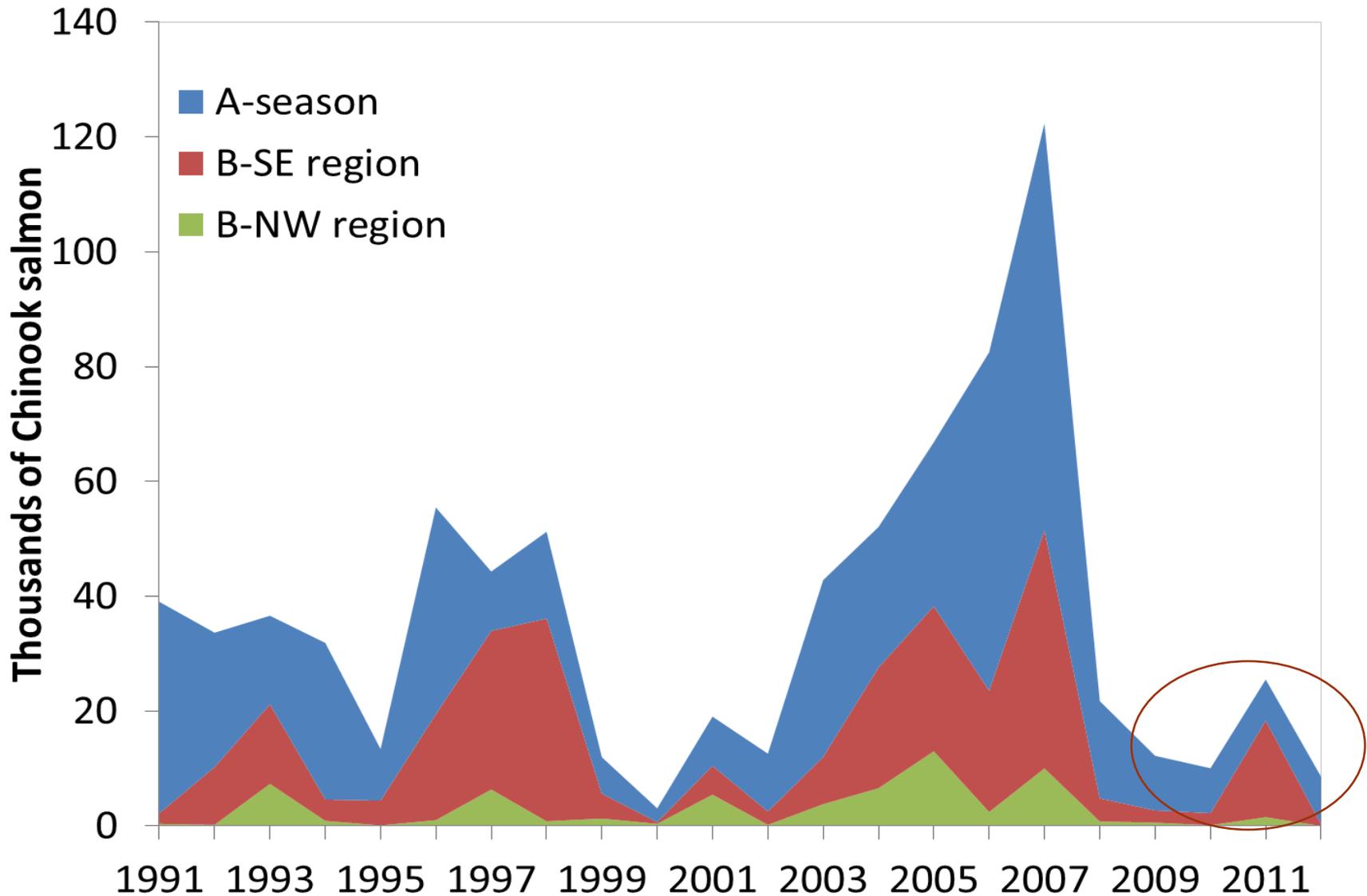


AEQ results impact rate



Chinook salmon bycatch patterns

By year and season/region

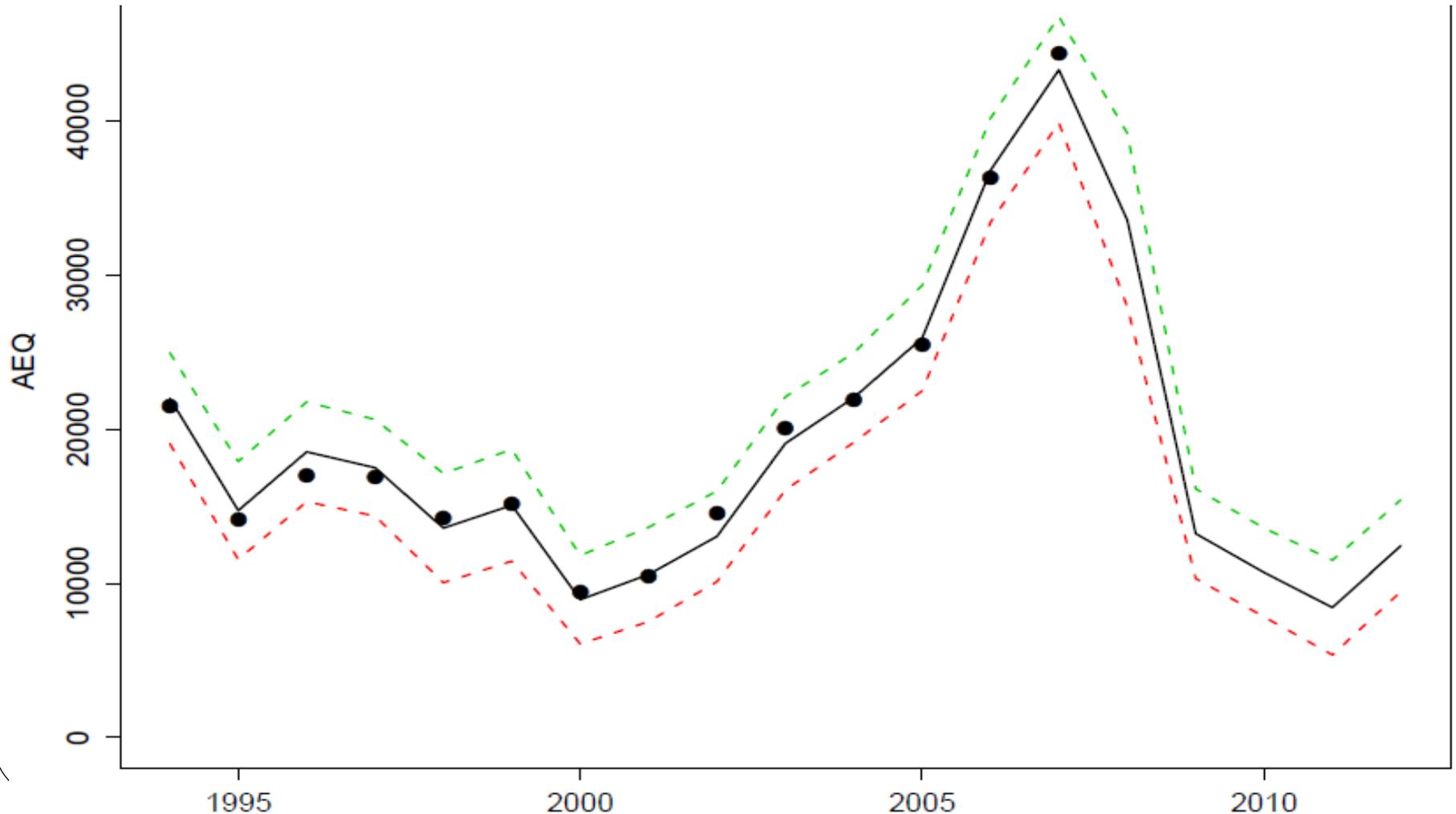


Predicting impacts from past studies

$$y_t = \beta_0 + \beta_1 T_{t-1} + \beta_2 T_{t-2} + \beta_3 A_t + \beta_4 B_{t-1}^{SE} + \beta_5 B_{t-1}^{NW} \dots$$

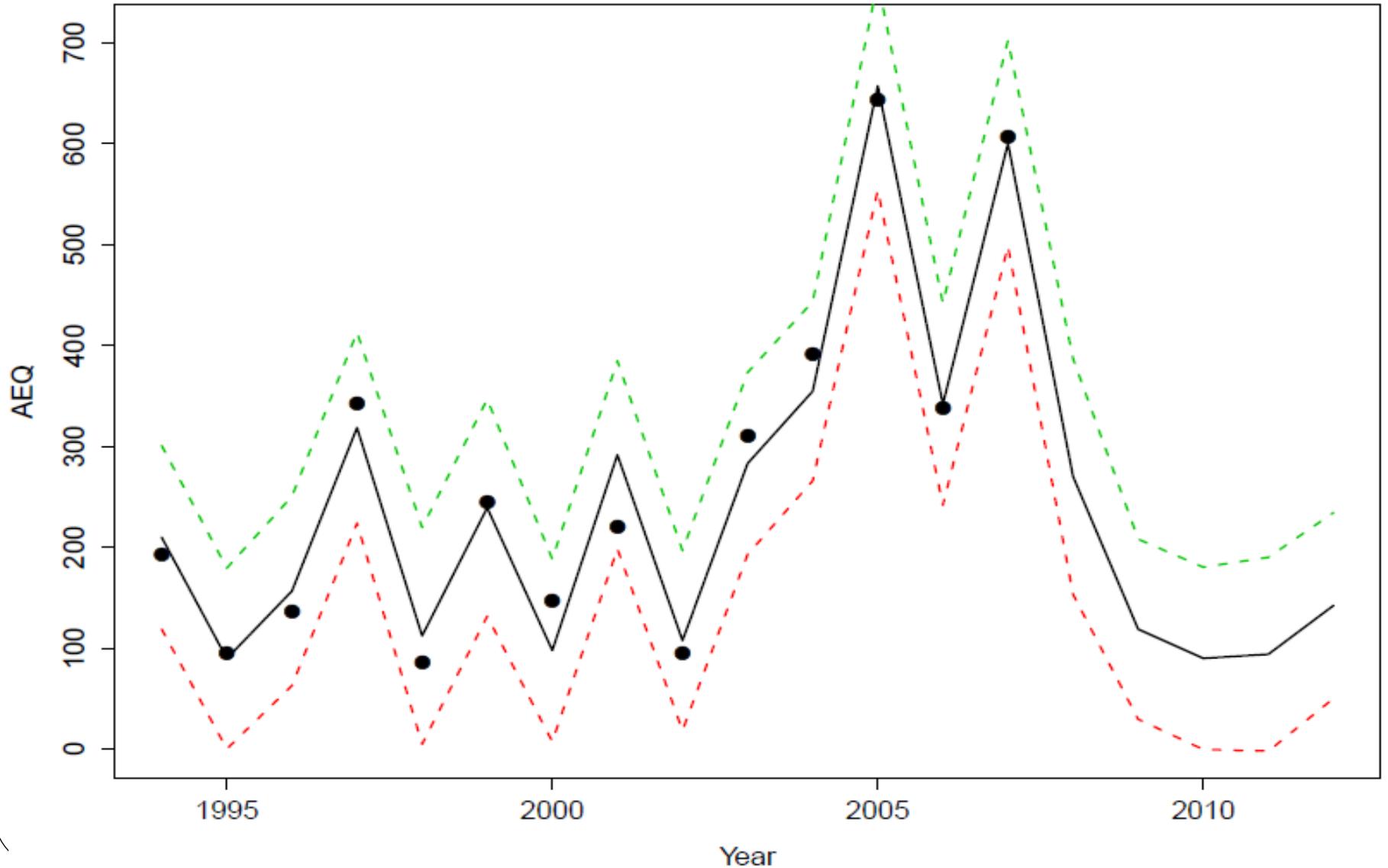
Predicting impacts from past studies

Current year plus last year—season and spatially split
2011 impact ranged 5.4 to 11.5 thousand Chinook



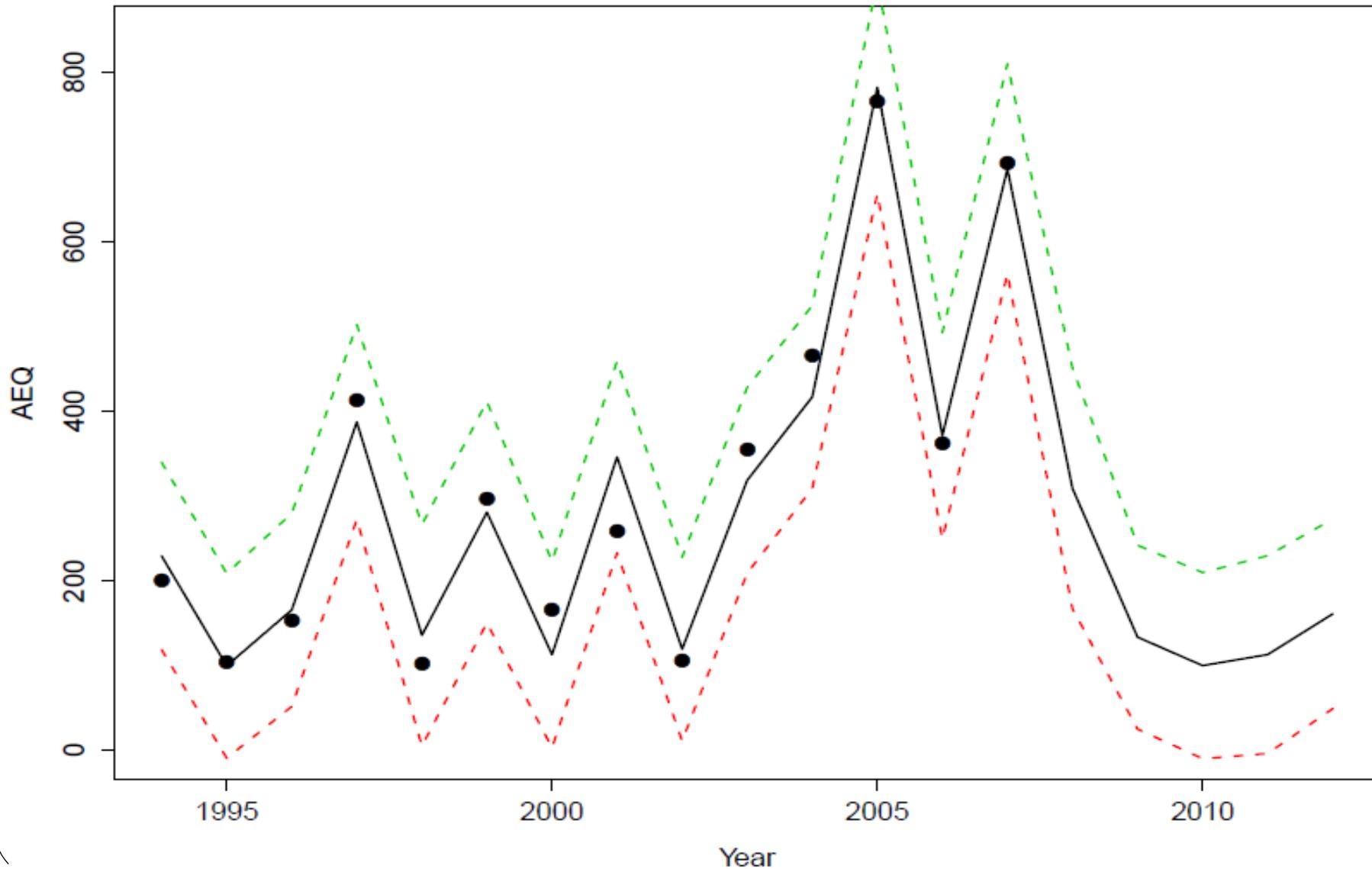
Predicting impacts from past studies

Upper Yukon Chinook salmon



Predicting impacts from past studies

Middle Yukon Chinook salmon



Factors affecting bycatch?

Fishing practices

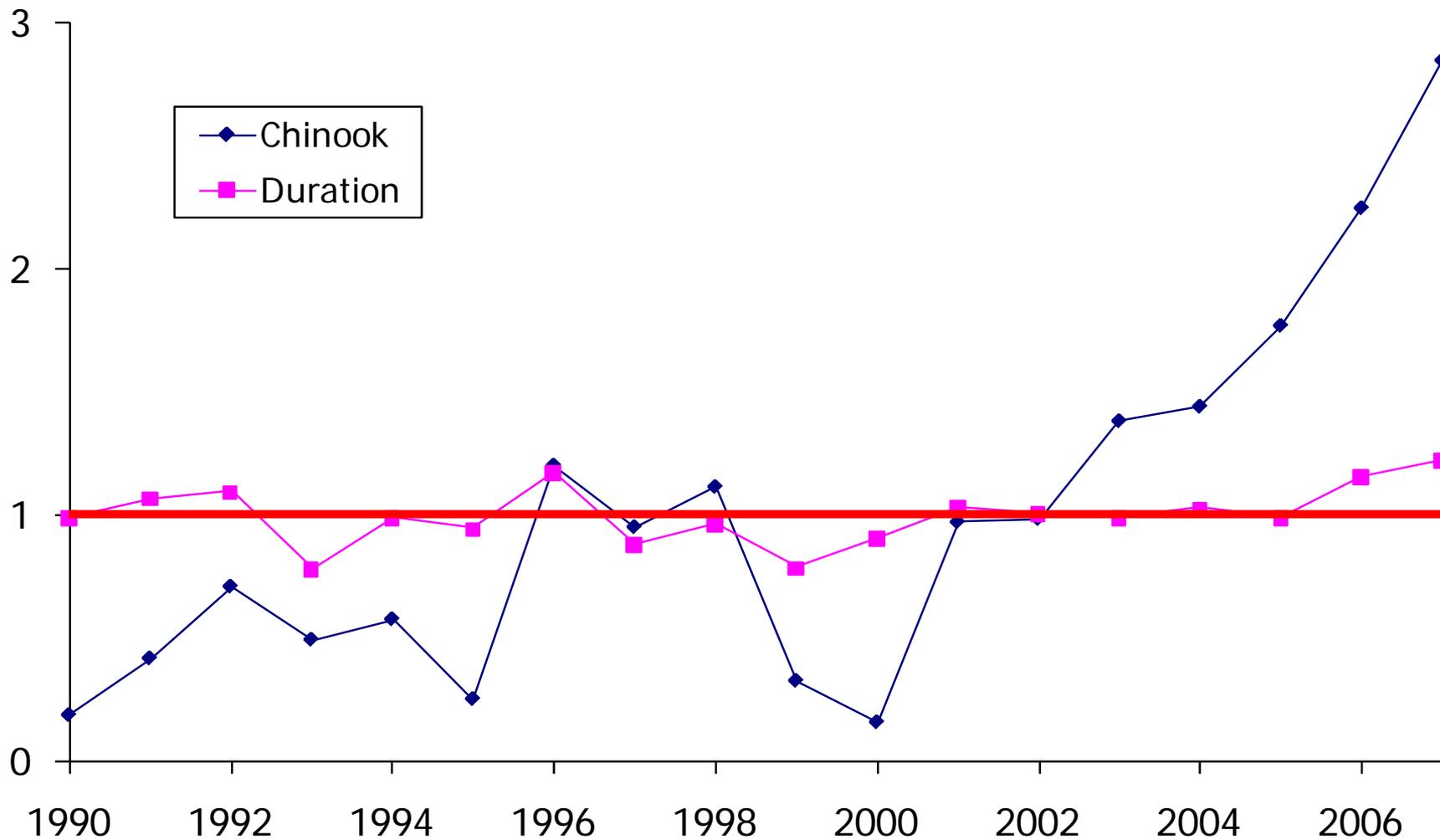
- Tow duration
- Day/night towing
- *Gear modifications*

Increased Chinook on fishing grounds due to:

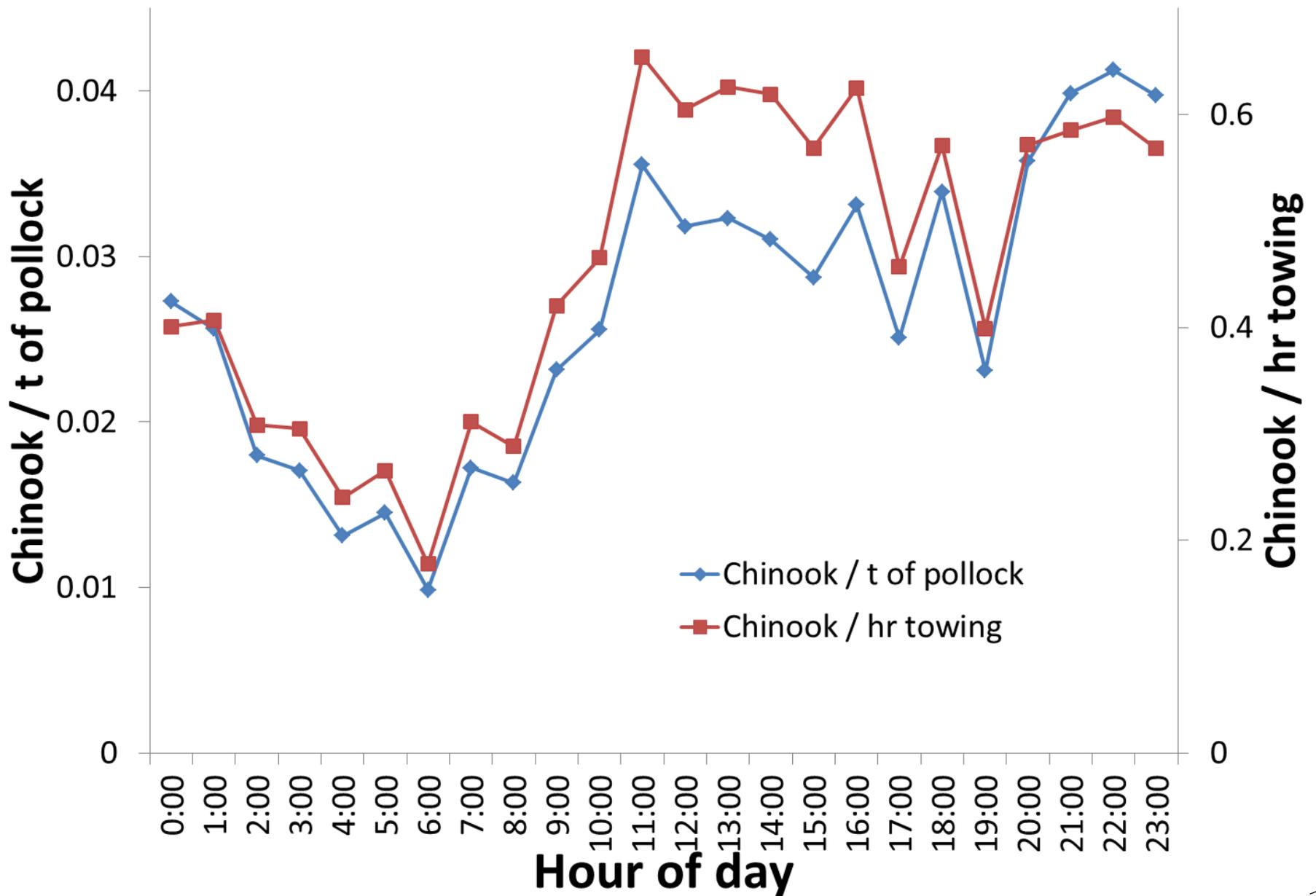
- Environmental conditions
 - NPRB temperature-bycatch study

Run sizes?

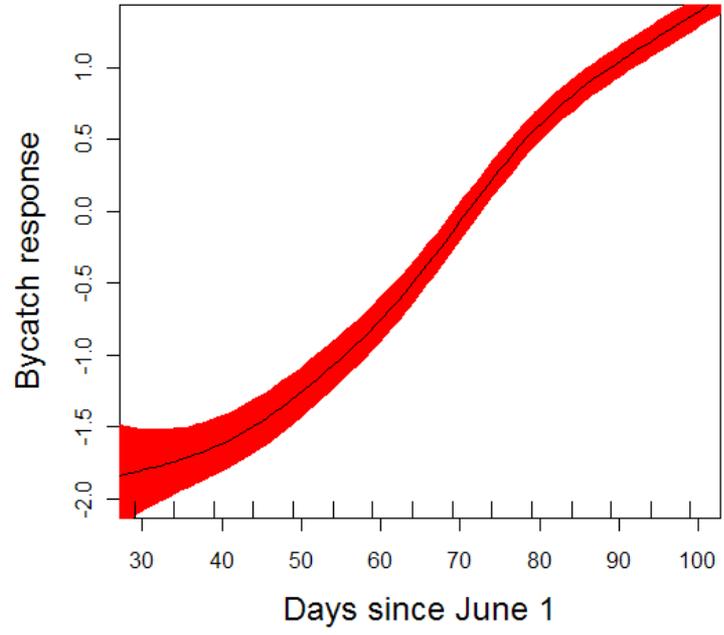
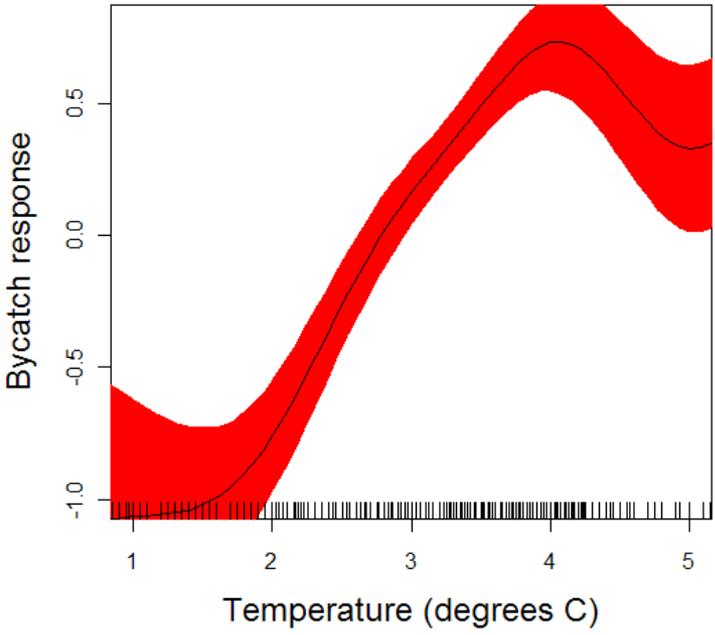
Tow duration



Day/night differences

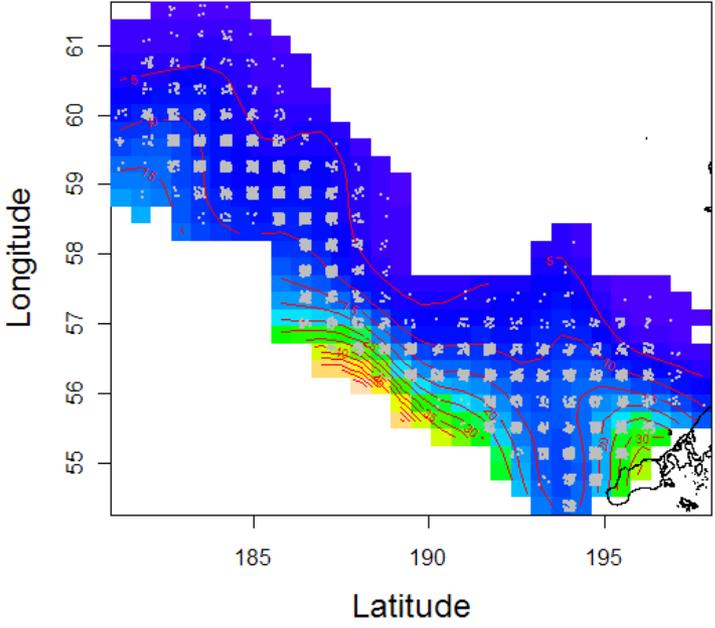


b)

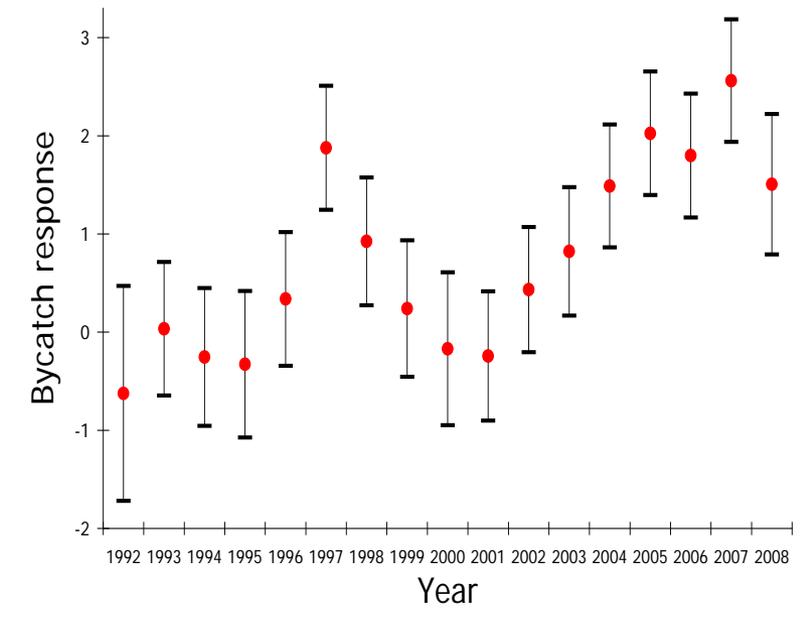


Modeling
Chinook
bycatch
rates
(NMFS
data)

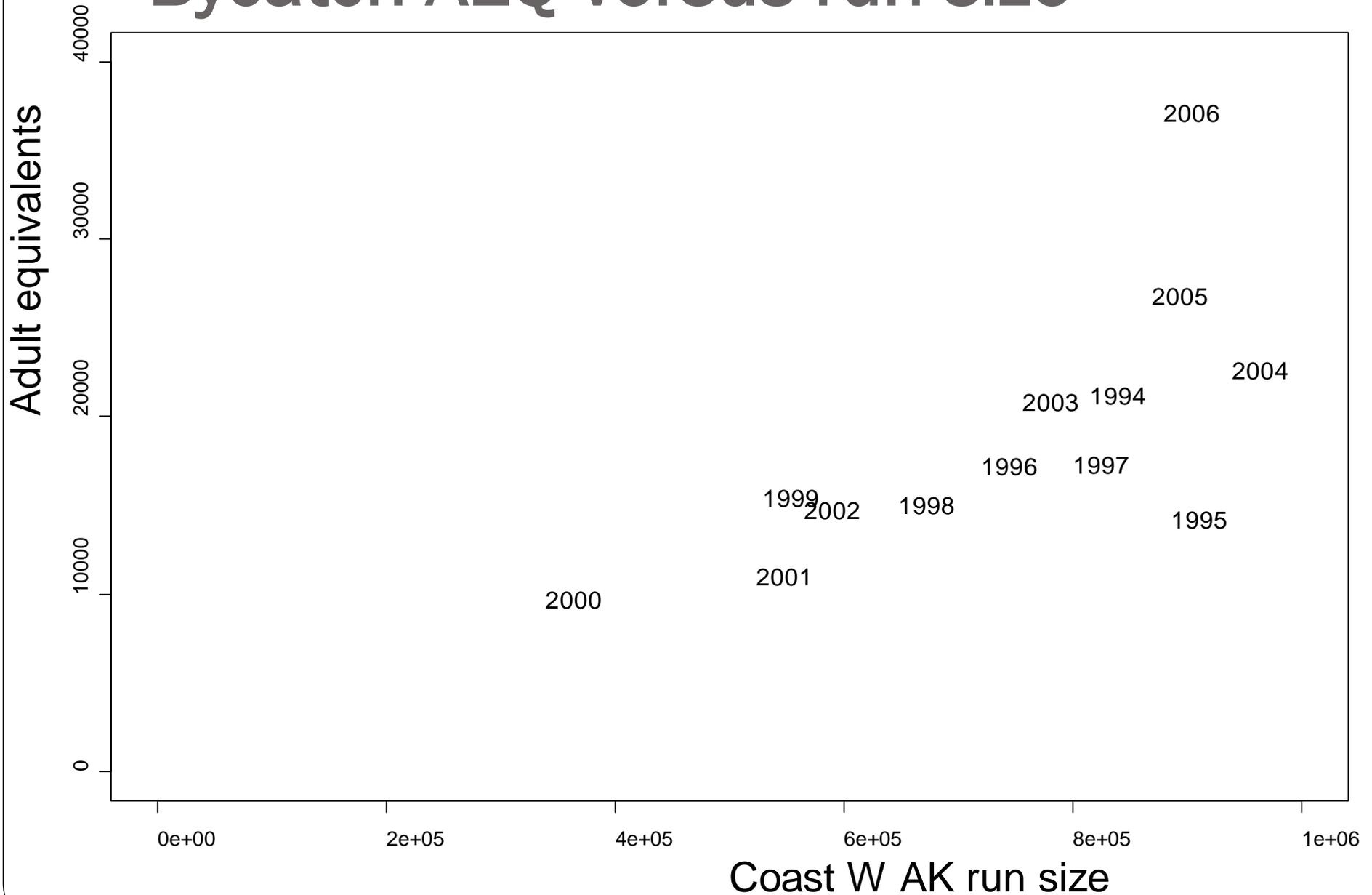
c)



d)



Bycatch AEQ versus run size



Management actions...

Chinook salmon bycatch action:

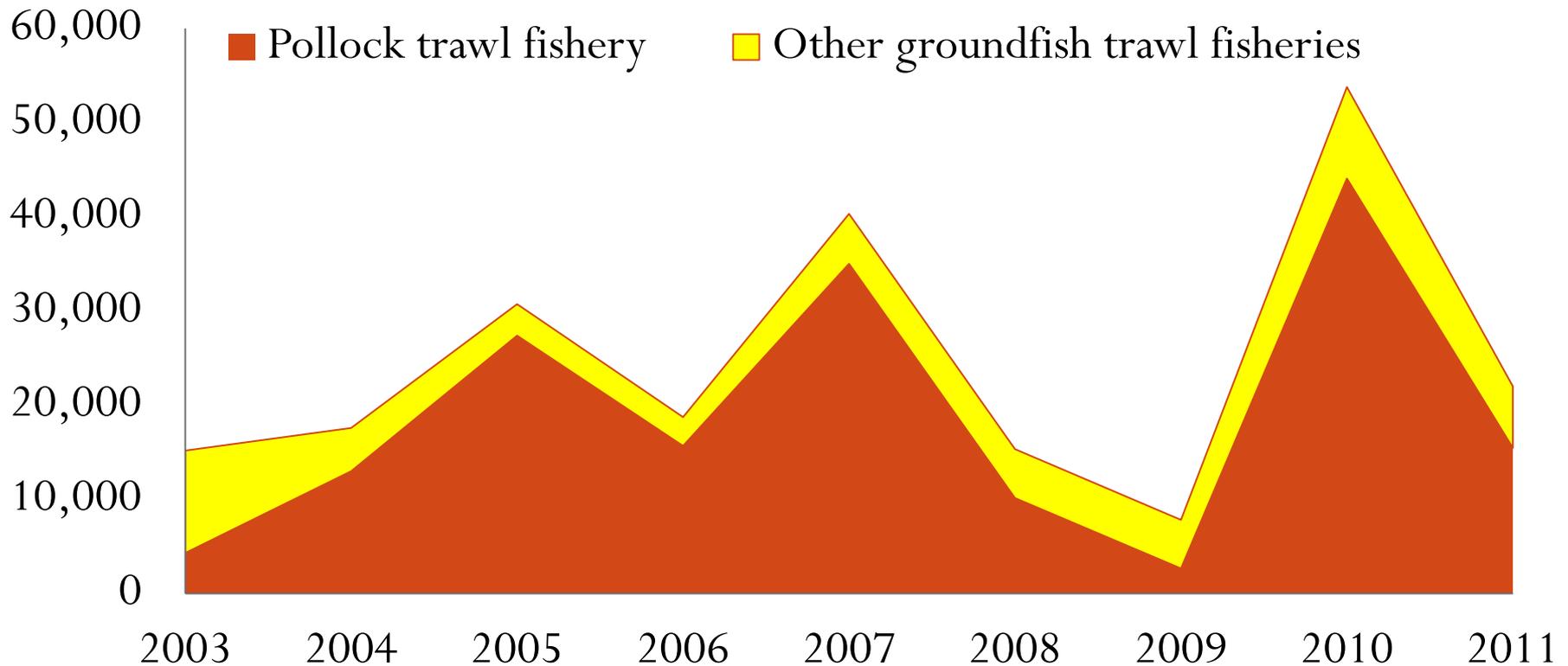
91st amendment to Fishery Management Plan

- Overall annual cap of 60,000 Chinook
 - Performance limit of 47,591
- Vessel Incentive Program
- 100% observer coverage on pollock fleet
- Complete census of salmon
- Increased genetic sampling
 - Both BSAI and GOA
 - Annual reports to Council

Chinook bycatch in Gulf of Alaska

- **25,000 Chinook salmon** limit for the GOA pollock trawl fishery
- Implemented by NMFS in 2012

Chinook Bycatch in GOA Fisheries



Chum bycatch management

Council considering Chum

- Caps
- Area closures
- Modification of current fleet rolling hot spot program



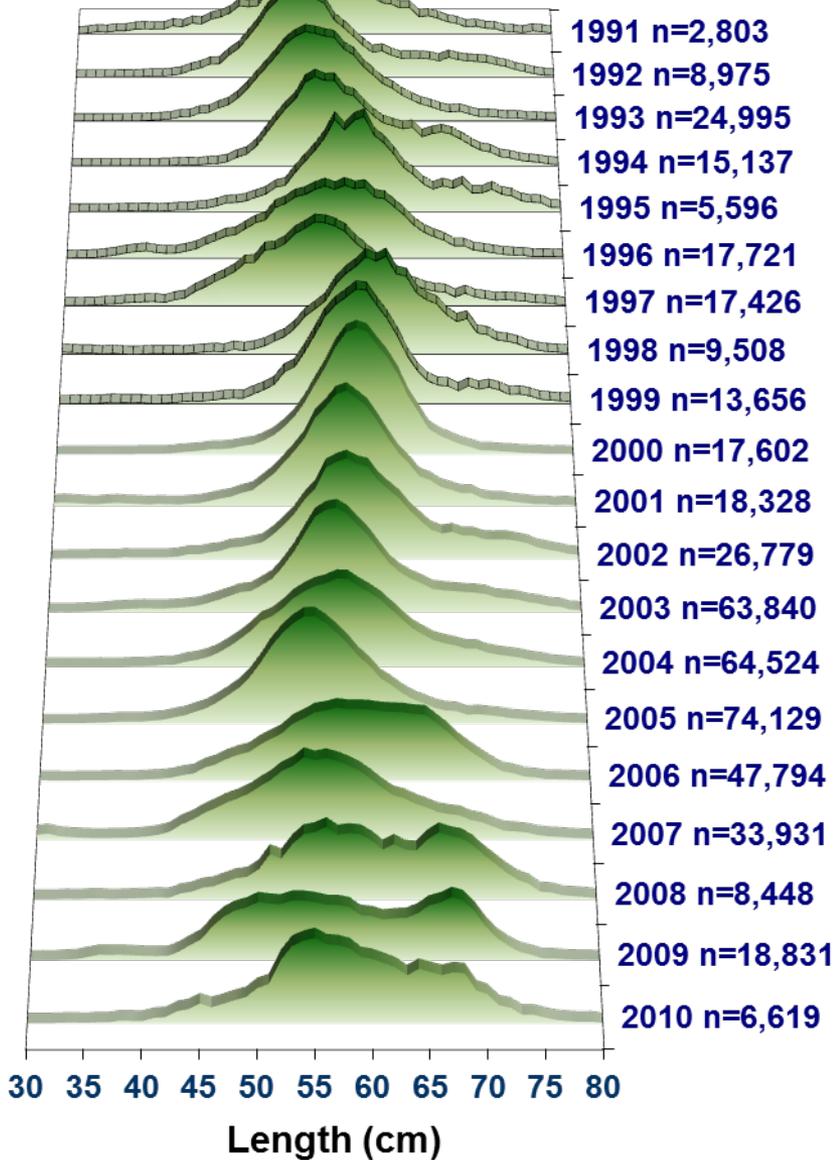
Complications

Timing differences of Chinook and chum bycatch

Council **prioritizes Chinook over chum**

Chum salmon

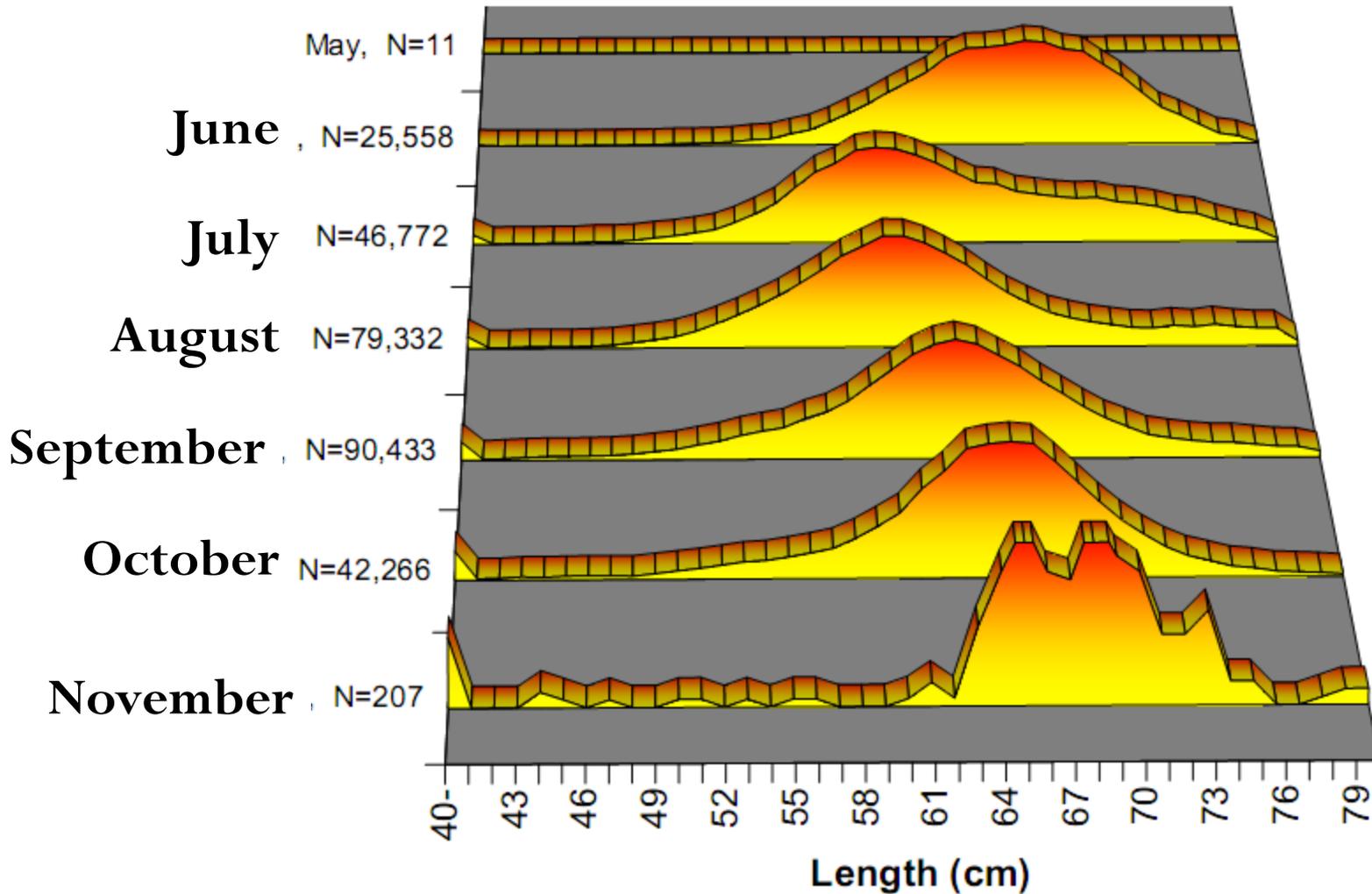
Proportions at length



n = number of
chum measured
by NMFS
observers on
pollock boats

Length of chum by month

Bigger chum earlier
in
summer



Chum salmon analytical innovation

Applying genetics results to AEQ

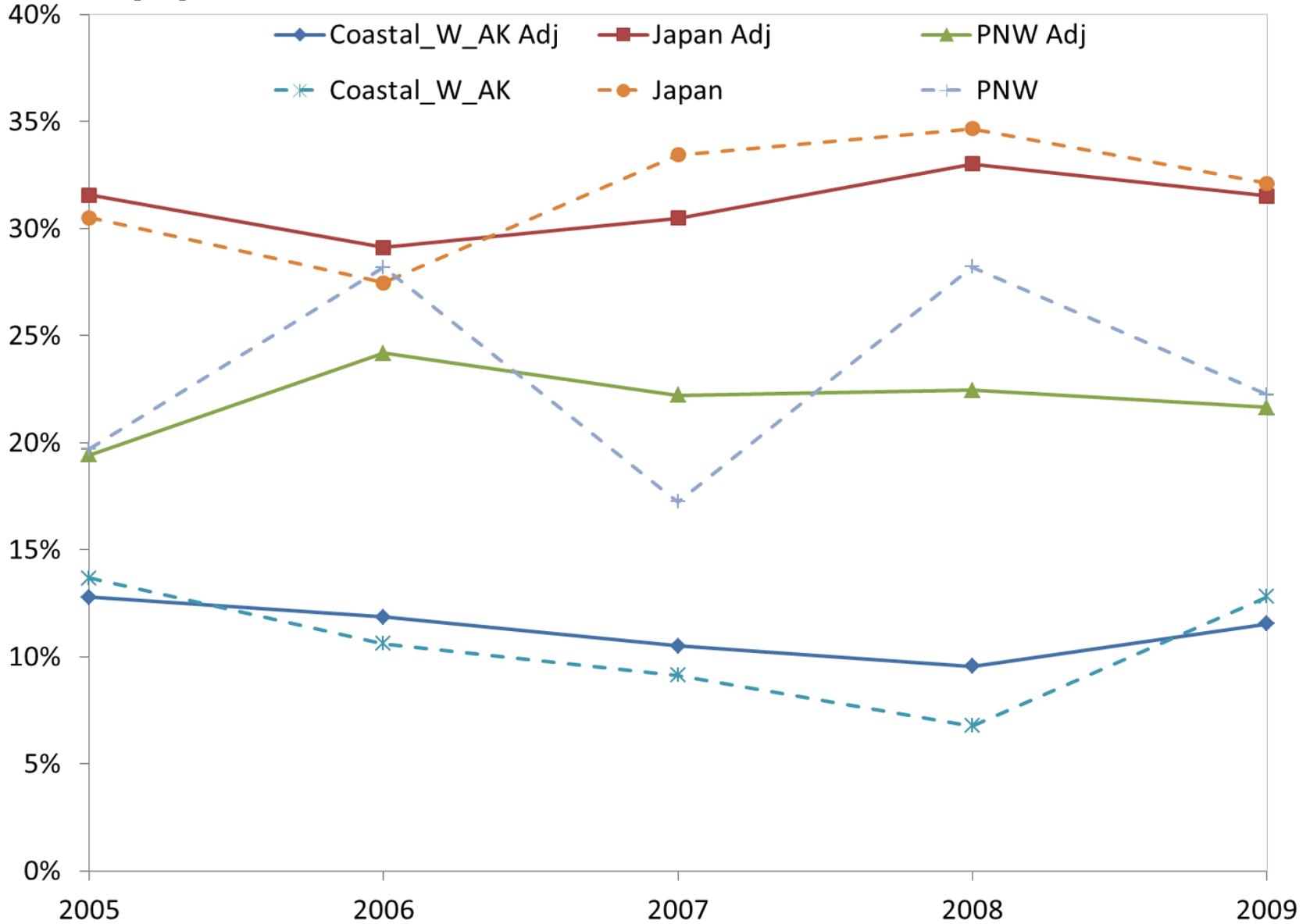
Need to bridge lag effect of juvenile chum salmon to region of origin

Example:

If 100 fish were projected from last year's bycatch to return this year...

- Then last year's genetic estimates of the bycatch would apply (not this year's)

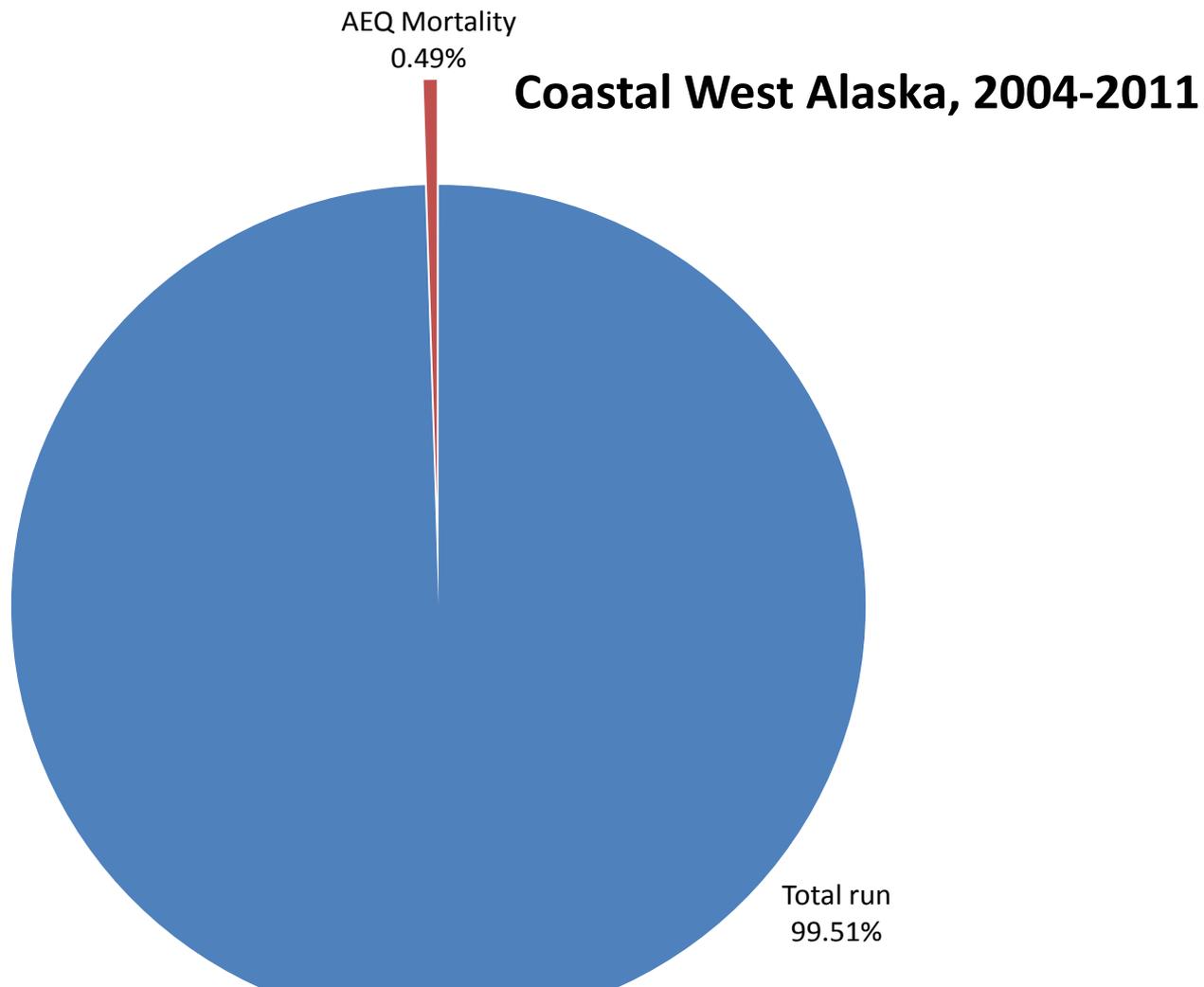
Application to chum salmon data



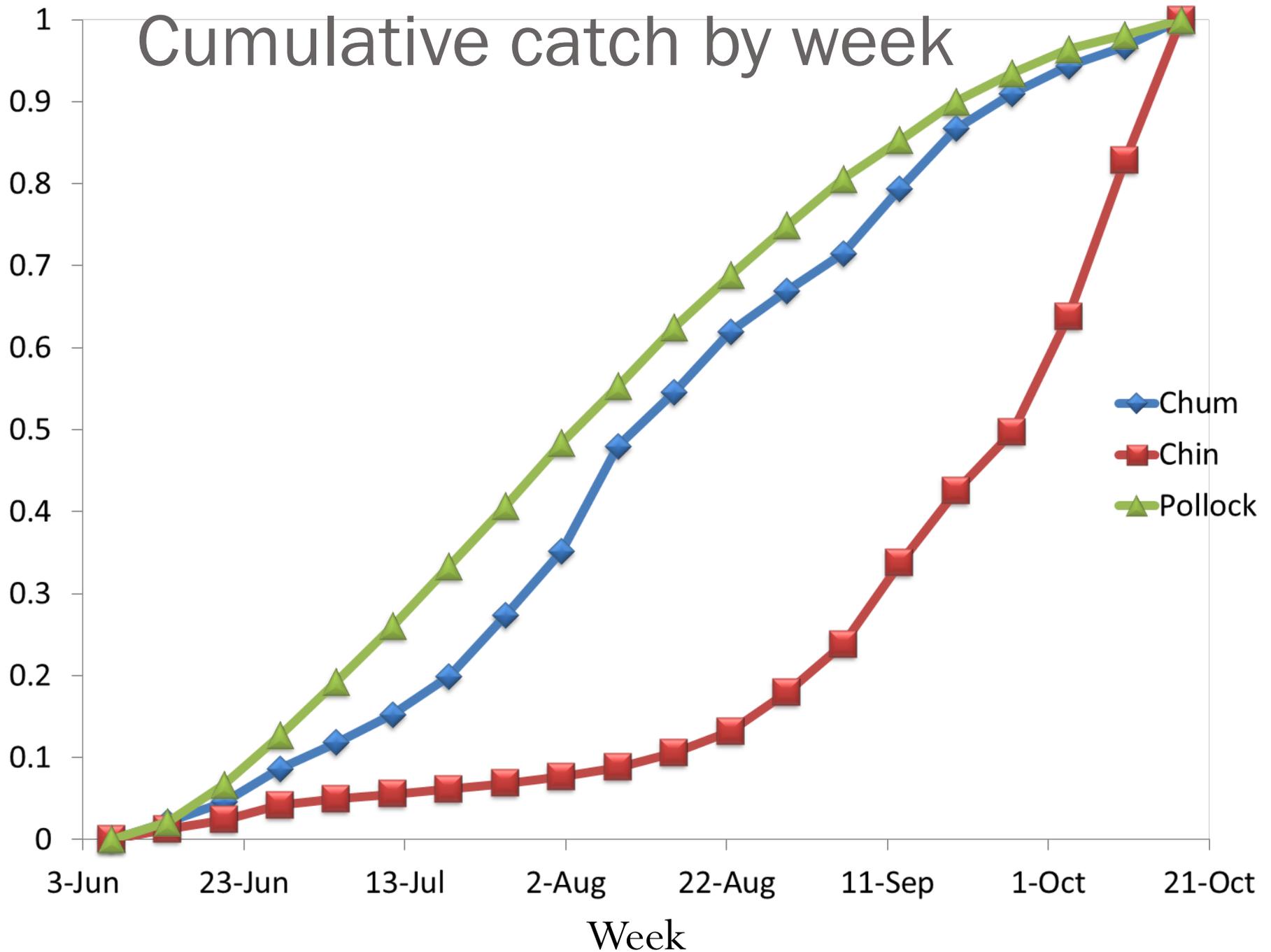
Chum analytical results

- Protection in June and July better for WAK chum...

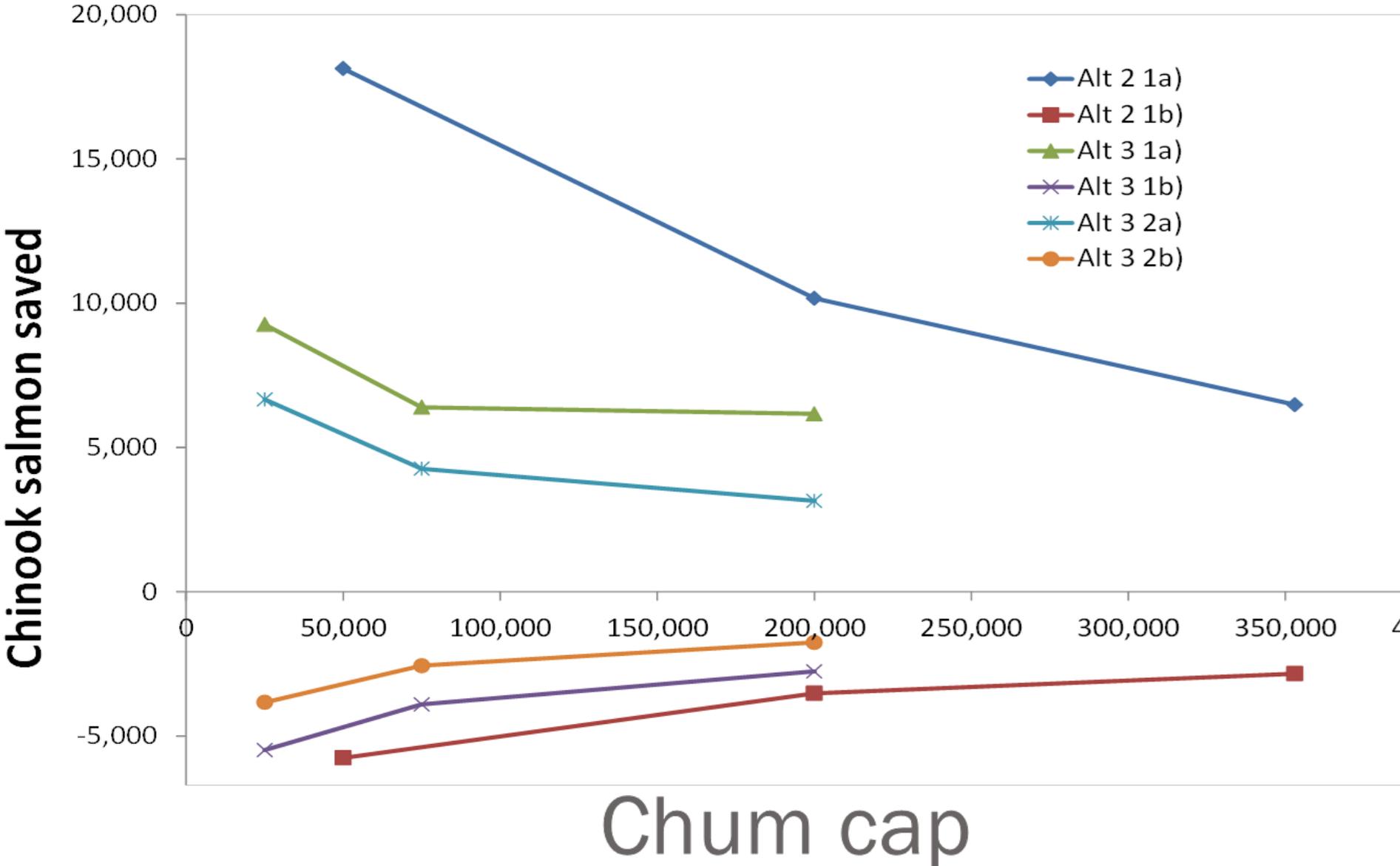
- Asian hatchery chum relatively higher in August



Cumulative catch by week



Chinook saved under chum measures



Research questions for Chinook bycatch

- More can be done with historical observer data
 - Oceanographic conditions
 - Diet and overlap studies
- Shift in priorities
 - More genetics samples resulting in
 - Loss of many length and biological samples
- Other studies
 - Update of AEQ analysis including lag effect of genetics
 - Spatial analysis of genetics and consistency over time

Thanks!