

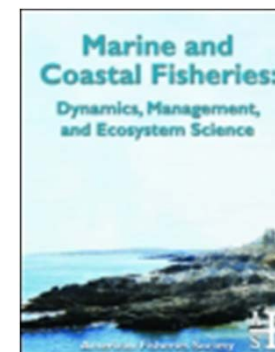
Juvenile Steelhead Distribution, Migration, Growth and Feeding in the Columbia River Estuary, Plume and Ocean Waters



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ARTICLE

Juvenile Steelhead Distribution, Migration, Feeding, and Growth in the Columbia River Estuary, Plume, and Coastal Waters

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Background

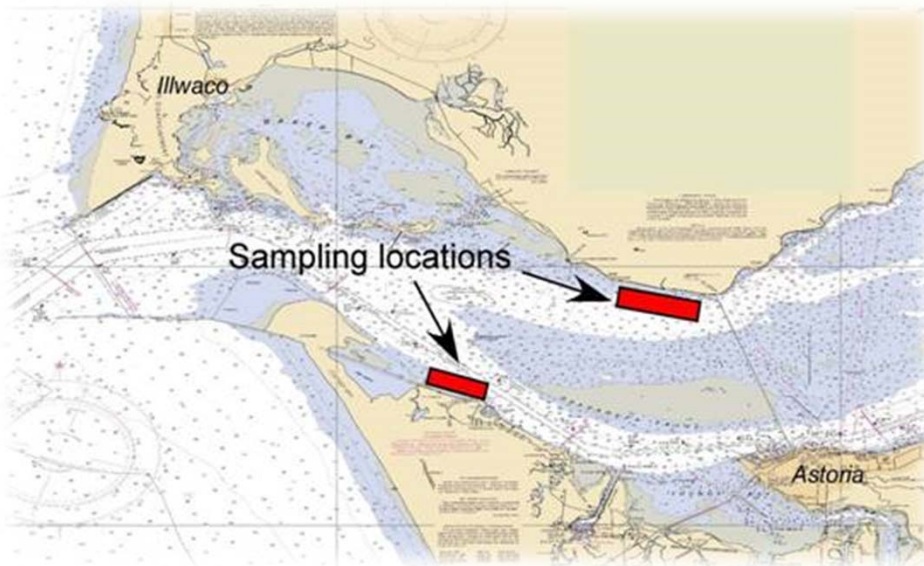
- Relatively little known about estuary and ocean life cycle despite being the third most abundant species caught in both areas during most years
- Steelhead migrate to the ocean in late-spring and early summer, and unlike other salmon species, they do not spend much time in the estuary and nearshore areas. Instead, they move quickly offshore to oceanic feeding grounds, bypassing the normal coastal migration route used by other salmon species

Outline

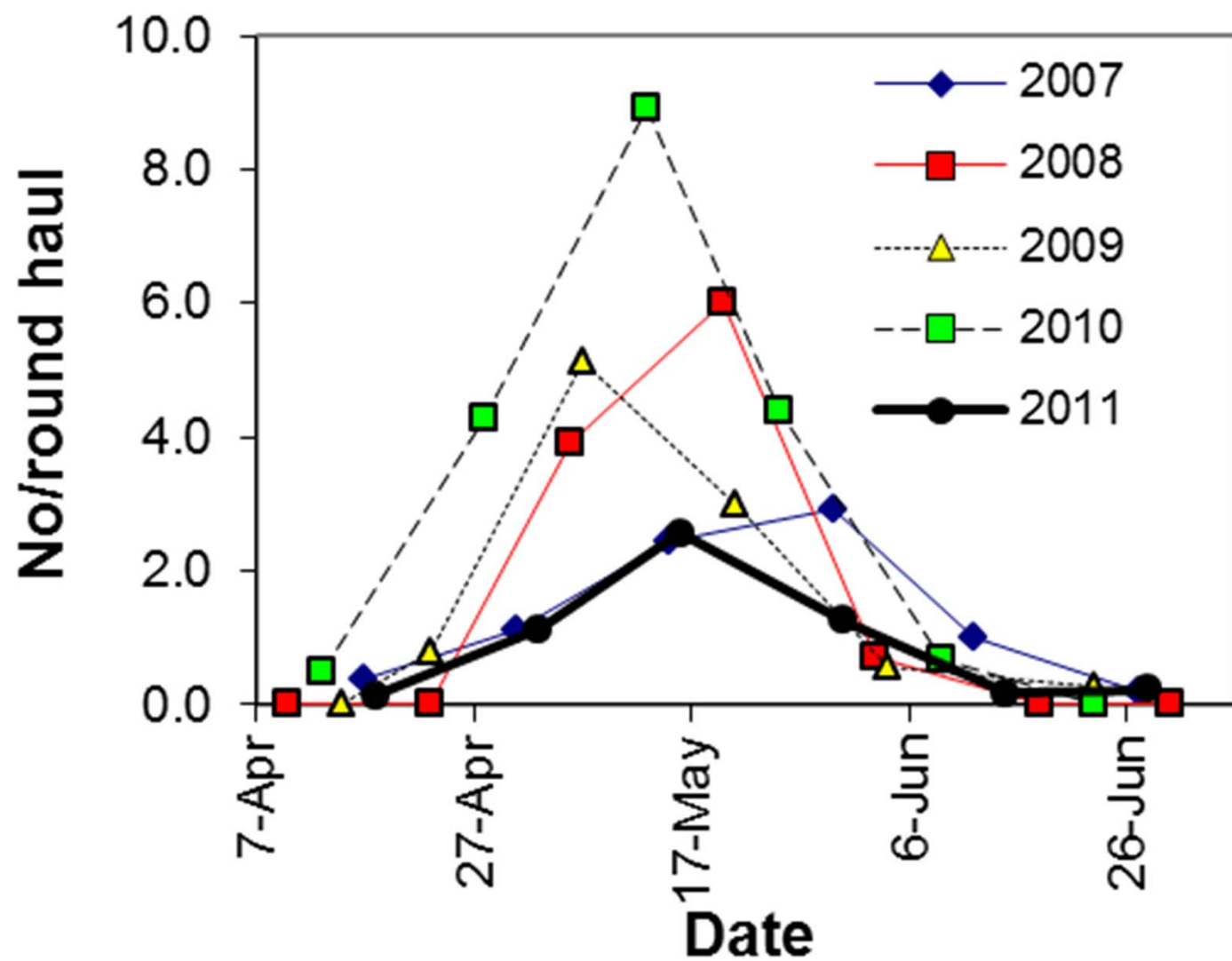
- Examine abundance and distribution of steelhead caught in the Columbia River estuary, plume and ocean for difference by season and year
- Examine a number of biological parameters (size, condition, growth, diets and feeding intensity) by year and region of capture
- Relate these to survival of steelhead under different ocean conditions

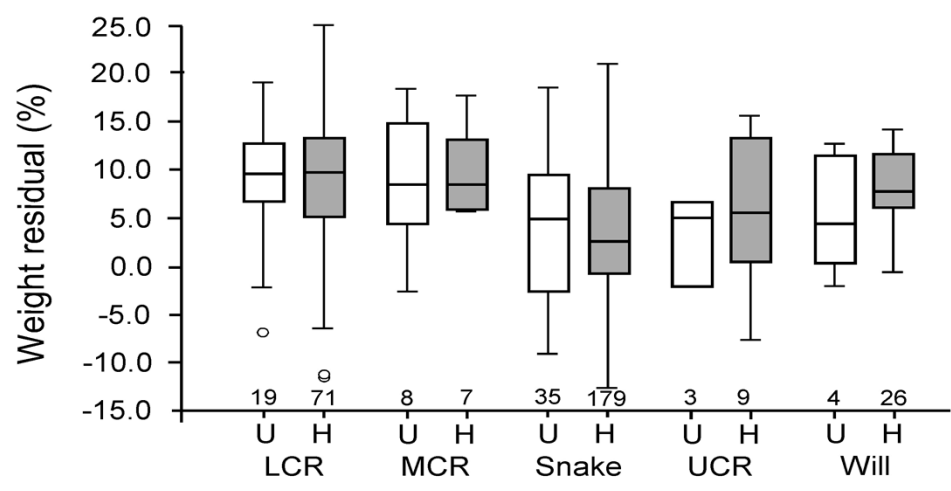
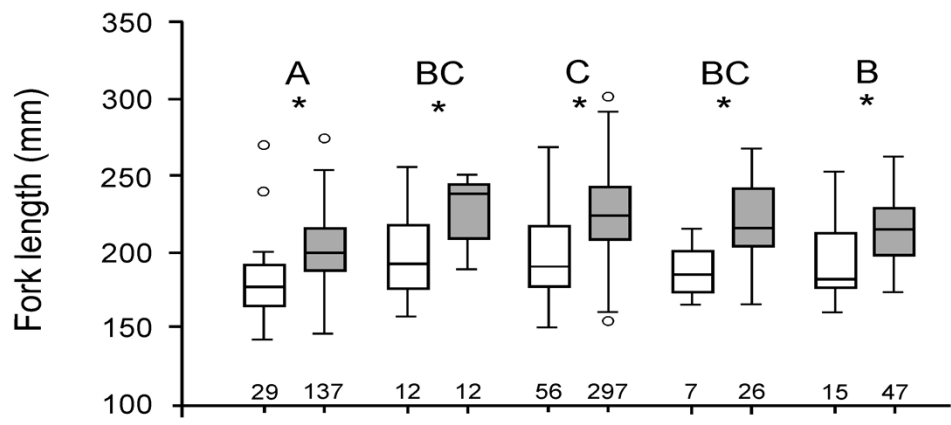
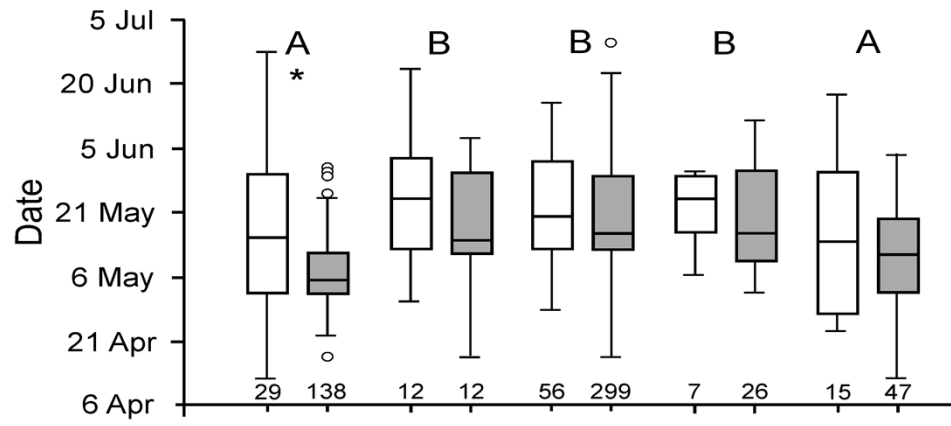
Estuary purse seine methods

- Sampling at edges of deep channels
- Every other week, mid April to late June
- Monthly sampling during July-October
- Fine mesh purse seine (10 m deep)

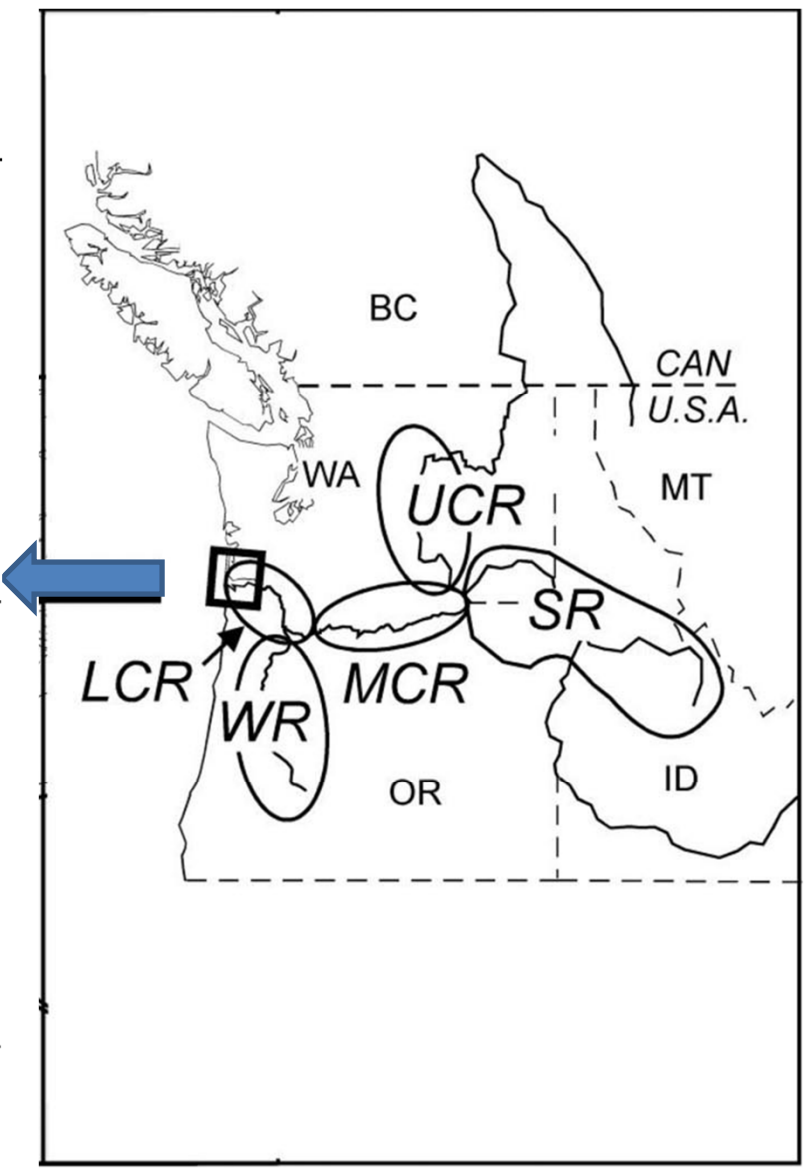


Steelhead



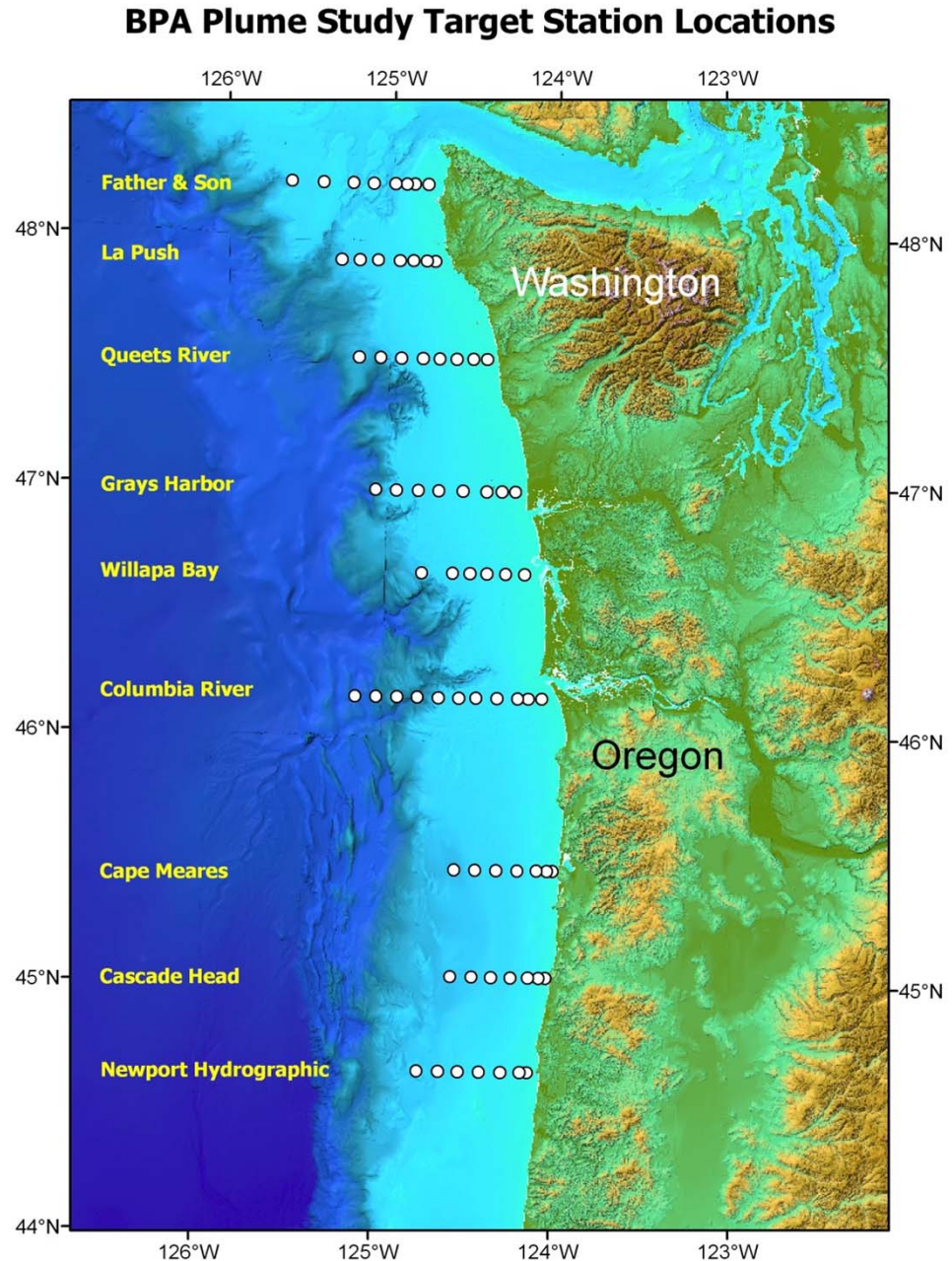


Stock group and production type

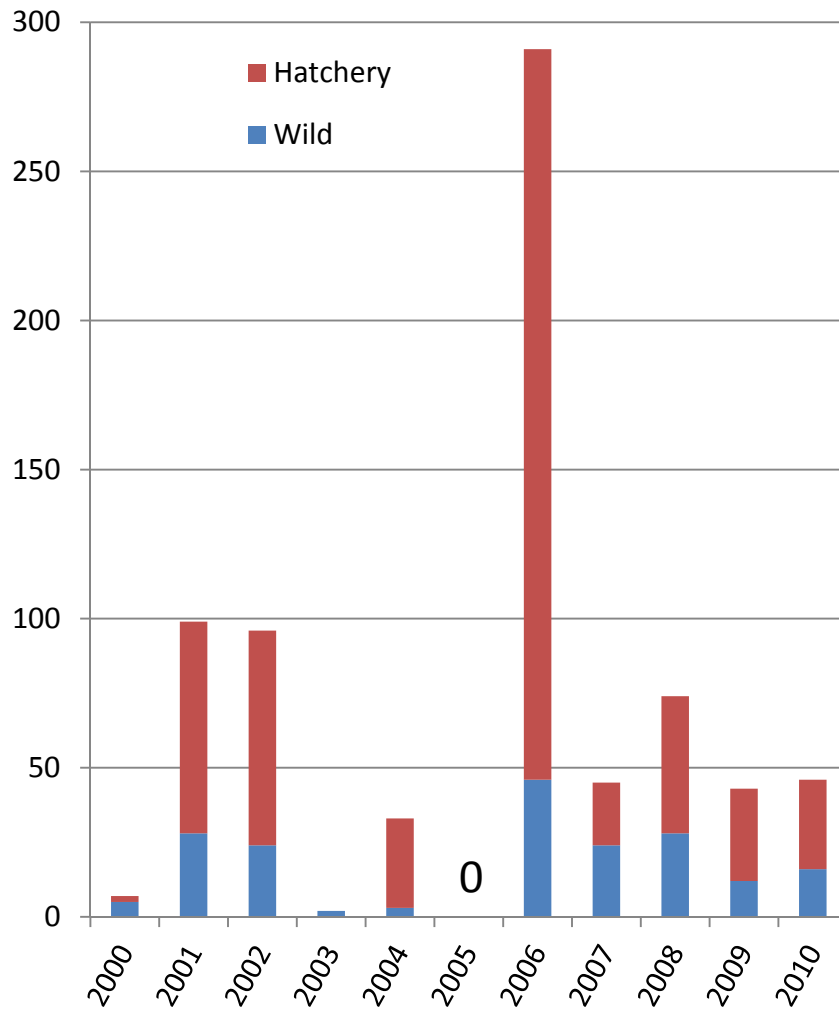


Ocean Methods

- Sampling along transects on shelf out to deepwater beyond shelf
- Every year during the last week of May and June
- One transect a day over 7-10 day period
- Fished large trawl (336 m²) in surface waters for 30 min.
- All trawling in daytime

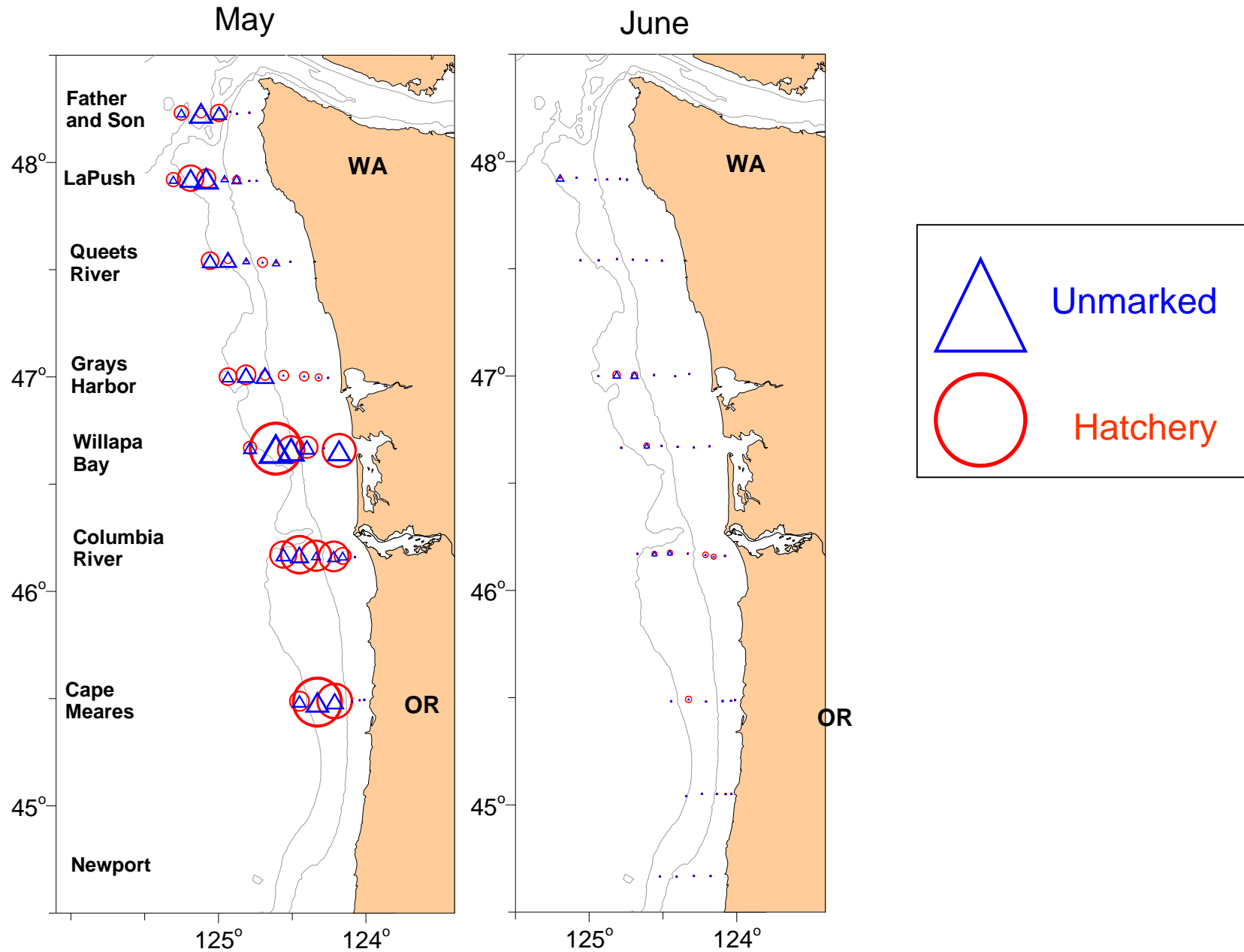


Sample size and clip rate

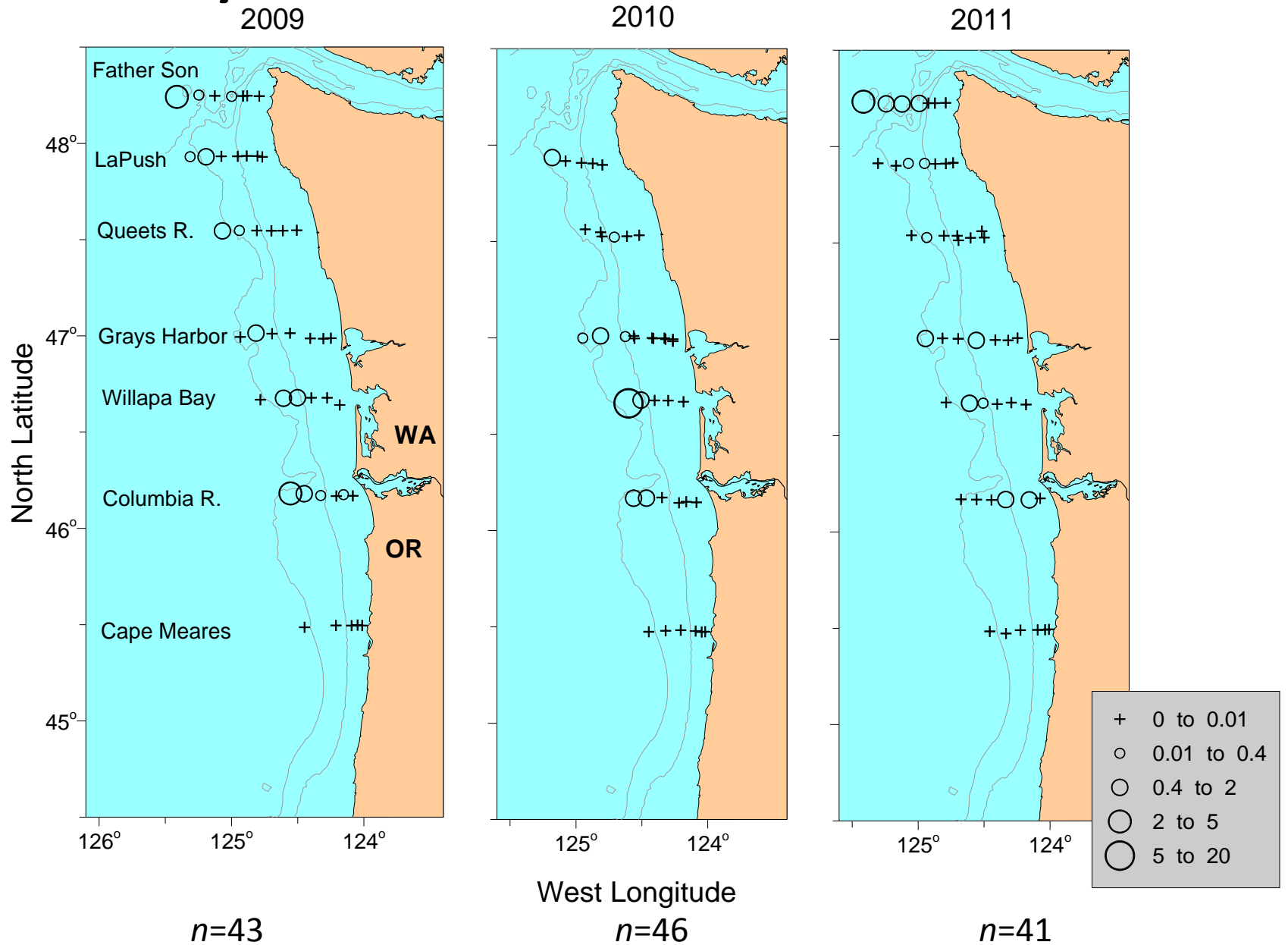


Year	Adjusted W	Adjusted H	Mark Rate %
2000	5	2	82.0
2001	28	71	79.0
2002	24	72	79.2
2003	2	0	79.5
2004	3	30	80.5
2005	0	0	86.0
2006	46	245	82.7
2007	24	21	83.9
2008	28	46	80.4
2009	12	31	79.8
2010	16	30	82.1
2011	14	25	87.8

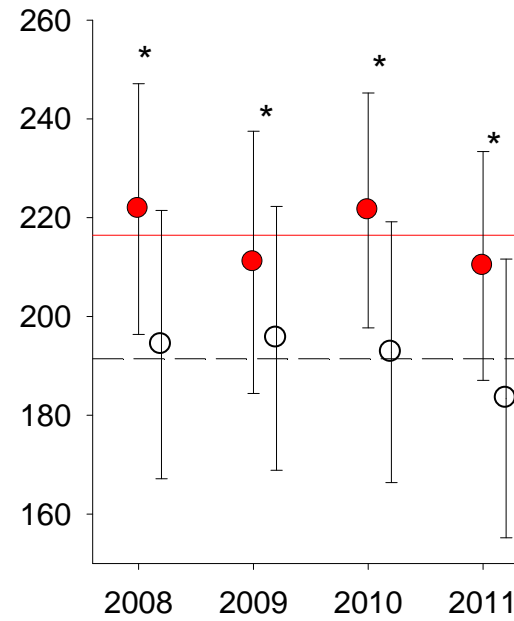
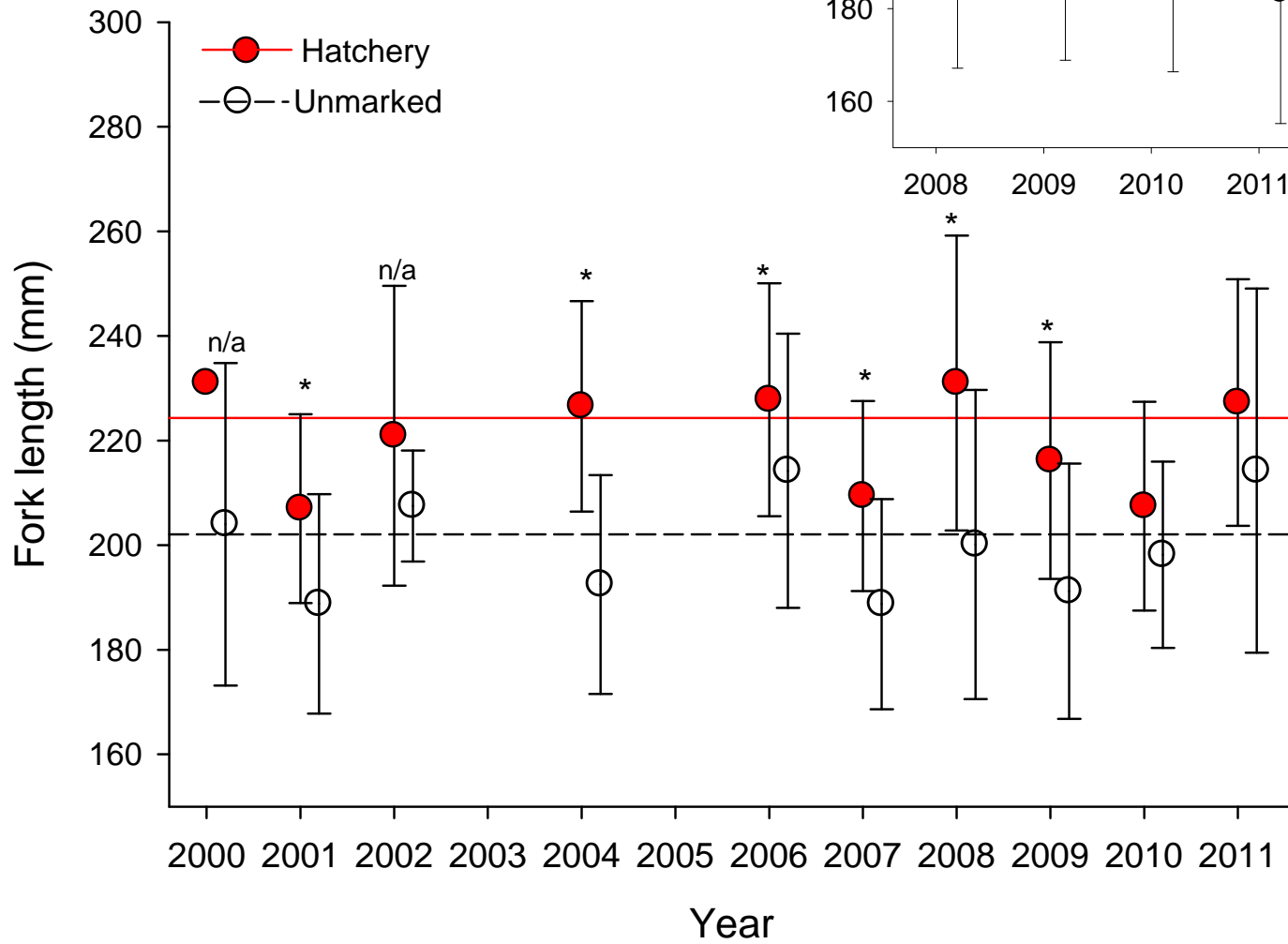
Steelhead salmon catches in May and June: unmarked and hatchery



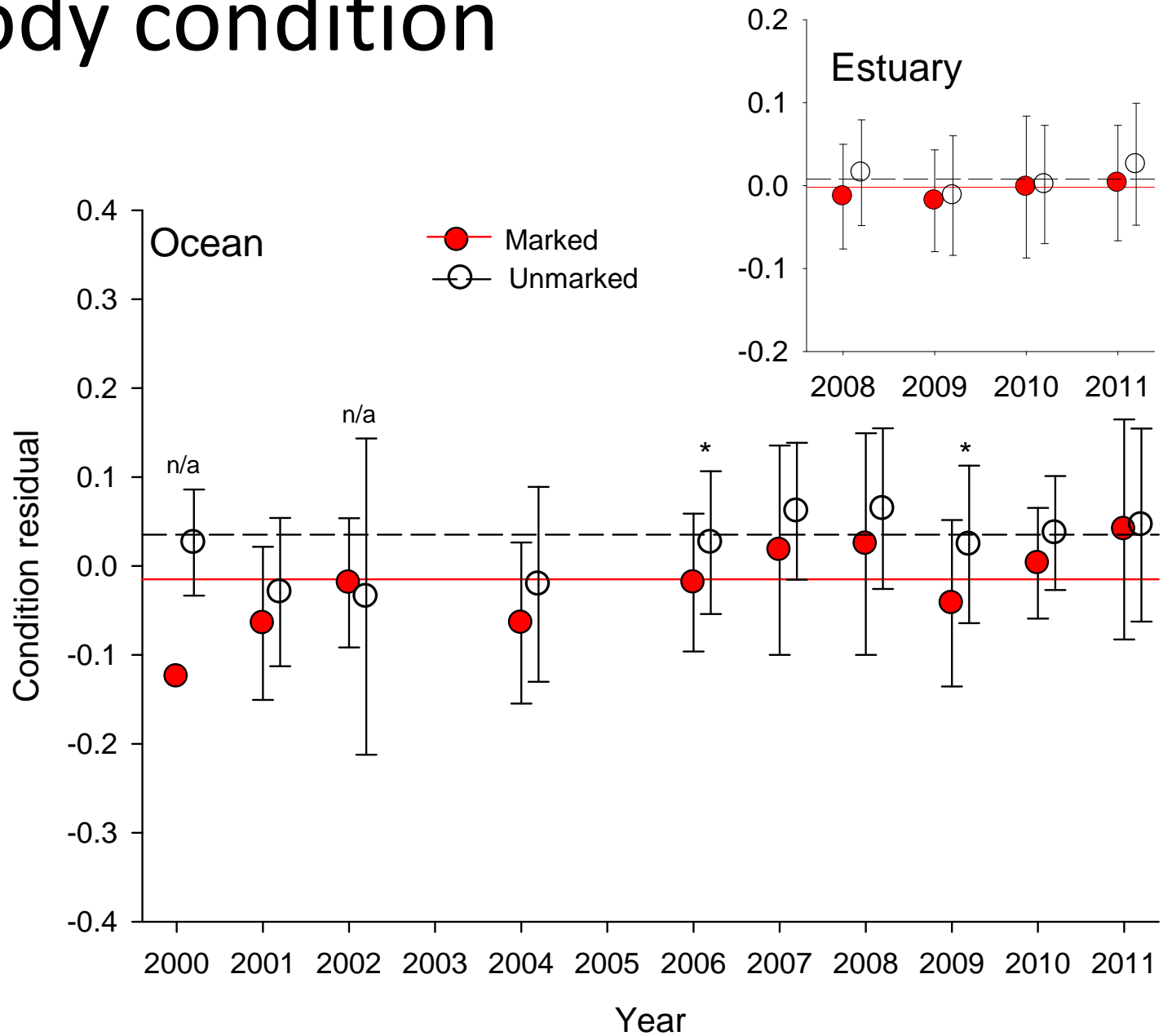
May steelhead distribution



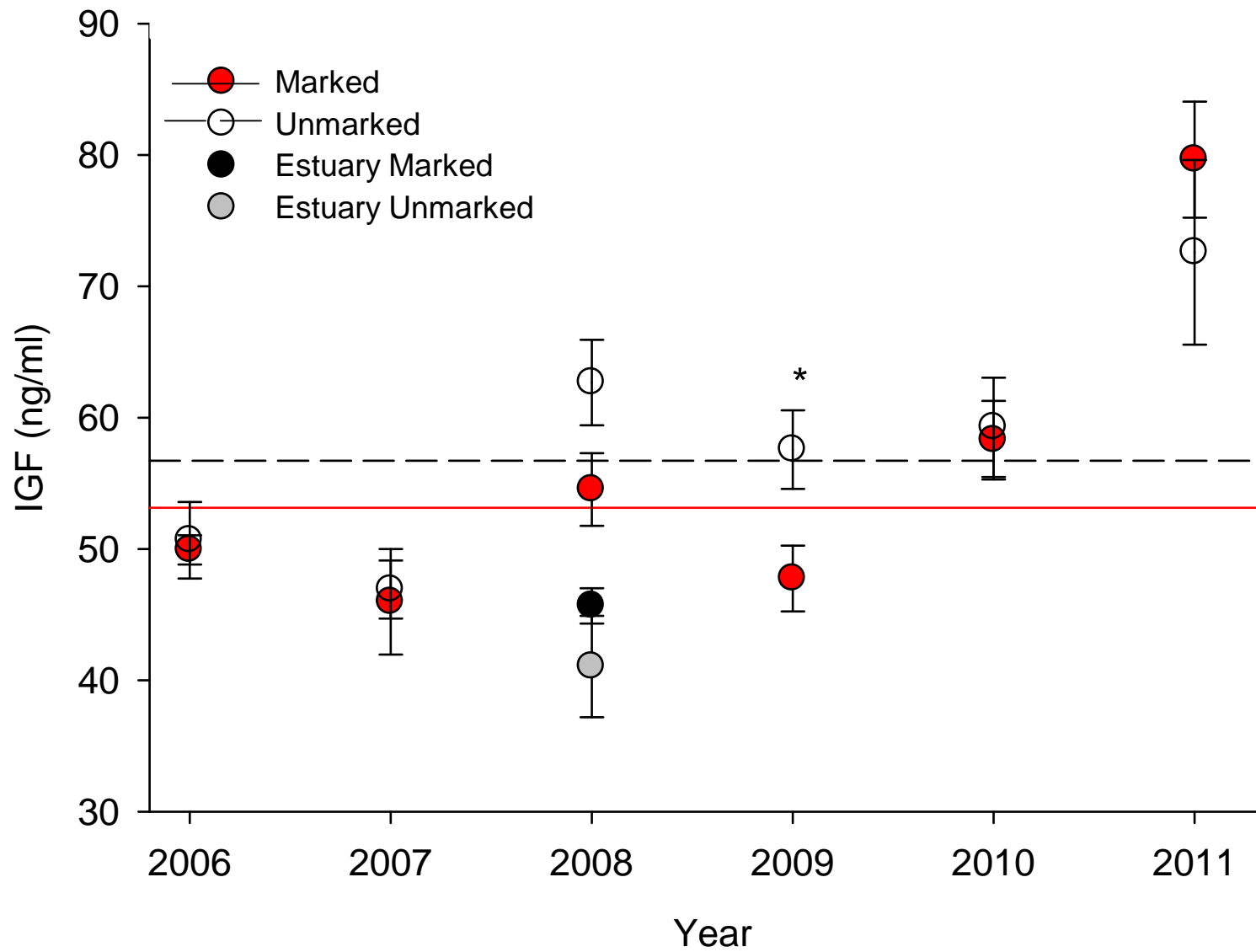
Fork length



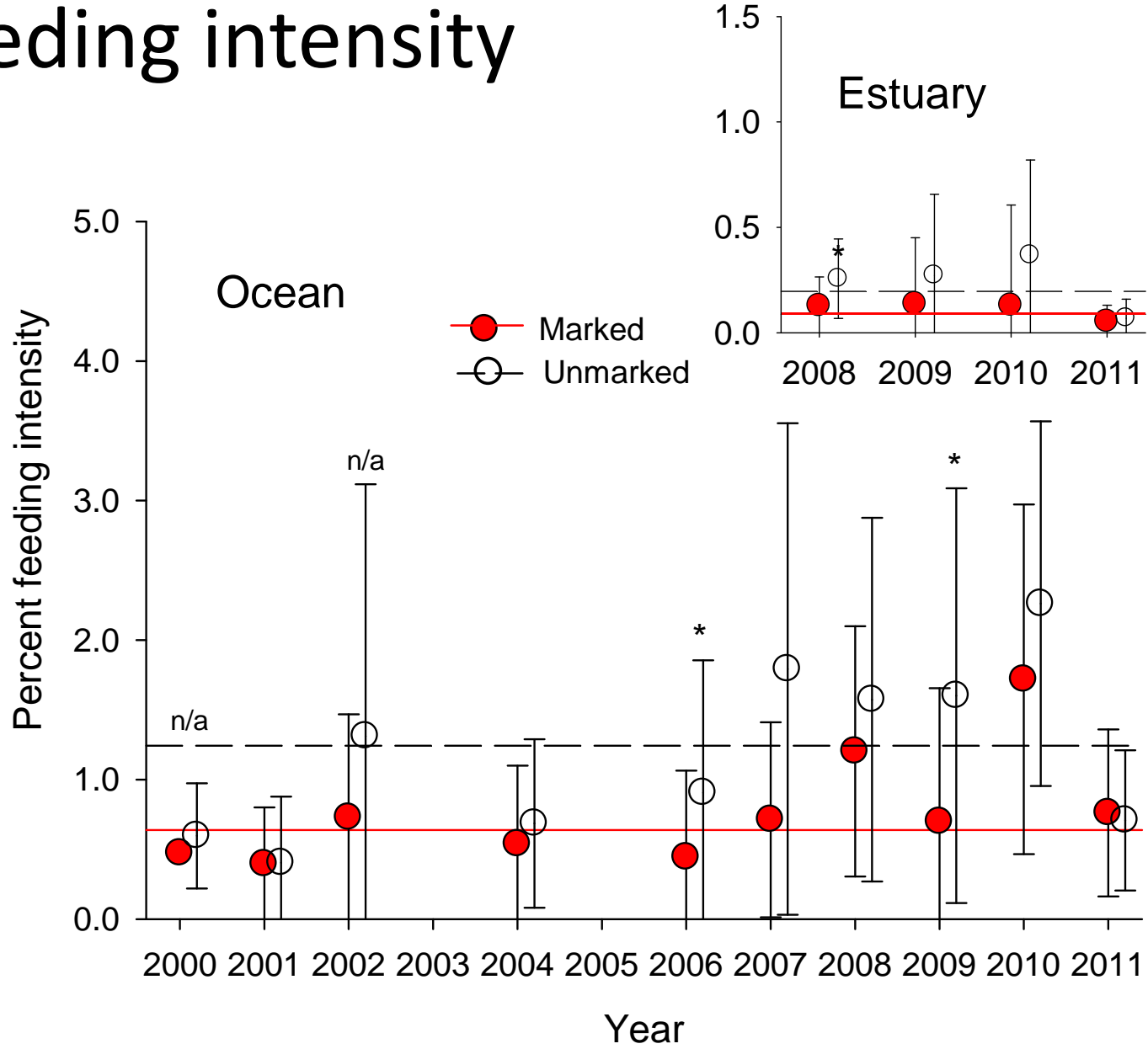
Body condition



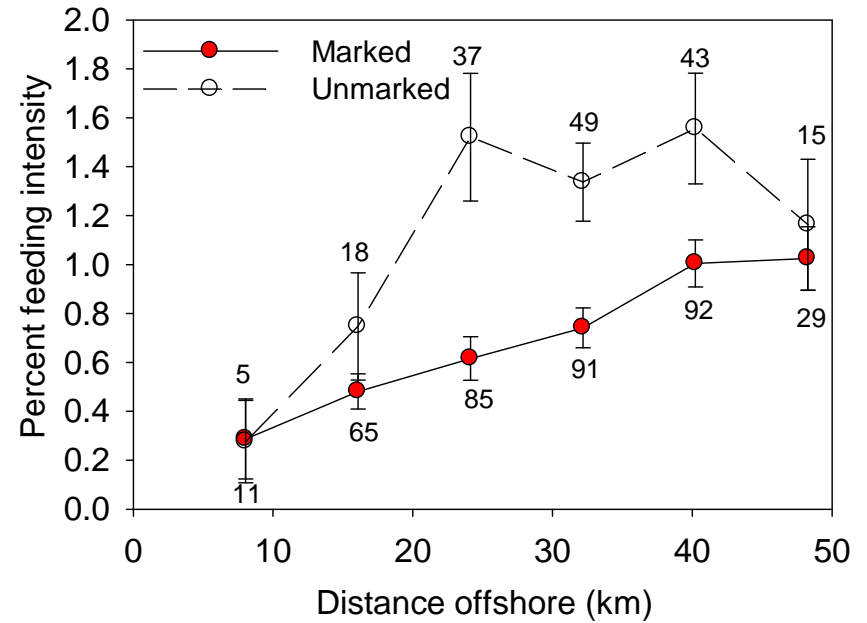
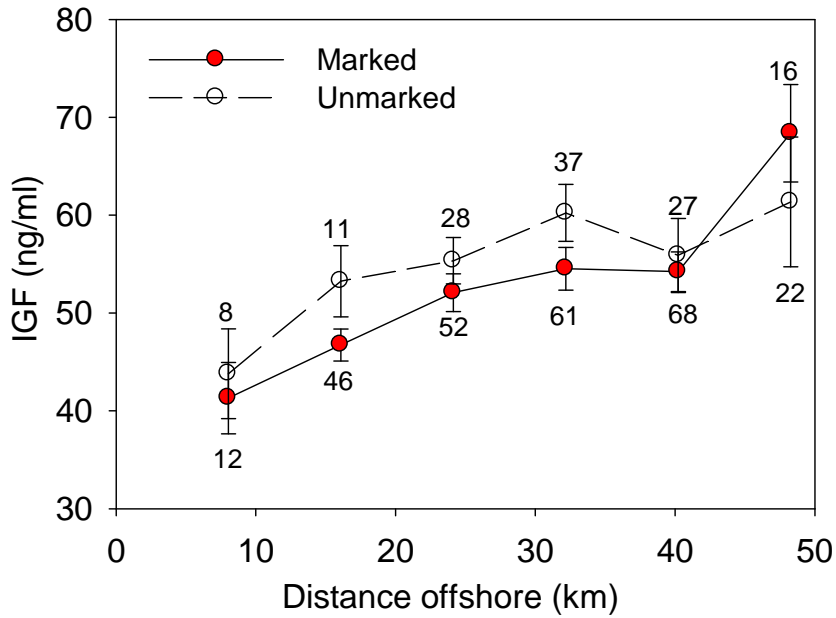
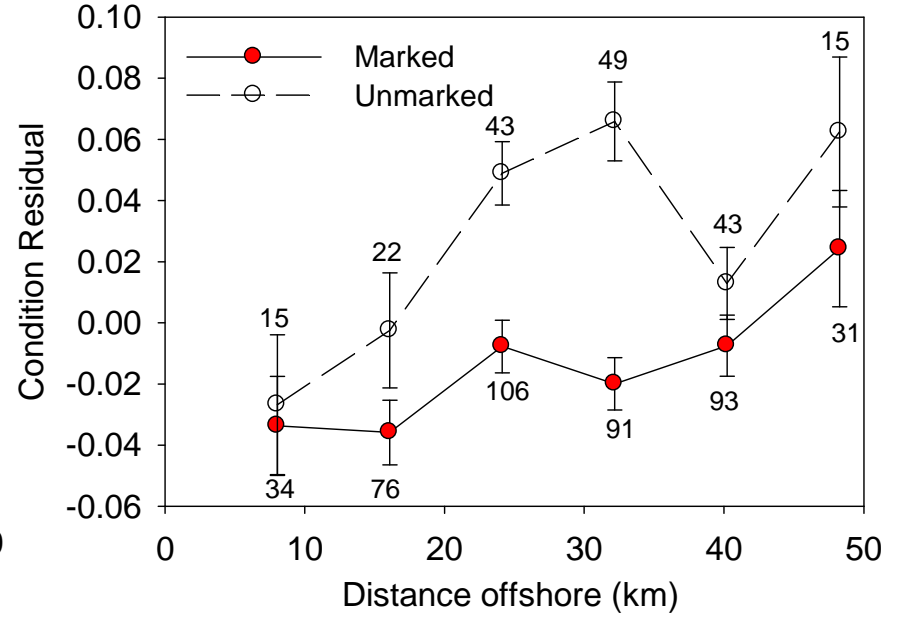
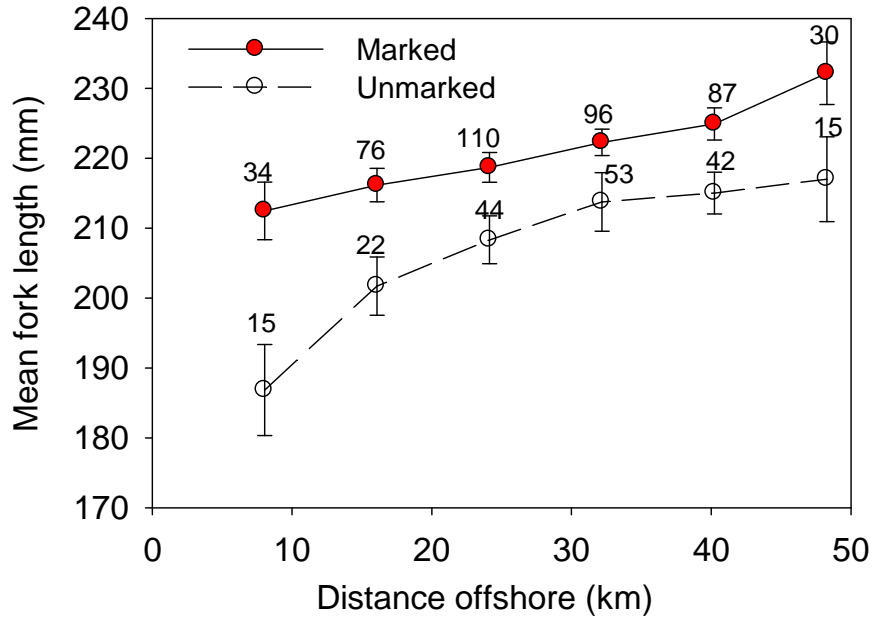
Recent Growth Rates - Insulin Growth Factor



Feeding intensity

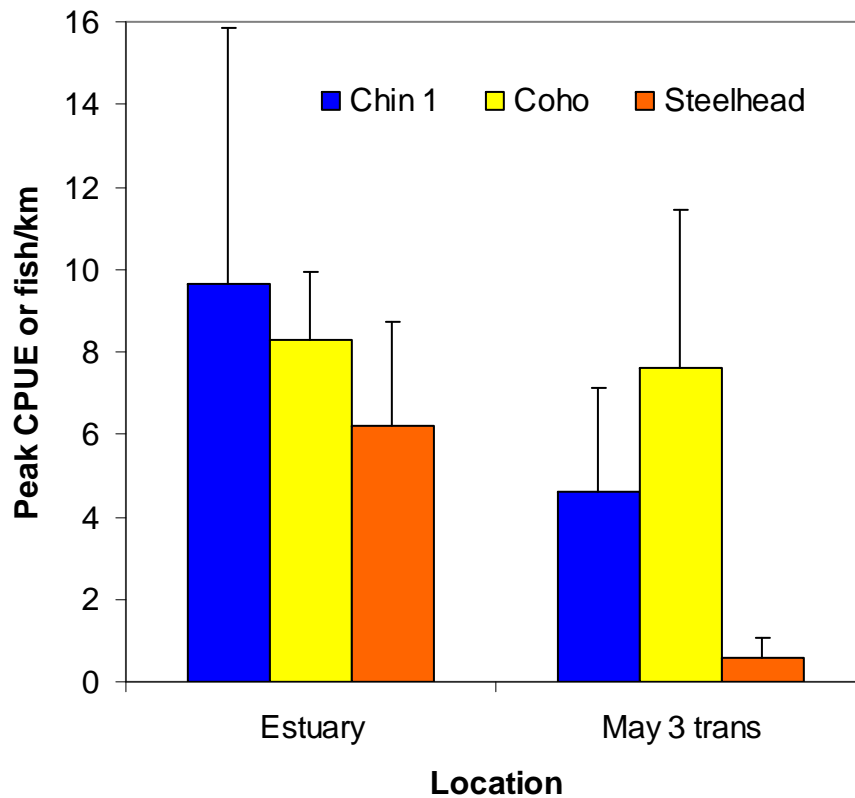


Steelhead vs. Distance Offshore

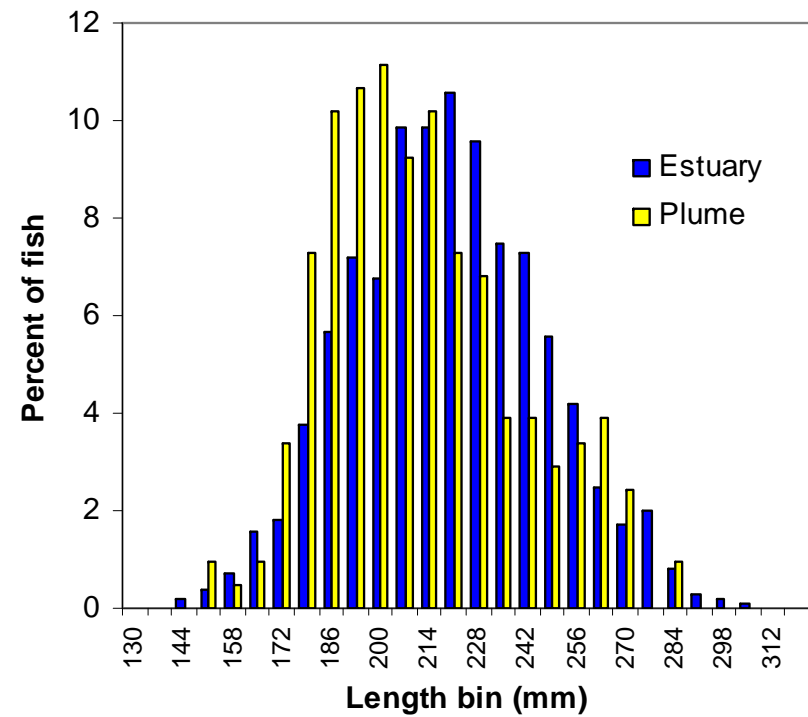


Are we missing steelhead in the plume?

Abundances, EPS vs Plume (2007-2010)



Length frequency (2007-2010)

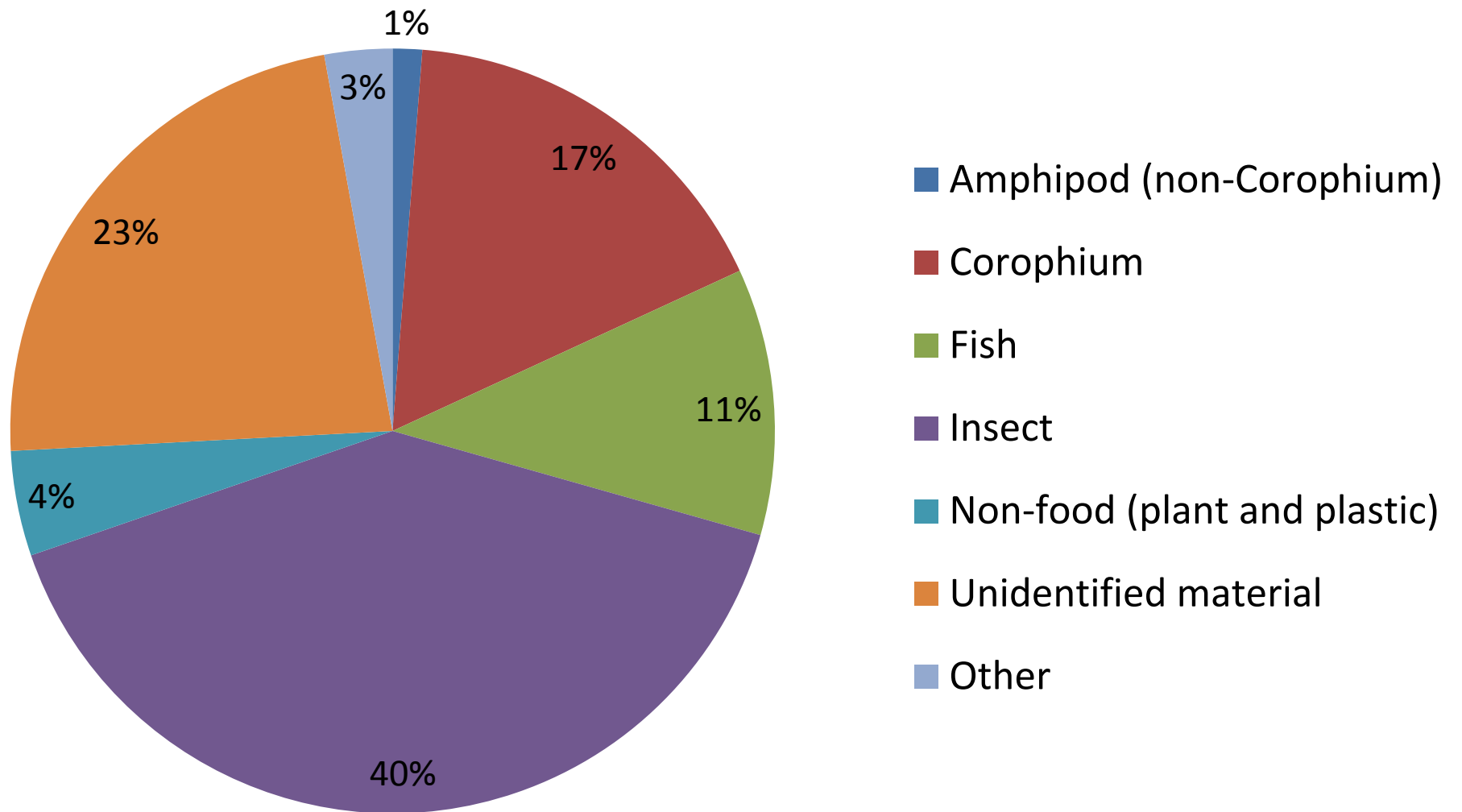


Mean FL (mm)

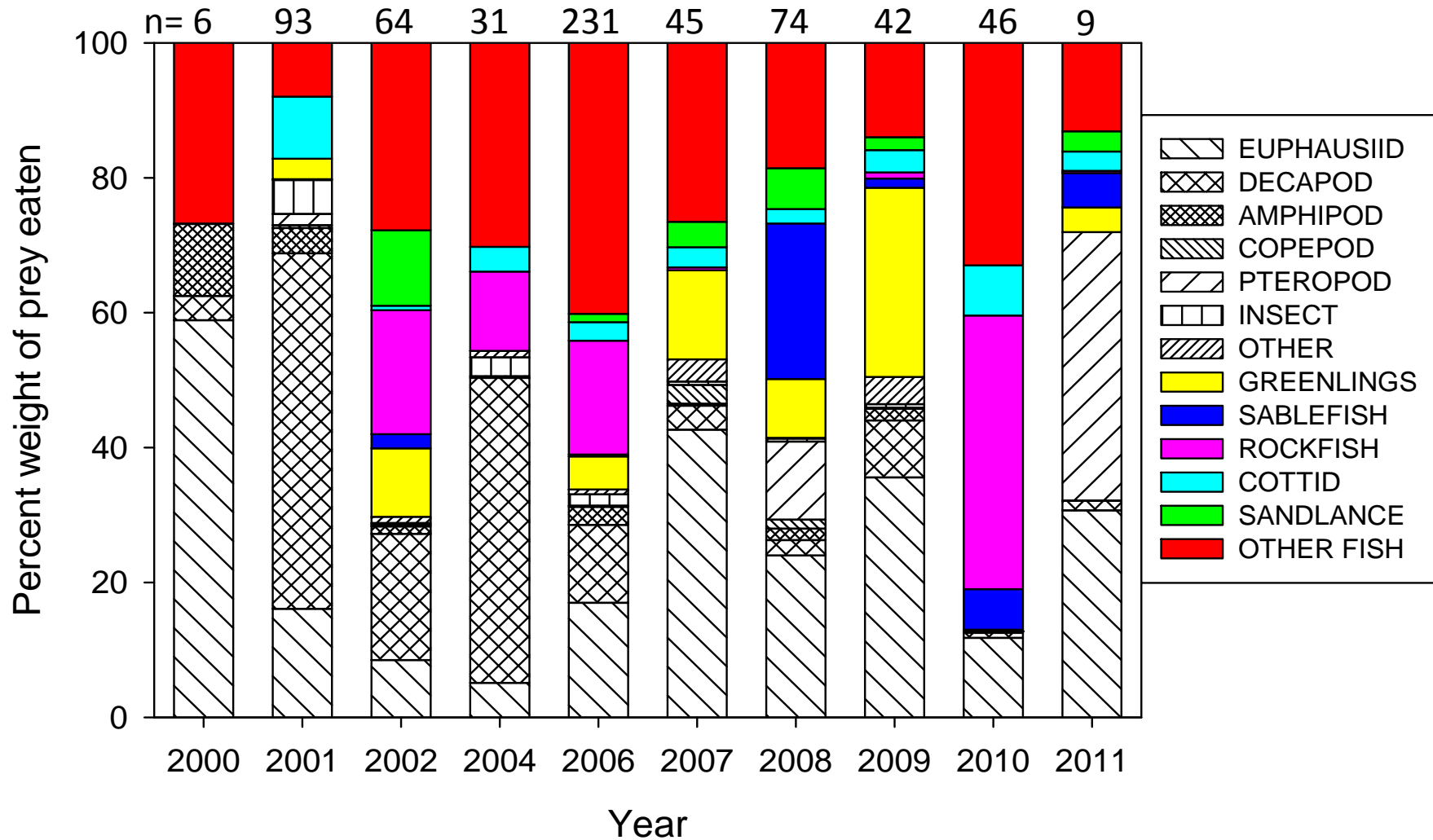
Plume: 208.1

EPS: 216.58

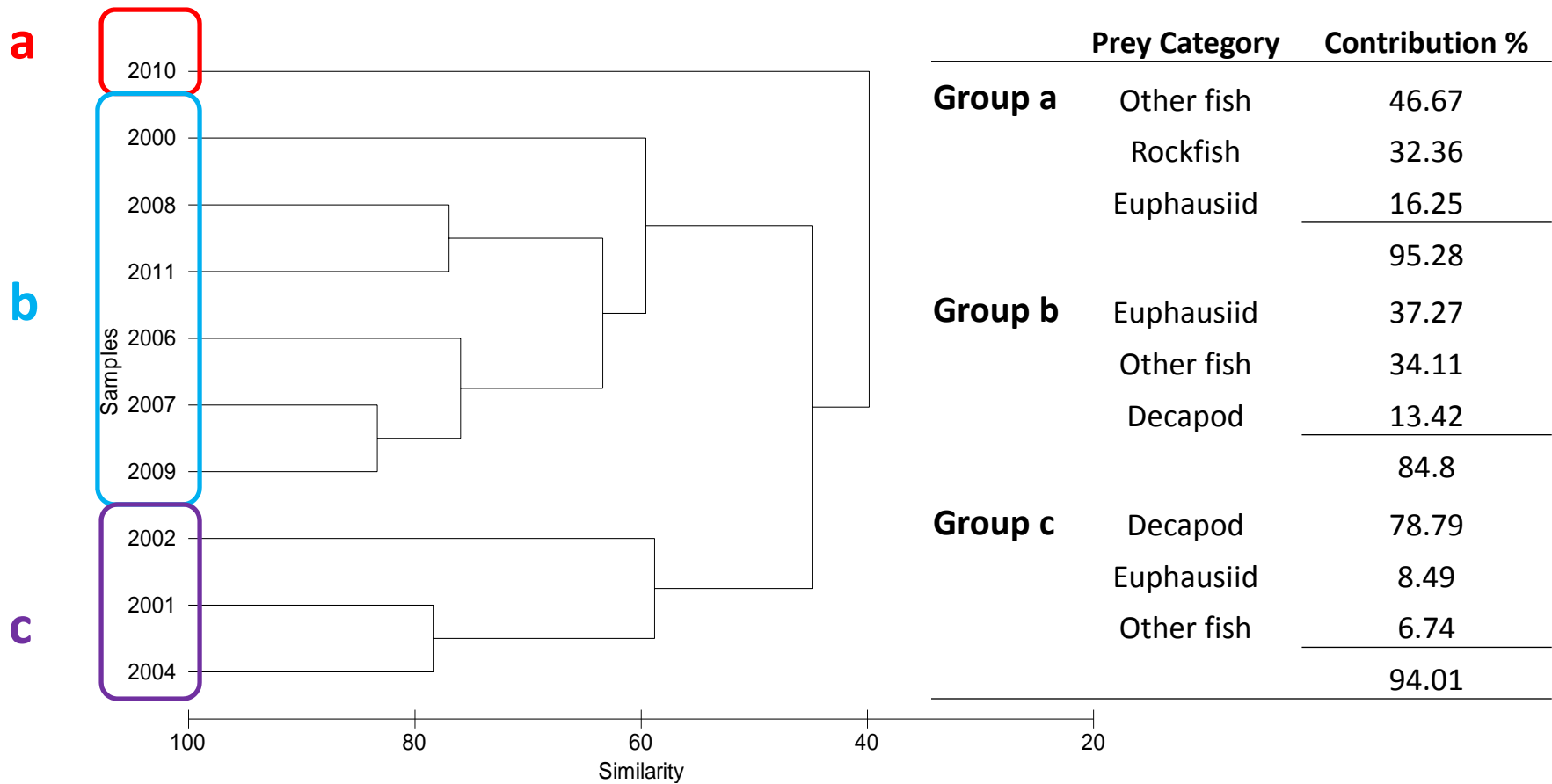
Estuary diet



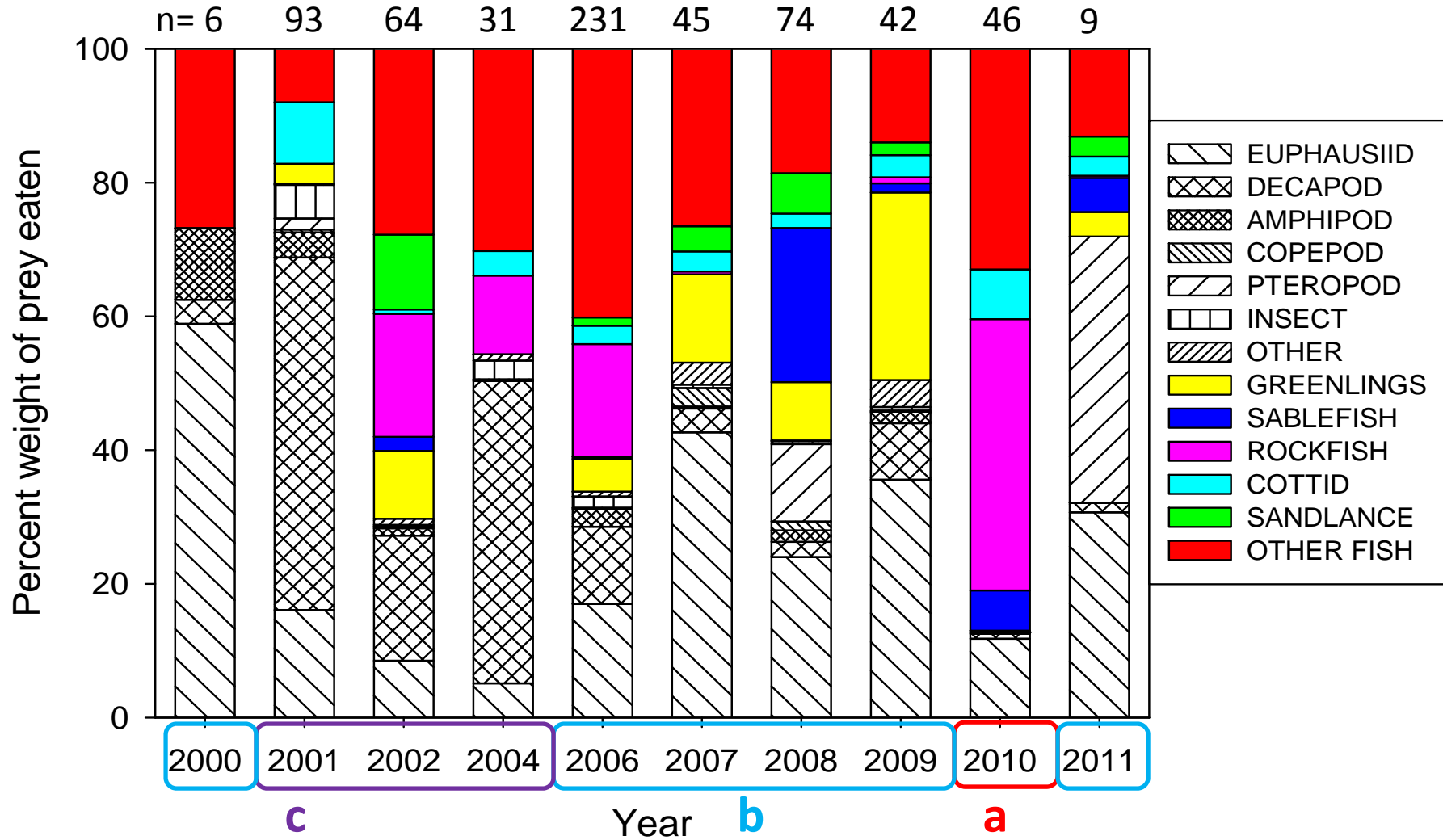
Ocean diet composition by year



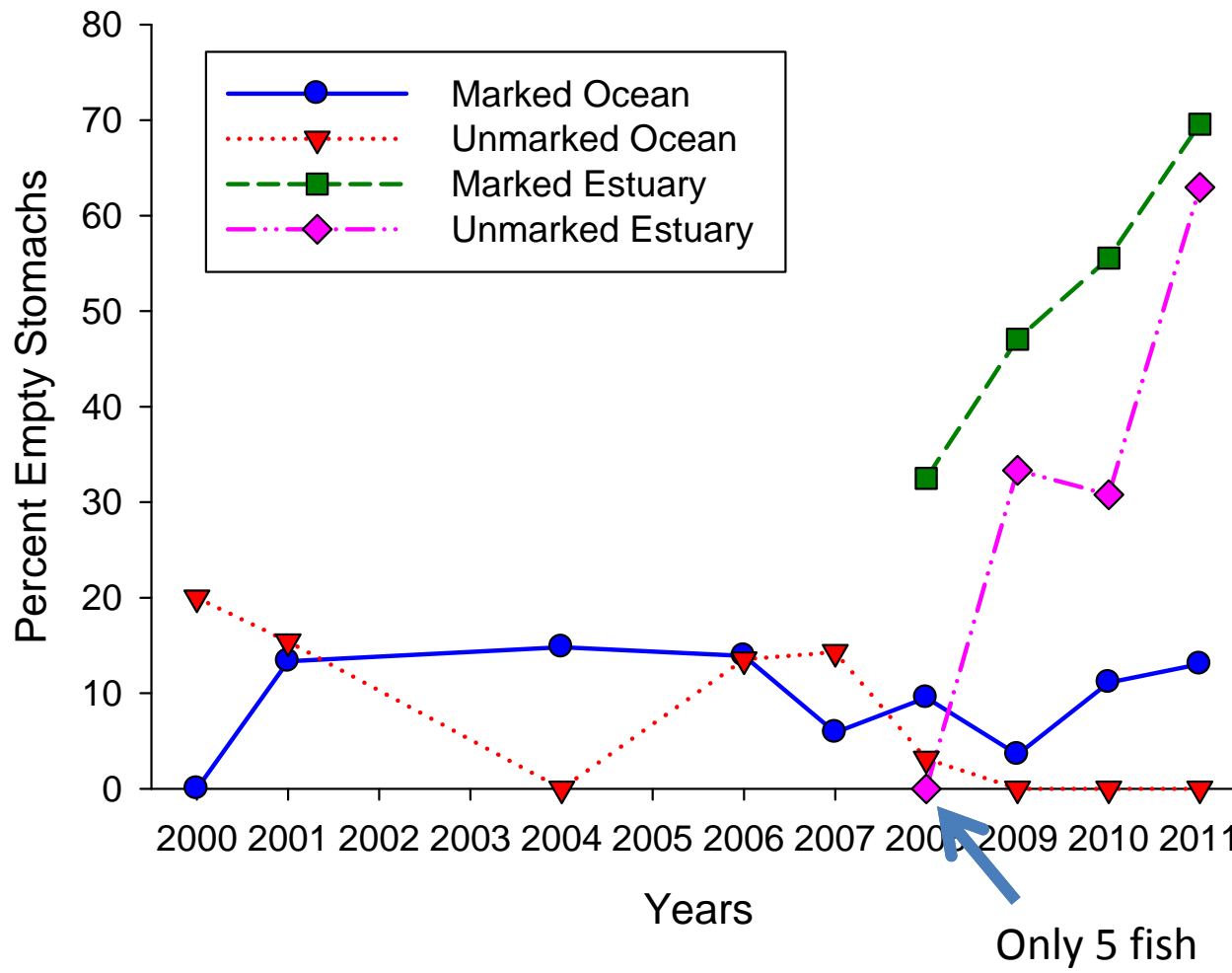
Cluster Analysis by Year-SIMPREF



Diet composition by year



Percent empty stomachs (% BW < 0.5%)



Conclusions

Distribution:

- Present in estuary during late April through early June
- Widespread and present at all transects mostly in May
- Not sampling far enough west to capture all juveniles
- Different migration patterns than coho and Chinook
- Need to determine genetic stock of origin for offshore fish

Hatchery-Wild:

- Hatchery fish are longer, but wild fish are fatter
- Hatchery fish have more empty stomachs
- No difference in growth rates and marine residency times (Not shown)
- Need to examine diet differences

Diet:

- Interannual variability related to ocean conditions and survival
- Wide variety of prey, fish most important (but also crab larvae and euphausiids)

ACKNOWLEDGEMENTS

NMFS/NWFSC - all those who go to sea to help collect data and process in lab

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