Apr 26th, 9:45 AM - 11:15 AM

Zooplankton community composition and biomass across a latitudinal gradient in the southern Salish Sea, 2014-2021

Amanda Winans
University of Washington

BethElLee Herrmann
University of Washington

Julie Keister
University of Washington

Zooplankton composition in the southern Salish Sea and responses during the 2014-2016 Pacific marine heatwave

Amanda Winans, BethElLee Herrmann, and Julie Keister

(University of Washington)

School of Oceanography
University of Washington

Puget Sound Zooplankton Monitoring Program

Purposes:

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1) To use zooplankton as environmental indicators.

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    - Time in Puget Sound is a critical feeding period
    - Body size is correlated with ocean survival

Zooplankton Diversity

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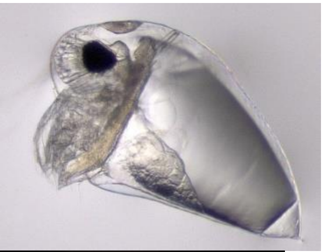
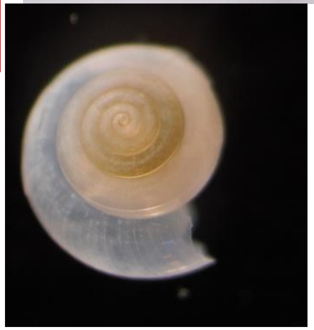







Zooplankton Diversity

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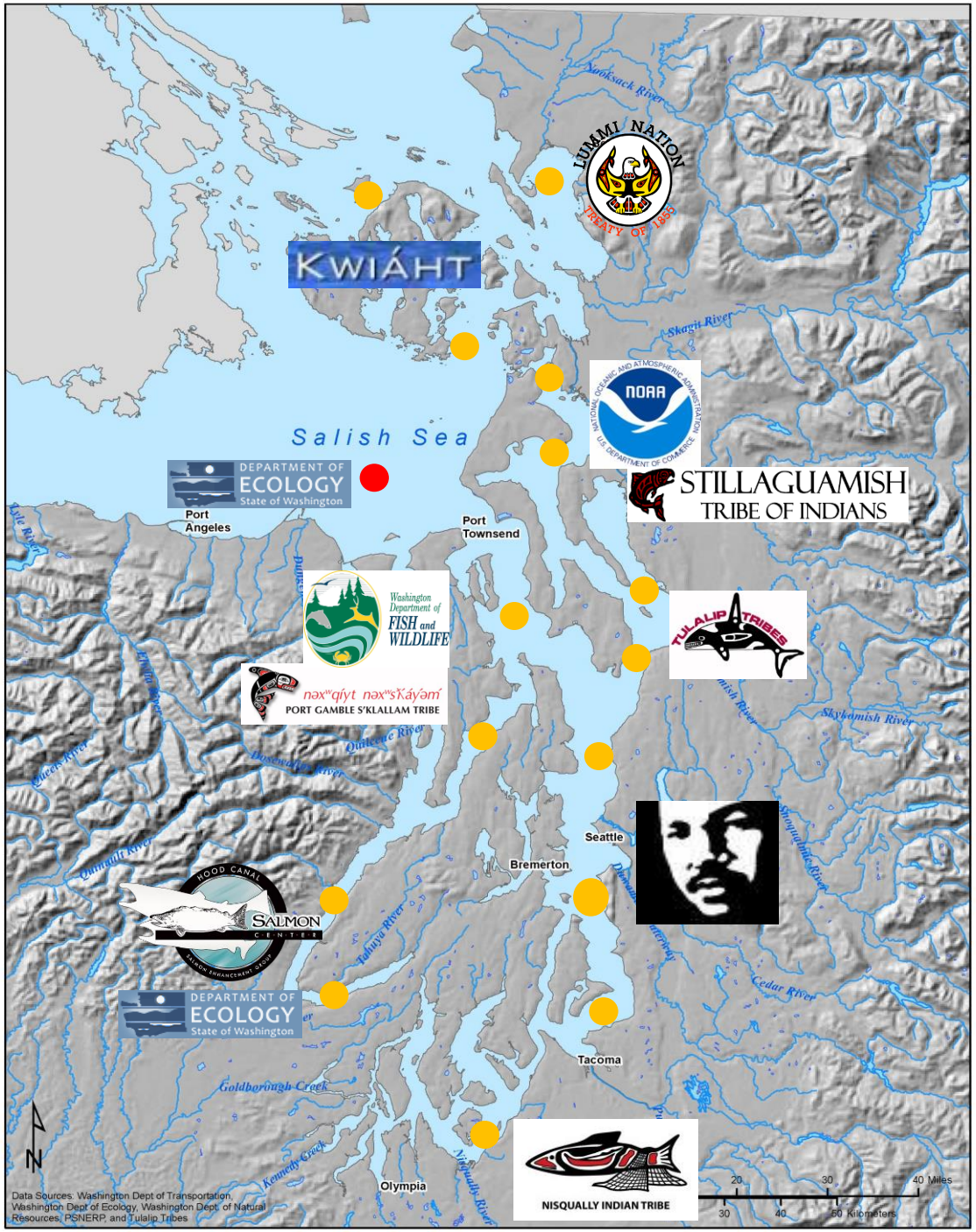
Puget Sound sampling:

At most locations
Bi-weekly sampling March-Oct
Many stations now year-round

Vertical net tows
Full water column tows
in ~100-200 m depth
60-cm dia., 200-µm mesh

CTD and chlorophyll data:
1997-present, monthly
(WA Dept of Ecology and King County)



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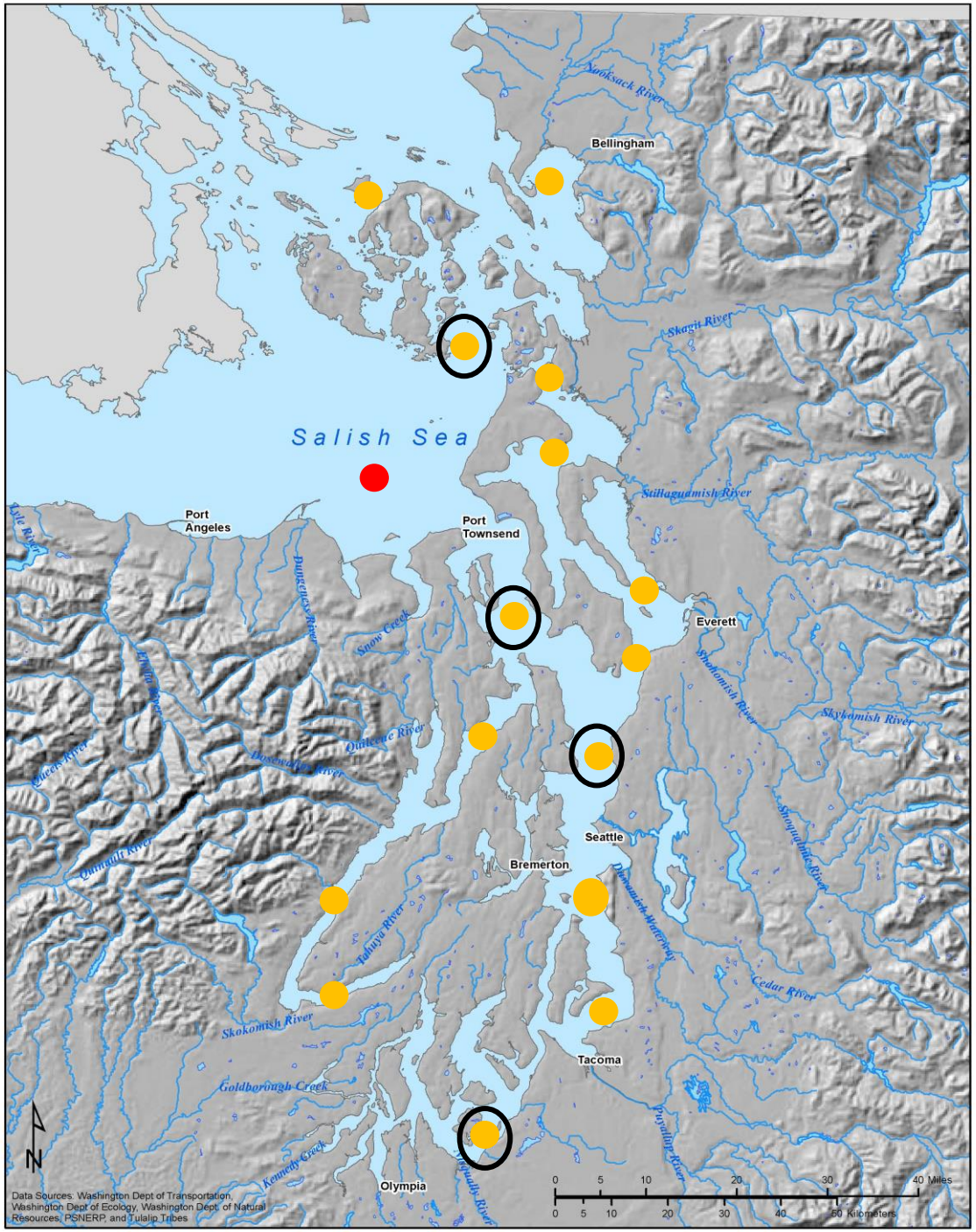

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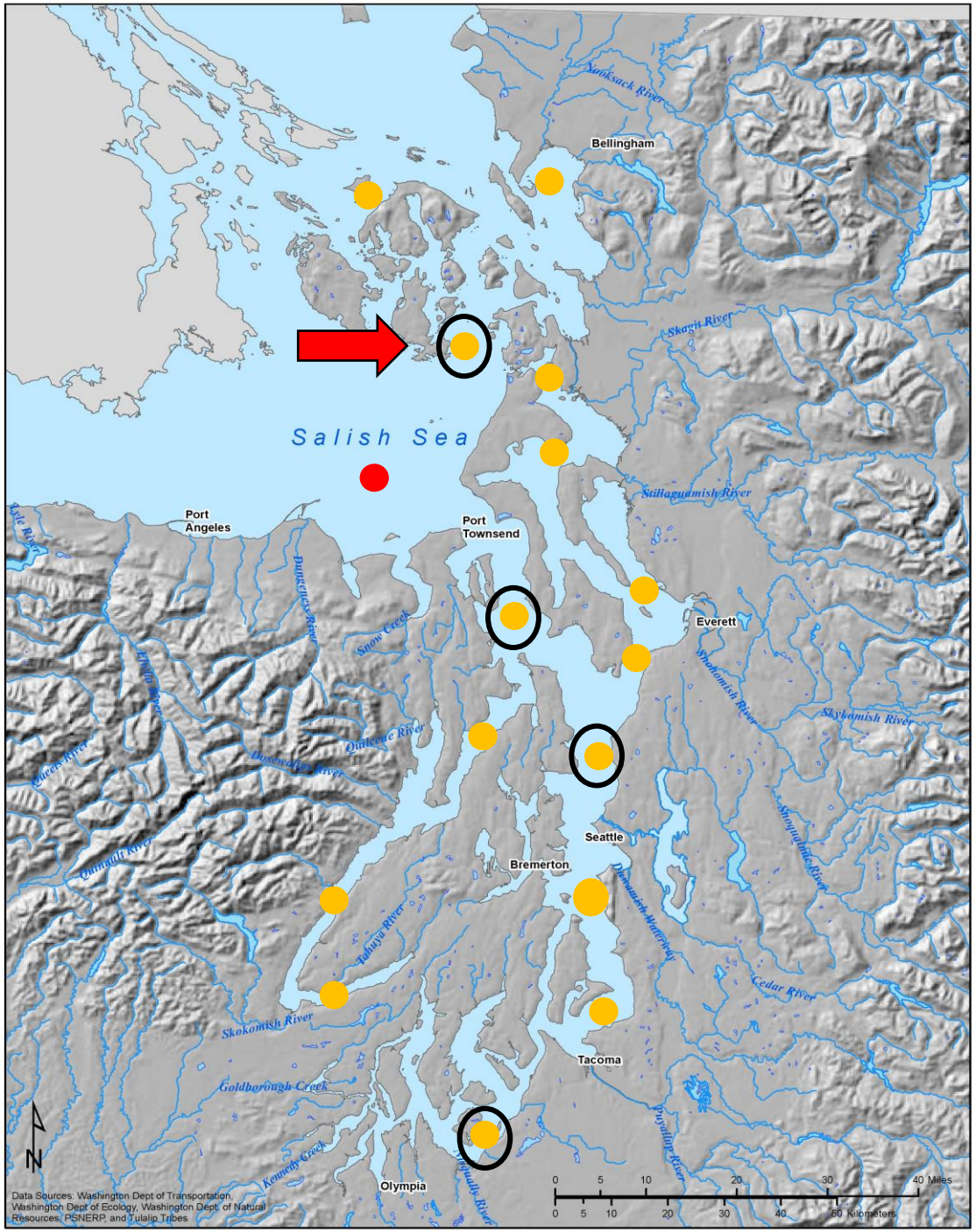

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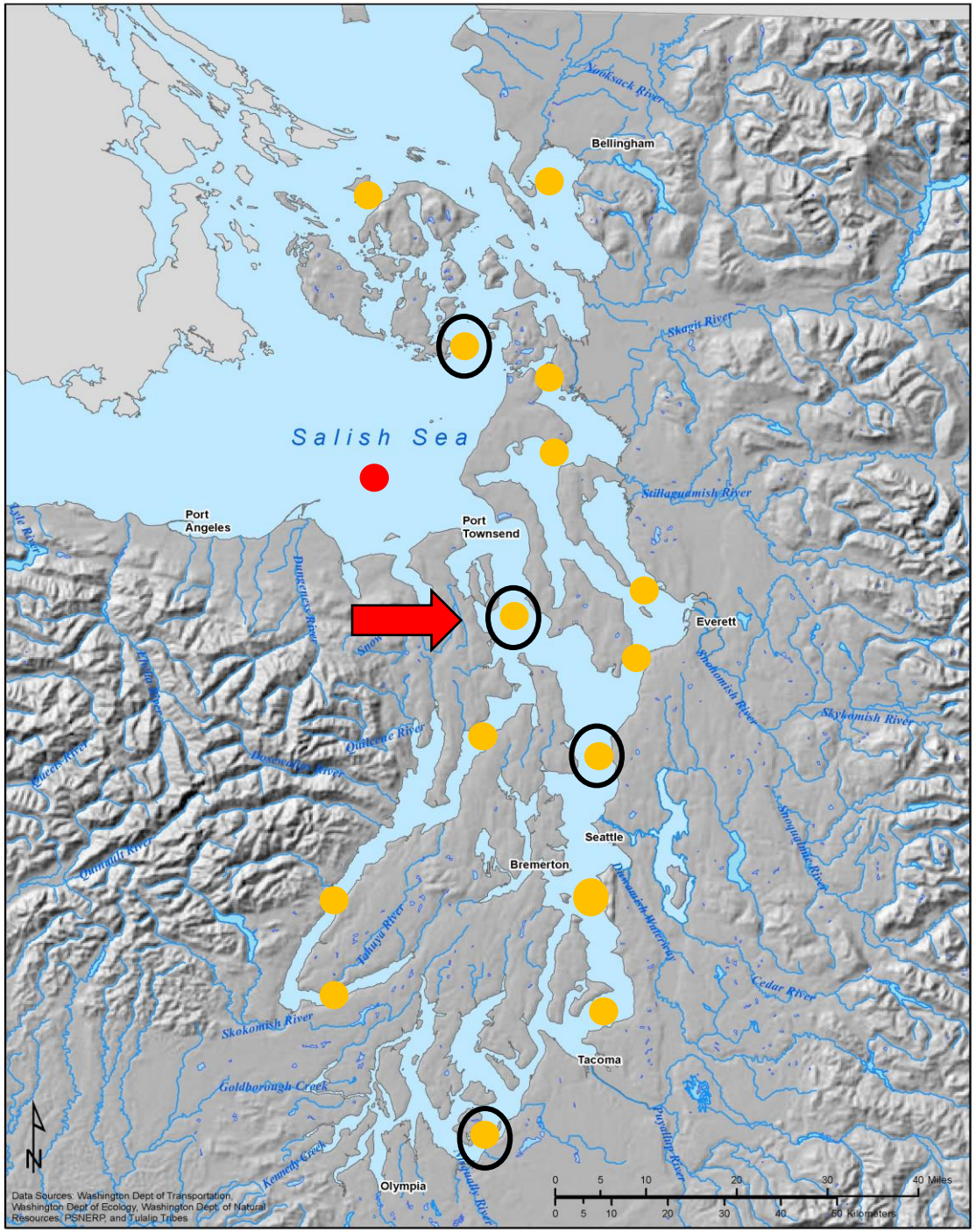

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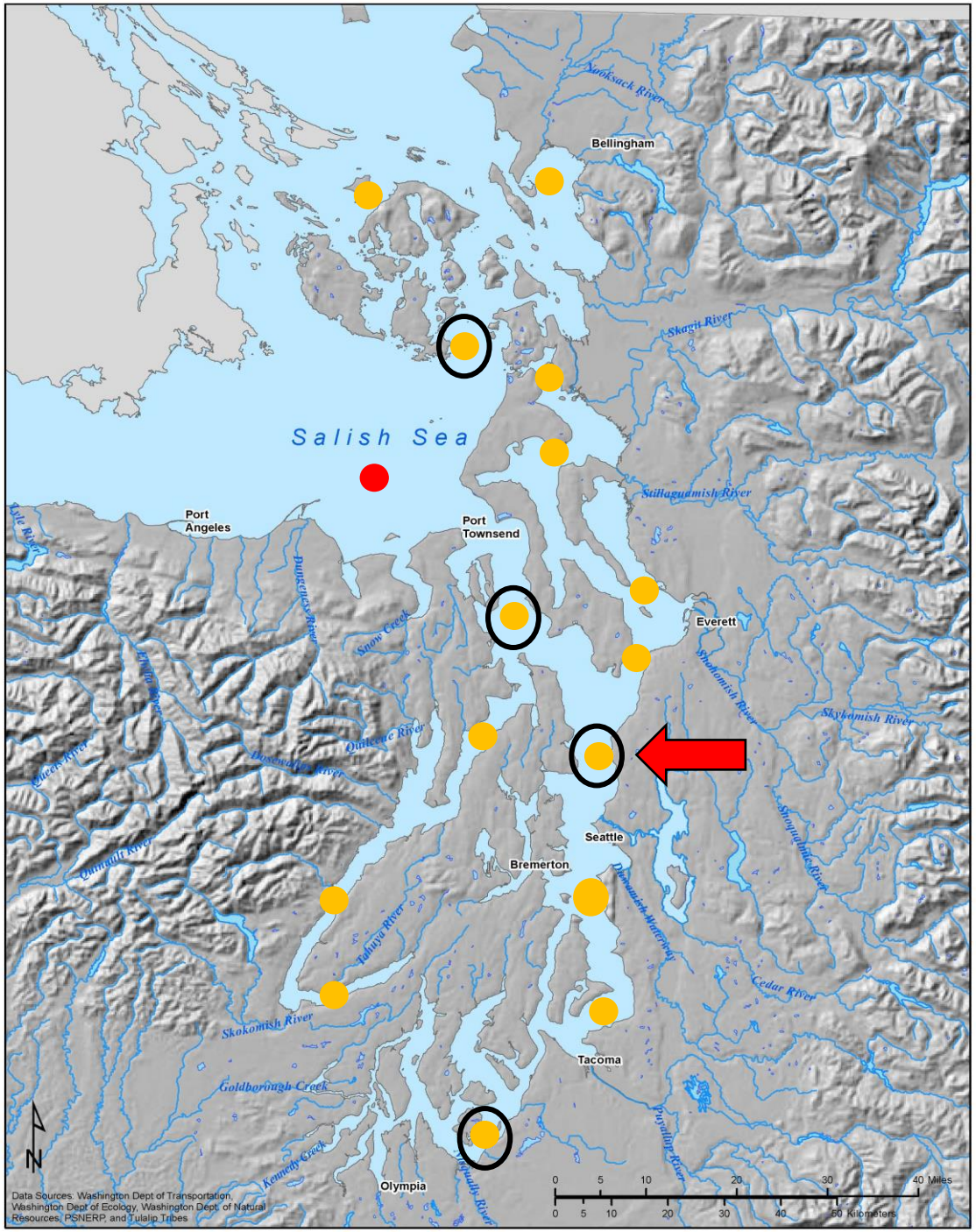

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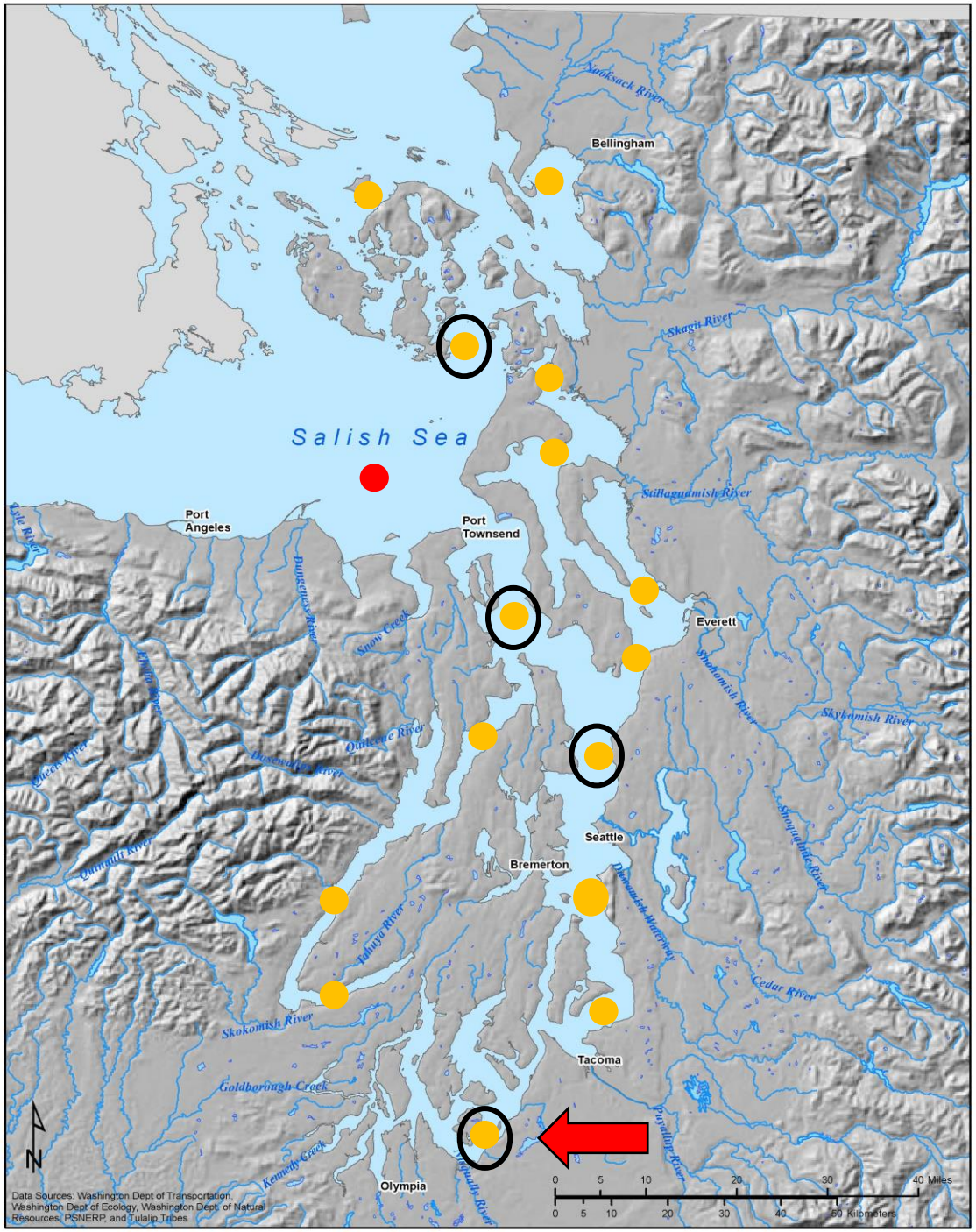
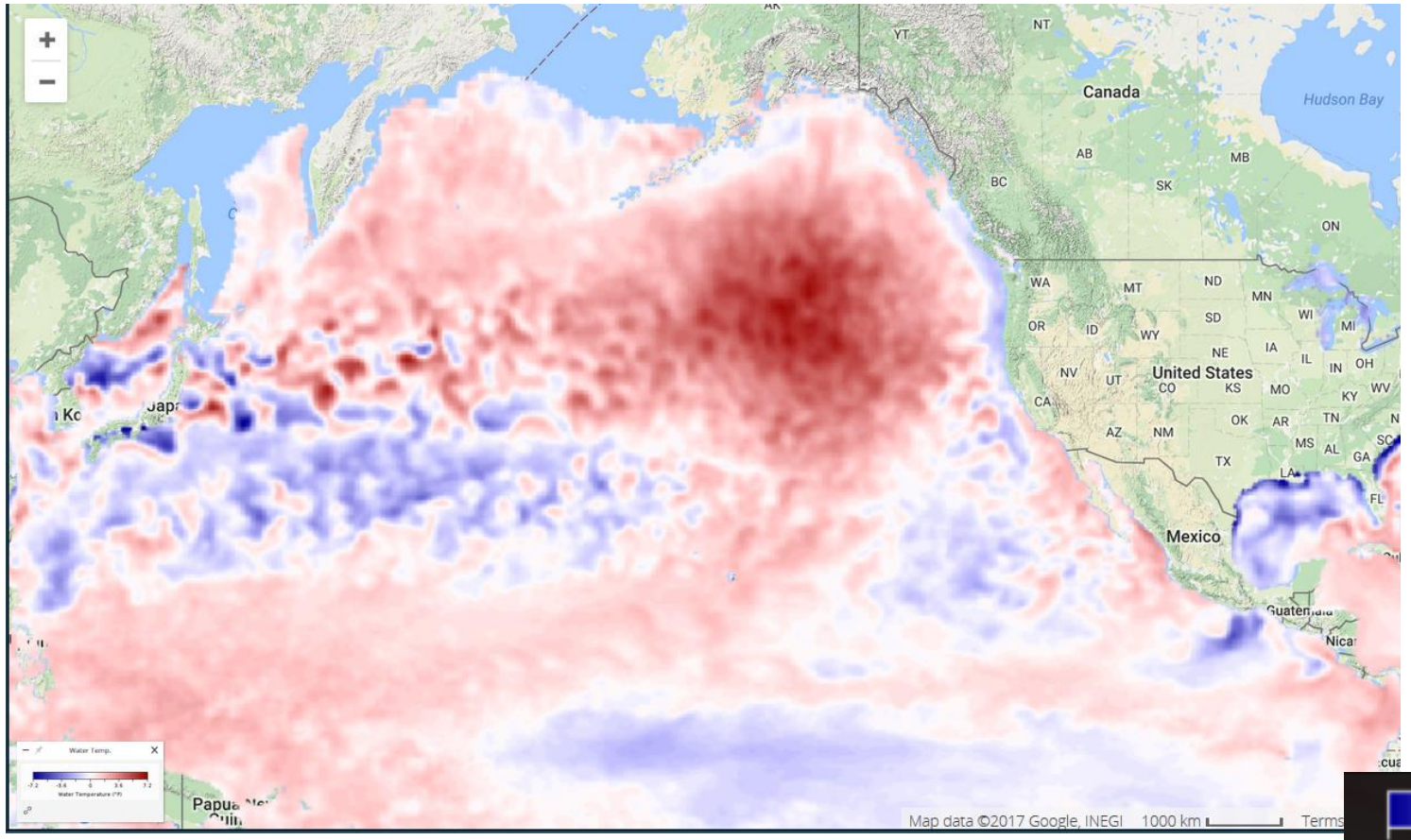


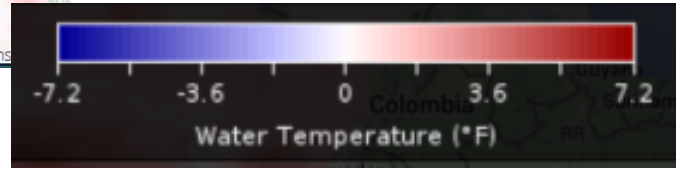
Development of the Pacific Marine Heatwave, a.k.a. “The Blob”

Winter 2013-2014

Developed offshore during winter 2013-14



SST anomalies



NANOOS Visualization System:
http://www.nanoos.org/

Objectives:

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1) Examine variability in zooplankton taxa among regions.

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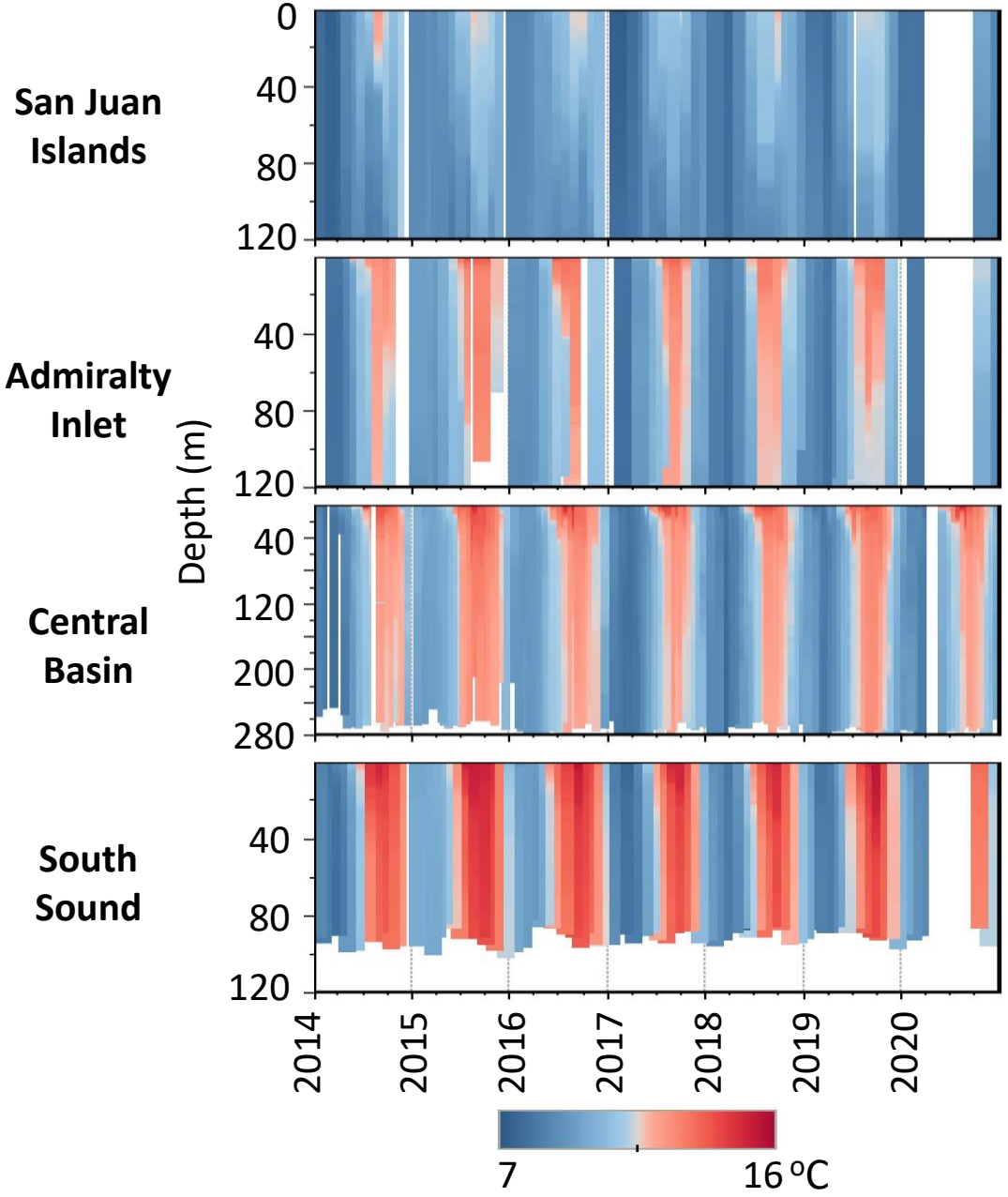
2) Examine effects of the marine heatwave.

Temperatures from monthly CTD casts:



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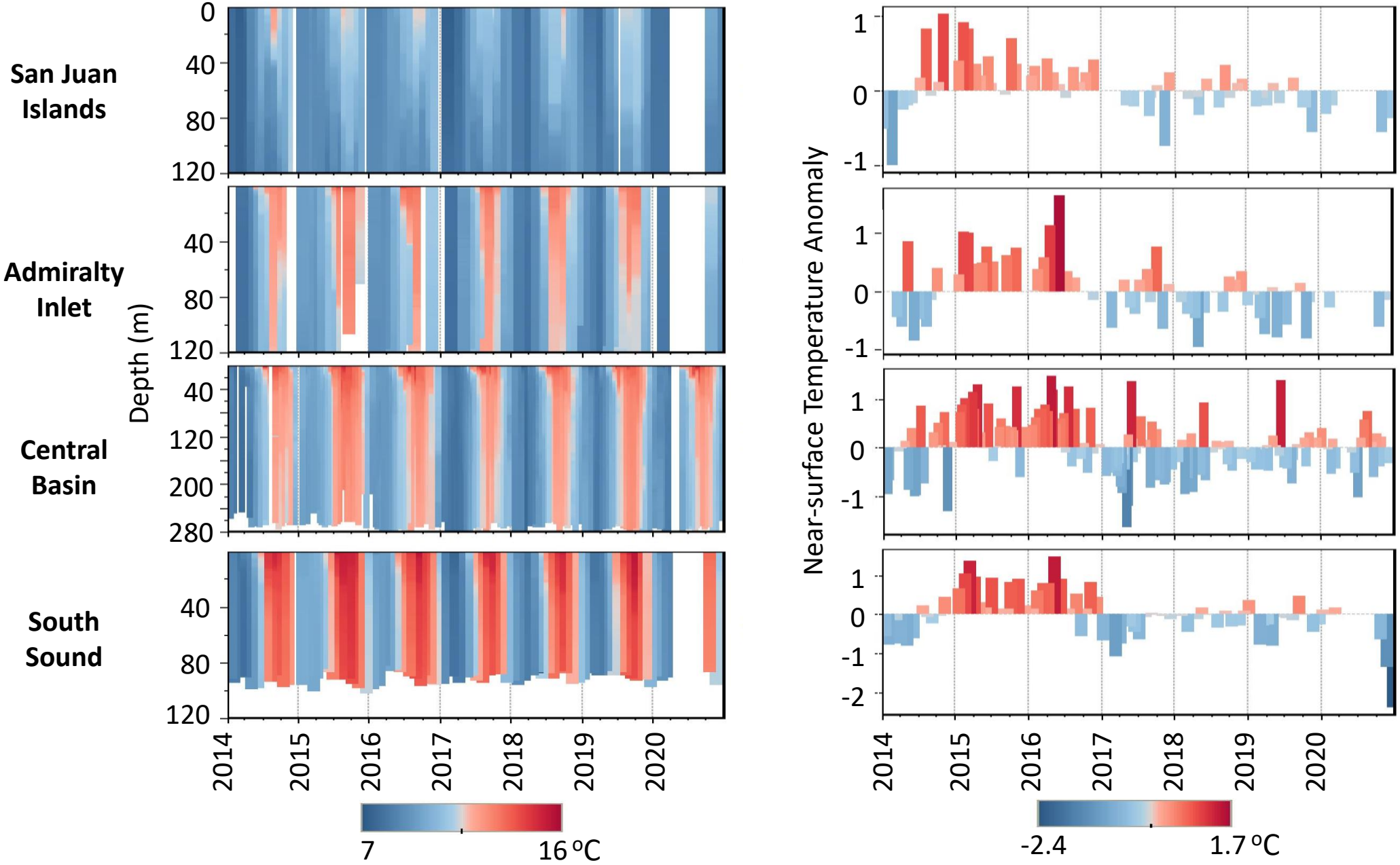

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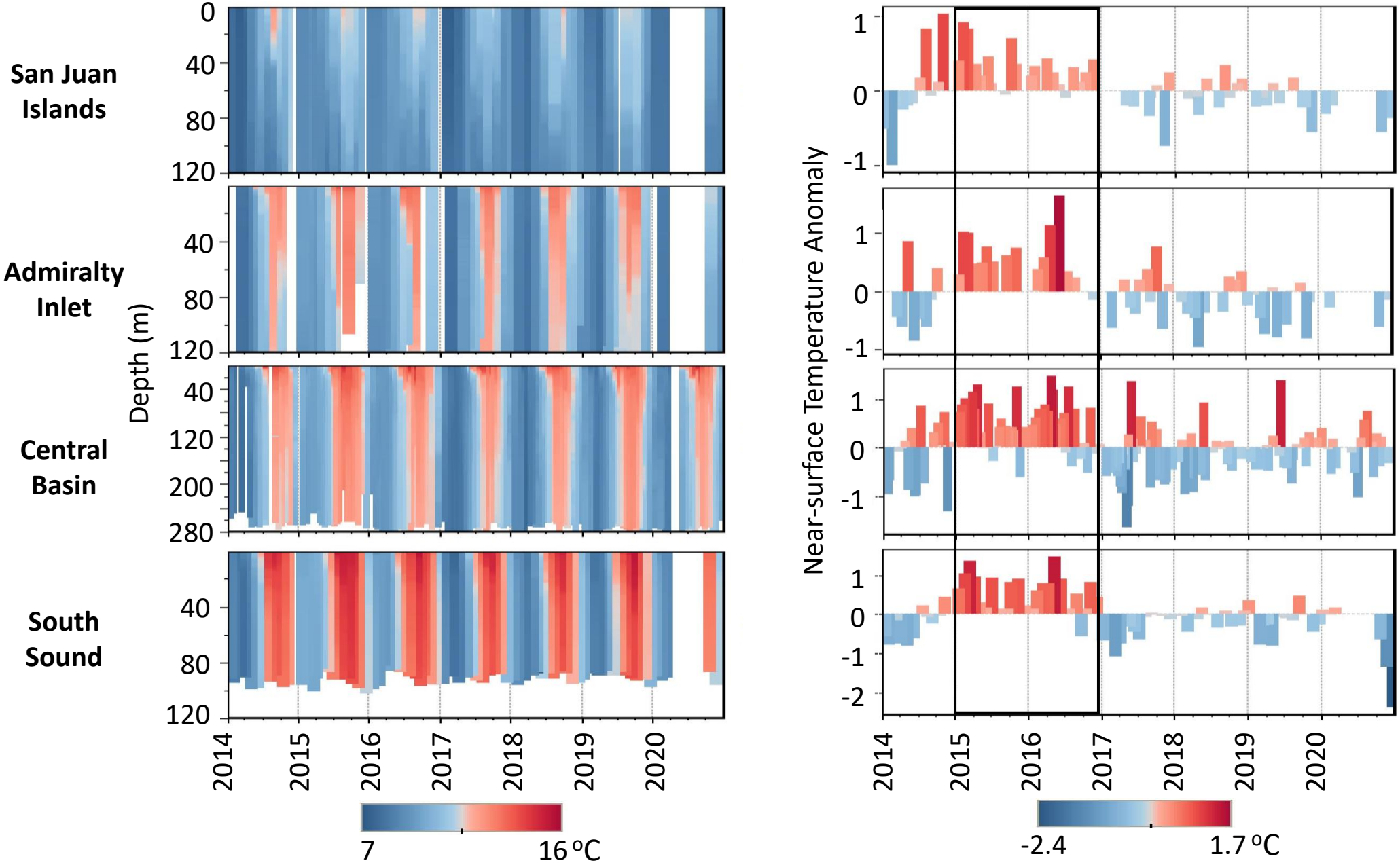
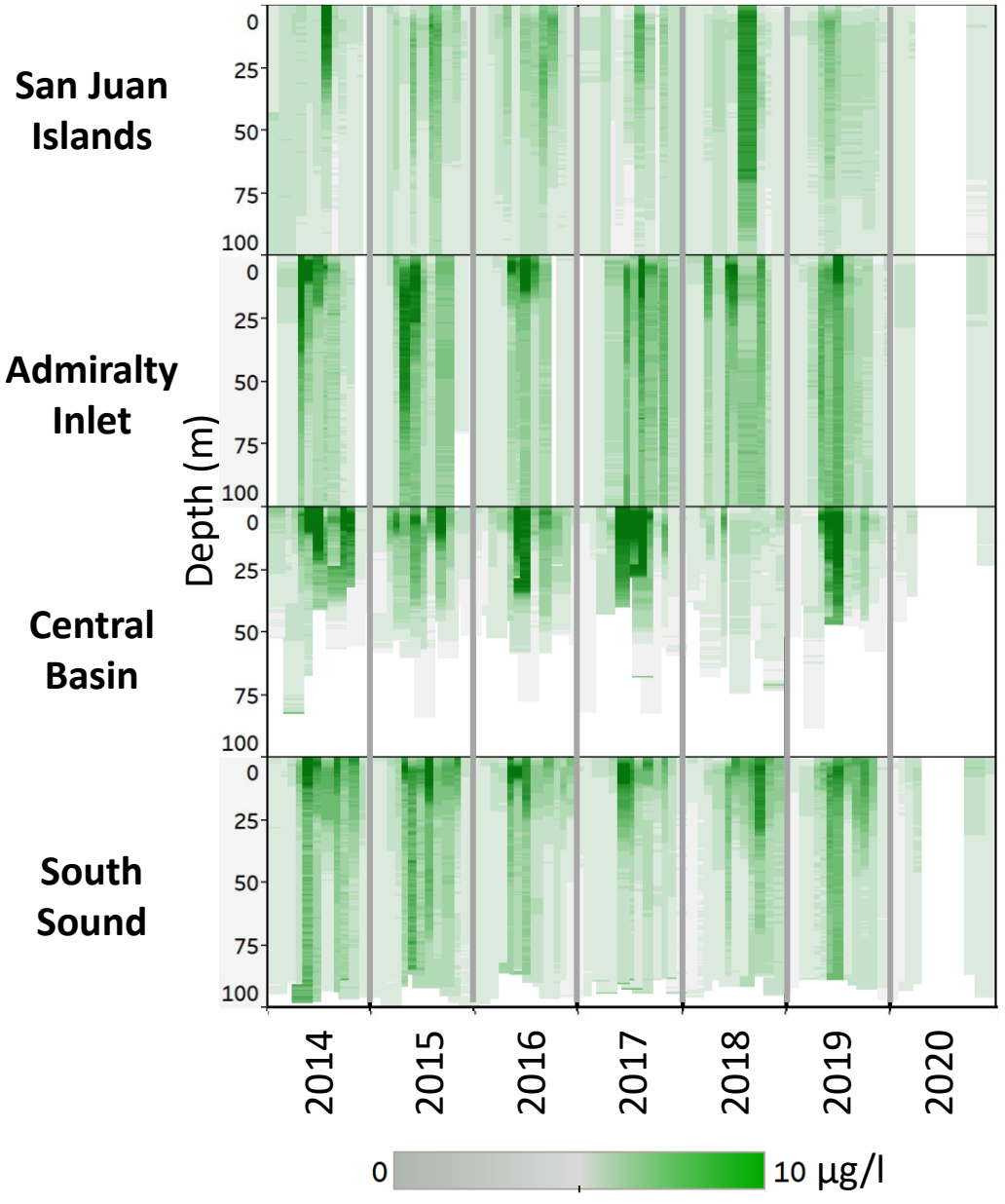
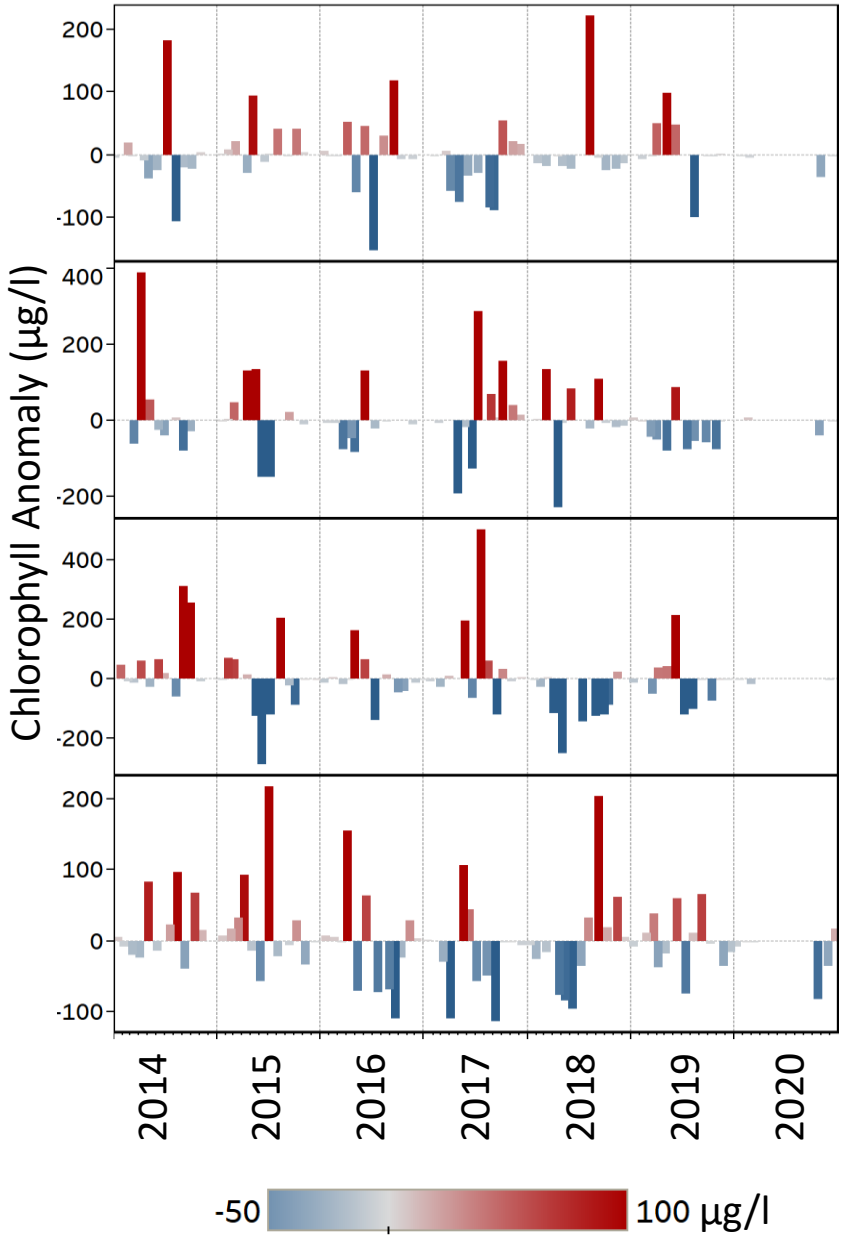


Chlorophyll from monthly CTD casts (relative to 2014-2020 mean):





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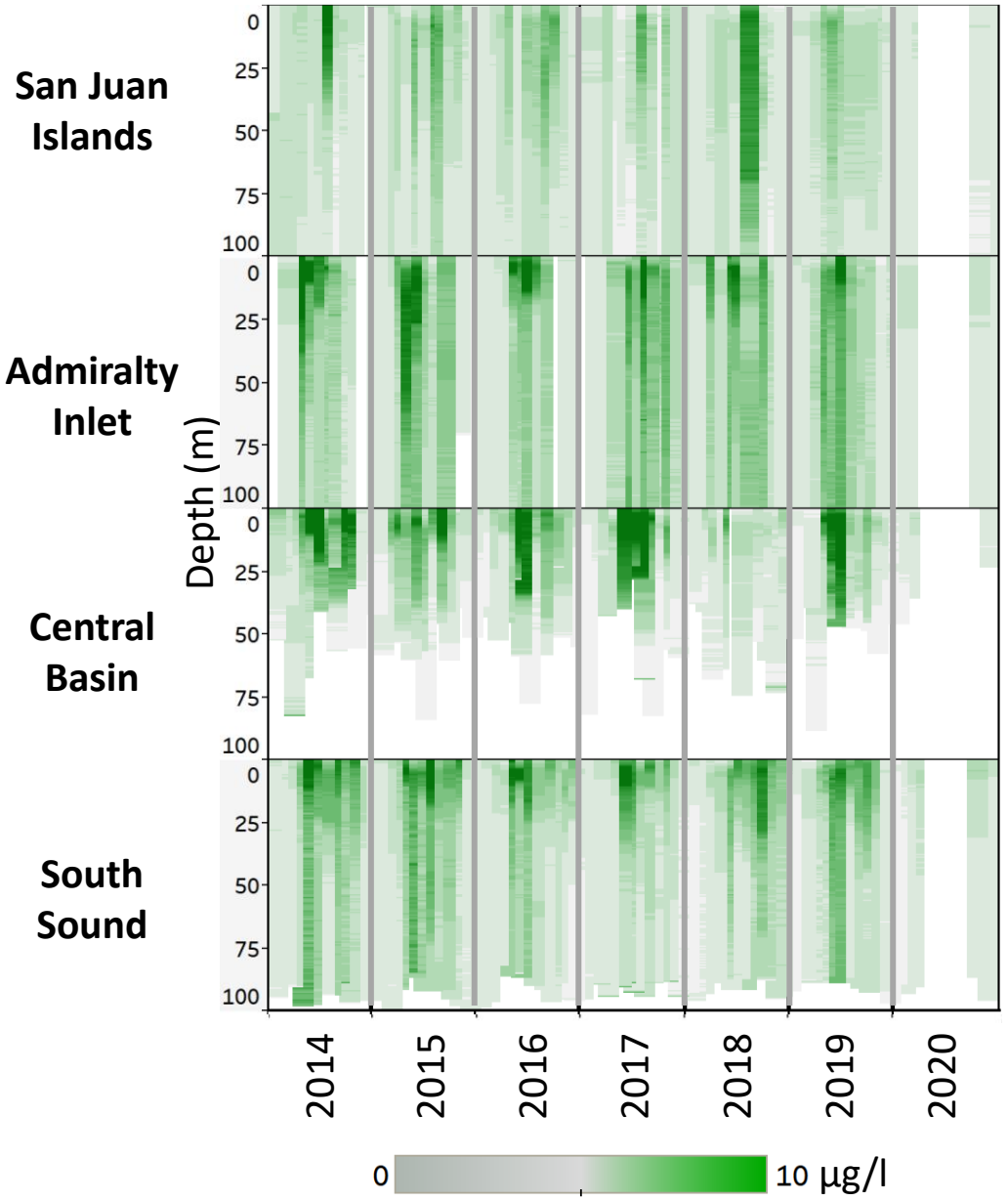
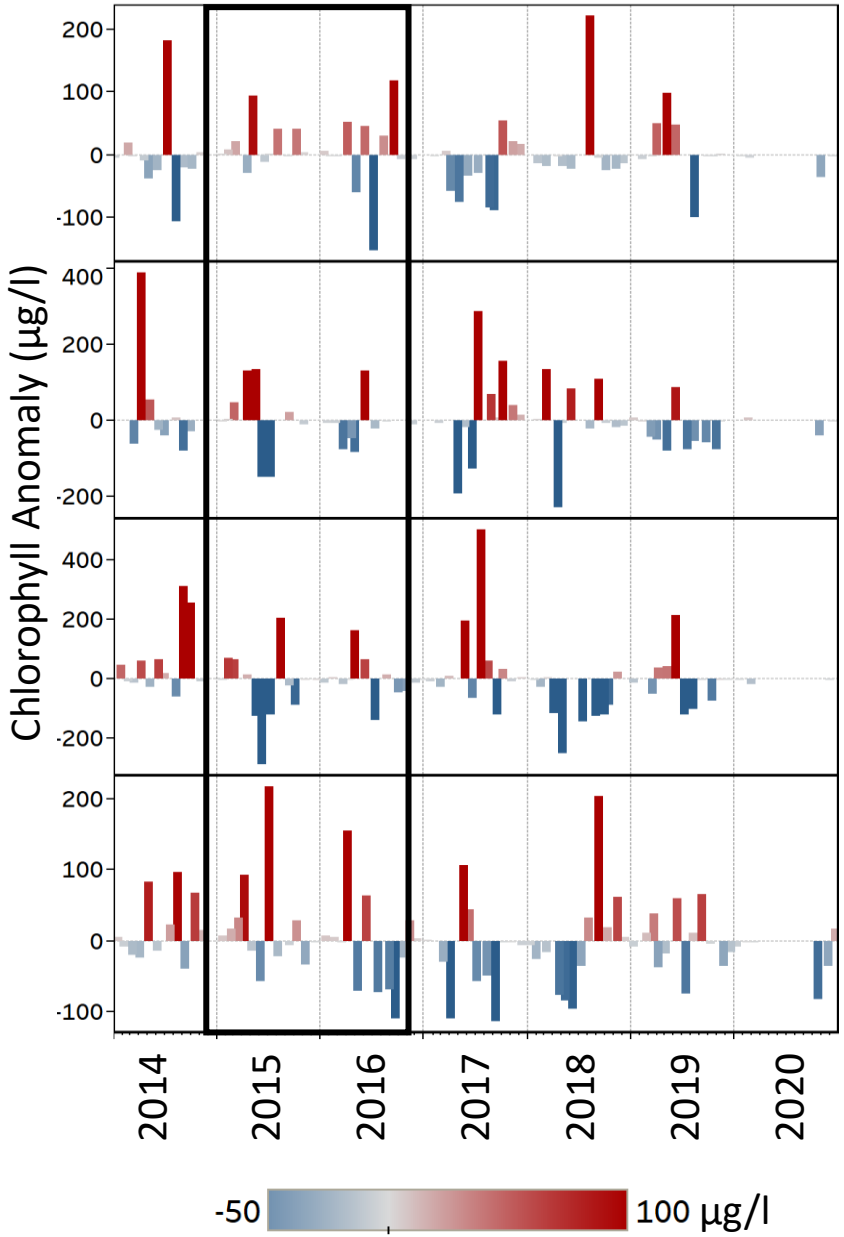
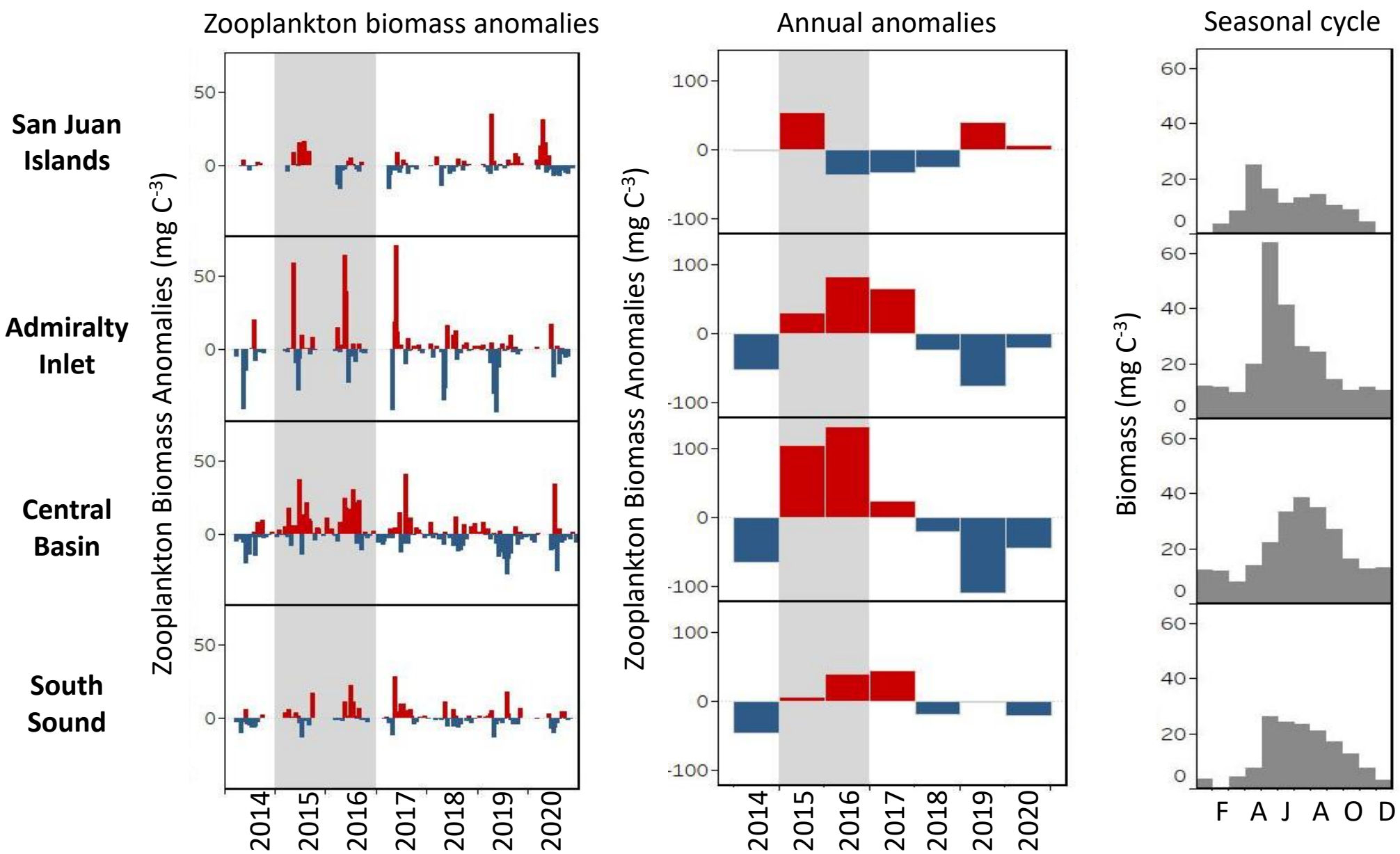
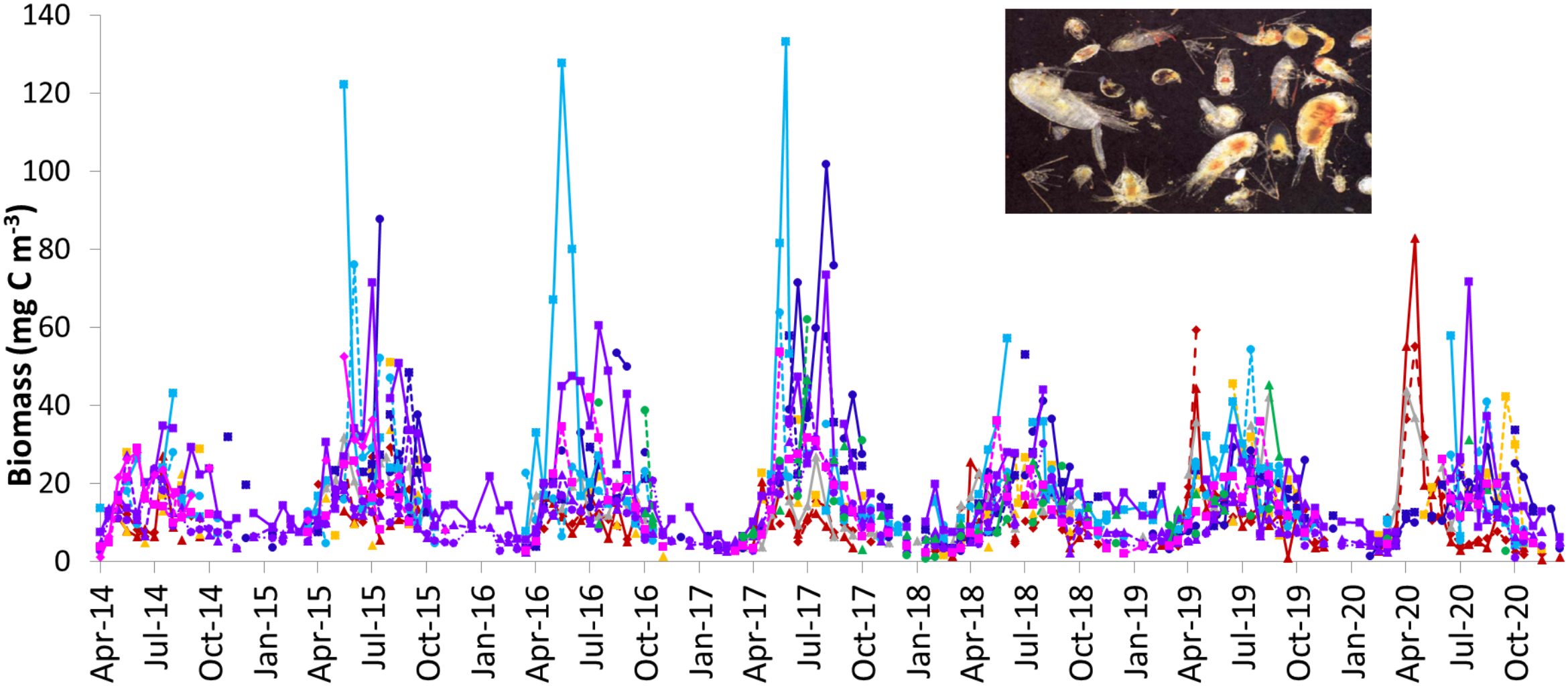




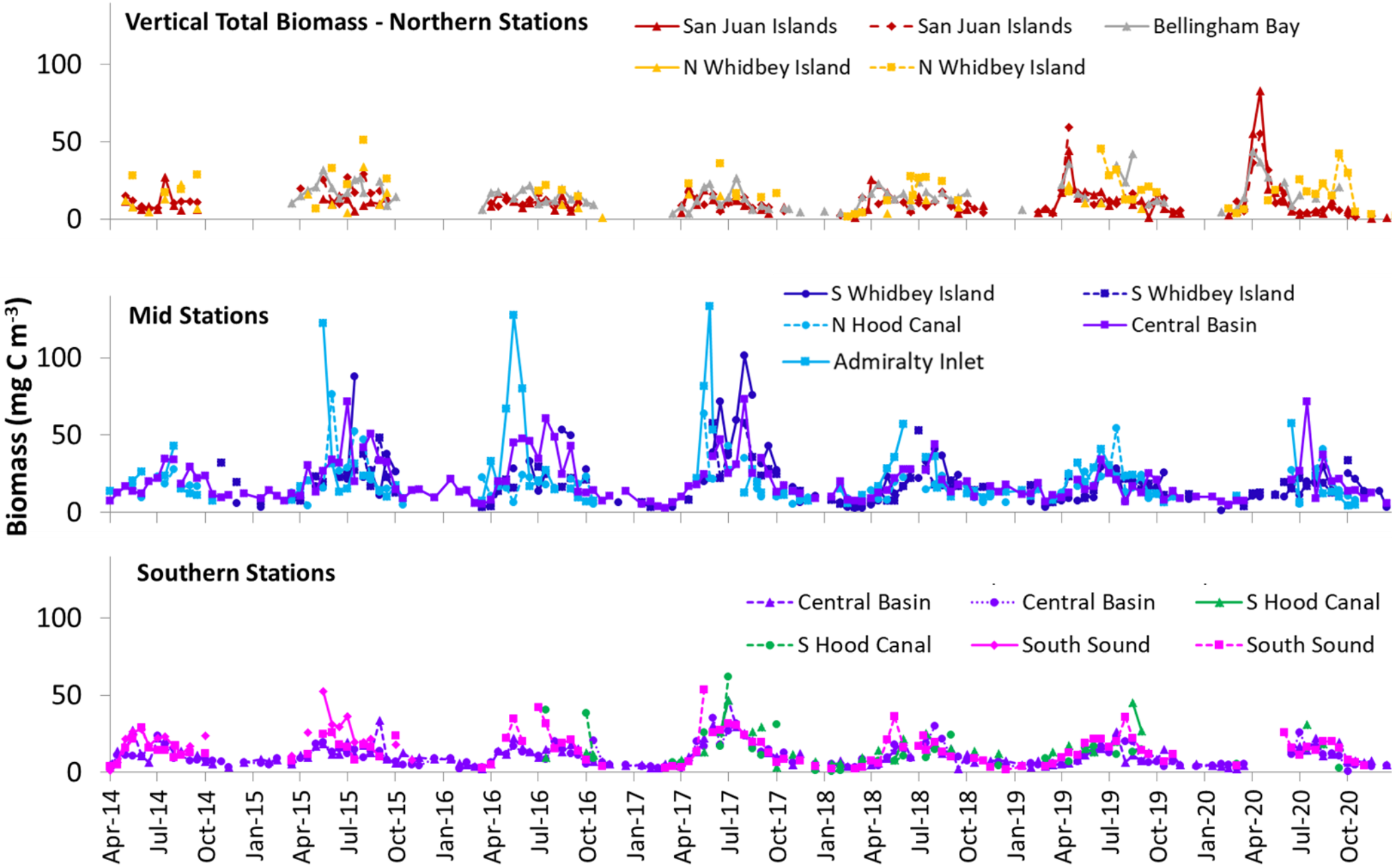
Zooplankton biomass anomalies:



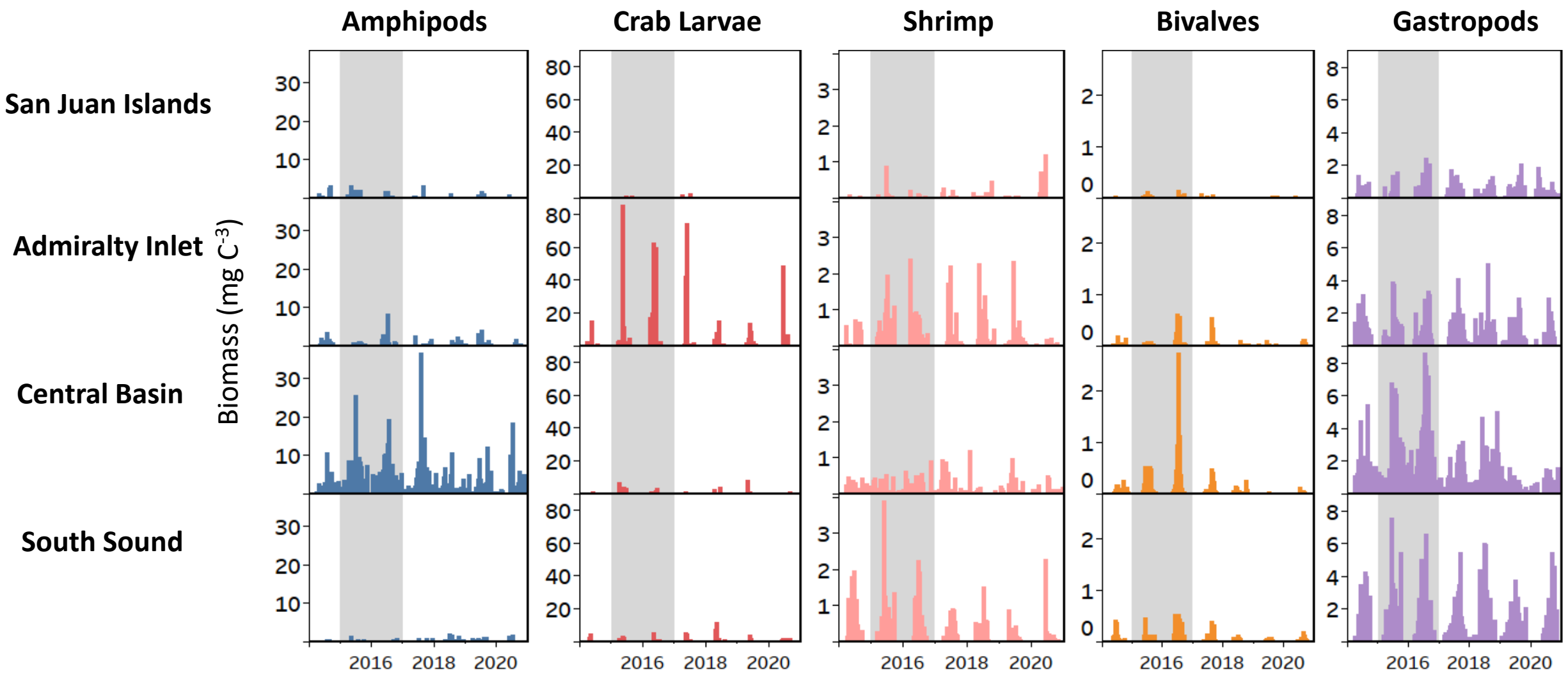
Total Zooplankton Biomass



Total zooplankton biomass by region



Crustacean and mollusc biomass were higher at mid stations



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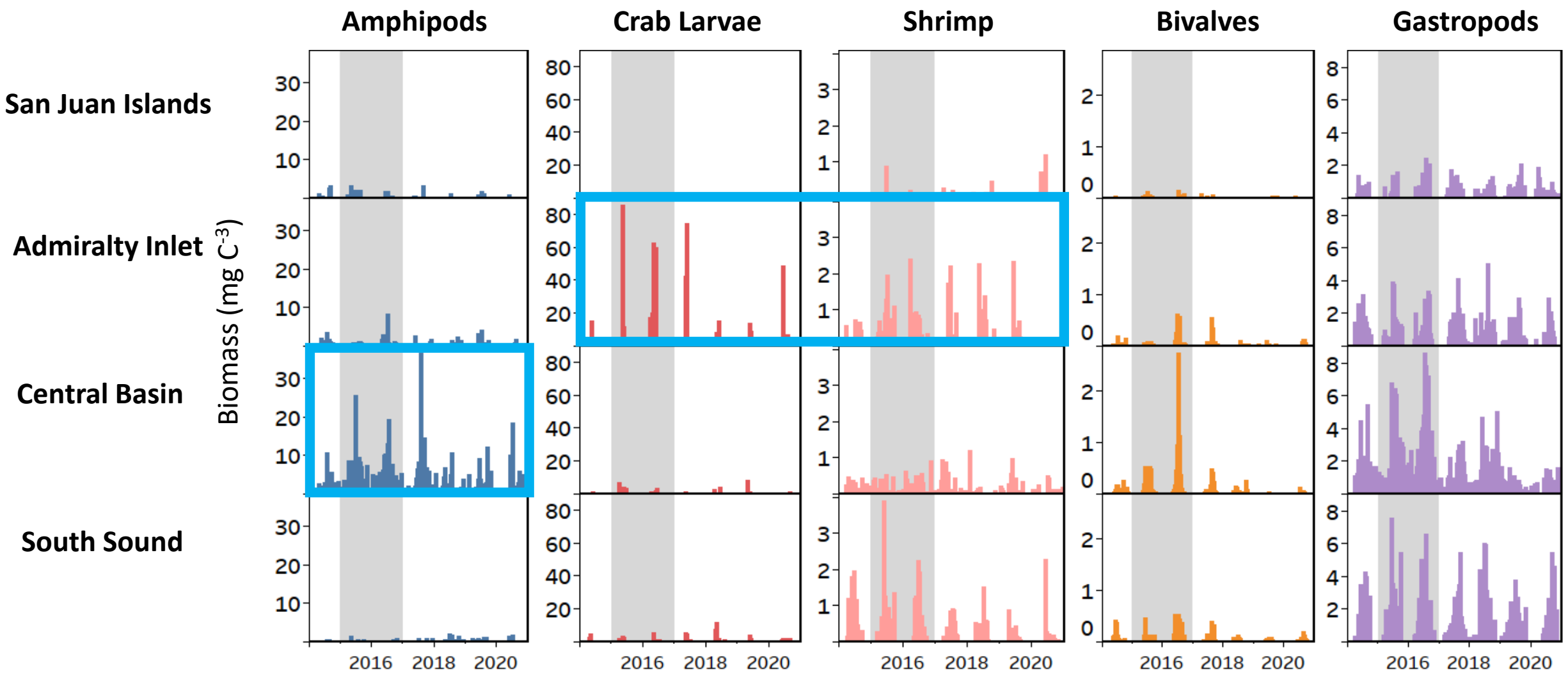

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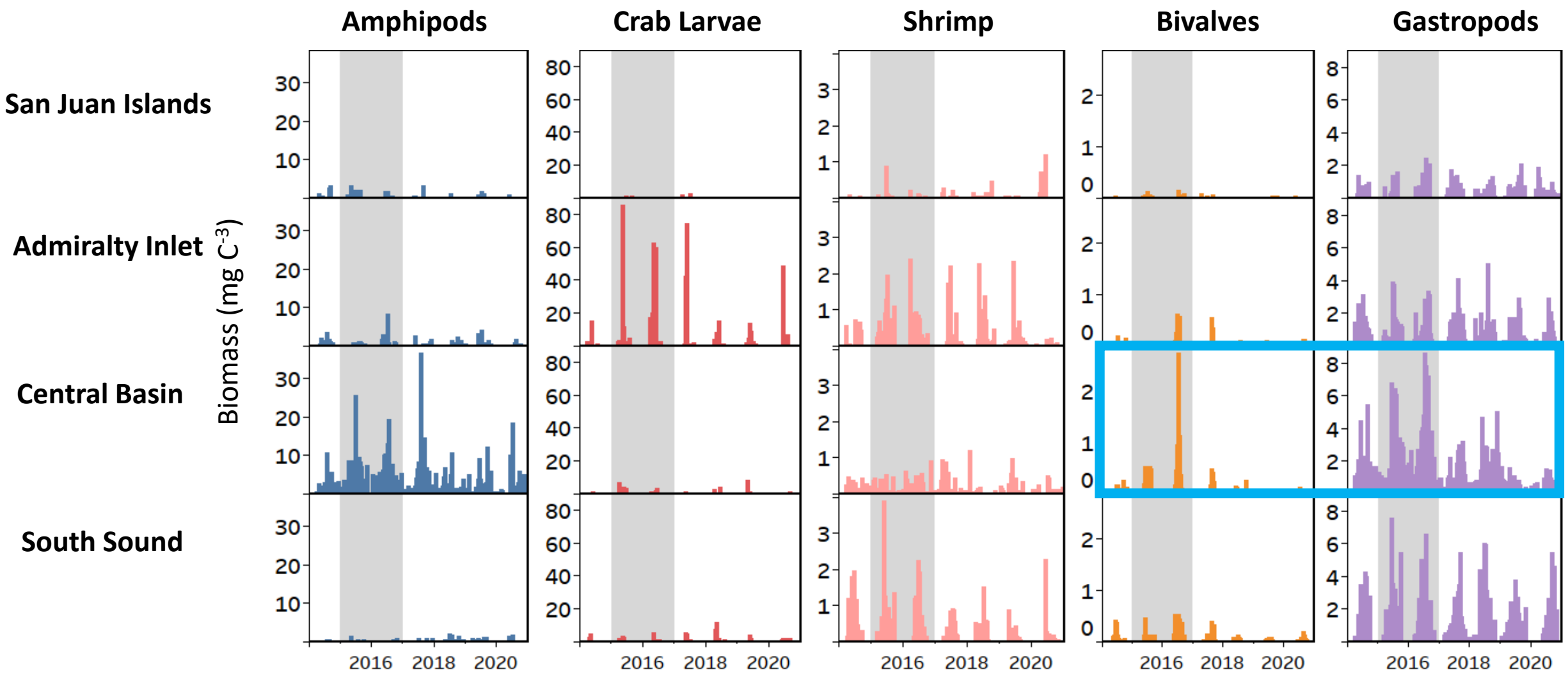
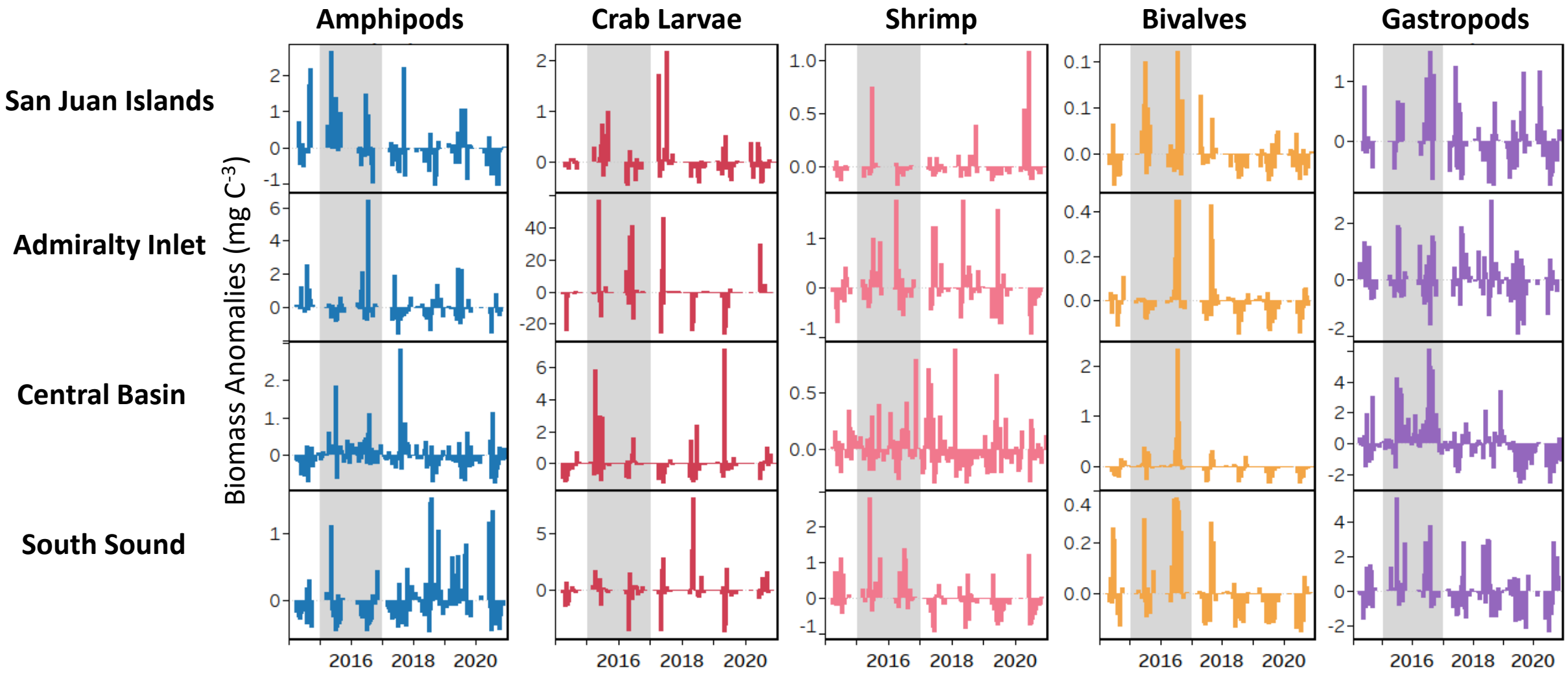


Crustacean and mollusc biomass increased during MHW



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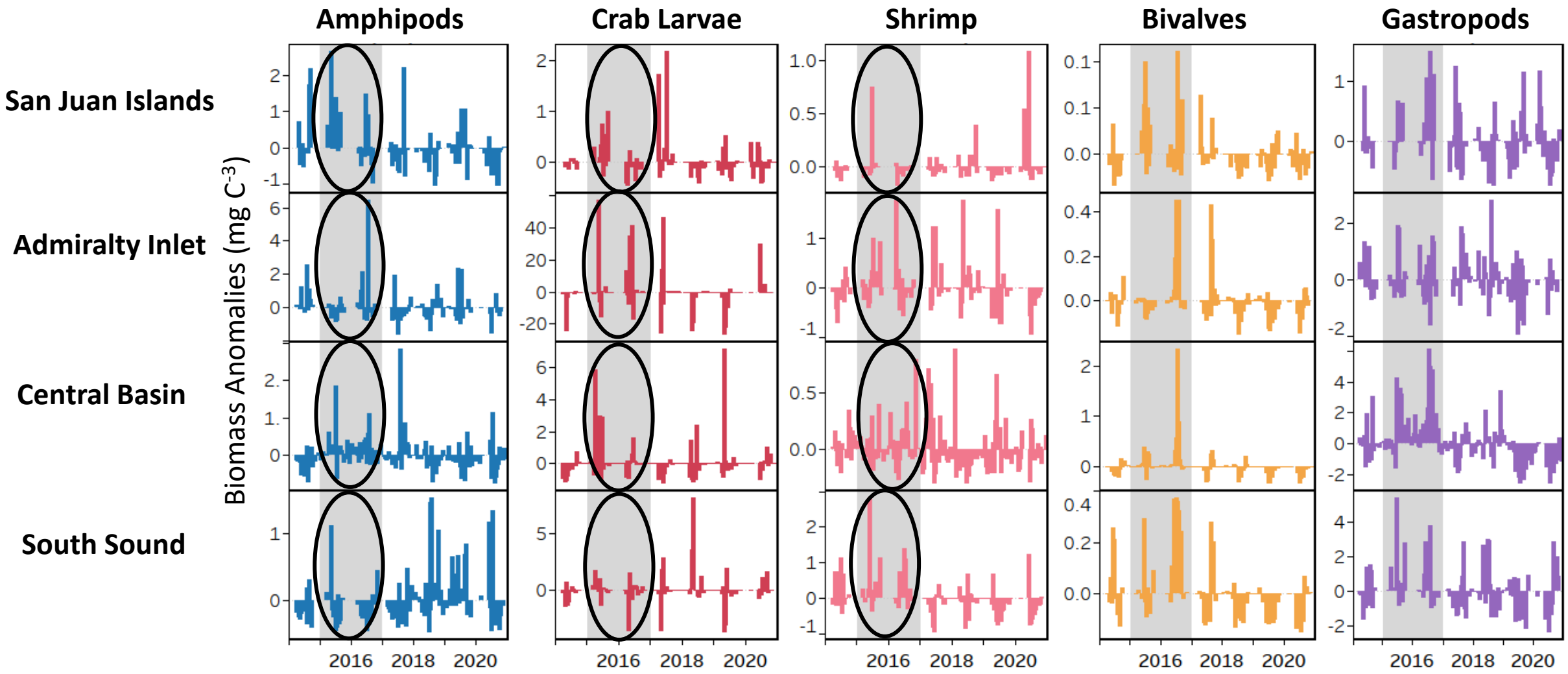

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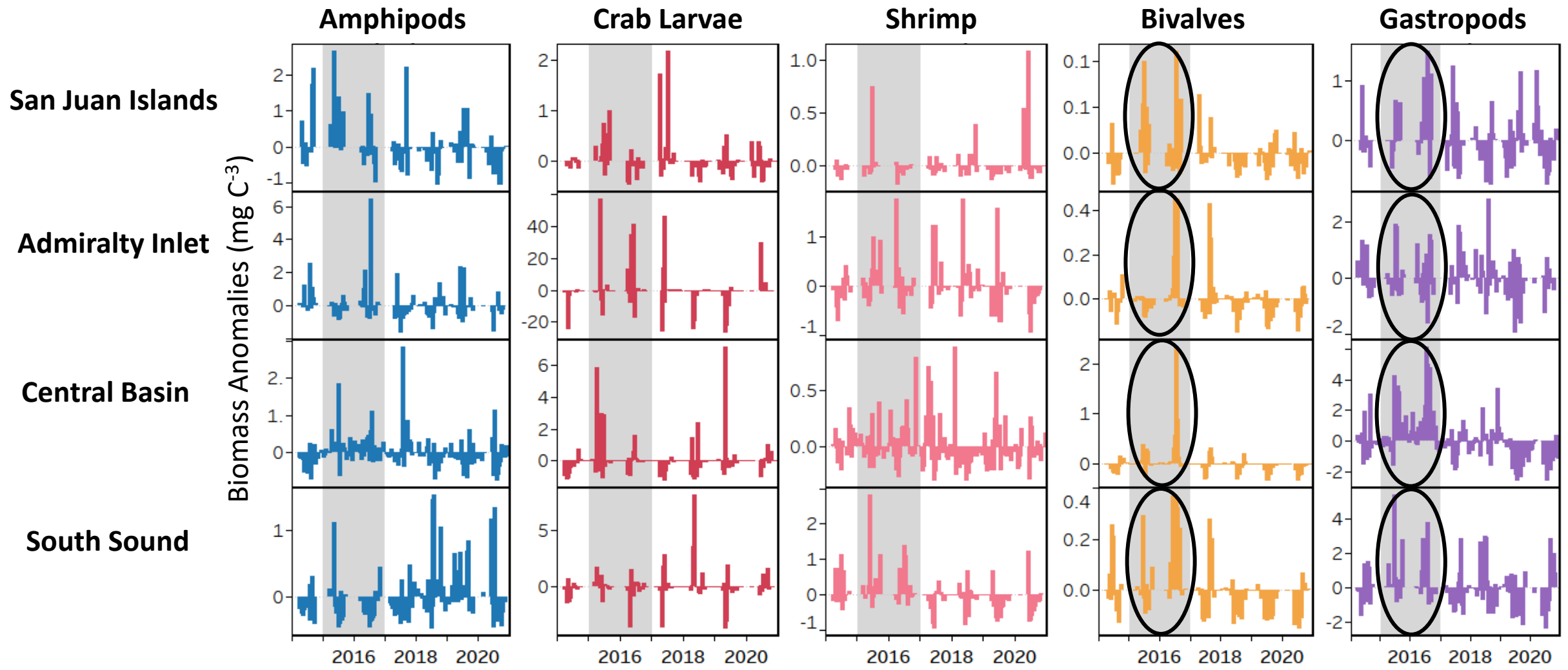
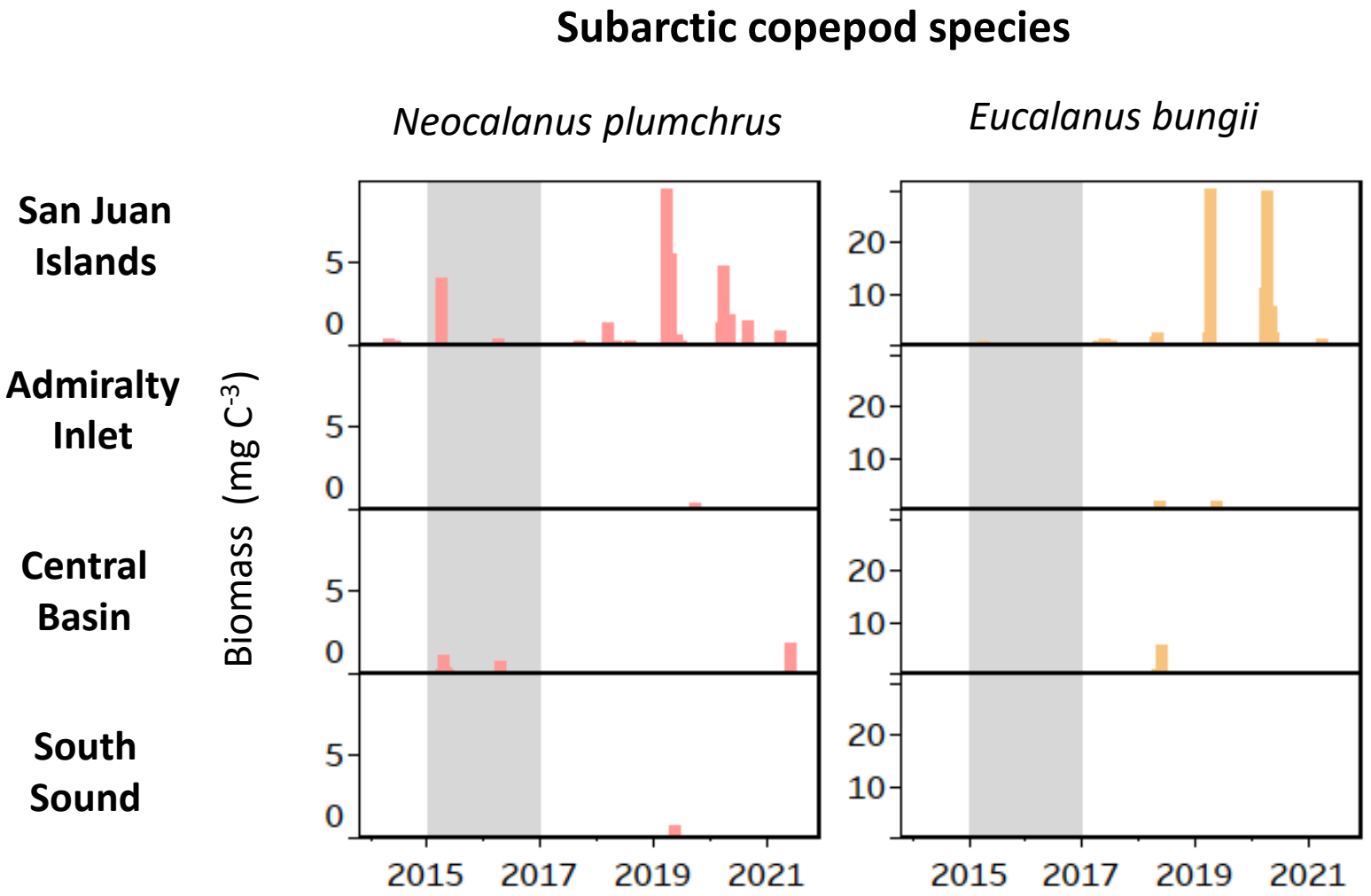


Differential copepod species composition



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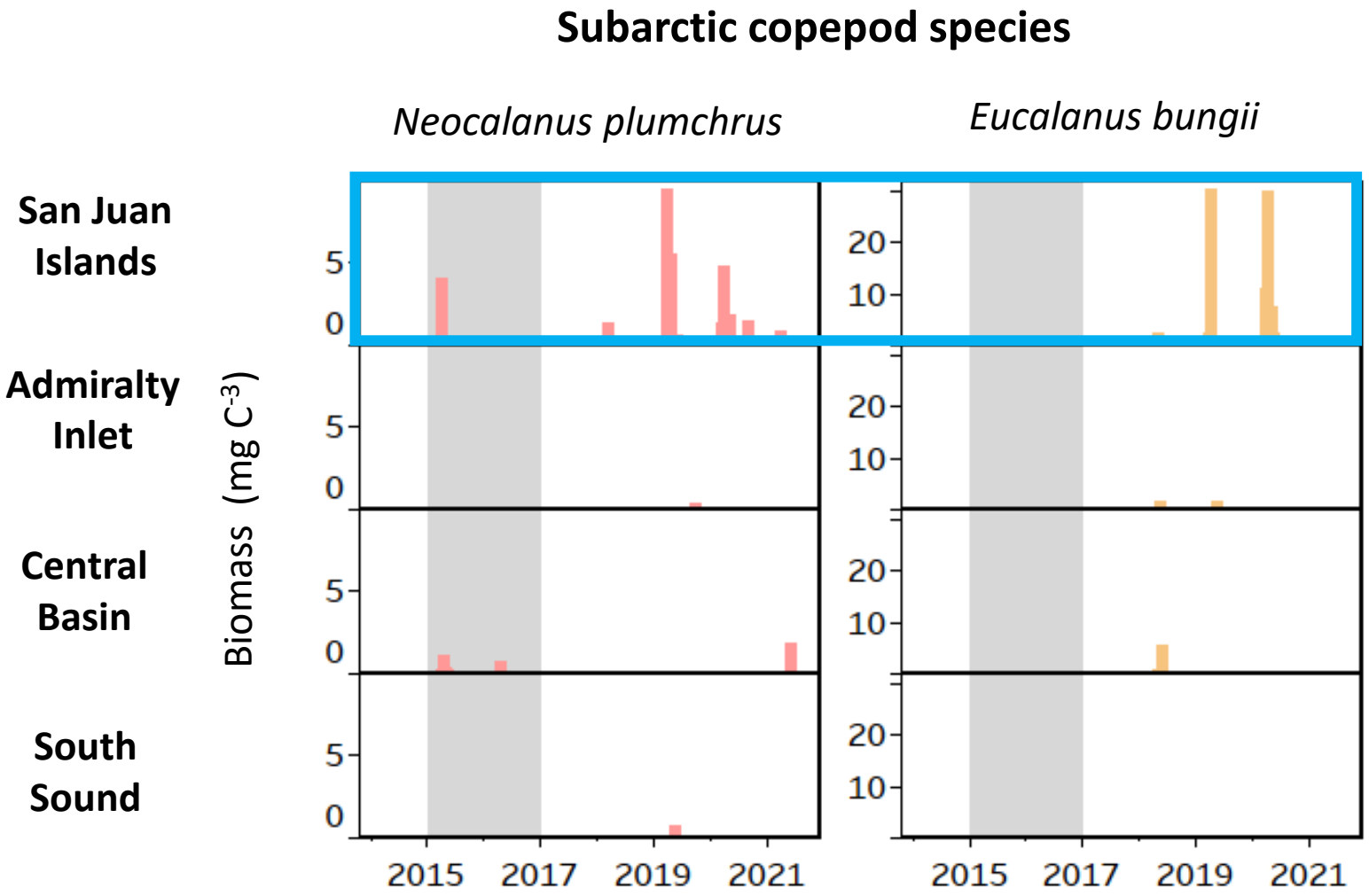
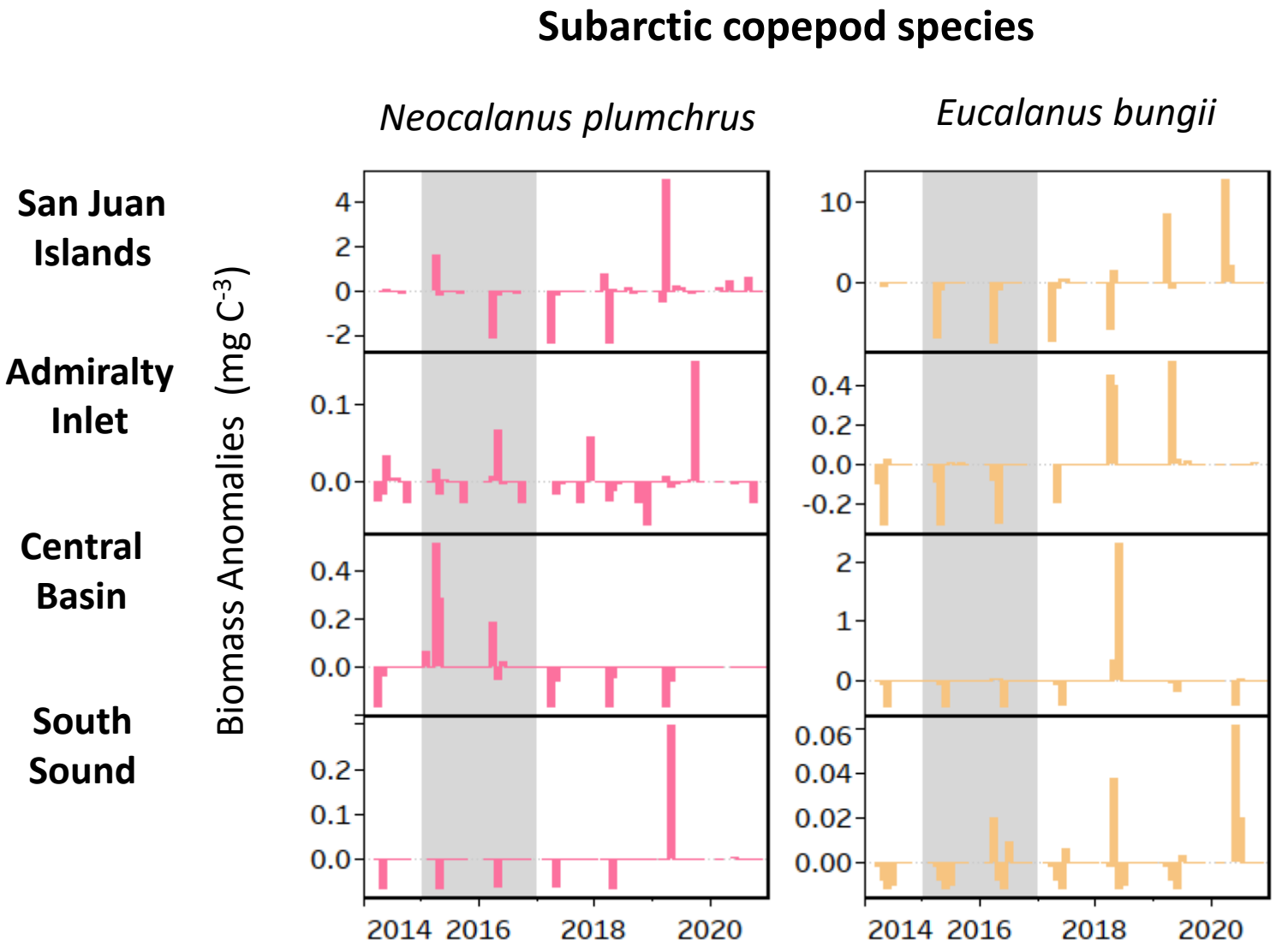


Copepod species response



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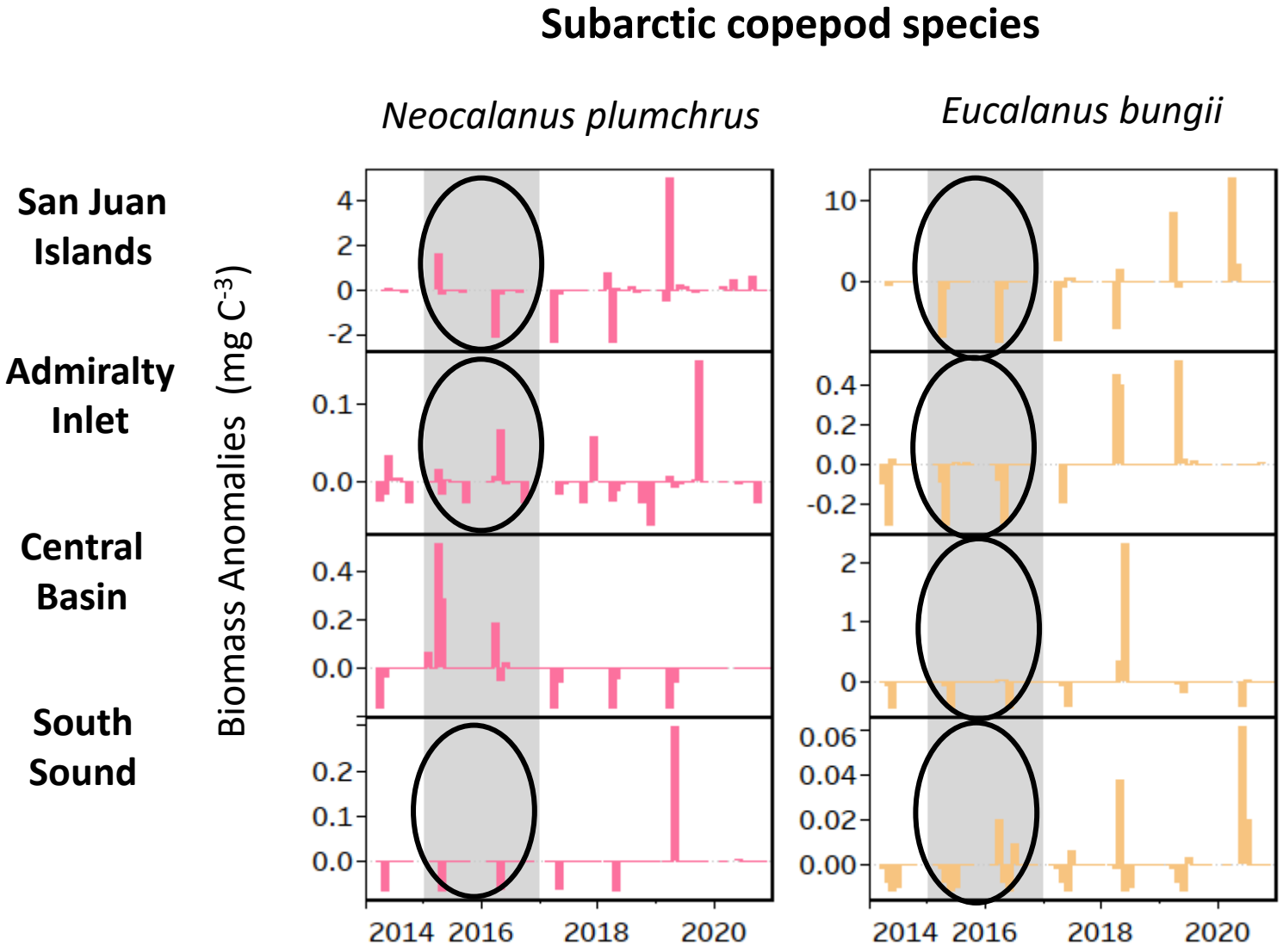

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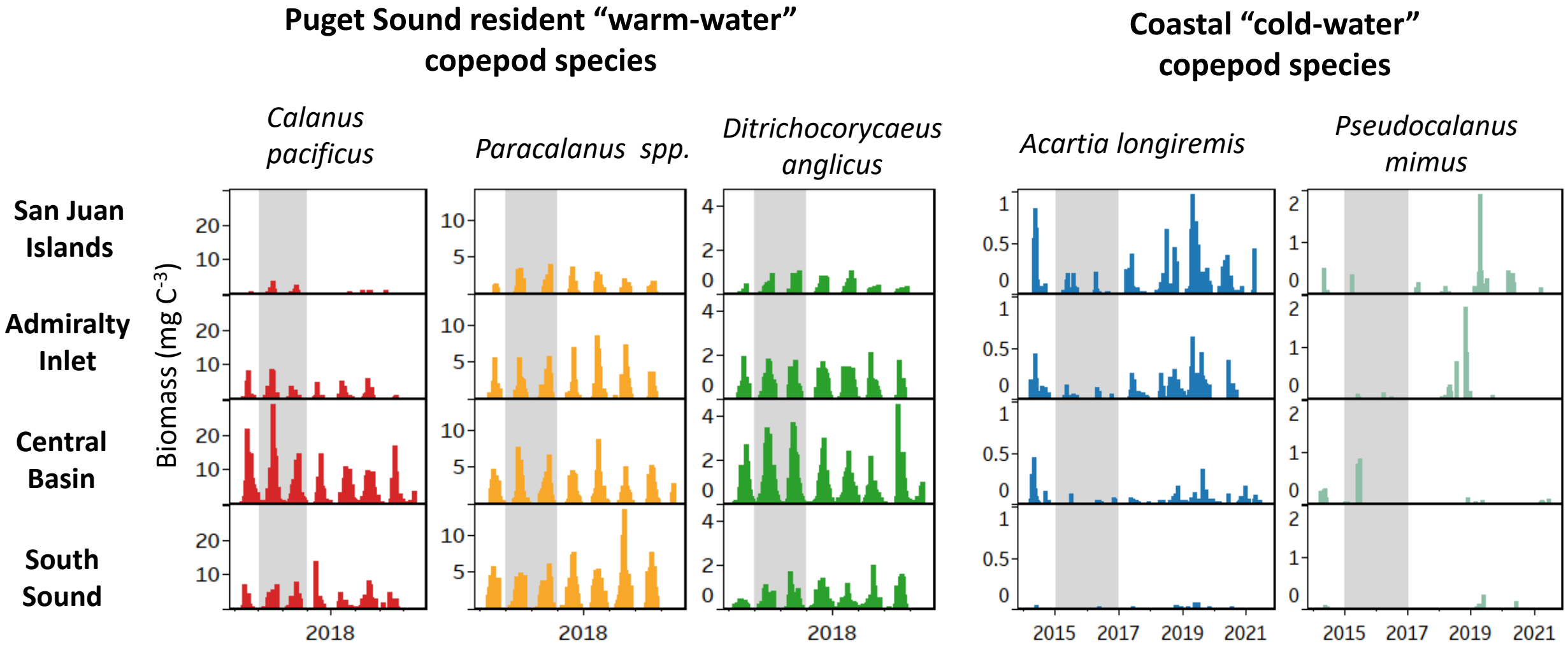

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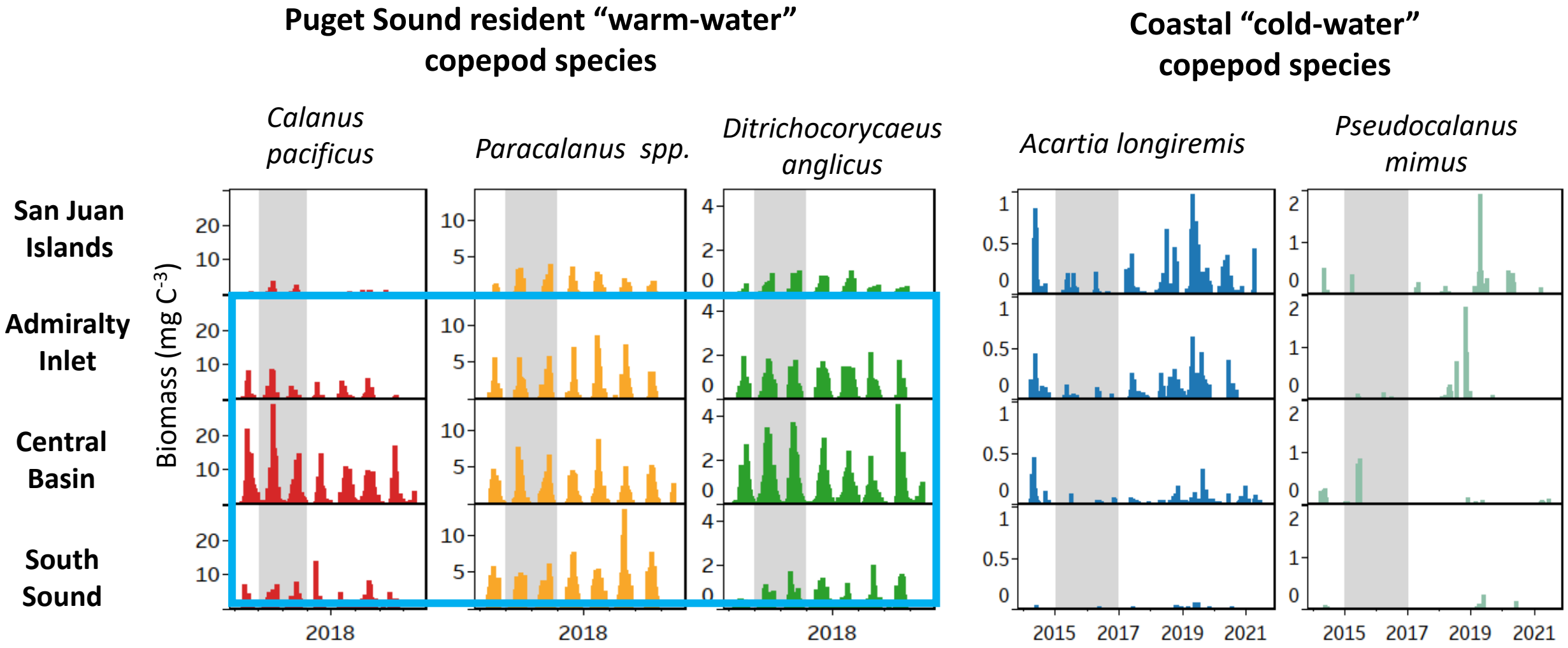

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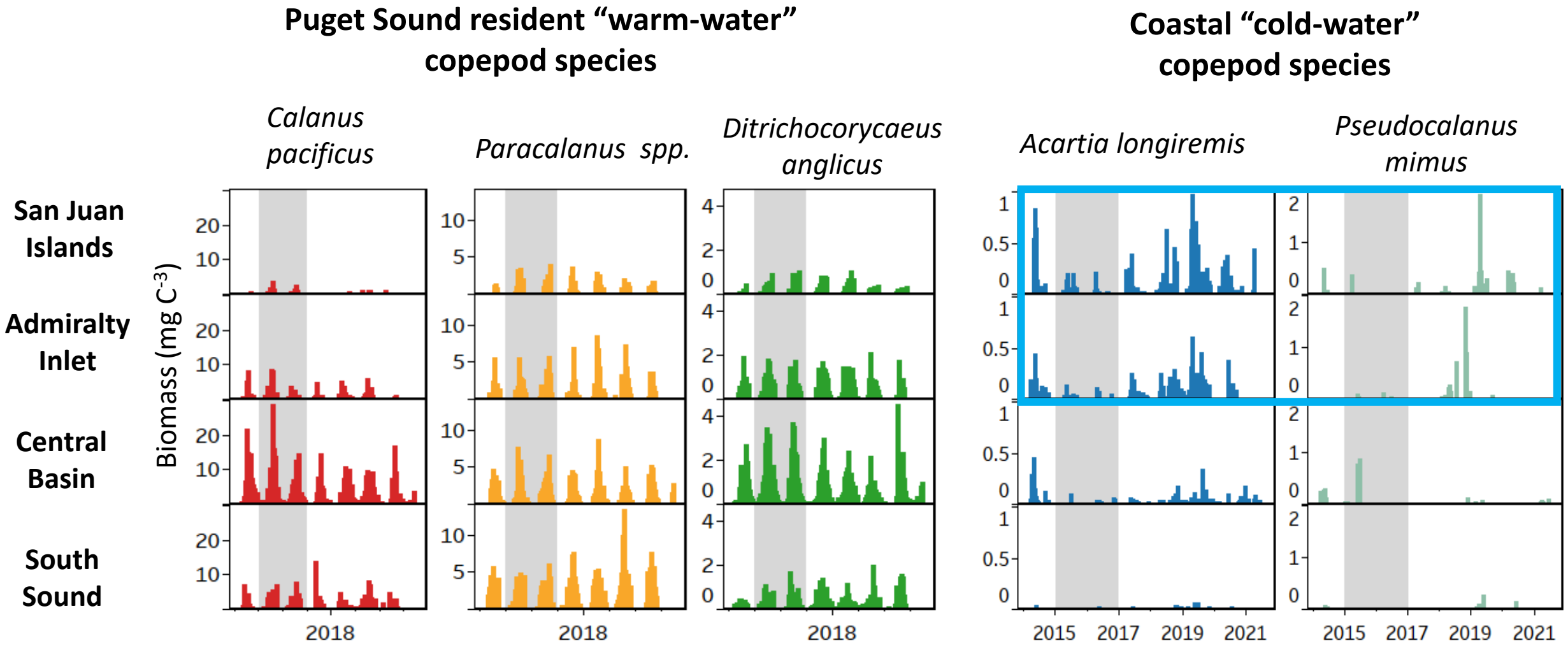

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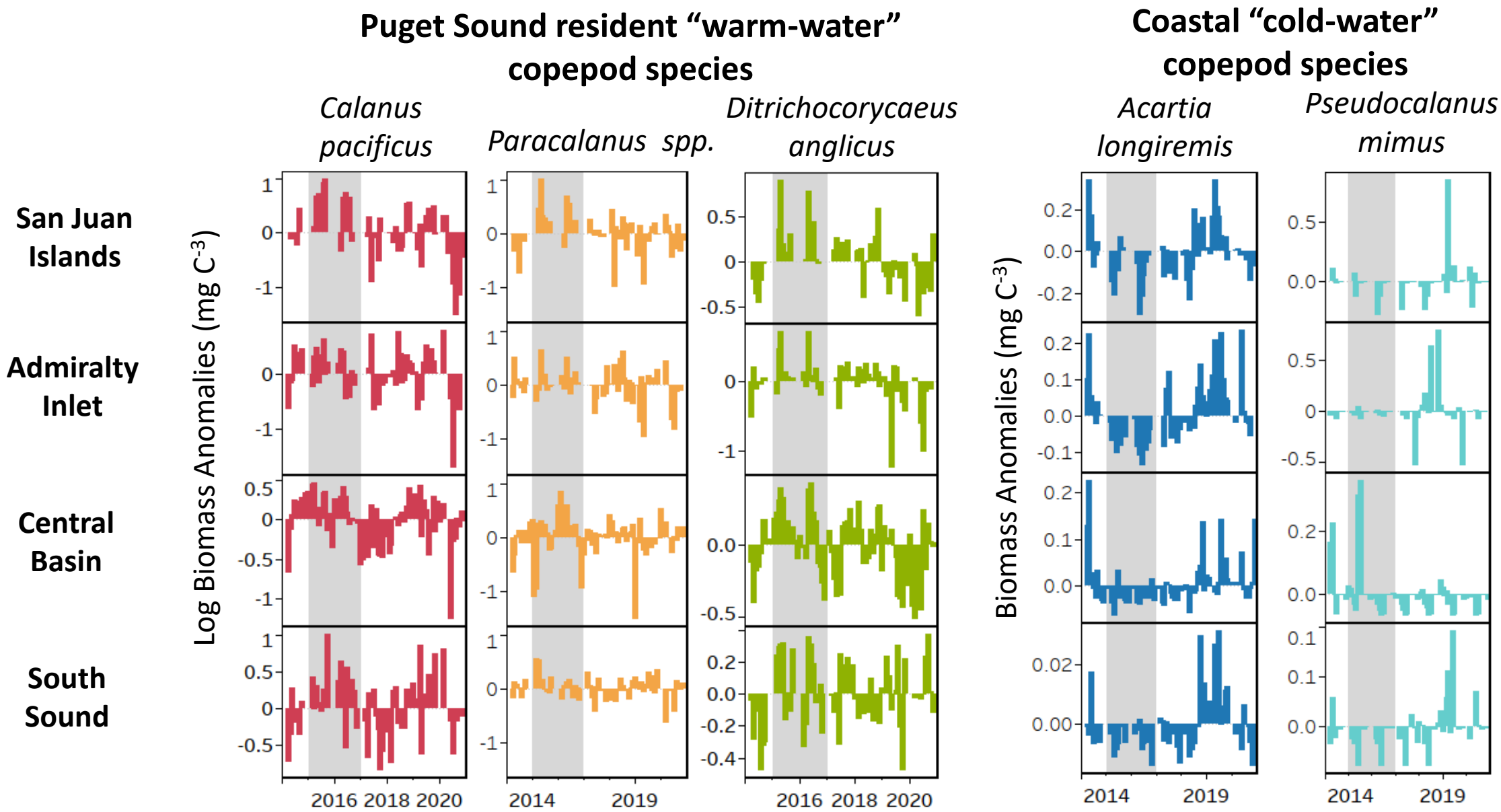

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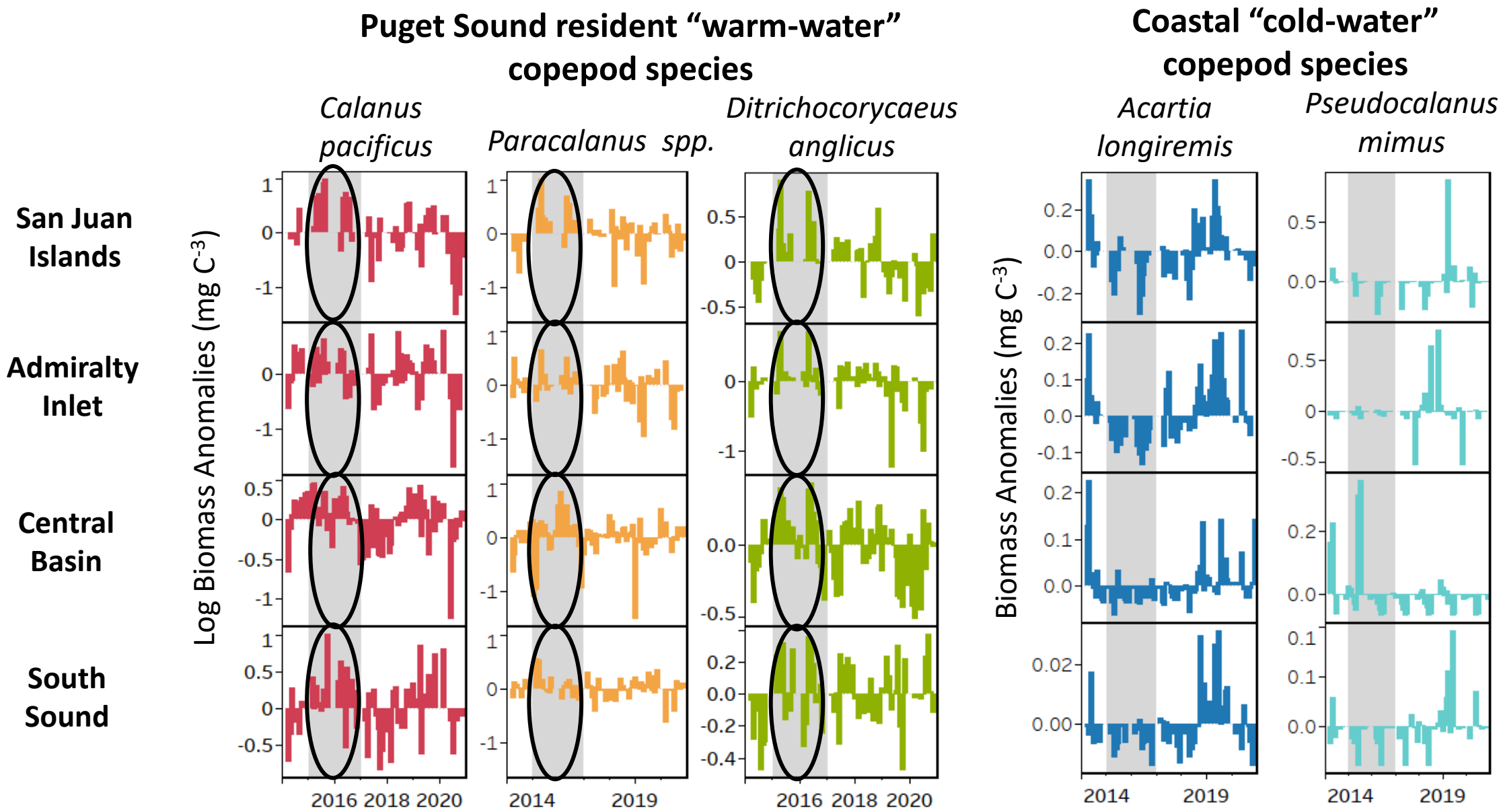

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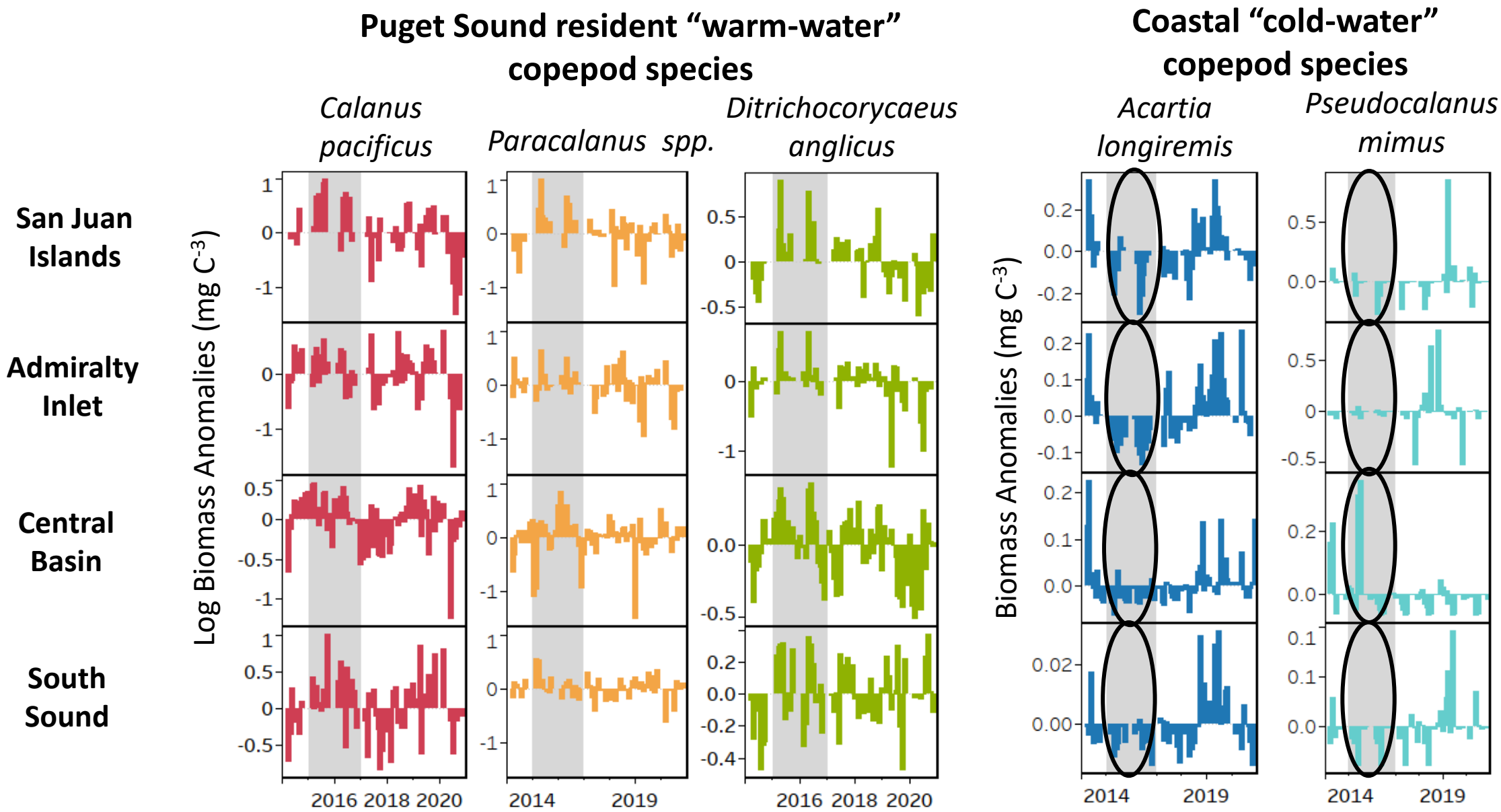
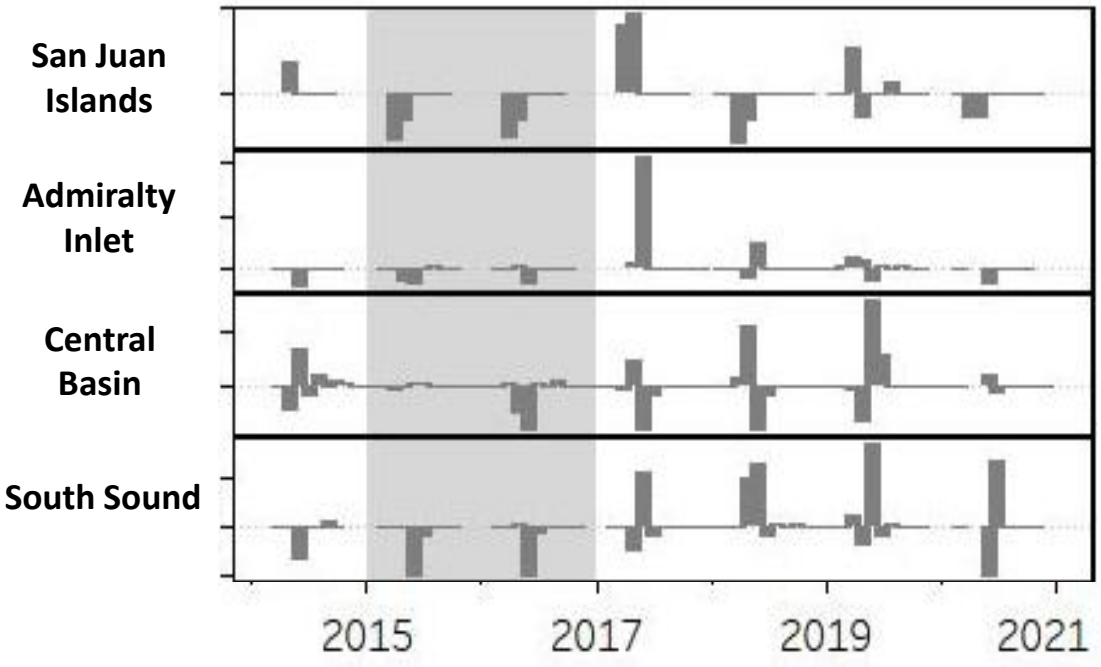
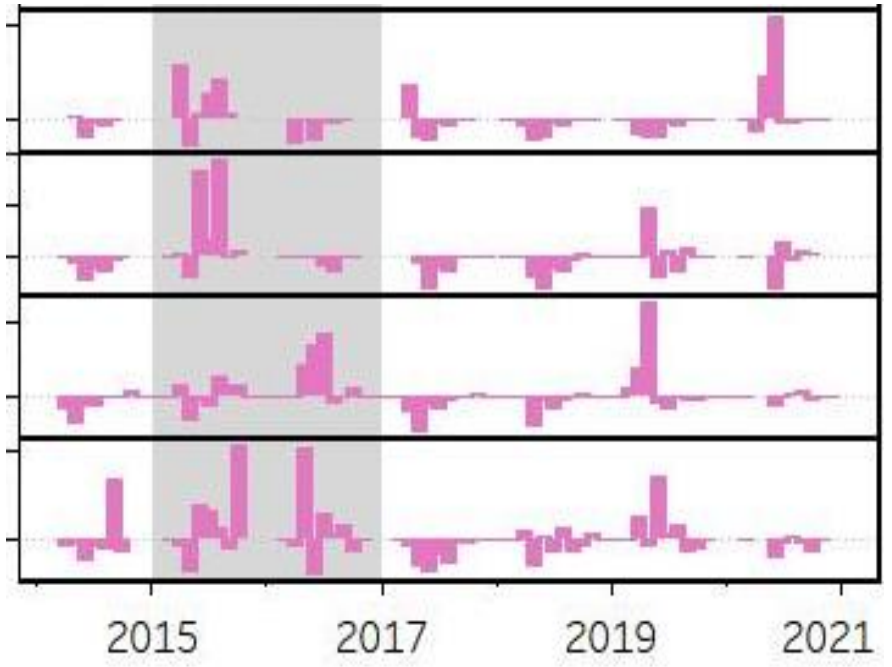


Differential euphausiid species response:

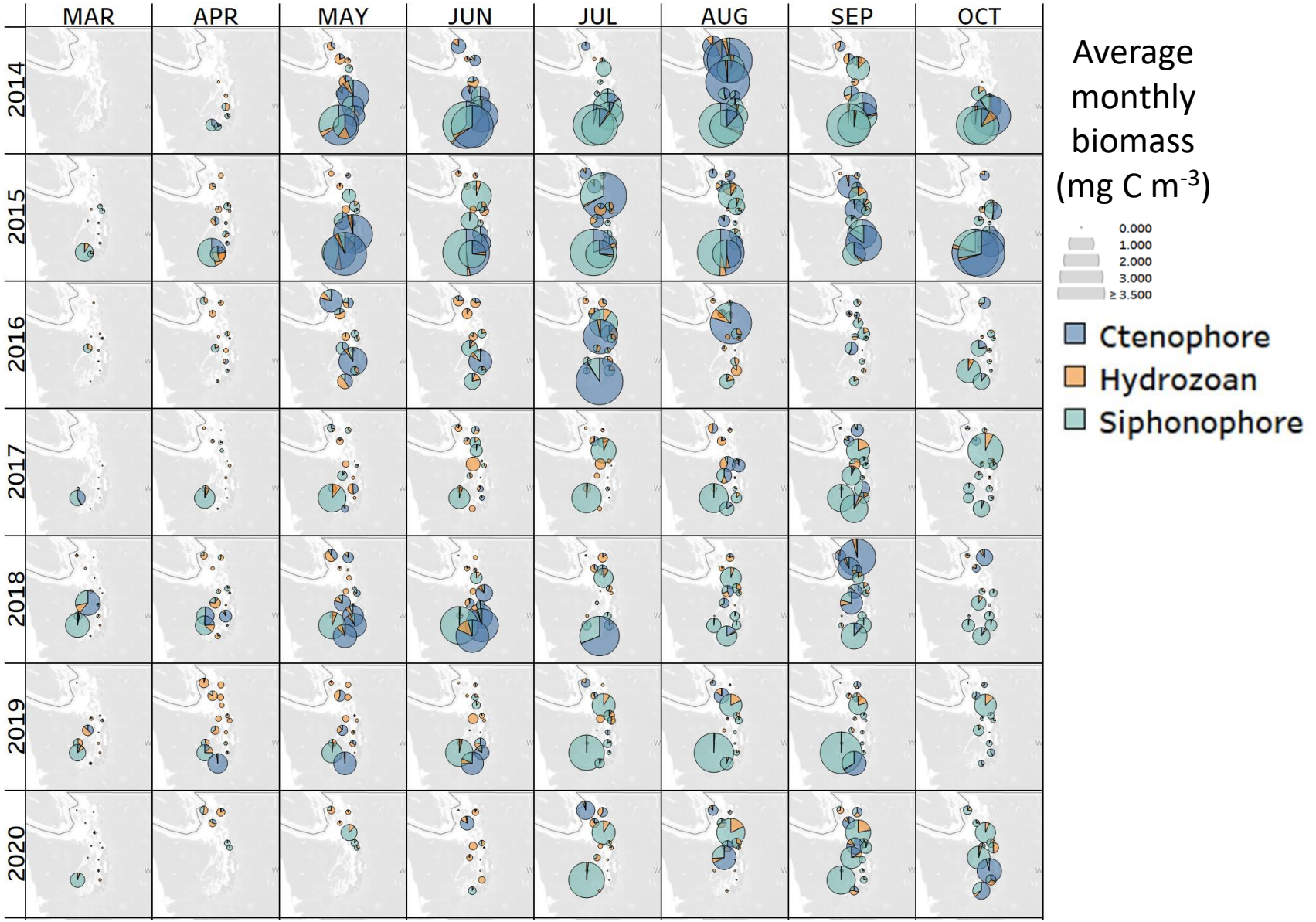
Thysanoessa raschii furcilia



Euphausia pacifica furcilia



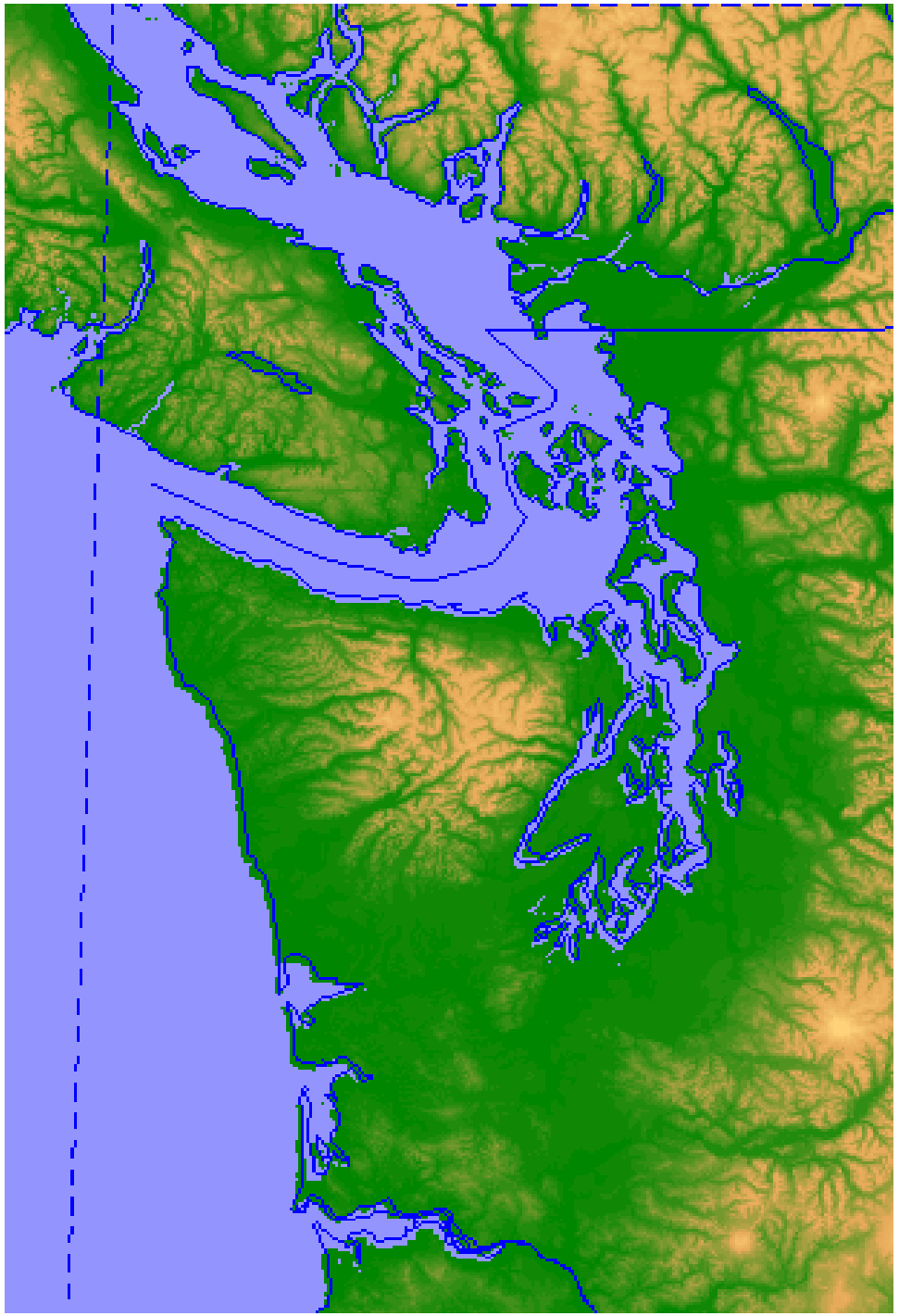
Gelatinous taxa have higher biomass in southern regions:



Summary:

Regional taxa differences:

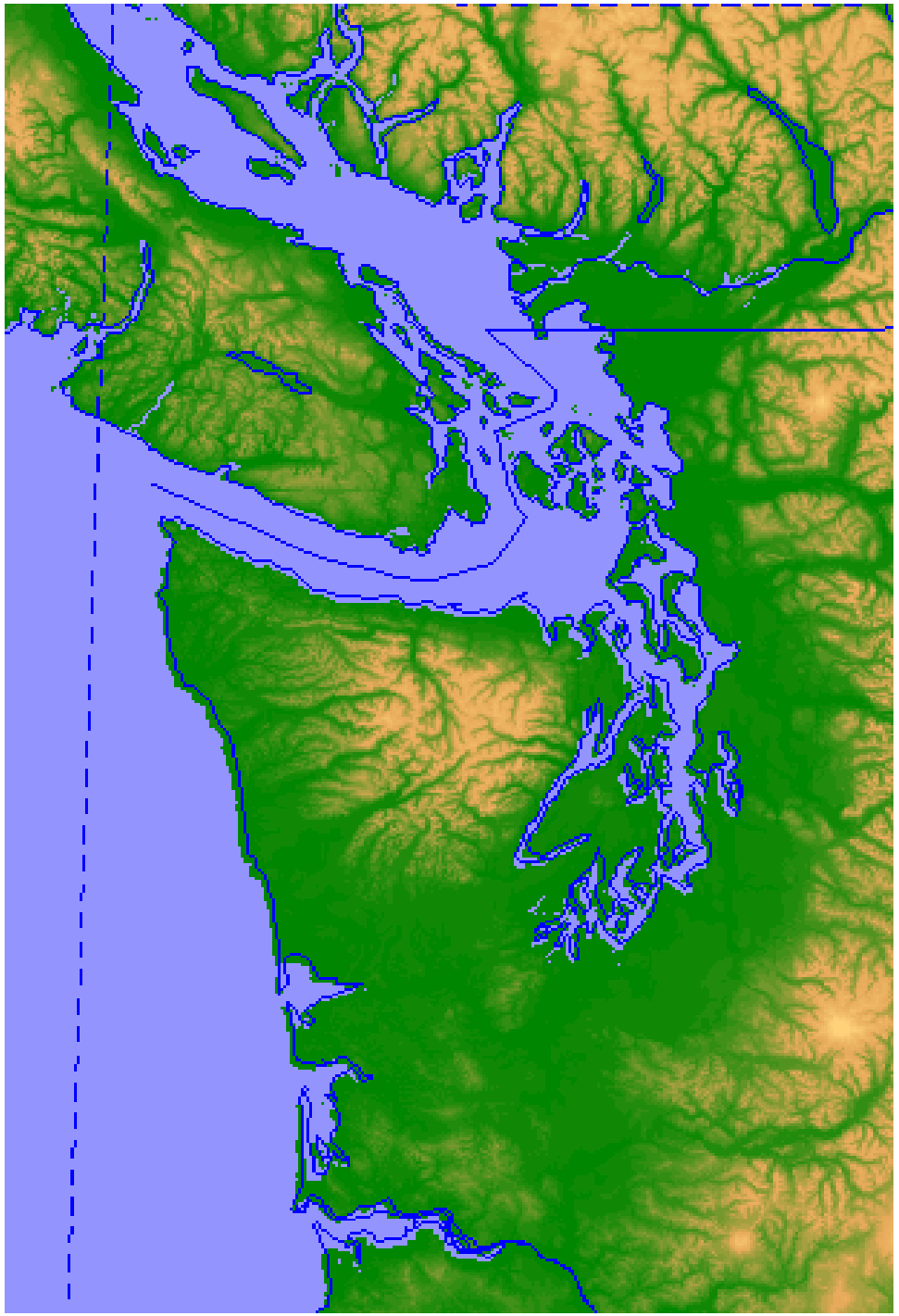
- More oceanic species in north
- More high-biomass crustacean species in mid stations
- More gelatinous taxa in south



Summary:

During MHW:

- Elevated temperatures
- Moderate, mixed changes in chlorophyll
- Elevated total zooplankton biomass
- Increases in many crustacean & mollusc taxa
- Increases in resident copepod taxa
- Decreases in coastal copepod taxa
- Early increases in gelatinous taxa



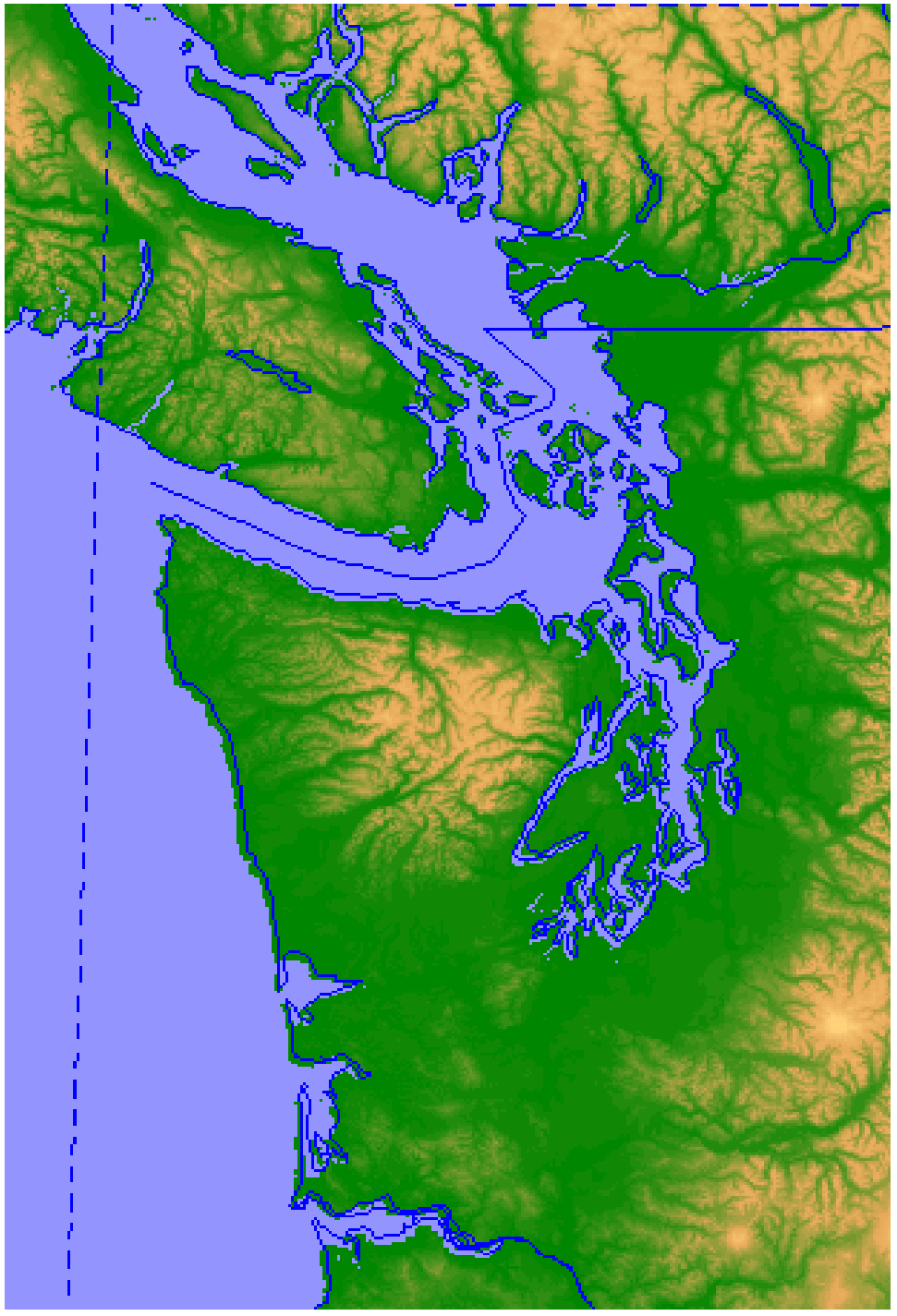
In the Salish Sea:

Q: Were changes in zooplankton biomass and composition due to:

→ Bottom-up changes in production?

→ Temperature-driven changes, increased metabolism and growth?

→ Top-down release from predation pressure?



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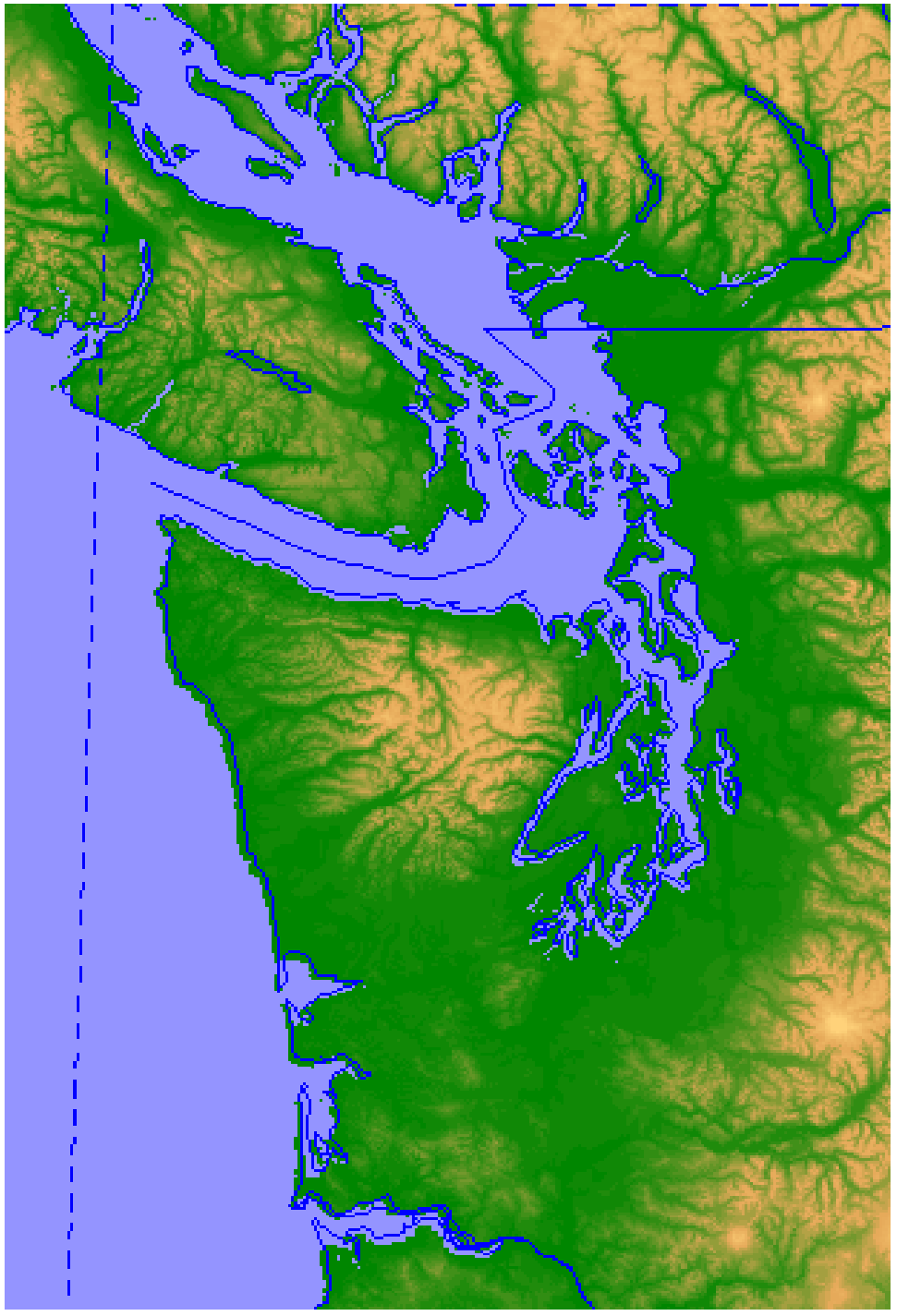
Salish Sea Model (Khangoankar et al. 2021) suggests:
overall temperature increase was modest (~0.6°C)
Bottom-up change: Increased river flow → increased exchange flow → increased nutrients

~20% increase in chlorophyll overall
~18% increase in zooplankton overall



Partnerships & Funding

SALISH SEA
MARINE SURVIVAL PROJECT

King County

LONG LIVE THE KINGS

EPA

UNIVERSITY OF WASHINGTON 1861

TULALIP TRIBES

DEPARTMENT OF ECOLOGY
State of Washington

Washington Department of FISH and WILDLIFE

PACIFIC SALMON COMMISSION

KWIÁHT

LUMMI NATION
TREATY OF 1855

WASHINGTON STATE DEPARTMENT OF
Natural Resources

HOOD CANAL SALMON CENTER

NISQUALLY INDIAN TRIBE

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

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PORT GAMBLE S'KLALLAM TRIBE