PUGET SOUND
VITAL SIGNS

VITAL Sign
ZOOPLANKTON

Zooplankton are a diverse group of tiny animals that live in the water column and feed on phytoplankton (plant plankton) and other zooplankton. This group includes jellyfish and comb jellies, small crustaceans like copepods and krill, the larval forms of crabs and oysters, the larval or juvenile forms of some fish, and many other organisms. This Vital Sign tells us about the abundance and distribution of zooplankton populations in Puget Sound. Zooplankton play a critical role in the marine food web as important prey for juvenile salmon and small forage fish.

VITAL SIGN > INDICATOR	PROGRESS	STATUS
Zooplankton		
Seasonal average zooplankton biomass	NO TREND	
Zooplankton Index	MIXED RESULTS	
Annual average zooplankton biomass	NO TREND	

Related Strategies

- Awareness of Effects of Climate Change
- Climate Adaptation & Resilience
- Education Partnerships
- Funding
- Research & Monitoring
- Salmon Recovery
- Stewardship & Motivating Action
- Strategic Leadership & Collaboration

Vital Sign Reporter

PSEMP Forage Fish & Food Webs Work Group

Last Updated

05/22/2025

KEY VITAL SIGN MESSAGES

- Zooplankton are a diverse group of organisms that include jellyfish and comb-jellies, small crustaceans (copepods and krill), and early life history stages of various animals (e.g., crabs, clams, and fishes). These play a critical role in the marine food web, and are vital prey for juvenile salmon and forage fish.
- The Puget Sound Zooplankton Monitoring Program addresses the effects of prey limitations on juvenile salmon survival during their critical growth phase. This ongoing monitoring effort, involving state, federal, tribal, and local agencies, fills long-standing data gaps for fishery managers and ecosystem modelers, and has shown correlations to salmon survival.
- Zooplankton communities are seasonally distinct throughout the several basins in the southern Salish Sea, and changes in these communities can be tied to large-scale climate fluctuations. Most zooplankton live in the top 650 feet of water, feeding on phytoplankton and other zooplankton. This Vital Sign tells us about their abundance and distribution in Puget Sound.
- The mechanisms affecting zooplankton populations in the Salish Sea and its unique basins vary from those on the outer coast, making regional studies of Salish Sea zooplankton critical for understanding local causes and effects of changing zooplankton communities.
- More than 200 types of zooplankton have been identified in the southern Salish Sea. Copepods are the most abundant, with over 70 species comprising over 50% of the total biomass. Other abundant groups include barnacles, larvaceans, gastropods, bryozoans, bivalves, polychaetes, cladocerans, and amphipods.
- During the 2015-2016 Pacific marine heatwave, zooplankton biomass was unusually high throughout the region, with the most dramatic increases seen in central Puget Sound stations. This increase in biomass persisted in Puget Sound through 2017.

BACKGROUND DOCUMENTS

Indicator Targets

Targets are not defined for these indicators. When evaluating trends in the indicators, it is important to note that high biomass of any group would indicate high prey availability for their predators. However, because there is a complex food web in the Salish Sea where sustained predation will decrease biomass, low biomass does not necessarily indicate that the system is in an unhealthier state than when biomass is high.

OTHER RESOURCES

Websites

- Dr. Julie E. Keister (http://faculty.washington.edu/jkeister/)
- Salish Sea Marine Survival Project
- Puget Sound Marine Monitoring (kingcounty.gov)

Papers

Suchy, K.D., E. Olson, S.E. Allen, M. Galbraith, B. Herrmann, J.E. Keister, R.I. Perry, A.R. Sastri, and K. Young. 2023. Seasonal and regional variability of model-based zooplankton biomass in the Salish Sea and evaluation against observations. Progress in Oceanography, 219, 103171. https://doi.org/10.1016/j.pocean.2023.103171.

Winans, A. K., B. Herrmann, and J. E. Keister. 2023. Spatio-temporal variation in zooplankton community composition in the southern Salish Sea: changes during the 2015-2016 Pacific marine heatwave. Progress in Oceanography, 214, 103022. https://doi.org/10.1016/j.pocean.2023.103022.

Khangaonkar, T., A. Nugraha, S. K. Yun, L. Premathilake, J. E. Keister, and J. Bos. 2021. Propagation of the 2014–2016 northeast Pacific marine heatwave through the Salish Sea. Frontiers in Marine Science 8. https://doi.org/10.3389/fmars.2021.787604.

Khangaonkar, T., A. Nugraha, L. Premathilake, J. E. Keister, and A. Borde. 2021. Projections of algae, eelgrass, and zooplankton ecological interactions in the inner Salish Sea – for future climate, and altered oceanic states. Ecol. Modell. 441: 109420. https://doi.org/10.1016/j.ecolmodel.2020.109420.

CONTRIBUTING PARTNERS

Zooplankton Vital Sign indicators development

Puget Sound Zooplankton Monitoring Program development & management

Puget Sound Zooplankton Monitoring Program/Salish Sea Marine Survival Project funding

- The Salish Sea Marine Survival Project (Long Live the Kings and the Pacific Salmon Foundation for program development and 2014 and 2015 sampling and analysis)
- King County (for Central Basin sampling, analysis, and CTD data)
- The NOAA Saltonstall-Kennedy Program and Tulalip Tribes (for 2016 sampling and analysis)
- The Environmental Protection Agency
- WA Dept. of Natural Resources (for 2017-2021 sampling and analysis)
- WA Dept. of Fish and Wildlife (for 2022-2023 sampling and analysis)

Zooplankton field samplers & coordinators

- King County
- Kwiáht Center for the Historical Ecology of the Salish Sea
- Lummi Nation
- Nisqually Indian Tribe
- NOAA
- Port Gamble S'Klallam Tribe
- WA Dept. of Fish and Wildlife
- Tulalip Tribes
- Hood Canal Salmon Enhancement Group
- WA Dept. of Ecology
- Stillaguamish Tribe of Indians

TO LEARN MORE ABOUT THE VITAL SIGNS VISIT: **vitalsigns.pugetsoundinfo.wa.gov**