Theme session A

Mesopelagic ecosystems: fish and invertebrate population biomass and biodiversity, and role in carbon flux

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The session was proposed by the ICES Working Group on Zooplankton Ecology (WGZE) recognizing that the mesopelagic zone, stretching from 200 to 1000 m depth, comprises about 60% of planet's surface and 20% of the ocean´s volume, constituting a large part of the total biosphere. The bulk part of the fish of the world live there, by number as well as by biomass: a 2008 study put the world marine fish biomass at 0.899 billion tonnes, a number that is only slightly lower than the 1980 estimate of mesopelagic fish biomass alone (~ 1 billion tonnes). It is, however, a zone of wide diversity; the dominating taxonomic groups are crustaceans, various jellyfishes, and cephalopods in addition to the fishes. Recent studies indicate that the total amount of mesopelagic fish biomass globally has been grossly underestimated, possibly by a factor of 10. The new assessment suggests a biomass in the order of 10,000 million tonnes, roughly equivalent to 100 times the annual catch of traditional fisheries of about 100 million metric tons.

Even though much is known about the mesopelagic community and its functioning in the marine ecosystems, still much remains unknown, especially the role of the many macroplanktonic taxa in the sequestration of carbon in the deep sea. The purpose of the session was to provide a forum for presentations on:

- mesopelagic taxonomy

- abundance and biomass

- trophic ecology

- reproductive biology

and the major gaps that remain to be addressed in order to sustain this system in the face of climate change and resource exploitation.

The session attracted 17 high quality research contributions from 8 countries of which 10 were presented orally and 8 as posters. In addition, there were two no shows; one talk (code A-75) and one poster (code A-610).

The papers may be grouped broadly into presentations on modelling, instrumentation, marine policy, and field observations. The only topic that received no contributions was the reproductive biology of mesopelagic organisms.

The following discussion provides an overview of the session based on this division.

Modelling

CM Code: A:338 The deadly midnight sun: visual predators and northern range limits in mesopelagic fish

CM Code: A:370 Fish community structure from productive shelf systems to open ocean environments

CM Code: A:111 Multi trophic diel vertical migrations and active carbon transport

Instrumentation

CM Code: A:479 Deep-see: an Instrument platform for sampling the twilight zone

CM Code: A:528 Mesobot: a new autonomous underwater vehicle for tracking and sampling animals and particles in the mesopelagic zone

Marine Policy

CM Code: A:266 Scaling the benefits of and risks to the ecosystem services of the midwater

Field Observations

Mesopelagic Taxonomy, Diversity

CM Code: A:40 Distribution, diversity and community structure of mesopelagic fauna in seamounts of the Madeira-Tore complex (Northeastern Atlantic)

CM Code: A:647 Zooplankton distribution in the mesopelagic strata across the tropical and subtropical domains of the Atlantic, Indian, and the Pacific Oceans

Abundance and Biomass

CM Code: A:57 Experimental fishery and utilization of mesopelagic fish species and krill in the North East Atlantic

CM Code: A:447 Distribution and composition of mesopelagic macroplankton and micronekton in the North-east Atlantic

Trophic Ecology

CM Code: A:418 Trophic pathways through gelatinous zooplankton in pelagic Southern Ocean food webs

CM Code: A:521 Elemental fluxes mediated by vertically migrating zooplankton and nekton into the mesopelagic oxygen minimum zone off Peru

CM Code: A:107 Zooplankton production and carbon export flux in the western Alboran Sea gyre (SW Mediterranean)

CM Code: A:536 The ecology of pelagic tunicates in the Cape Verdean oceanic ecosystem

CM Code: A:260 Trophic ecology of mesopelagic fishes (F. Myctophidae) and their prey in Gorringe Bank (Northeastern Atlantic)

CM Code: A:293 The unique ecological role of pyrosomes in the Costa Rica Dome

CM Code: A:569 Mesozooplankton and POM $\delta13C$ and $\delta15N$ signatures at and under the Cabo de Hornos Current off theChilean Patagonia

The session was well attended with between 50 to 75 individuals present for the talks. Tom Langbehn talk on " The deadly midnight sun: visual predators and northern range limits in mesopelagic fish" (A:338) won the best presentation of the ASC.

Countries of Contributors:

Chile, Denmark, Germany, Norway, Portugal, Spain, UK, USA

In the final general discussion, three questions were considered:

(i) What are the major problems in abundance estimation of the mesopelagic biomass?

It was agreed that estimation is difficult, due to depth distribution of the taxa and there is a need for more sophisticated acoustic devices as well as models. Also, it was highlighted the importance of knowing the number of species that belong to mesopelagic and agreed that DNA techniques will be extremely helpful in this case.

(ii) What are the major steps forward shown in the session?

It was considered the need to have more works on the relation of gelatinous organisms with the mesopelagic and to study the influence of water masses (e.g. gyres) with the mesopelagic distribution. The importance of having more studies with a similar focus to the one presented by A:57 was highlighted, were the use of commercial ships were used to map the distribution of mesopelagic fishes that will help to explain to explain variations on biomass and to estimate biomass.

(iii)   What will be the future challenges for abundance estimation of
         mesopelagic species?

It was considered that more technological developments with new instrumentation will help estimate abundance of mesopelagic species but, models are also very useful for that.