

Using the optical plankton recorder LOKI (Lightframe On-sight Key species Investigations) to elucidate high-resolution vertical distribution patterns of Arctic key zooplankton species in Fram Strait

Rationale: Optical measurements are increasingly important in zooplankton studies as they allow for covering wide spatial ranges and study the distribution of the dominant taxa in greater detail than classical net tows. In the Fram Strait, hydrographical conditions change quickly due to the prevailing current system. Thus, zooplankton depth distribution may change on short spatial scales.

Methods: We studied the community composition, abundance and depth distribution of the mesozooplankton species in the Fram Strait. Two hauls from 1000 m depth to the surface were taken with LOKI (Lightframe on-sight key species investigations), an optical plankton recorder, during a RV Polarstern cruise in July/August 2015 (PS93.2) to the "AWI-Hausgarten". We sampled at the most northern (N5; 79°56'35"N, 3°11'45"E) and at the most southern station (S3; 78°35'97"N, 5°4'11"E). All organisms were measured and identified in the pictures taken by LOKI.

LOKI (Lightframe On-sight Key species Investigations)

- Vertical tows down to 1000 m depth (Fig. 1A)
- 27 high resolution pictures sec⁻¹ (Fig. 1B,C)
- One cm mesh on top that no large zooplankton clog the cuvette
- Equipped with net of 150 µm mesh size
- Depth, Sal, T, O₂, and fluorescence recorded simultaneously



Fig. 1A: LOKI, deployed in the Fram Strait

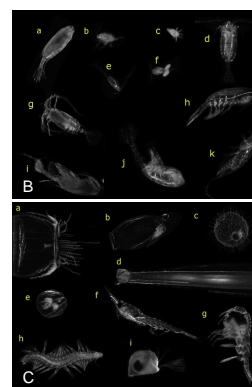


Fig. 1B: Examples of copepods; (a) *Aetideopsis* sp., (b) *Microcalanus* sp., (c) nauplius, (d) *Calanus* spp. Stage CV, (e) *Oithona* sp., (f) *Oncaea* sp. female with egg sacks, (g) *Gaetanus* sp. female, (h) *Calanus* spp. Stage CIV, (i) *Paraeuchaeta* sp. female with egg sack, (j) *Metridia* sp. female, (k) *Heterorhabdus* sp.

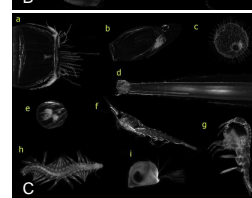


Fig. 1C: Examples of non-copepod zooplankton; (a) *Aglantha digitale*, (b) Siphonophora, (c) Radiolaria, (d) Chaetognatha, (e) Ctenophora, (f) Euphausiacea, (g) Amphipoda, (h) Polychaeta, (i) Ostracoda

Results

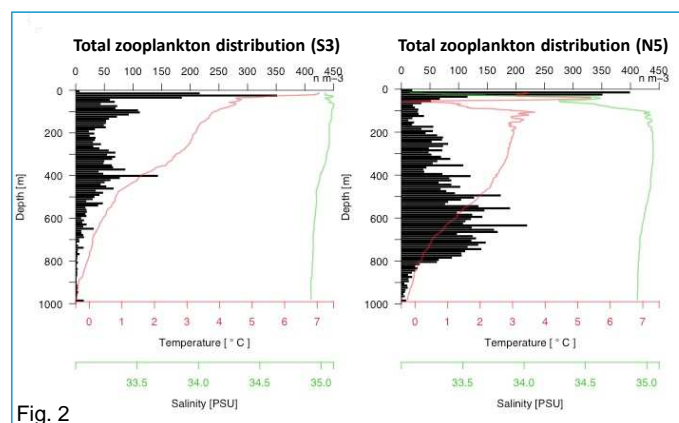


Fig. 2

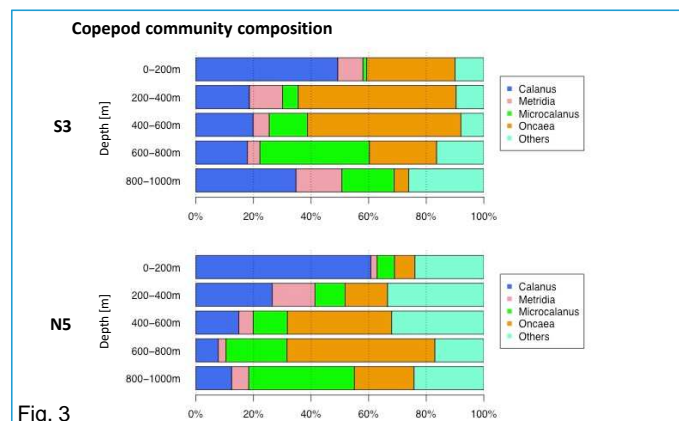


Fig. 3

Mean-weighted depths

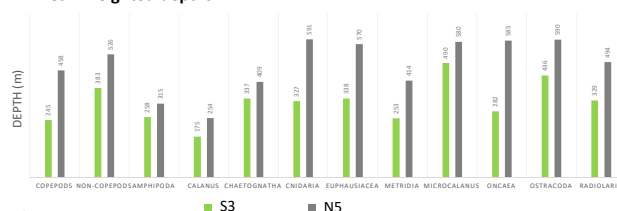


Fig. 4

Depth distribution of *Oncaea* spp.

Depth distribution of *Calanus* spp.

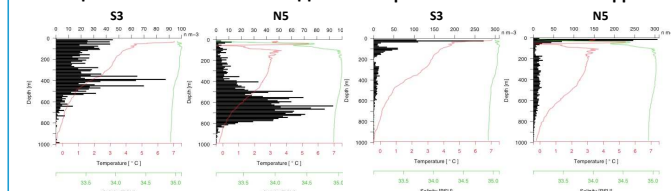


Fig. 5

- Total mesozooplankton abundance 2x higher at N5 than at S3 (Fig. 2)
- Copepod species composition similar at S3 and N5 (Fig. 3)
- Mean weighted depth ~150 m deeper at N5 (Fig. 4, 5)
- Vertical distribution and hydrography → related to deeper North Atlantic current and deeper Return Atlantic Intermediate Water, dominant species reside at greater depth at N5