GUDP-projekt MEDUSA (34009-23-2140), AP2, M2.2, UF2
Udbredelse, biologi og fiskeri af gopler

Cornelia Jaspers, Centre for Gelatinous Plankton Ecology & Evolution (CGPEE), National Institute of Aquatic Resources, Technical University of Denmark

The common jellyfish *Aurelia aurita* is a natural member of Danish ecosystems. However, in certain areas of inner Danish waters, mass occurrence of certain jellyfish species have raised concern for tourism, aquaculture and cooling water intake activities. It has been suggested that such jellyfish blooms are a result of global change induced ecosystem disturbances. This work package addresses the distribution, biology and ecology of the major jellyfish and comb jelly species in Danish waters. As such, this work package has investigated the spatial and temporal distribution of all major jellyfish and comb jelly species in the North Sea, Baltic Sea, especially Bornholm Basin, the Skagerrak and Kattegat as well as Limfjorden in 2023 and 2024 (see Fig. 1 for regional coverage).

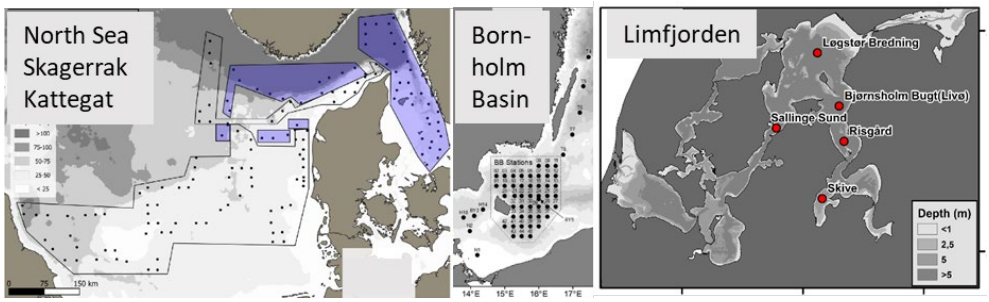

Figure 1. Stations investigated for jellyfish and comb jelly abundance and biomass data during 2023 and 2024 to evaluate hot spot areas for jellyfish and comb jellies as well as identification of target species that can be harvested.

It can be concluded that *Cyanea capillata*, the lion´s mane (brandmand på dansk), *Aurelia aurita*, the common moon jellyfish (vandmand på dansk) and *Mnemiopsis leidyi* (den amerikanske rippegople, eller dræbergople på dansk) are the most wide spread species reaching the highest densities and biomasses in Danish waters (see Fig. 2 for species description). The non-indigenous *Mnemiopsis leidyi* is an invasive species in Danish waters. It is native to the east coast of the USA and has been present in Danish waters since 2005 (see Jaspers et al. 2018 for references). It is a species with an exceptional low carbon content, however, due to its invasive nature, selective removal of *M. leidyi* biomass could potentially lead to lowering its impact on food web structure and functioning. Hence a selective harvesting of this species would be advantageous. Extraction protocols established by DTU Kemi (AP3) based

DTU Aqua
National Institute of Aquatic Sciences
Anker Engelunds Vej 101
Bygning 101
2800 Kongens Lyngby
Tel. 3588 3247
Mobil. 93511774
coja@dtu.dk
www.dtu.dk

on material collected and provided by AP2 to DTU Kemi in autumn 2023, are promising and indicate successful water removal with high quality protein of this species.

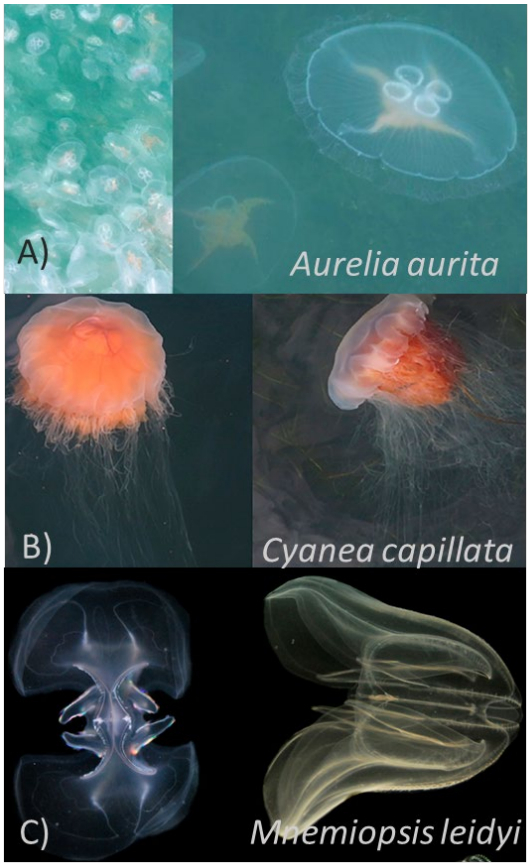

Figure 2. The most common jellyfish and comb jelly species present in Danish waters with the highest harvesting potential with A) *Aurelia aurita*, the common moon jellyfish (vandmand), B) *Cyanea capillata*, Lion´s mane (brandmand), C) *Mnemiopsis leidyi* the invasive comb jelly (amerikanske rippegoble).

The second species of interest is the native lion´s mane *Cyanea capillata*. It can reach exceptional large sizes during late summer in the higher saline Skagerrak and Kattegat regions and is commonly found throughout deep waters of the Borholm Basin and in the North Sea. This species has successfully been harvested and protein extraction been tested by DTU Kemi in spring 2024. Due to the adverse effects of this species on tourism and aquaculture activities, as a result of its high stinging capacity, a targeted removal of this species from late summer plankton communities can be regarded as advantageous. It is not expected that this targeted removal will negatively impact plankton communities. However, due to its high stinging capacity, extracted protein fraction would need to be checked for toxicity and potential adverse effects.

The third species of interest with documented large population densities is the moon jellyfish *Aurelia aurita*. This species is widespread in coastal waters of all Danish

waters. It is also common in the low saline central and northern Baltic Sea surface water, where both the lion´s mane and the *Mnemiopsis leidyi* do not occur. *Aurelia aurita* forms clusters of very high abundance each summer in Limfjorden, especially in the Skive Fjord area. In Limfjorden, it has been described that mass occurrences have impacted fisheries activity with up to 60% of the fishing trawls that could not be completed because the trawls were overloaded with jellyfish (see Riisgard et al. 2012).

Hence, Limfjorden and especially Skive Fjord can be regarded as hotspot with exceptional high abundances of *Aurelia aurita*. Therefore, Skive fjord is targeted as the primary jellyfish fisheries site to establish a potential jellyfish fishery. Removal of *A. aurita* in this area and reduction of its biomass in the future is expected to lead to an ecosystem recovery of this area, which is suffering from wide spread oxygen depletion during summer probably caused by heavy predation control of zooplankton (i.e. copepods) by jellyfish and lack of phytoplankton biomass control by the zooplankton. We have implemented a test fishery during June 2024 where we tested large mesh sizes (i.e. 3mm) for the targeted removal of jellyfish in surface waters of Limfjorden. Bycatch of other plankton and fish species in this area was basically non-existing. Hence, no negative impacts on biodiversity due to the highly specific and targeted removal of *Aurelia aurita* in Skive Fjord and other areas of Limfjorden could be documented during June 2024 and are not expected in the coming years. We harvested a moderate 0.2 tonnes, as this was the maximum biomass the other work packages could handle during down-stream applications. Further test fisheries, including test of gill net harvesting, is planned for autumn 2024.

References:

Jaspers, C., Huwer, B., Antajan, E., Hosia, A., Hinrichsen, H.-H., Biastoch, A. et al. (2018) Ocean current connectivity propelling the secondary spread of a marine invasive comb jelly across western Eurasia. Global Ecology and Biogeography 27: 814–827.

Riisgård, H.U., Andersen, P., Hoffmann, E. (2012) From fish to jellyfish in the eutrophicated Limfjorden (Denmark). Estuaries and Coasts 35(3): 701-713.