

Norwegian management plan for harvesting *Calanus finmarchicus*



DIRECTORATE OF FISHERIES

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Outline

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- Ecological effects of the calanus fishery
- Small scale trial fishery
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Definitions

- The geographical area that is suggested in the plan is defined by the Norwegian Economic Zone (NEZ) and the Jan Mayen zone in the Norwegian Sea
- Based on the biological knowledge we separate between fishing in the coastal area/coastal current and fishing in areas further out at sea:
 - The coastal current and coastal zone/areas are areas shallower than 1000 m depth
 - The area deeper than 1000 m depth is here defined as an oceanic area/fishery.

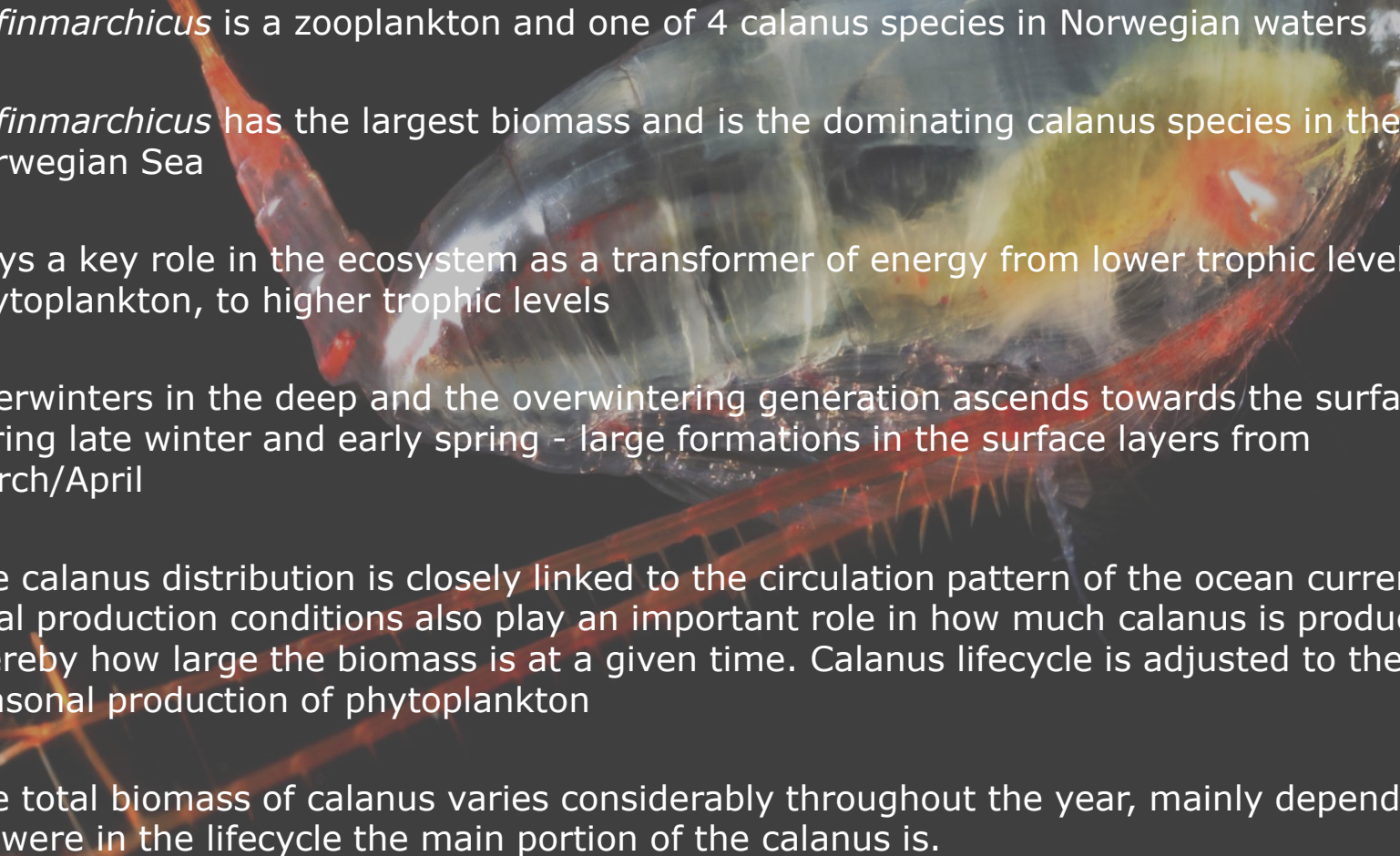
Background

- On a world basis, commercial harvesting of small zooplankton is not a widespread activity compared to the harvesting of larger crustaceans such as shrimp, crawfish, crabs and lobster
- To date, the largest zooplankton fishery is the harvesting of Antarctic krill (*Euphausia superba*) in the Southern Ocean (Antarctica)
- This fisheries has been regulated since 1982 through CCAMLR (Commission for the Conservation of Antarctic Marine Living Resources) and is part of the Antarctic treaty
- In 2012 the Ministry of Trade, Industry and Fisheries asked the Directorate of Fisheries to contribute to the composition of a management plan for *Calanus finmarchicus*. This has been a collaboration with the Institute of Marine Research
- It is up to the Ministry to conclude whether the management plan sets the basis for permitting an ordinary fishery on *C. finmarchicus*.

Status

- Today's management goal for *C. finmarchicus* is to secure the biodiversity and the ecosystem functioning
- To date, the situation regarding the knowledge of all the biological and ecological aspects of the stock is not well known
- Based on the low knowledge level, the regulation of *C. finmarchicus* will be based on a precautionary approach
- *C. finmarchicus* is a large and commercially little utilized marine resource both in Norway and other countries. The potential for a larger exploitation is substantial due to its large abundance
- The demand for marine raw material both for fish/animal feed and as a raw material for various products for human consumption is very high
- Today it is prohibited to harvest *C. finmarchicus*, one company has been given a permit to harvest up to a 1000 t yearly (2003-2017). Another company can also harvest smaller phyto- and microplankton (2009 – 2016, up to 50 t)
- The key role *C. finmarchicus* has in the ecosystem is essential, and must not to any extent be affected negatively by today's selection. The quota and limitations of the fishery in the coastal current is characterized as a precautionary approach. The purpose of the management plan is also to contribute to a knowledge based management where the consequences of harvesting *C. finmarchicus* in a larger extent is described and weighed against each other.

Calanus finmarchicus - Biology and ecology

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- *C. finmarchicus* is a zooplankton and one of 4 calanus species in Norwegian waters
 - *C. finmarchicus* has the largest biomass and is the dominating calanus species in the Norwegian Sea
 - Plays a key role in the ecosystem as a transformer of energy from lower trophic levels, phytoplankton, to higher trophic levels
 - Overwinters in the deep and the overwintering generation ascends towards the surface during late winter and early spring - large formations in the surface layers from March/April
 - The calanus distribution is closely linked to the circulation pattern of the ocean currents, local production conditions also play an important role in how much calanus is produced, thereby how large the biomass is at a given time. Calanus lifecycle is adjusted to the seasonal production of phytoplankton
 - The total biomass of calanus varies considerably throughout the year, mainly depending on where in the lifecycle the main portion of the calanus is.

An aerial photograph of a fishing net being deployed or retrieved in the ocean. The net is a fine-meshed, rectangular structure with a dark green or black border, extending from the top center towards the bottom right. The water is dark blue with white foam from the net's movement. A semi-transparent dark grey rectangle is overlaid on the center of the image, containing the title text in white.

Ecological effects of the calanus fishery

Bycatch challenges

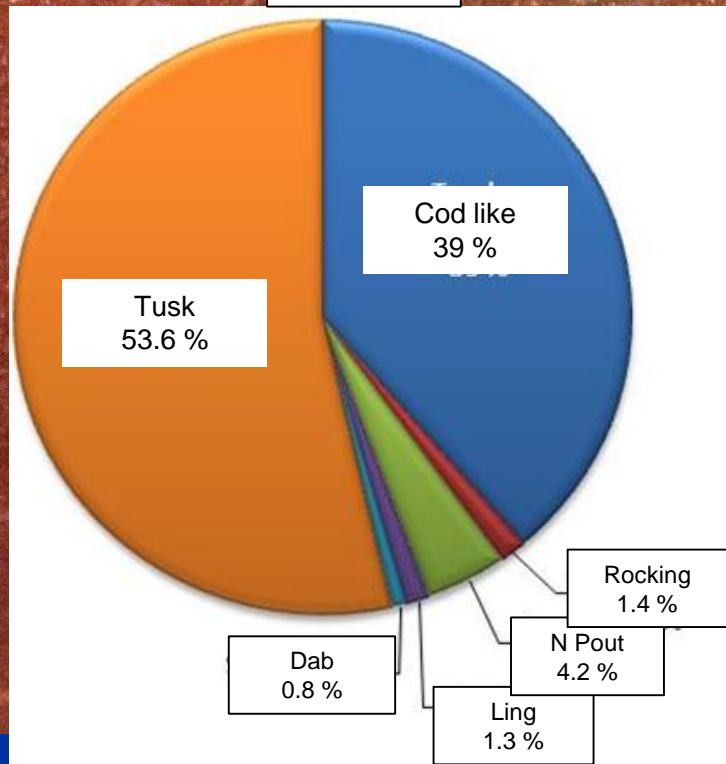
- The harvesting of calanus will affect various parts of the ecosystem:
 - the actual calanus stock,
 - predator stocks feeding on calanus,
 - bycatch of other species
- Another challenge with harvesting calanus will be fishing other species of zooplankton
- To date, the bycatch of eggs, larvae and fry of various fish species is regarded as the largest negative influential factor on the ecosystem.



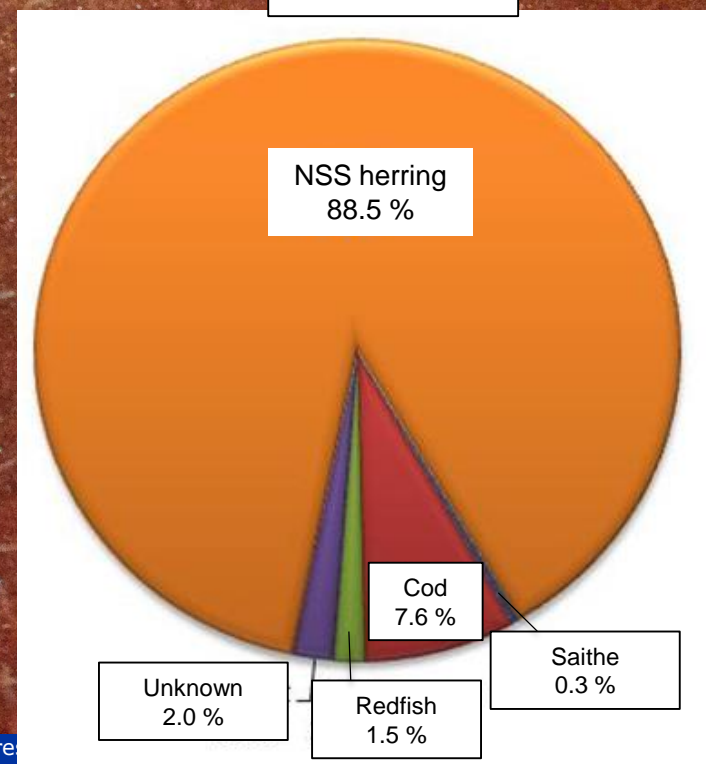
Bycatch challenges cont.

- The bycatch of cod like eggs and tusk eggs made up the largest part in 2014
 - The majority of eggs were caught south of 70°N. Tusk eggs were for the most part taken early in the season, while the cod like eggs increased during the season
- The bycatch of larvae was dominated by NSS herring (88 %), cod (8 %)
 - Herring larvae dominated through large parts of the season. Towards the end, the fishery took place further out at sea (Tromsøflaket), where the bycatch was composed of a variety of several species: cod, redfish, saithe and herring and unidentifiable larvae
- The conclusion from the 2014 fishery: the bycatch of eggs and larvae from the yearly quota of 1000 t will have an insignificant effect on the size of the fish stocks (Broms et al. 2015).

EGGS

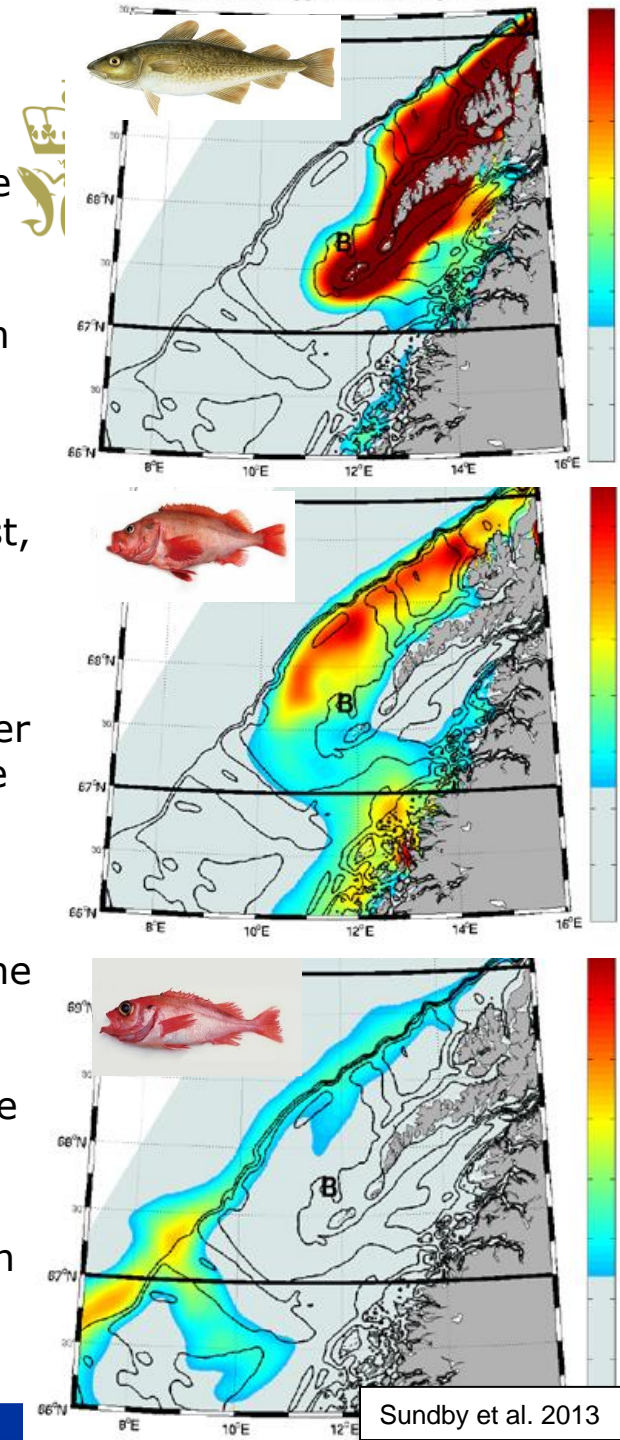


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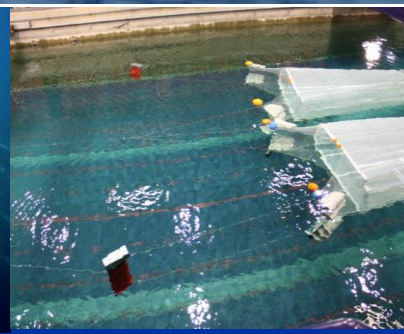
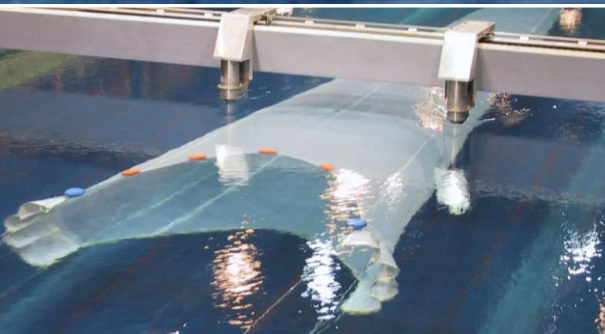
Vulnerable coastal fish stocks

- From 2013, parts of the quota was fished in specific areas inside the baselines
- The larval transport northwards takes place between 10-30 m in the upper water column, while harvesting calanus is carried out from 0-10 m
- The coastal cod is a stock in bad condition - spawns on the coast, e.g. outside Lofoten/Vesterålen where it is vulnerable in the egg- and larval stages
- Common redfish is also a stock in bad condition, while deepwater redfish is in a considerable better condition. Redfish do not have egg and larval stages, but they are vulnerable in their youngest stages
- A small portion of the coastal cod will be caught as bycatch in the area between the baselines and 4nm, along with the common redfish in their youngest stages. Overall, fishing in a limited extent in this area will probably not cause an unreasonably large strain on the ecosystem
- Until these bycatch challenges are solved, a potential increase in the Norwegian fishery of calanus must take place outside of the coastal current.



A small scale Norwegian calanus fishery

- A small scale trial fishery has been carried out since 2003
- The permit includes one participant, Calanus AS, with a yearly quota of up to 1000 t and lasts until 2017
- The fishery has mostly taken place in coastal areas, but in 2014 and 2015 the fishery was conducted further out to sea with moderate success (Tromsøflaket and Ingøydjupet)
- In 2015 the total catch was 513 t - largest catch so far (two vessels)
- The most efficient method of harvesting calanus is using a pelagic trawl. It is easiest to catch during the Spring/Summer months when it forms in loose aggregations in the upper water column (0-50 m)
- The trawl is composed of a fine mesh. The trawling speed is adjusted to the trawls ability to filter water out of the fine mesh, and is towed through the water with a speed of 0.5 – 1.5 nm per hour.

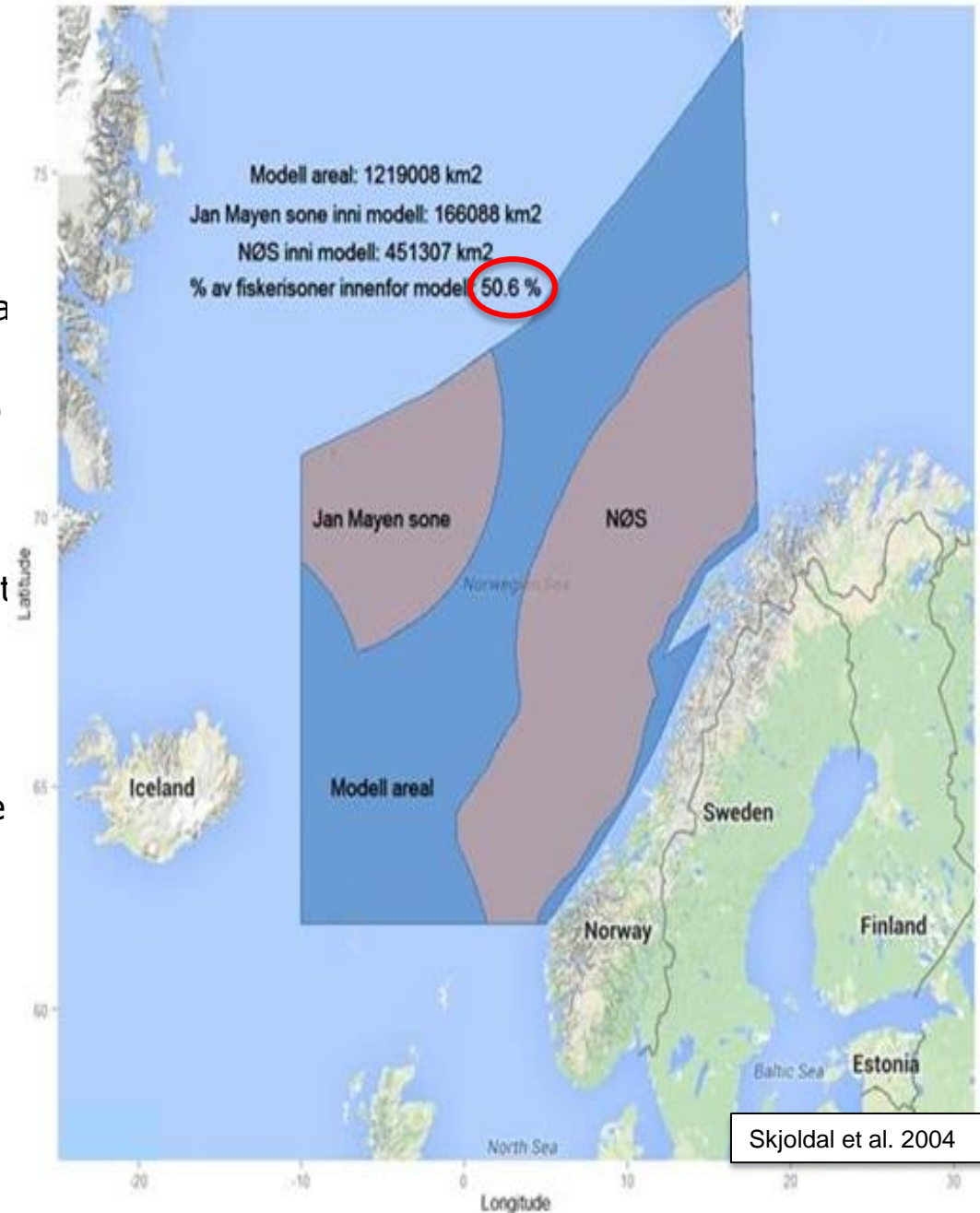


An aerial photograph of a fishing net being deployed or retrieved in the ocean. The net is a fine-mesh grid, and the surrounding water is dark blue with white foam from the boat's wake. A semi-transparent dark rectangle is overlaid on the center of the image, containing white text.

Suggestions: Regulation measures for harvesting calanus

Geographical area

- Suggestions for the total Norwegian quota is based on the NEZ and the Jan Mayen zone in the Norwegian Sea
- The total area corresponds to 50.6 % in the Norwegian Sea
- The NEZ north of 62°N between the baselines and 1000 m depth and west of 24°E
 - also include parts of the Barents Sea: Tromsøflaket and Ingøydjupet
- Outside 12 nm in the Jan Mayen zone



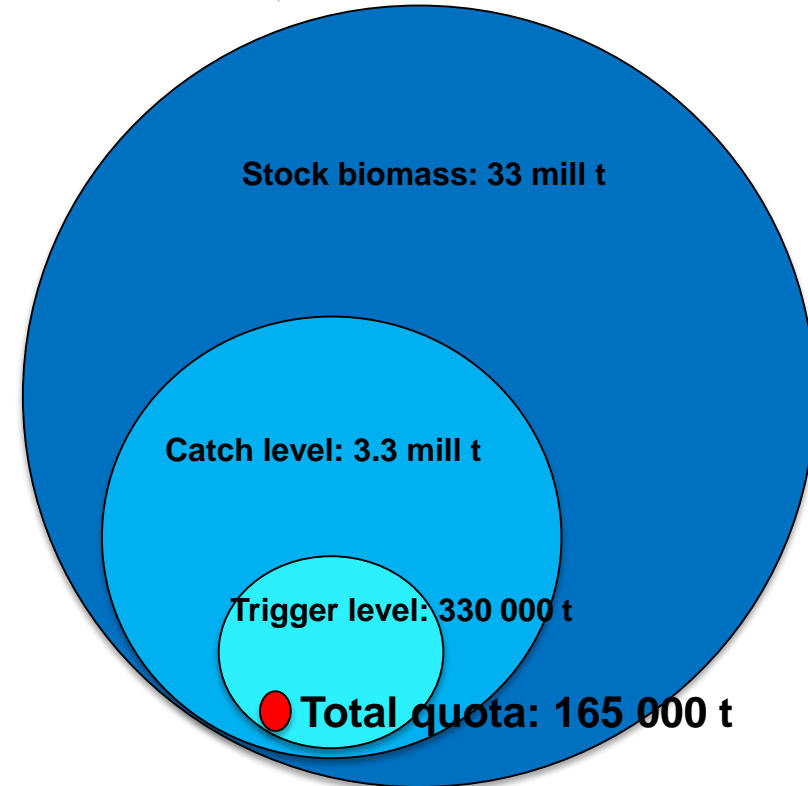
Establishing the Norwegian quota



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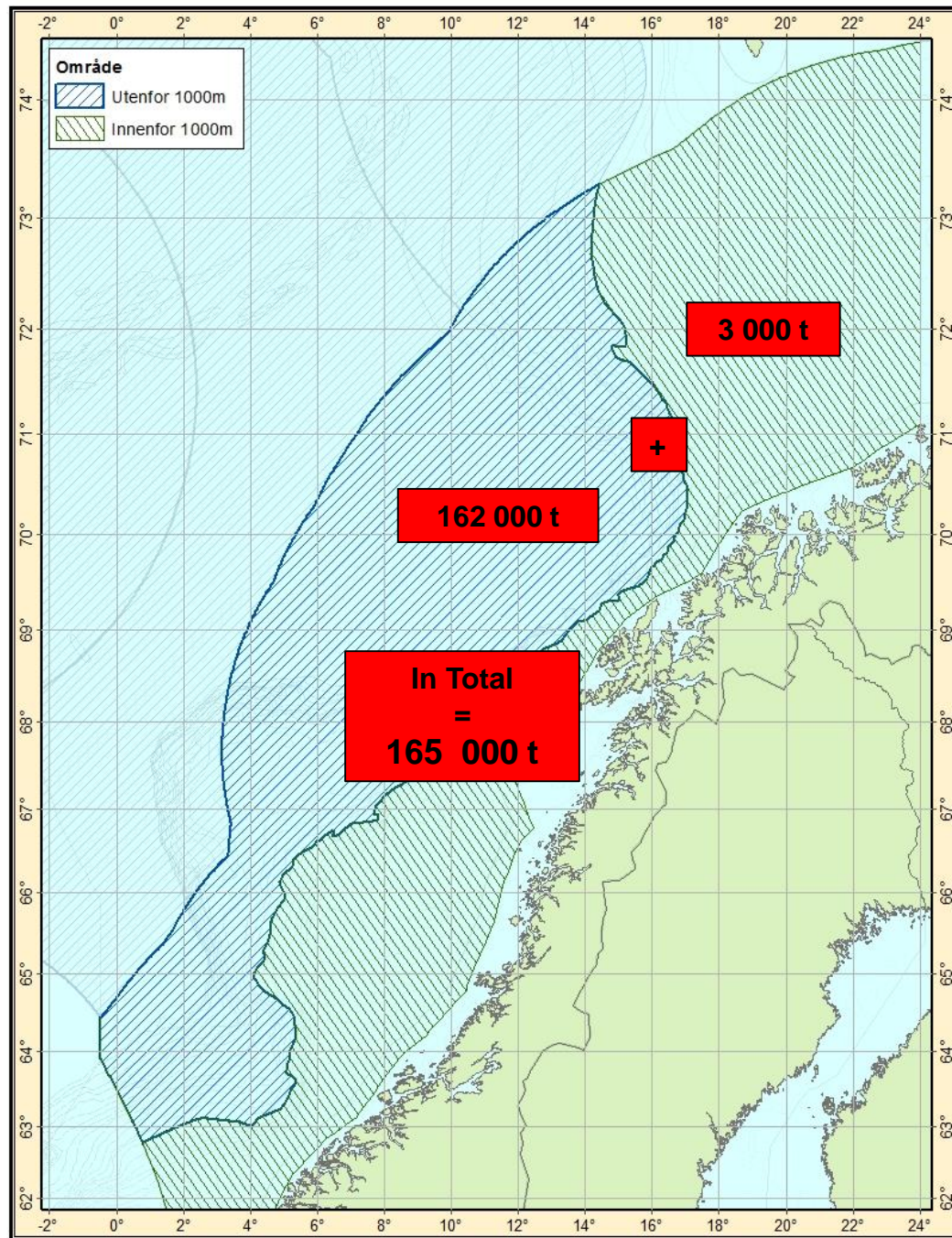
- **Stock biomass** of calanus is estimated to be about **33 mill t** in the Norwegian Sea
- Using the CCAMLR quota estimation method as an inspiration
- **Catch limit:** an exploitation degree of 10 % of the estimated standing stock would be 10 % of 33 mill t = **3.3 mill t**
- **Trigger level:** based on a pre-cautionary approach. 10 % of 3.3 mill t = **330 000 t**
- The total Norwegian quota is suggested to include the NEZ and the Jan Mayen zone in the Norwegian Sea. This area constitutes 50.6% of the total area for the Norwegian Sea.

The **total quota = 165 000 t** (330 000 x 50%)



Norwegian quota

- The NEZ north of 62°N outside the baselines and west of 24°E, and outside 12 nm in the Jan Mayen zone
- Divided into two main areas:
- Area between the baselines and 1000 m depth:
 - 3 000 t
- Area deeper than 1000 m within NEZ and outside 12 nm in the Jan Mayen zone
 - 162 000 t
- **In total 165 000 t**



Requirements for participation



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- Fishing vessel: relatively large size (30 m -), storage room, conservation/preservation of the catch
- Gear: pelagic trawl, so far only gear that has been utilized
- Mesh size: maximum mesh size is 2000 μm (throughout the trawl, in order to limit catch of fish fry and small fish)
- Specific catch permit:
 - **Area between the baselines and 1000 m depth, west of 24°E:**
 - Should have another trawling licence in addition to the specific catch permit
 - Need to be registered with the Register of Fishing Vessels. May provide new permits for those that do not have one
 - Quota: 3000 t, ca. 350-500 t per vessel – up to **10 specific catch permits**
 - Passive permits will be confiscated after 3 years (certain requirements/criteria) and may be re-allocated to other applicants
 - Vessels that are provided this permit, can also harvest calanus in the area outside 1000 m and in the Jan Mayen zone
 - **Area deeper than 1000 m and in the Jan Mayen zone:**
 - Require a trawling licence
 - No restrictions regarding the participation of the fishery in this area (depends on the development in the fishery)
 - The quota: 162 000 t
- Due to natural causes fishing after calanus will not be a yearly fishery, but take place during Spring- and Summer months.

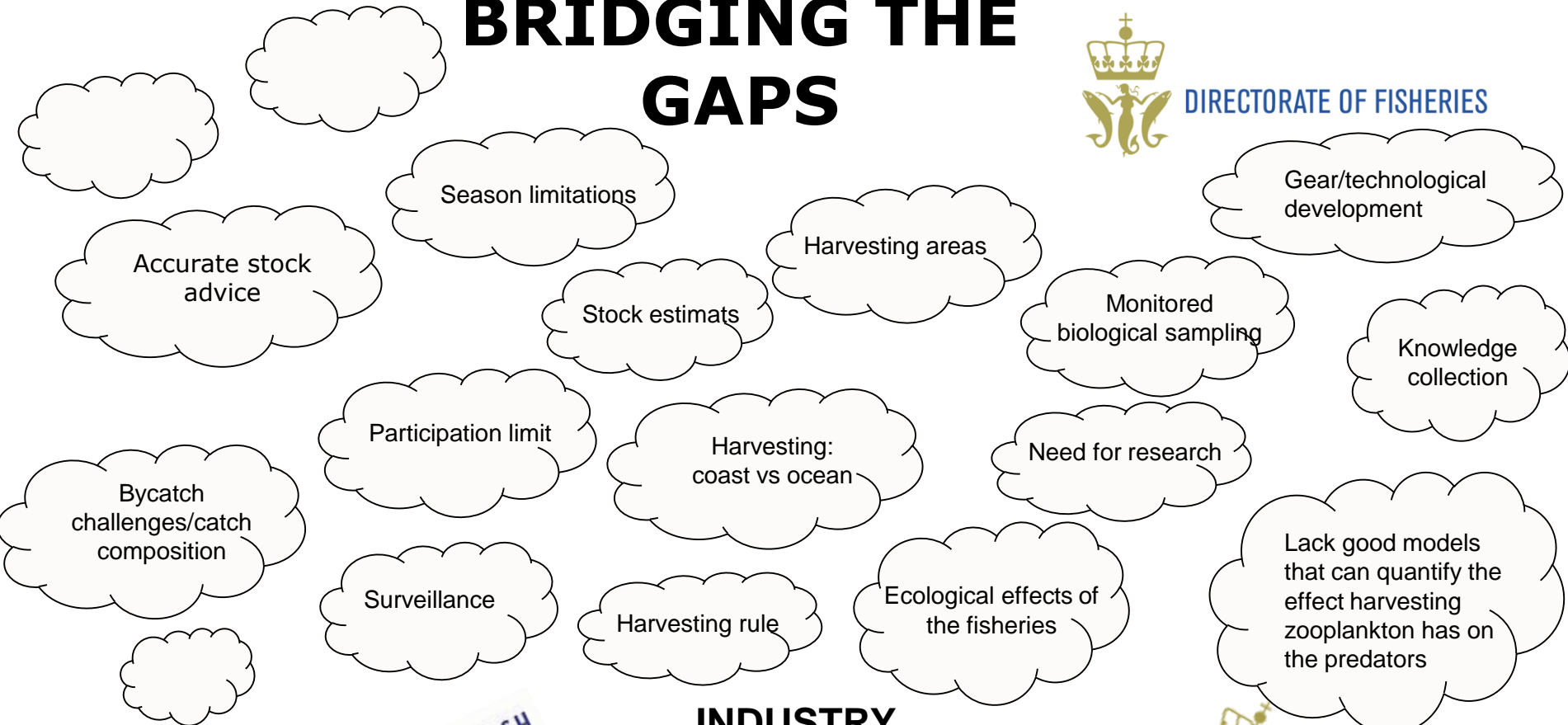
Conclusions

- The total Norwegian quota outside the baselines in the NEZ defined by 62°N and 24°E, and in the Jan Mayen-zone is **165 000 t**
- 3000 t is set to the area between the baselines and 1000 m depth in NEZ
- 162 000 t is set to the area outside 1000 m depth in NEZ (165 000 minus 3000)
- Fishing inside the baselines is prohibited
- Fishing inside 12 nm in the Jan Mayen-zone is prohibited
- No time restrictions with regard to season are set to the calanus fishery
- In order to participate in the fishery the vessels have to comply to the requirements of a standardized biological sampling system
- The fisheries authority may require that inspectors/observers are put onboard the vessels for prolonged periods of time
- Adjustments to the regulations will be conducted in consolidation with the industry, equivalent to other Norwegian fisheries.

BRIDGING THE GAPS



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INDUSTRY



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Exploit the knowledge and competence as best as possible – need a closer interaction in order to serve a sustainable fishery of the stock

Surveillance and control

- The existing landing regulation will also apply to the harvesting of calanus
- A standardized biological sampling system of the catch and reporting of the samples taken (protocol composed by IMR and Calanus AS)
- Continuous surveillance and control of the calanus fisheries will be central in the follow-up of this new potential fishery
 - Utilization of traditional control measures: the Coastguard and inspectors from the Directorate of Fisheries both at sea and on land
- The government can also place inspectors/observers onboard the vessels. These inspectors may stay onboard the vessels for prolonged time periods
- Usual protocol with regard to satellite tracking, electronical reporting etc.

