Mega-swarm of northern sea nettles (*Chrysaora melanaster*) in the Gulf of Alaska, winter 2019

Brian Hunt, IYS Workshop, PICES, 19-20 October 2019

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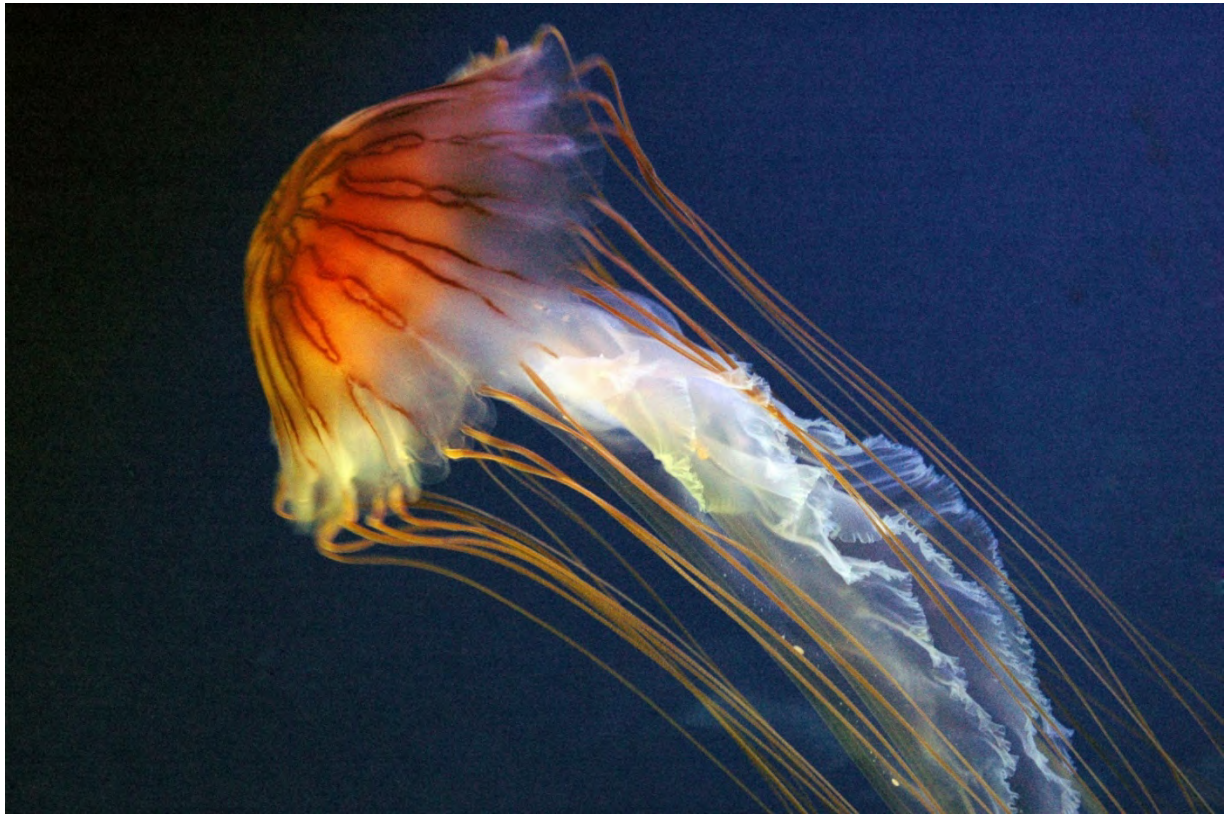
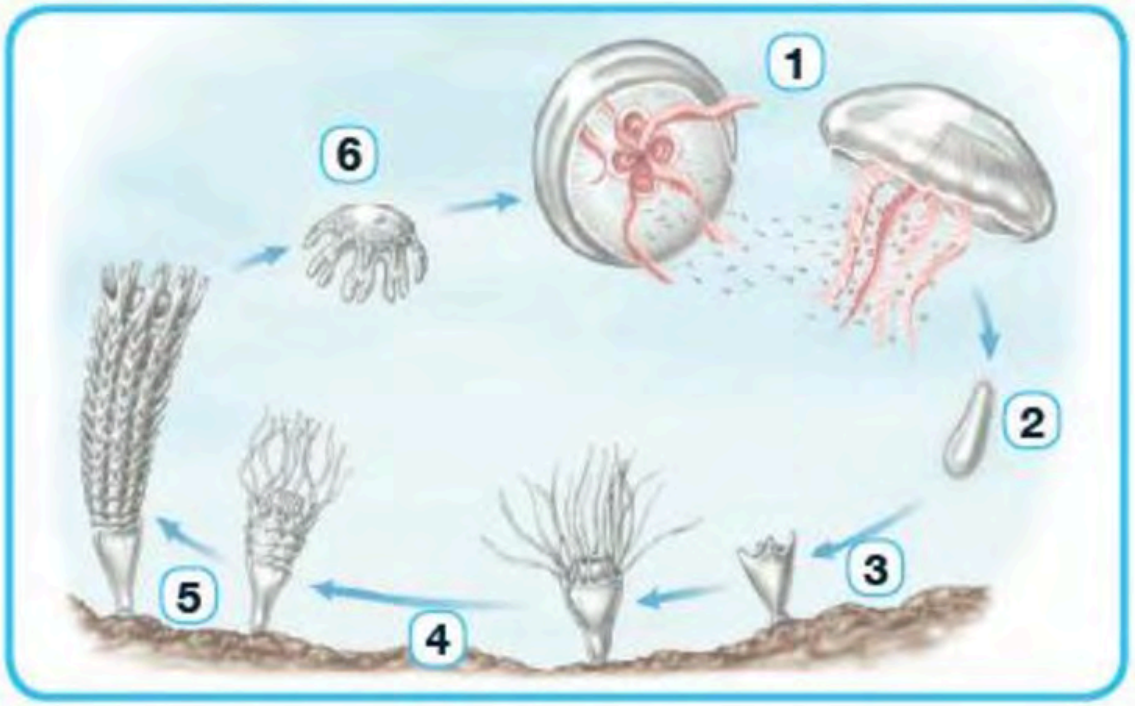
TODAYS PRESENTATION

1. Chrysaora in the Gulf of Alaska
2. Update on Stable Isotope analysis of food webs

Chrysaora melanaster – A scyphozoan jellyfish



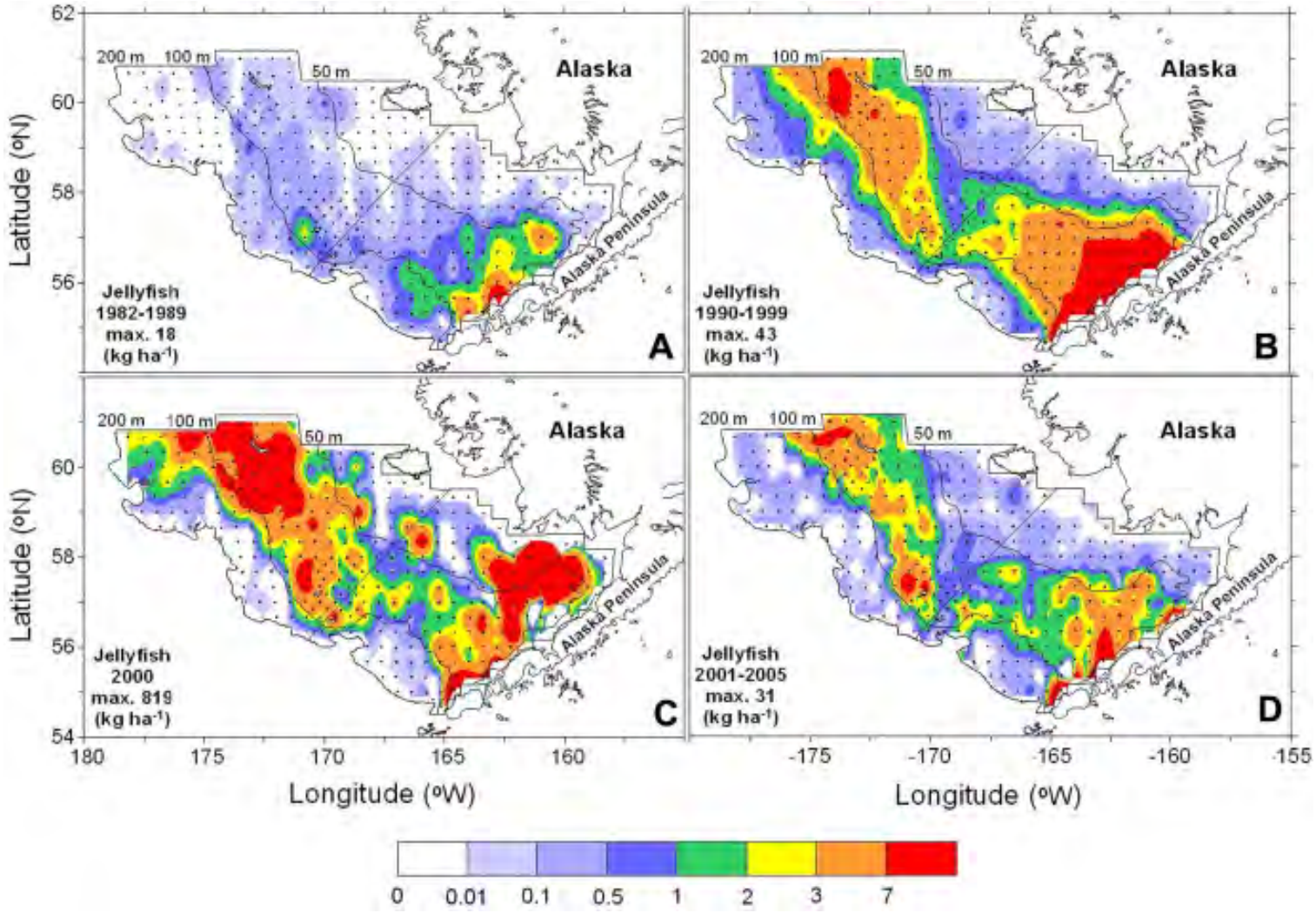
Chrysaora life cycle



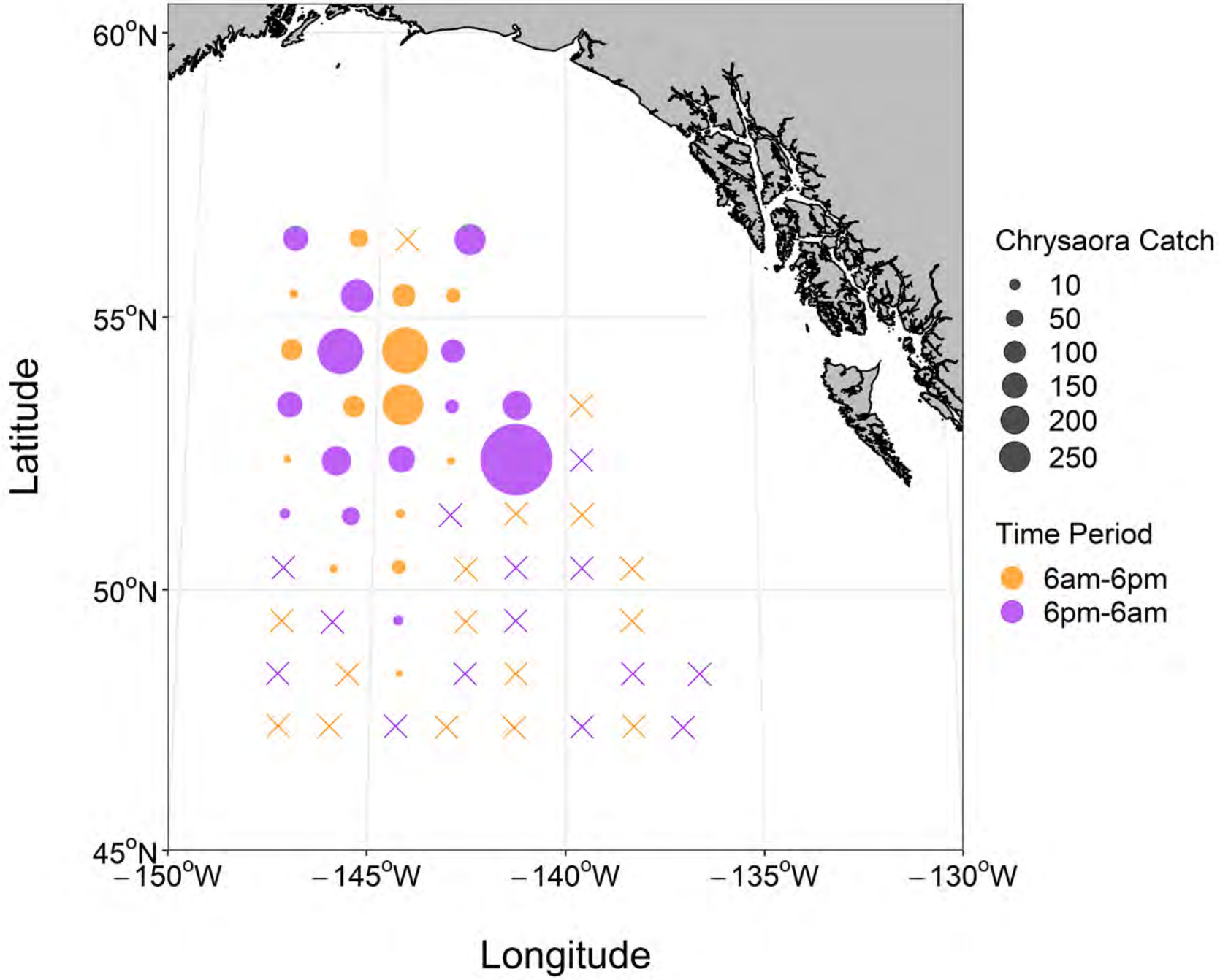
CHRYSAORA IN THE BERING SEA

- *Chrysaora* well documented in the Bering Sea;
- Particularly abundant in cold years;
- Have not found previous records of *Chrysaora* in the GoA

Bering Sea distributions - Brodeur et al 2008



CHRYSAORA DISTRIBUTION WINTER 2019



CHRYSAORA BIOMASS (WET WEIGHT)

Species	q	Frequency of occurrence (%)	Numbers (million fish)	Biomass (thousand tons)
Oncorhynchus gorbuscha	0.3	17.2	4.21	1.63
Oncorhynchus keta	total	63.8	27.73	27.70
Oncorhynchus nerka	total	31.0	9.04	10.30
Oncorhynchus kisutch	0.3	37.9	13.59	10.37
Oncorhynchus tshawytscha	0.3	5.17	0.37	1.32
All species	**total**	**82.8**	**54.95**	**51.33**
Chrysaora melonaster	**0.1**	**51.7**	**5,021.54**	**1,233.49**

****Dry weight: Salmon = 10.26 vs *Chrysaora* 50.57 thousand tons**

FOOD CONSUMPTION

Chrysaora were distributed in the northern area (265,200 km^2)

Zooplankton biomass (Juday Net - upper 200m)
485,316 tons Carbon

Chrysaora biomass
2386.8 – 3978 tons Carbon

% winter zoo standing stock consumption (November to Feb)
Ave = 13.5%, Max = 35%
Brodeur estimated 33% for Bering sea (Broduer et al MEPS 2002)

Important factors in calculations

- Catchability coefficient - Visual observations indicated that q was 10% of actual biomass
- Daily ration

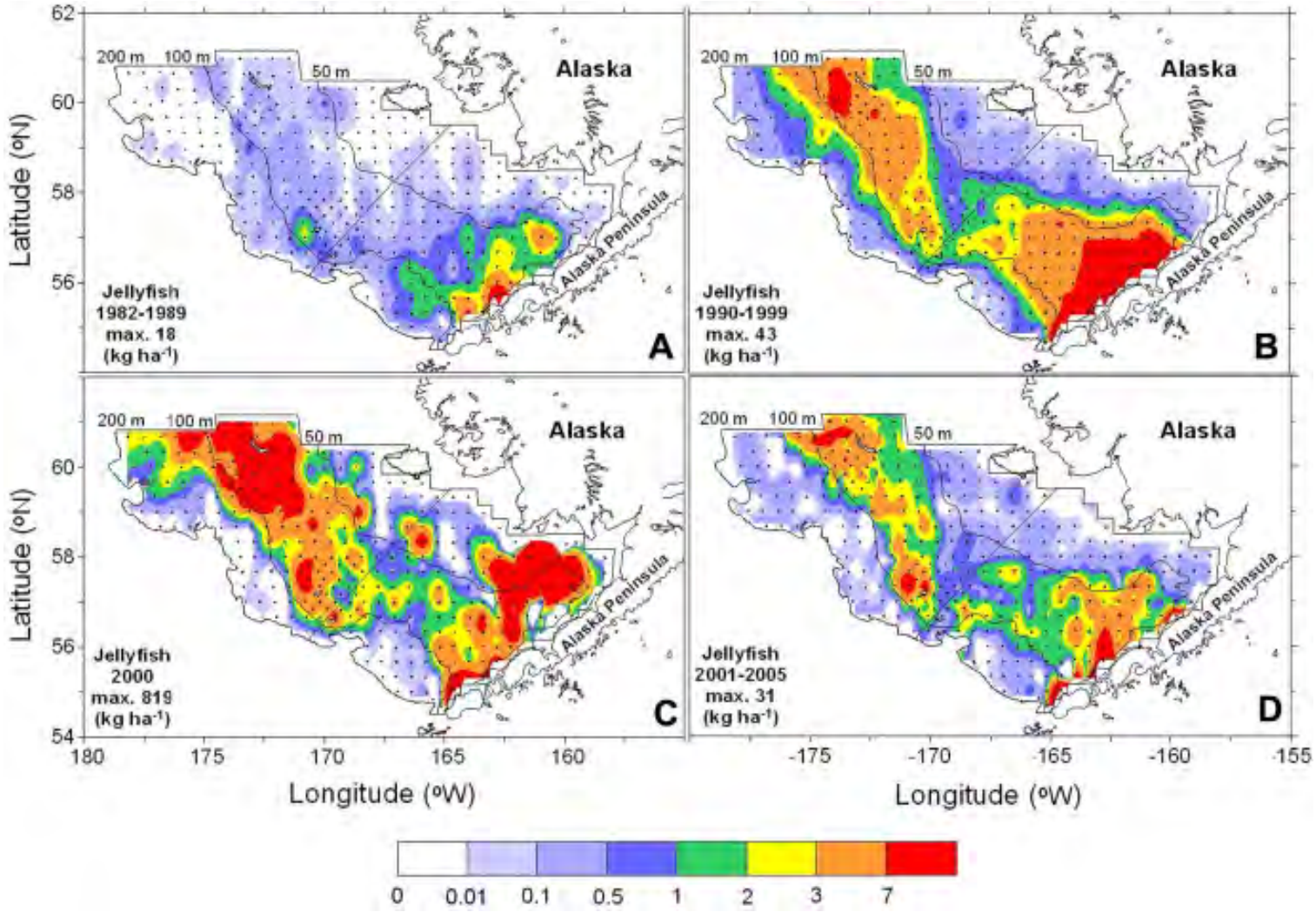
SOURCE OF CHRYSAORA

- *Chrysaora* well documented in the Bering Sea

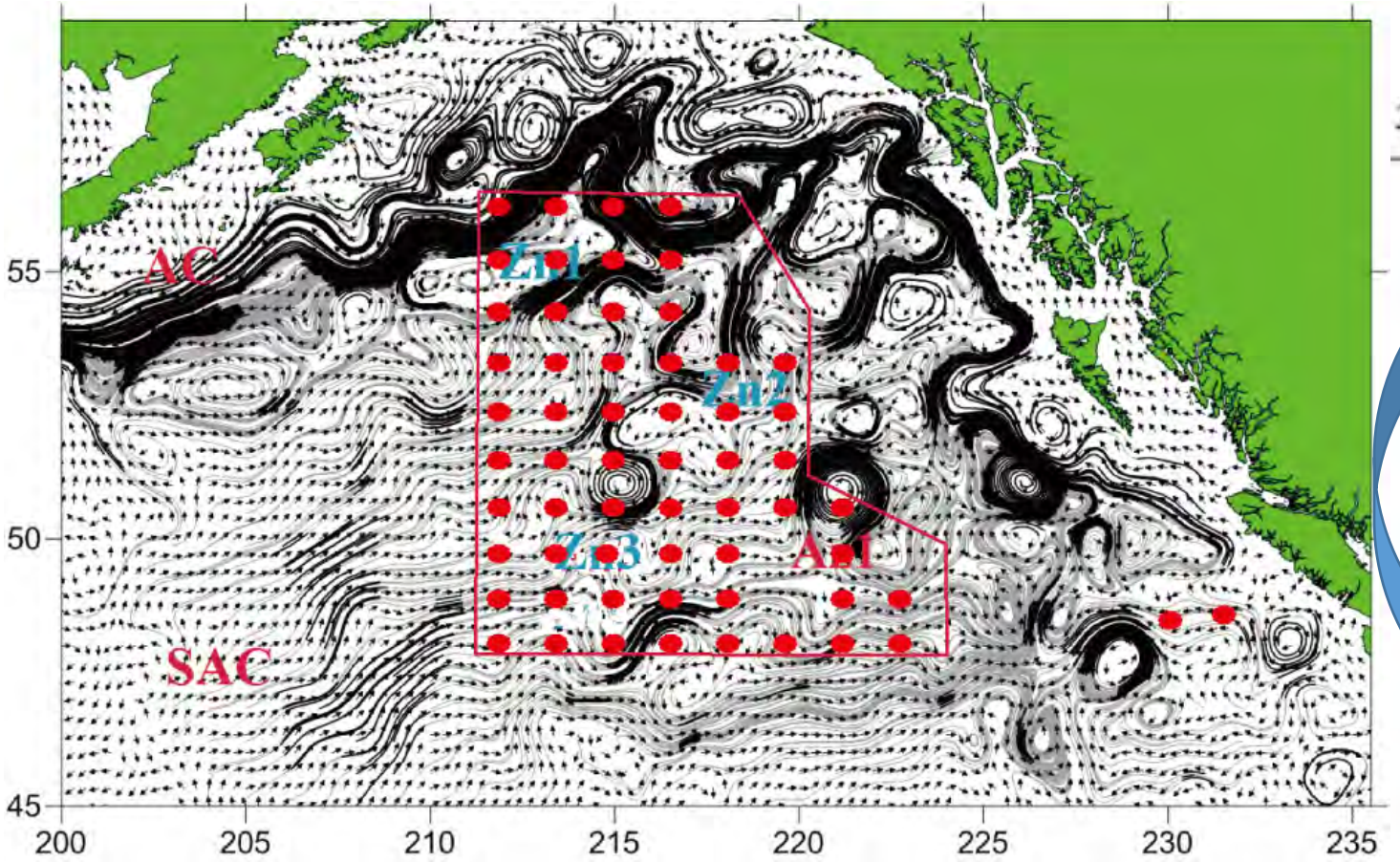
- Particularly abundant in cold years;

- Center of distribution appears to be Aleutian Islands
  - ➢ Support for benthic polyp phase
  - ➢ Aleutian shelf the likely source to the GoA

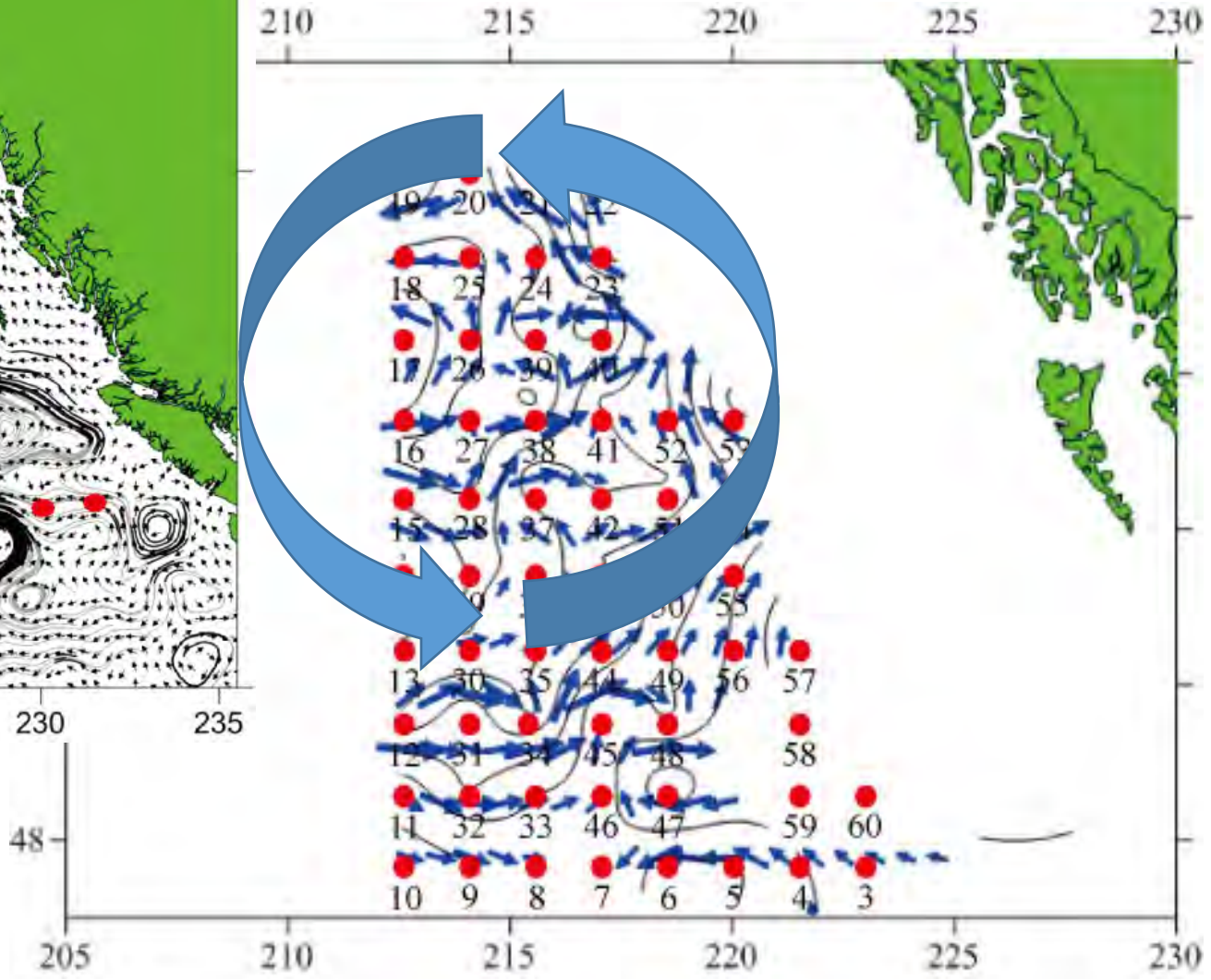
Bering Sea distributions - Brodeur et al 2008



Modelled circulation

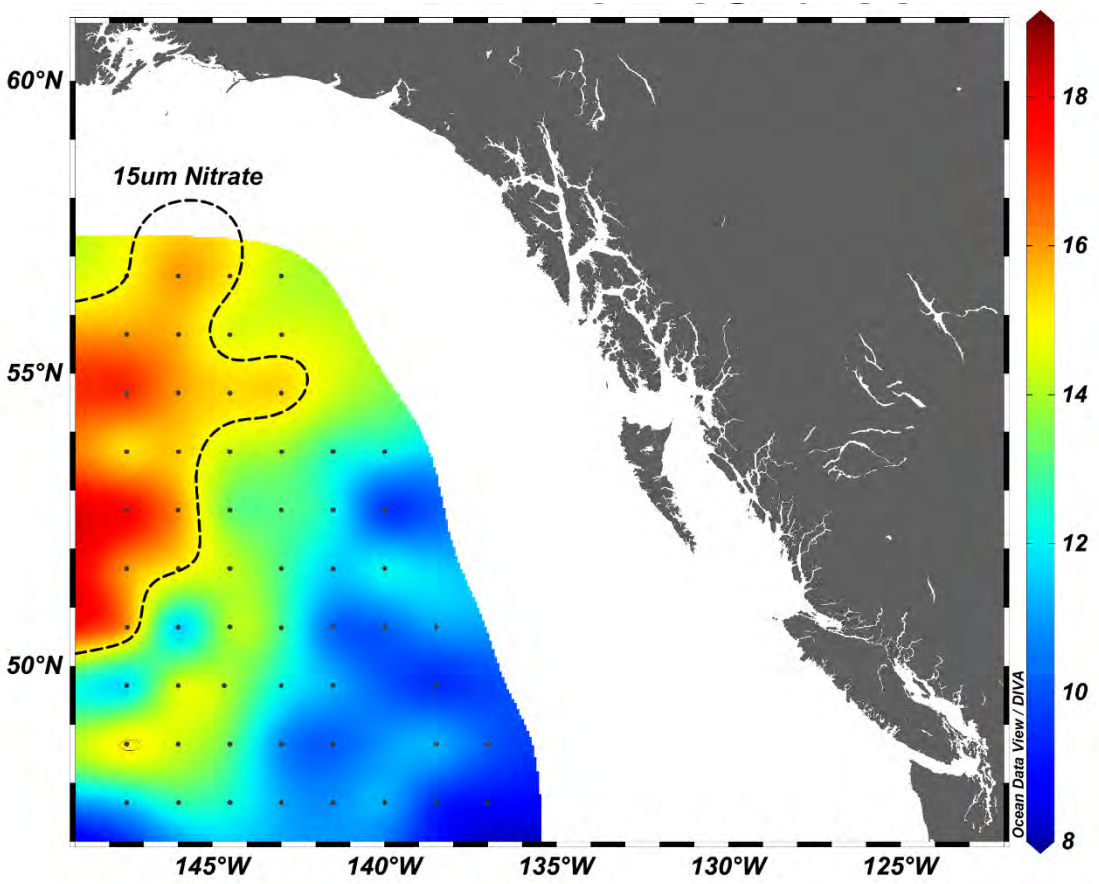


Current vectors

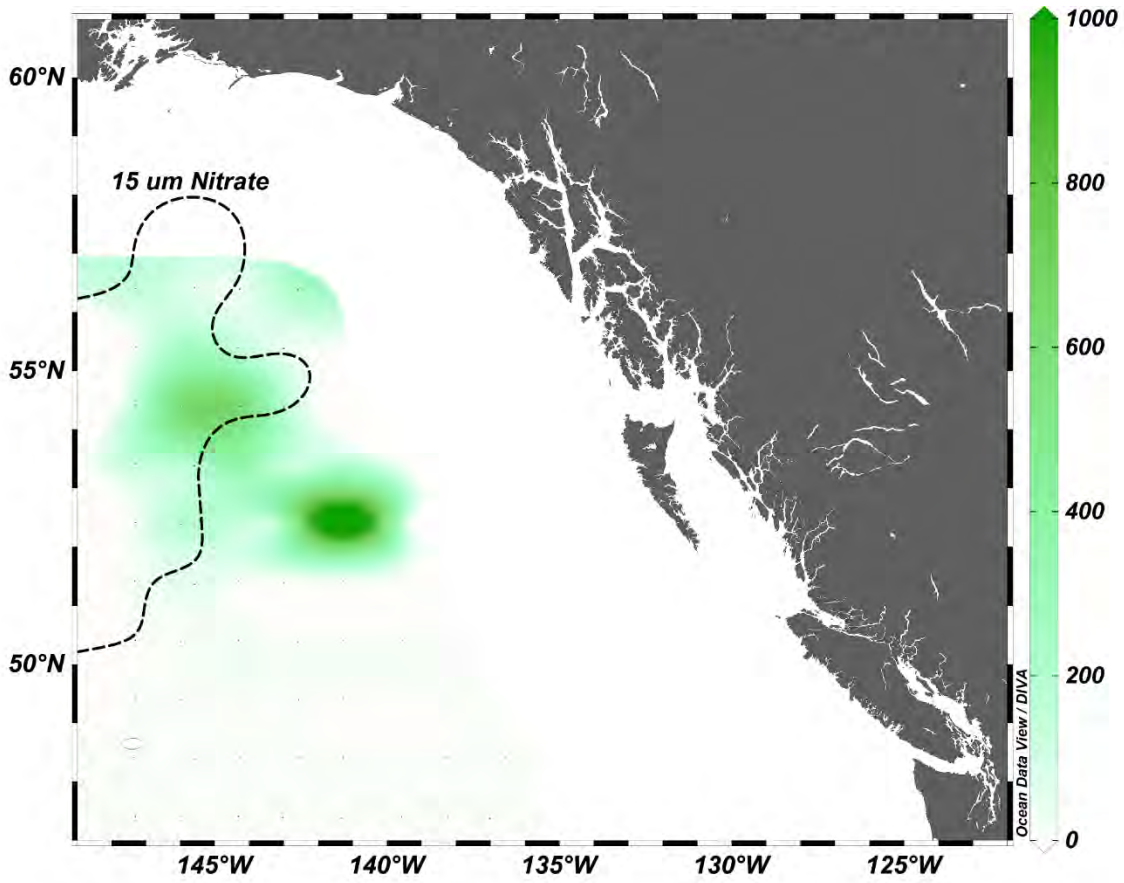


CHRYSAORA IN THE ALASKA GYRE

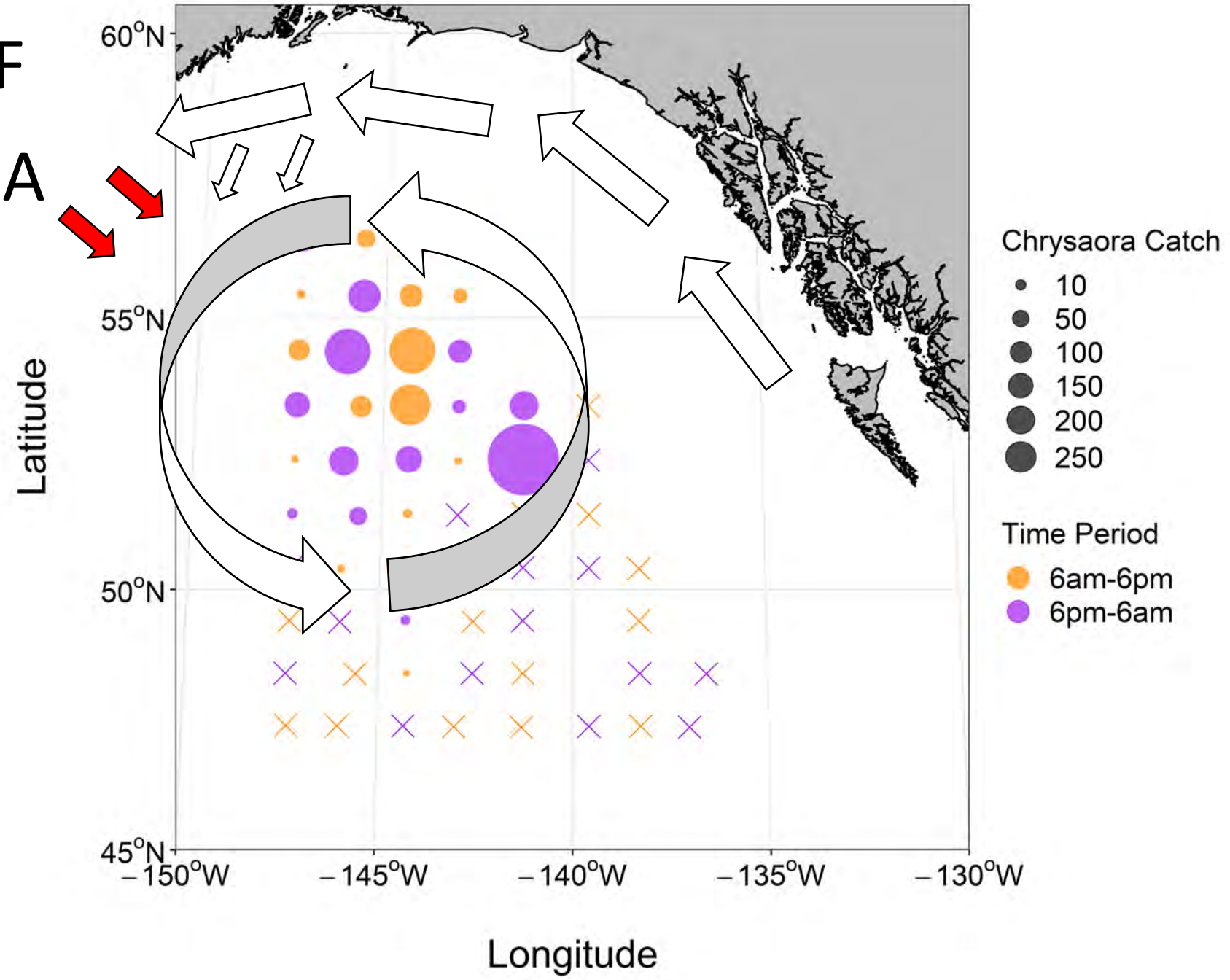
Whitney 2005 – defined the central gyre by the 15µM nitrate contour (upwelling)



Chrysaora within and on edge of the gyre



Source of Chrysaora



FURTHER CONSIDERATIONS

Chrysaora clearly overwintered in the GoA

- What is their life cycle in this region? Longevity?
- Do they recruit back to the shelf?
- Is the GoA a dead end?

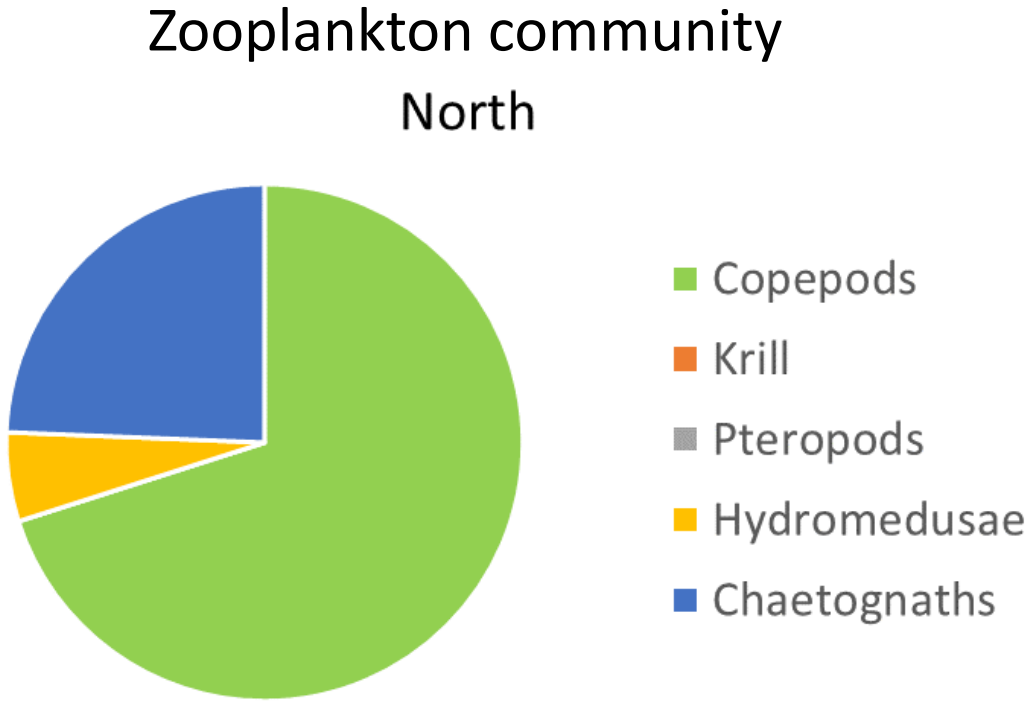
Can not find prior records of Chrysaora in the GoA

- Is this normal? (not reported)
- Is this is a shift in the ecosystem dynamic (increased southward transport?)

FURTHER CONSIDERATIONS

Where do they fit in the food web?

- Consumption calculations used entire zooplankton community
- Data from Bering Sea suggests that they favour large crustacean zooplankton and small fish - may have underestimated impact on salmon prey



Next steps

Isotopic analysis of the GoA food web

Phytoplankton (POM)

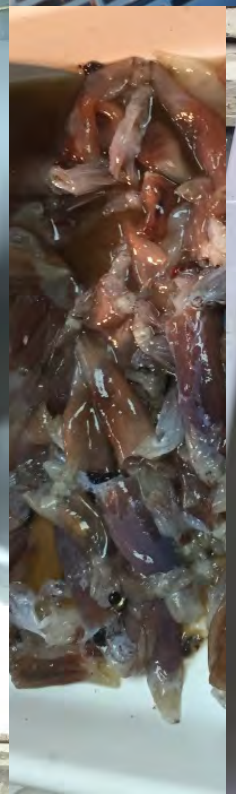
Zooplankton

- Size fractions & major species

Micronekton

Nekton

All salmon species

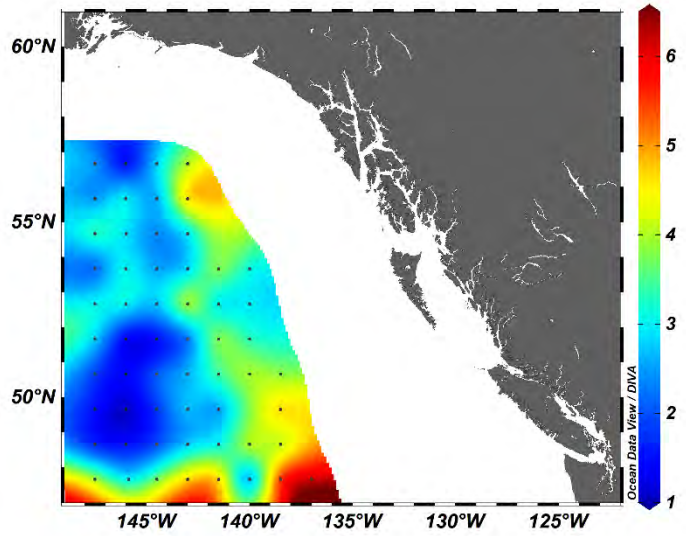


Next steps

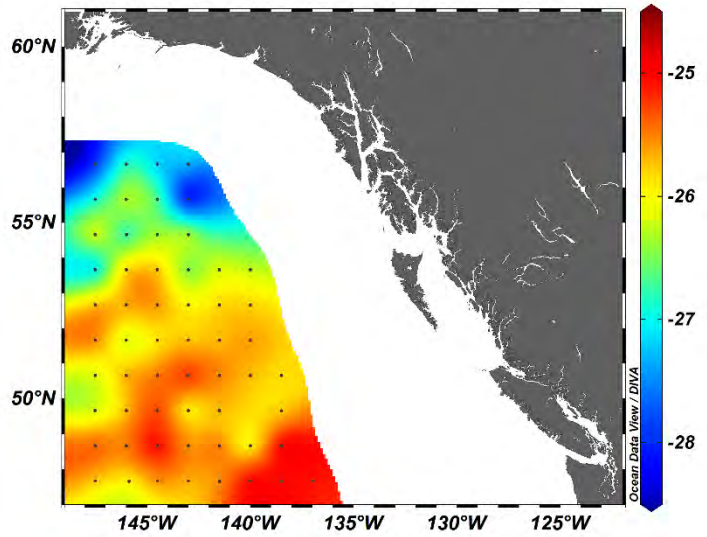
Isotopic analysis of the GoA food web

POM from all stations already processed; data in hand

POM $\delta^{15}N$



POM $\delta^{13}C$



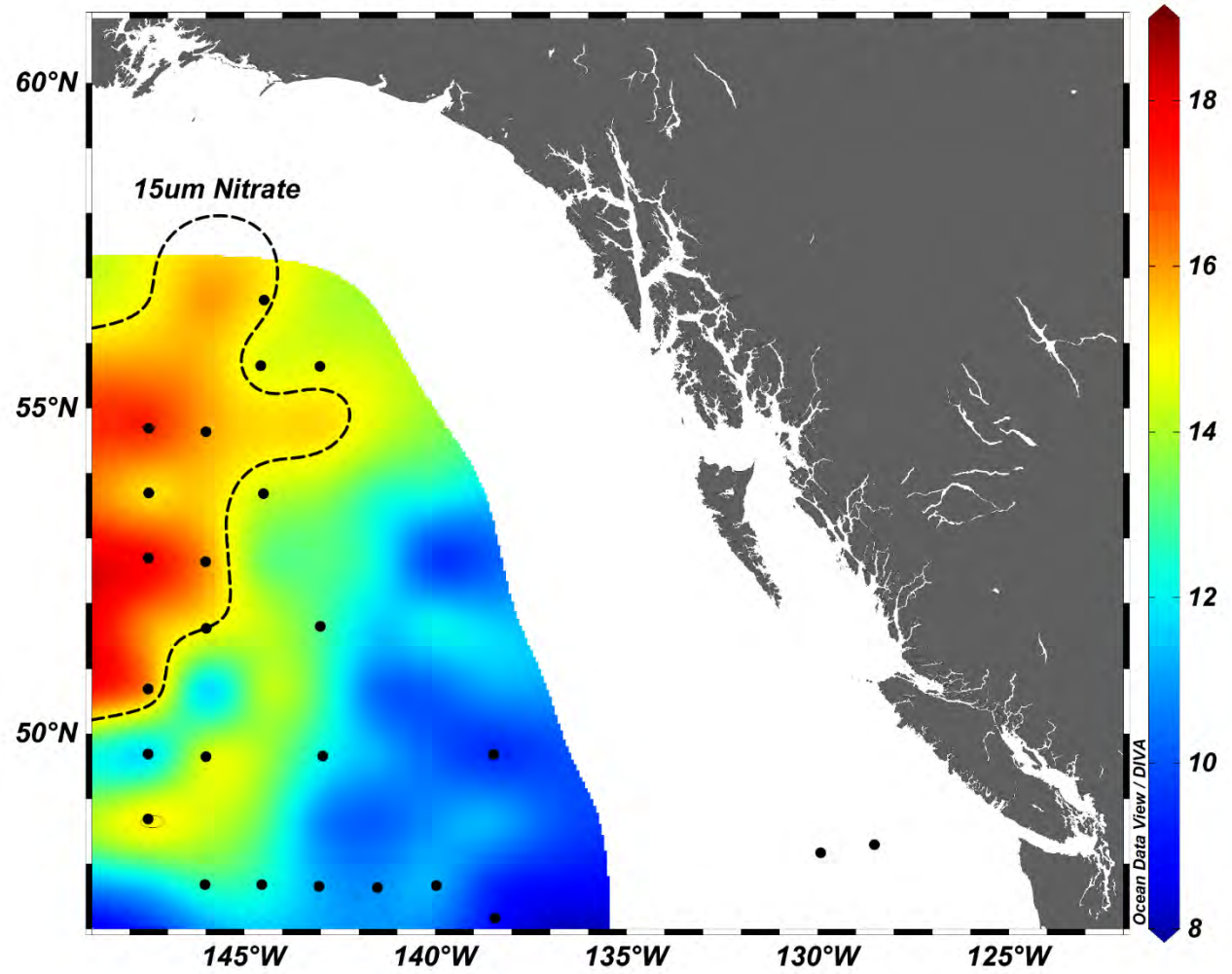
NEXT STEPS

Isotopic analysis of the GoA food web

POM from all stations already processed; data in hand

Full catch from 26 Stations processed and submitted for analysis.

Stations processed for isotopes



NEXT STEPS

Isotopic analysis of the GoA food web

Food web mapping

- Species & size based trophic levels
- Mixing models to estimate contributions of major macroplankton / micronekton taxa to predators; niche overlap and potential competition among consumers, e.g., salmon and *Chrysaora*

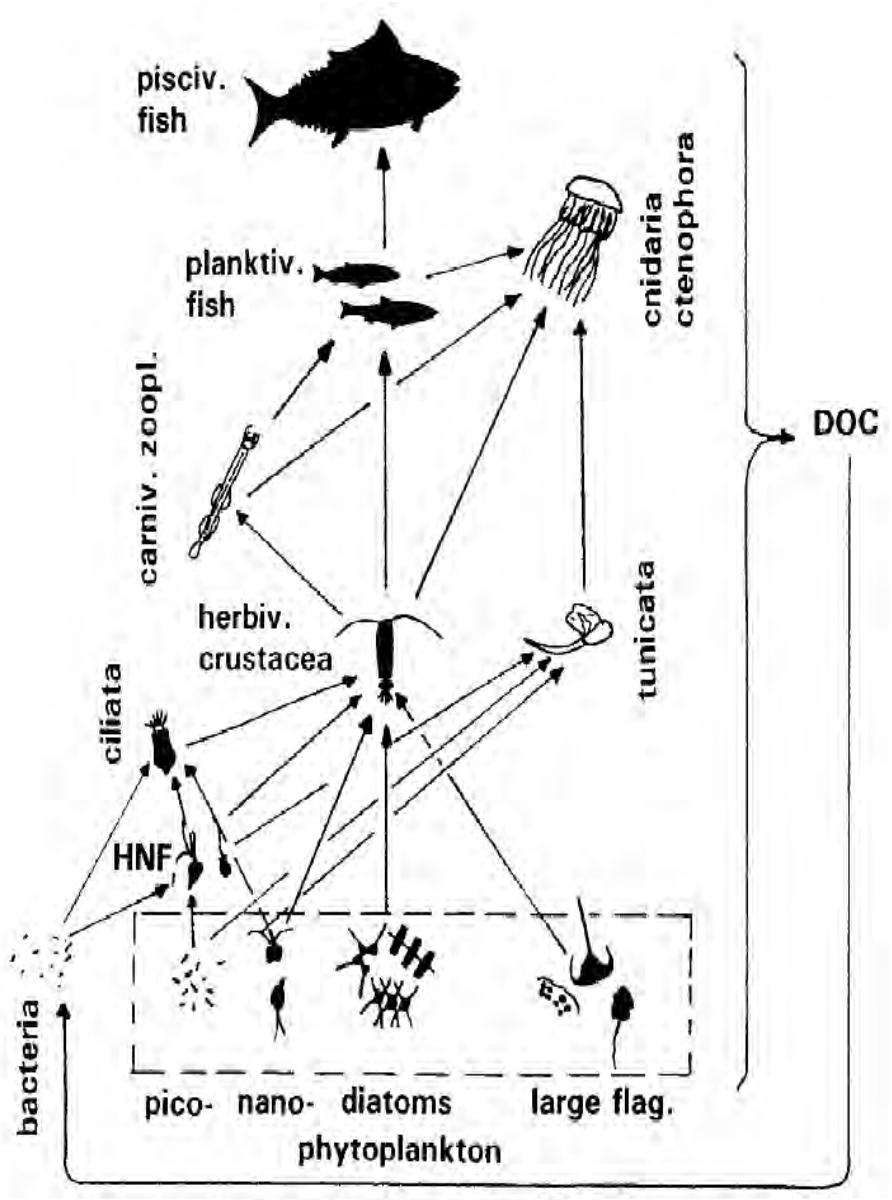
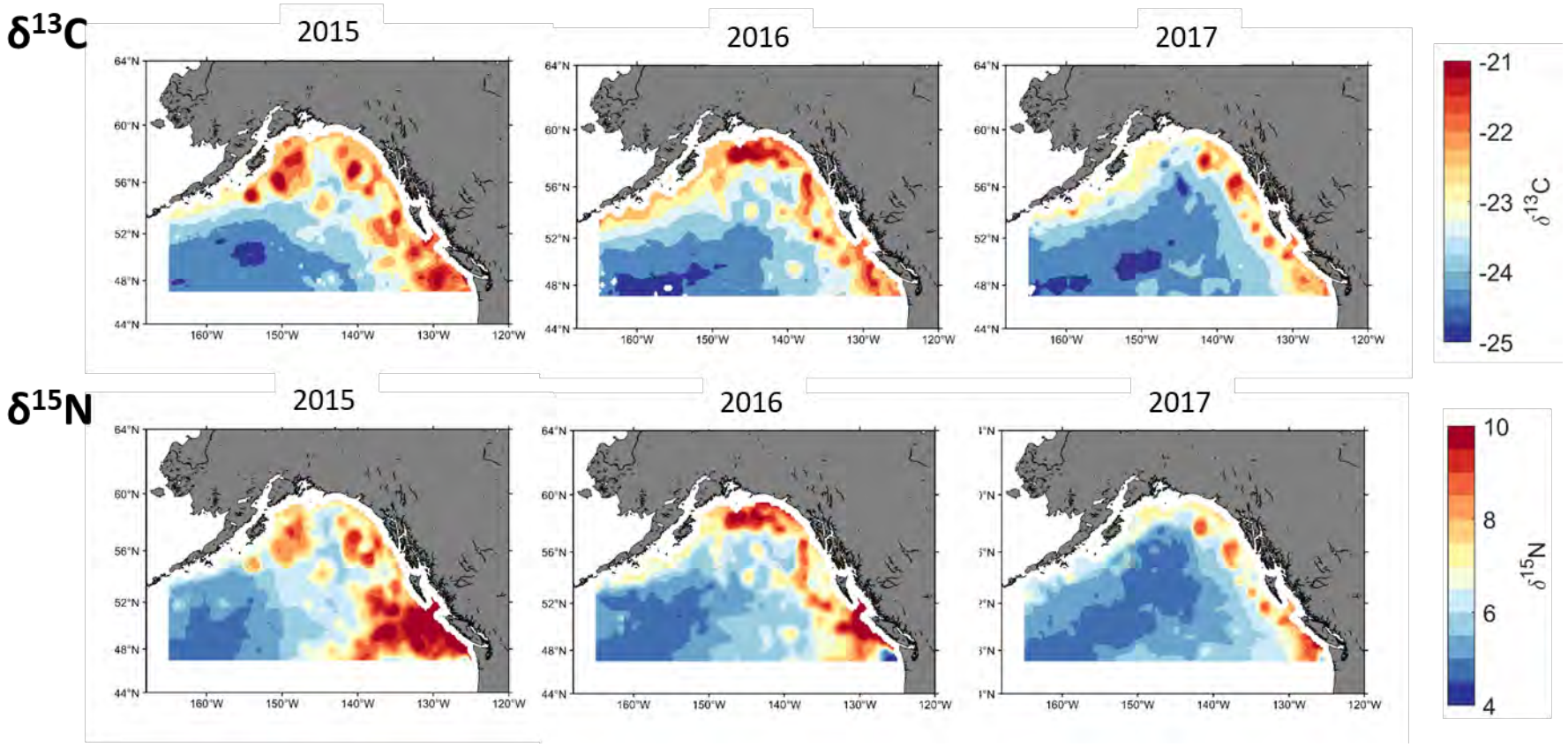


Figure 1. Generalised pelagic food web.

NEXT STEPS

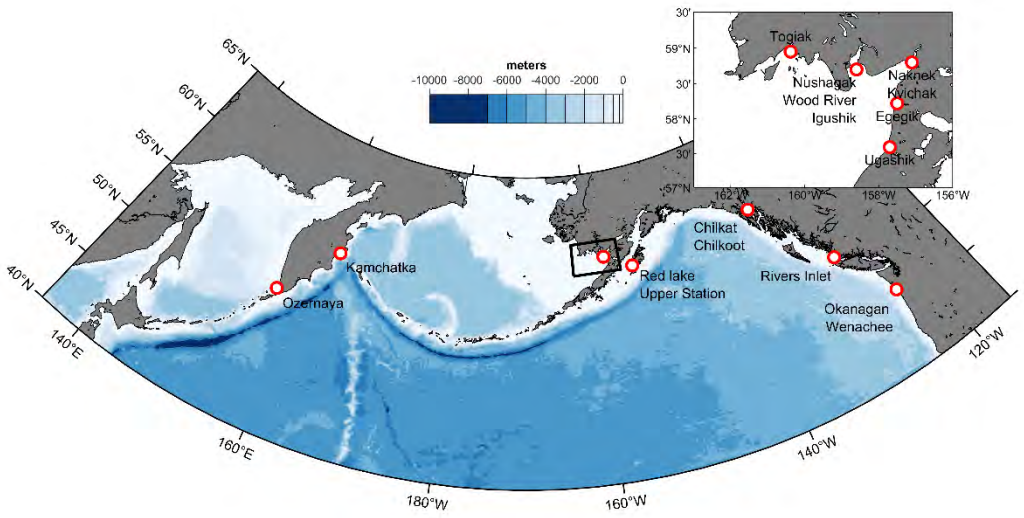
Validation of North Pacific Isoscapes



NEXT STEPS

Comparison of isotope derived predictions of salmon distribution with catch

Salmon stocks



In review

Predicted distributions

(estimated using salmon isotopes time series)