

Possibilities and challenges for sustainable harvesting and processing of mesopelagic fish

The importance of the ocean economy is increasing with a growing population. The report "Value created from productive oceans in 2050" describing potentials towards 2050 based upon the marine based industries (NTNU, The Royal Norwegian Society of Sciences and SINTEF, 2012). With a current estimate of 10 billion tons the unexploited mesopelagic fish resources can be the most promising global sustainable source for protein and healthy marine lipids in the future.

SURVEYS WITH "BIRKELAND" 2016 - 2017

This work is based on data collected in three cruises that were carried out in the North Atlantic, ICES-NEAFC RA 1 Reykjanes Ridge area on June-July 2016, April-May 2017 and July-August 2017 (Fig. 1).

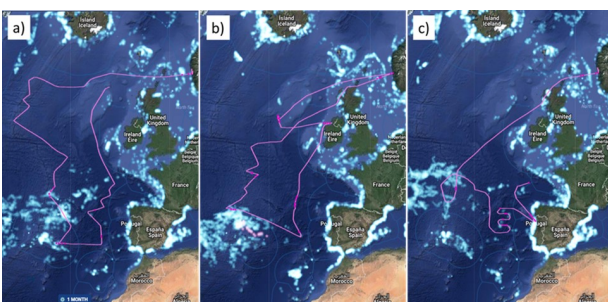


Fig. 1: All cruises were carried out in the ICES-NEAFC RA 1 Reykjanes Ridge area. The pink line shows the route followed by MS Birkeland in a) June-July 2016 (cruise 1), b) April-May 2017 (cruise 2), and c) July-August 2017 (cruise 3).

More than 30 mesopelagic species were identified during three surveys with "Birkeland" 2016 - 2017. *Maurolicus muelleri*, *Benthoosema glaciale* and krill were the three most abundant species and represented approximately 98% of the total in volume in the catches. Catch rates reached up to 12.000 kg per hour.



Fig. 2: *Maurolicus muelleri*, *Benthoosema glaciale* and krill were the three most abundant species, represented approximately 98% of the total

The vessel used in the cruises was the commercial trawler MS Birkeland (62 m LOA). The instruments applied were Sonic Kaijo Denki KSE 300 sizing echo-sounder with split beam transducer (38, 70 and 120kHz) mounted in a retractable keel, Kayo Denki fisheries search sonar, type KCS-228Z, 24kHz and KCH-1828, 160kHz, Simrad trawl sonar, type FS20/25, 90kHz horizontal and 120kHz vertical sonar heads, RD Instruments Acoustic Doppler Current Profiler, type Ocean Surveyor (ADCP).



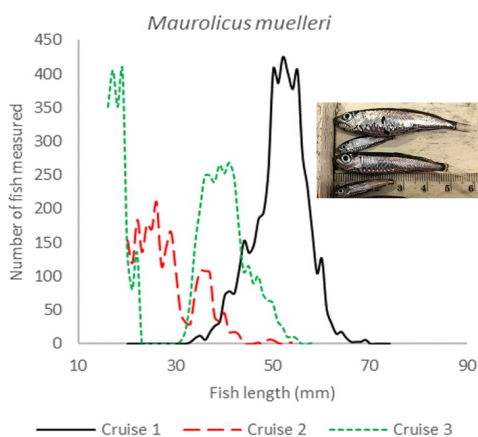
LABORATORY PROCESSING ON BOARD

Due to the rapid degradation of the raw material (catch), there was established an on-board laboratory scale processing facility where representative fresh (unfrozen) raw material from the mesopelagic catches was processed in order to monitor mass balances (oil, emulsion, hydrolysate/stickwater and sediment). Different processing technologies were used, such as: i) thermic separation ii) hydrolysis and iii) production of silage.

CHEMICAL CONTENT, UNWANTED SUBSTANCES & BIOLOGY

The chemical content in the dominant mesopelagic species in the Atlantic Ocean makes them interesting as healthy food and feedingredients. We also found very low values of unwanted substances such as dioxins, PCBs, PAH, chlorinated pesticides, and heavy metals (Pb., Cd., Hg. og As.).

The growth of the mesopelagic species *Maurollicus muelleri* is rapid with a high reproduction potential; early sexual maturity and long spawning season.



SUSTAINABILITY

The sustainability in a development of a mesopelagic fishery must be documented. The possibilities for sustainable harvesting and processing of mesopelagic fish can only be investigated and realized in a joint and committed long time effort between governmental bodies including the Norwegian Institute of Marine Research, leading private companies and leading R&D institutions



LESSONS LEARNED 2016-2018

2016: massive registrations and (theoretically) catch rates of *Maurollicus muelleri* (50 mm) and *Benthoosema glaciale* (37 mm)

2017: massive registrations but small mesopelagic catches, smaller average size of *Maurollicus muelleri* (20 – 40 mm) and *Benthoosema glaciale* (27 mm)

2018

Enormous areas ... , more surveys necessary for tracking/identification of commercial interesting areas and seasons. Very expensive surveys ...

