7-11-2013

Length Structure of Deep-Pelagic Fishes Sheds New Light to their Life Histories

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THURSDAY 11th July

09:15 Keynote lecture

VERTICAL ECOLOGY OF THE PELAGIC OCEAN: QUANTIFIED PATTERNS AND NEW PERSPECTIVES

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Applications of acoustic and optical sensing and intensive, discrete-depth sampling, in concert with collaborative international research programs, have substantially advanced our knowledge of pelagic ecosystems in the 17 years since the last Deep-water Fishes FSBI Symposium. Although the epipelagic habitat is the best-known, and remote sensing and high-resolution modeling allow near-synoptic investigation of upper layer biophysical dynamics, ecological studies within the mesopelagic and deep-demersal habitats have begun to link lower and upper trophic level processes. Bathypelagic taxonomic inventories are far from complete but recent projects (MAR-ECO and CMarZ, supported by the Census of Marine Life program) have quantitatively strengthened distribution patterns previously described for fishes and provide new perspectives. Synthesis of net and acoustics studies suggests that the biomass of low-latitude mesopelagic fishes may be 2-3 orders of magnitude greater than the total global commercial fisheries landings. Inclusion of high-latitude mesopelagic and global bathypelagic fish biomass estimates suggests that the majority of Earth's fish biomass may be deep-pelagic. Acoustics studies have detected pronounced deep-scattering layers well below 1000 m, while discrete-depth net sampling has documented deep-pelagic fish biomass maxima below 1500 m in some regions. Investigations of bathypelagic ecosystems demonstrate that gelatinous zooplankton, as well as other "alternate pathways," are key trophic resources for deep-water fish production. Lastly, perhaps the most exciting discovery is that vertical interconnectivity among fishes throughout the water column is widespread. As Peter Herring (2002) remarked, "*Every time we think we understand the [deep ocean] ecosystem and the organisms they manage to produce a new rabbit out of the oceanic hat, so that we are required to readjust our previous perspective.*"

10:30 Theme session: Deep-pelagic ecology

LENGTH STRUCTURE OF DEEP-PELAGIC FISHES SHEDS NEW LIGHT TO THEIR LIFE HISTORIES

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Here we use a new technique to study life history variation in deep-pelagic fishes from a mid-ocean ridge system. Shape of length distribution in a population is to a significant

extent determined by the degree to which an average individual approaches its asymptotic maximum size. Analysing the material from the pelagic trawl hauls taken during the 2004 Mar-Eco expedition along the northern Mid-Atlantic Ridge, we show that length distributions in many deep-pelagic fish species are characterised by negative skew (the left tail of the distribution is longer). In other words, a large proportion of individuals had a size close to species-specific maximum size. Provided that our sampling can be considered representative, this finding suggests that deep-pelagic fishes have a low mortality rate relative to the rate at which they grow towards their asymptotic size.

10:50

TROPHIC ECOLOGY OF THE LANTERNFISH *LAMPANYCTUS CROCODILUS* IN NW MEDITERRANEAN IN RELATION TO REPRODUCTIVE CYCLE AND ENVIRONMENTAL VARIABLES

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The trophic ecology and distribution of the lanternfish Lampanyctus crocodilus was investigated over a wide bathymetric range (450-2200 m) and at a seasonal scale in the NW Mediterranean. The reproductive cycle and environmental variables were also analysed in order to identify drivers of the observed trends. Juveniles of the species (<9 cm TL) were more abundant on the upper (ca. 500-600 m of depth) and lower slope (ca. 1500 m), according to the distribution of deep zooplankton. Adults mostly inhabited on the middle slope (ca. 800-1000 m), while the greater number of mature females were found at 1000-1200 m. Reproduction took place in February (as measured by the GSI index) and it is driven by temperature and food availability as deduced by Generalized Linear Models. Consistently, the feeding ecology varied both seasonally and over the depth range explored. On the upper slope L. crocodilus mainly fed on euphausiids and mysids during all seasons, while below 1000 m euphausiids were also important prey together with gelatinous plankton in spring and mesopelagic fish in summer. In autumn L.crocodilus fed on a wider array of prey (suprabenthic gammariids, cumaceans, decapods).. Conversely, on the upper slope trophic diversity was greater in summer. Surface primary production recorded 2 months before sampling was responsible of fullness patterns, consistent with the expected delay between vertical food inputs and the response of benthopelagic species over the slope.

11:10

TOPOGRAPHIC BLOCKAGE CONTRIBUTES TO THE DIET OF INDIAN OCEAN SEAMOUNT FISHES

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Seamounts often harbour considerable aggregations of fish and micronekton, some of which are targeted by fisheries. These aggregations are thought to be sustained by localized trophic subsidies, provided by mechanisms like the topographic blockage of descending zooplankton and lateral advection of allochthonous material. We combined acoustic