Energy demands of copepods and decapods in the Benguela upwelling system and their contribution to active carbon flux

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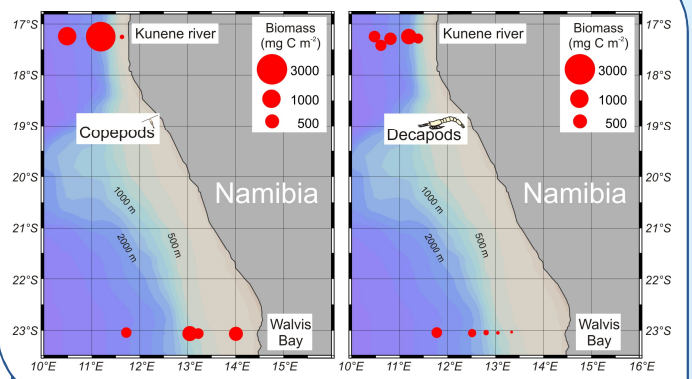
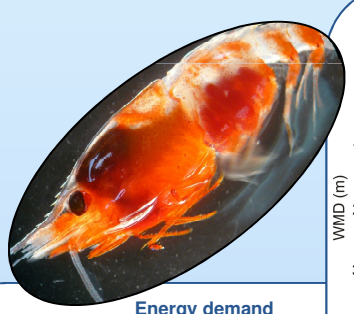
Introduction

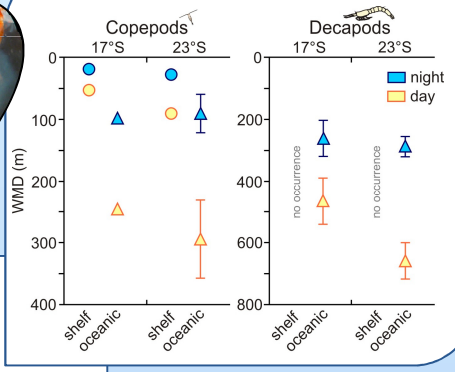
Copepods and decapods are major components of the meso- and macrozooplankton community in Benguela upwelling system with key species representing major trophic links between primary production and higher trophic levels. Furthermore, they play a crucial role in the cycling of organic matter via moulted exoskeletons, faecal pellets, and respiration processes. Diel as well as seasonal or ontogenetic vertical migration of zooplankton contributes to the downward carbon flux, as organisms consume organic carbon in surface waters, which they respire at depth. The presented data set is essential for the development of realistic carbon budgets and food-web models.

Biomass





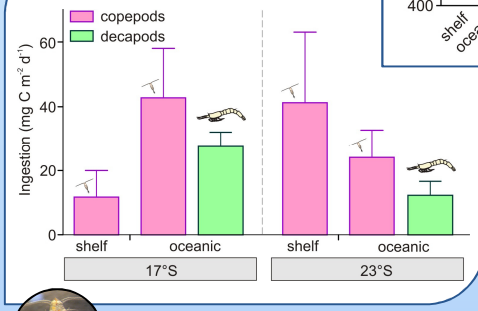
Day/Night distribution



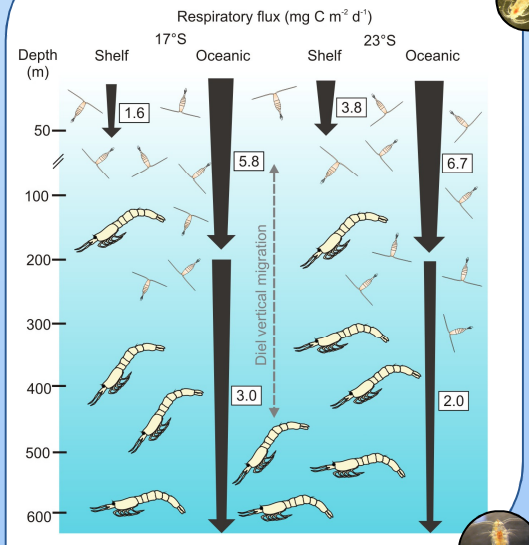
Abundance, biomass and weighted mean depth (WMD)

- Copepods had a higher abundance (4-32 x 10^3 ind. m^{-2}) as compared to decapods (<1-19 ind. m^{-2}).
- However, biomass of copepods and decapods was in the same order of magnitude and highest at the northern transect at 17°S.
- Migration amplitude of copepods was higher at oceanic stations (147-204 m) as compared to shelf stations (33-63 m).
- Decapods occurred in deeper water layers at oceanic regions during day and night than copepods.

Energy demand



Active carbon flux of vertical migrants



Active carbon flux

- Active carbon flux in the upper 50 m at shelf areas of the northern and southern transect was 1.6 and 3.8 mg C m^{-2} d^{-1}, respectively, due to vertically migrating copepods.
- Copepods contributed with 24% (17°S) and 60% (23°S) to total carbon flux in the euphotic zone in oceanic areas, whereas decapods contributed with more than 90% to total carbon flux in deeper water layers (200-600 m).
- Total active carbon flux of all migrant species was similar at both transects.

Carbon consumption

- Carbon consumption of copepods was significantly higher at the shelf area off Walvis Bay (23°S) as compared to the northern transect (17°S).
- In contrast, total carbon consumption of both taxa was higher in oceanic areas at the northern transect.

Conclusions

➢ Vertically migrating copepod species are important for the carbon flux in the euphotic zone of the northern Benguela system, especially in the region off Walvis Bay, whereas pelagic decapods are more important in mesopelagic depth.

➢ The active carbon flux of migrating copepod and decapod species is equivalent to up to 70% of sinking POC and thus, both taxa apparently play an important role in the biological carbon pump of the Benguela upwelling system.

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