

We could detect food-web disruptions (and maybe even predict salmon survival) using a fatty acid-based index... but we need phytoplankton data first.

Is there a disruption in the food-web pathways in the Strait of Georgia that might be related to the declines in the Pacific salmon in Canada?

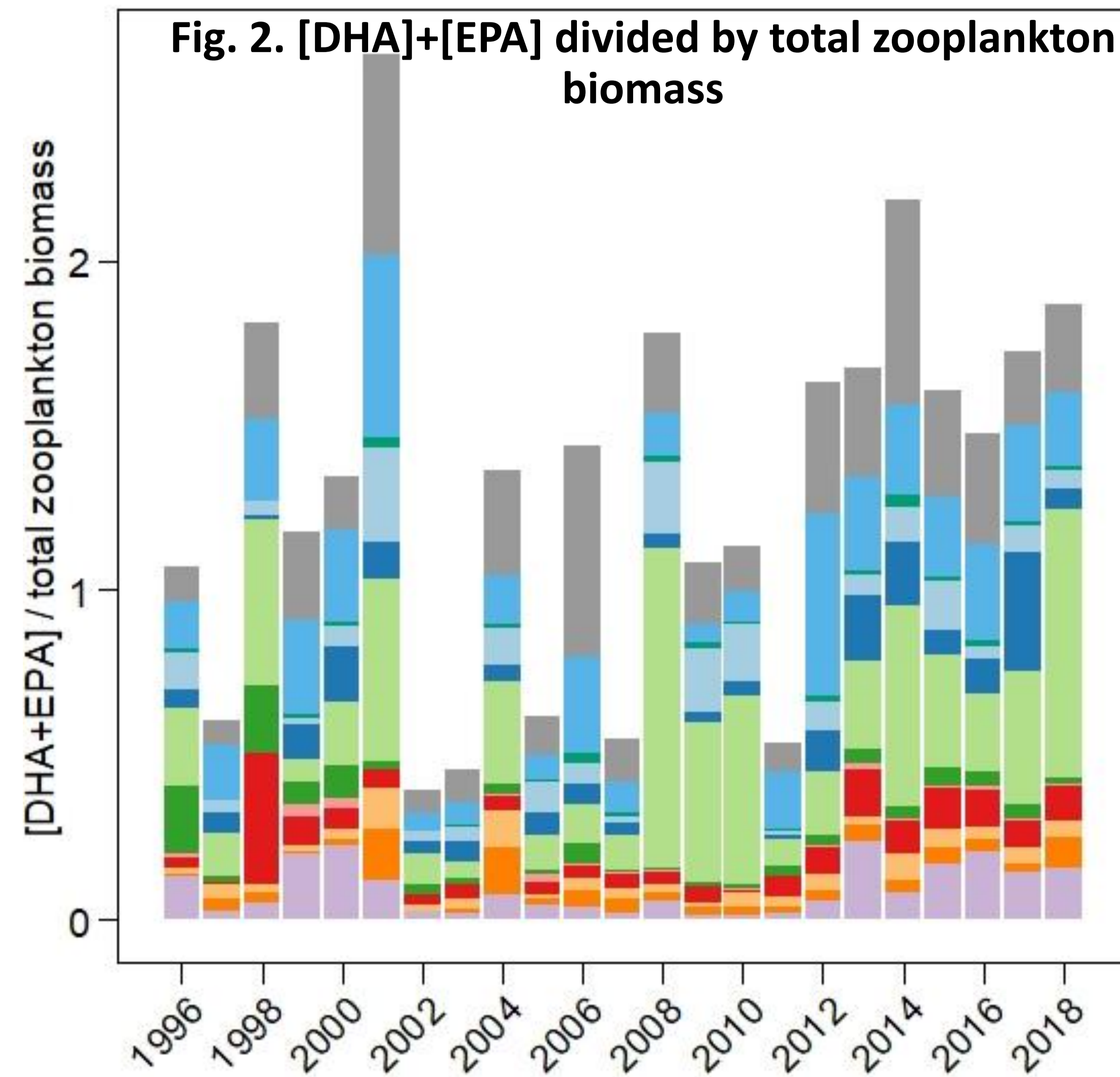


David Costalago (He/Him), Brian P.V. Hunt, Chrys Neville, R. Ian Perry, Kelly Young, Nina Nemcek, Ian Forster

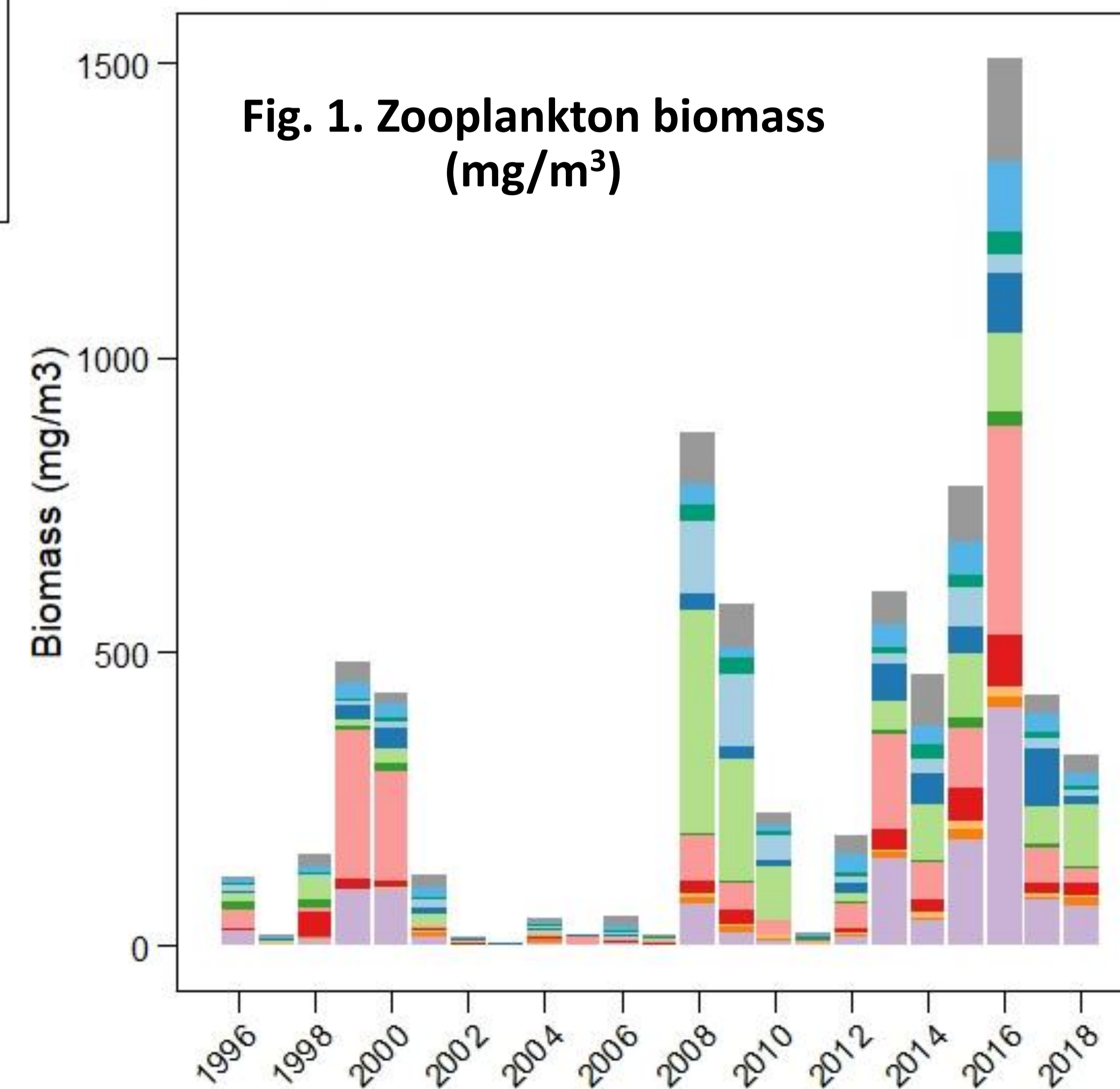
d.costalago@oceans.ubc.ca

INTRODUCTION

- Fish growth and survival are determined by the nutritional content of their food, and the fish that grow quickly during early life stages are more likely to reproduce.
- Polyunsaturated fatty acids (PUFAs) play a role in animals' health, and their abundance is correlated with the somatic growth of zooplankton and fish (Kainz et al. 2004).
- The PUFAs 20:5n3 (EPA) and 22:6n3 (DHA) are known to be particularly important for marine fish (Dalsgaard et al. 2003). However, the ability of fish to biosynthesize EPA and DHA is limited.
- Consequently, fish must acquire these PUFAs through their diet, and thus their abundance in the plankton is used as a proxy for the nutritional quality of potential prey for fish.
- We measured [DHA]+[EPA] in different zooplankton taxa as a proxy for their quality as food for juvenile salmon.



- Amphipods
- Calanoid copepods
- Copepods
- Chaetognaths
- Decapods
- Euphausiids
- Fish larvae
- Gelatinous plankton
- Molluscs
- Paraeuchaeta elongata
- Pasiphaea pacifica
- u/i Crustaceans



METHODS

- We used zooplankton community composition time series data (Fig. 1) from Mackas et al. (2013) and DFO in the Strait of Georgia (map).
- Additional zooplankton samples for fatty acid analyses were collected in 2017-2018.
- Zooplankton larger than 1700 μm were sorted by species and their fatty acid composition was analyzed (Costalago et al. under review).
- We extrapolated the [DHA]+[EPA] values to the zooplankton species on the time series multiplies by the biomass of each taxon for every year.

DISCUSSION

Despite the much larger biomass of zooplankton in more recent years (Fig. 1), particularly in 2008, 2015-2016, zooplankton provided a similar or higher amount of [DHA]+[EPA] commensurate with total zooplankton biomass in some of the earlier years (i.e. 1998-2001) than in 2008 or 2015-2016 (Fig. 2).

Changes in the zooplankton community composition, and thus in the overall nutritional quality of the available prey for fish, might have been more critical for salmon survival than changes in the quantity of zooplankton.

Since the FA composition of zooplankton ultimately depends on the phytoplankton community composition, a FA-based index for the lower trophic levels could be used to detect historical disruptions in the energy flux in the planktonic food-web and how this has affected the quality of the food for juvenile salmon.

BIBLIOGRAPHY

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