

Theme Session C

Mid-ocean ridges and seamounts: oceanography, ecology, and exploitation

ICES CM 2008/C:02

Structure and distribution of fish and cephalopod communities on the Burdwood Bank (Southwest Atlantic)

Paul Brickle, Vladimir Laptikhovskiy, and Alexander Arkhipkin

The Burdwood Bank is an underwater plateau, with large shallows of less than 100 m, lying in the Southwest Atlantic between the western extremities of the Scotia Ridge and southern South America. The Bank is in the path of the Antarctic Circumpolar Current and as a feature it gives rise to the Falklands Current. The area is characterized by an anticyclonic gyre which, in conjunction with its local hydrography, results in unique fish and cephalopod communities. Surveys were carried out between September 2002 and June 2007 using a semi-pelagic net. They revealed that the Burdwood Bank has a rich fauna comprising at least 120 species of fish and 28 species of cephalopods between depths of 94 and 1212 m. Hierarchical cluster analysis and other multivariate analyses are used to identify distinct assemblages both geographically and bathymetrically and are compared with those inhabiting the southern part of the Patagonian Shelf around the Falkland Islands.

Keywords: Burdwood Bank, fish, cephalopods, community structure, Falkland Islands, shelf, slope.

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ICES CM 2008/C:03

Bycatch of cold-water corals from an experimental trawl survey in Corner Rise and New England Seamount Complex (NAFO Regulatory Area. Divs. 6EFG) during the year 2004

F. J. Murillo, P. Durán Muñoz, M. Mandado, T. Patrocinio, and G. Fernández

Bycatch of cold-water corals from an experimental trawl survey during 2004 in three Northwest Atlantic Fisheries Organization (NAFO) seamounts was examined (Corner Rise and New England Seamount Complex). Three hauls were carried out over two peaks located in New England Seamount Complex (Divs. 6EF). In this area, catches of commercial resources were negligible and bycatch of corals was recorded (degraded pieces of dead *Enallopsammia* spp. and *Keratoisis* spp. and a few live corals, such as *Solenosmilia variabilis*, *Metallogorgia melanotrichos*, and *Paragorgia johnsoni*), demonstrating some interaction between fishing and vulnerable habitats and that trawl fishing in the area is unfeasible. Ninety-two hauls were carried out over one peak located in Corner Rise Seamount Complex (Div. 6G), with big catches of alfonsino (*Beryx splendens*), but only six hauls showing coral records (*Enallopsammia rostrata*, *Solenosmilia variabilis*, *Madrepora oculata*, *Acanella eburnea*, and *Placogorgia terceira*) and in smaller quantities than in Divs. 6EF. The low bycatch of corals in the Div. 6G peak could be related to the less rough bottom in this area and to the previous alteration of sessile epifauna because of intense fishing activity during the last decades of the twentieth century. The results of the experimental survey indicate that the impact of trawling on seamounts could be important and that the closed area agreed in 2007 to protect the bottom habitats of the seamounts within NAFO Regulatory Area (Divs. 6EFG) should be maintained and improved.

Keywords: NAFO Regulatory Area, Northwest Atlantic Ocean, Corner Rise Seamount, New England Seamount, trawl, cold-water corals, bycatch.

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ICES CM 2008/C:04

Nursery grounds of orange roughy

M. R. Dunn and I. J. Doonan

We provide the first description of nursery grounds for orange roughy (*Hoplostethus atlanticus*) around New Zealand. The dataset consists of 12 541 bottom trawls and 713 midwater trawls, sampling depths from the surface to 2000 m. Orange roughy were only caught in midwater trawls when aggregated in vertical spawning "plumes", and were therefore large fish. No individuals smaller than 22 cm SL were caught in midwater trawls. Orange roughy of <22 cm SL were regularly caught in bottom trawls; those in their first year of life (<5 cm SL) were caught predominantly on flat ground, over a relatively narrow depth range, at greatest densities in depths of 850–900 m, and in association with known spawning grounds. As the fish got

larger, the spatial area over which they occurred increased, extended into both shallower and deeper water, and for fish lengths >15 cm SL became skewed towards deeper water. For the largest stock on the Chatham Rise, it appears the distribution of juveniles may be limited by water temperature. In stock assessment models, recruitment has usually been assumed to be constant, simply because of a lack of usable observations to the contrary. For the Chatham Rise stock we use the research survey catches of pre-recruits to estimate an upper bound to future recruitment. The results support future recruitment being substantially lower than assumed in assessments. This would explain the mismatch between the model, which predicted a biomass rebuild since the mid-1990s, and catch-per-unit-effort biomass indices, which indicate a continued decline.

Keywords: deep-water fish, orange roughy, recruitment, juvenile.

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ICES CM 2008/C:05

Could seamounts be important for fish speciation?

Paul J. B. Hart

Seamounts can be considered as islands in the deep. For many species, depth is just as much a barrier to dispersal as is the water between islands such as the Hawaii chain. This leads to the hypothesis that seamounts could be places where speciation leads to many new forms. Estimating the number of endemic species on seamounts is fraught with difficulties caused mostly by remoteness from research centres, difficulty of access due to depth, and sampling problems deriving from the nature of the habitat. A review of all seamount studies from all oceans estimated that 11.6% of fish on seamounts are endemic. Recent work on the Norfolk Ridge, the Lord Howe, and the Tasmanian seamounts and the Sala-y-Gómez chain of seamounts in the Pacific have found that potential endemics might form 29–51% of fish caught. Although based on only two groups of seamounts, these proportions for endemism support the view that seamounts might be the location of active speciation. This paper reviews the rates of endemism that have been found so far on seamounts. The reliability of the estimates will be evaluated before I analyse what is known of the selective forces and isolating mechanisms that might exist on seamounts and which would determine the possibilities for speciation. Particular emphasis will be placed on mechanisms such as barriers to gene flow and on the possible selective effects of resource competition, which have been shown to be significant in the origin of new species on island groups such as the Galapagos.

Keywords: seamounts, speciation, endemism, selective forces.

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ICES CM 2008/C:06

Abundance of seamounts in the Azores and its effect on aggregating visiting species

Telmo Morato

It has been suggested that seamounts hold higher abundances of some “visiting” animals, such as tuna, sharks, billfish, marine mammals, sea turtles, and even seabirds, but this has been based on sparse records, warranting further examination. In this paper we (i) characterize the seamount distribution of the Economic Exclusive Zone (EEZ) of the Azores and (ii) examine whether the predicted higher abundances of tuna, marine mammals, sea turtles, and seabirds actually occur around those mapped seamounts. Our algorithm showed that peaks and seamounts are common features in this region of the North Atlantic. Sixty-three large and 398 small seamount-like features are mapped and described in the Azorean EEZ. Our results indicate that some marine predators (skipjack and bigeye tuna, common dolphin, and Cory’s shearwater) were significantly more abundant in the vicinity of some mapped shallow-water seamount summits. Our methodology, however, failed to demonstrate a seamount association for bottlenose dolphins, spotted dolphin, sperm whale, terns, yellow-legged gull, and loggerhead sea turtles. Not all seamounts, however, seemed to be equally important for these associations. Only seamounts shallower than 400 m depth showed significant aggregation effects. These seamounts may be considered hotspots of marine life in the Azores and a special effort should be made to ensure sustainable management of these habitats.

Keywords: seamounts, locations, tuna, seabirds, marine mammals, sea turtles association.

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ICES CM 2008/C:07

Spatial difference in fatty acids profiles and stable isotopes values, $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$, of *Calanus finmarchicus* along the northern Mid-Atlantic Ridge

Hildur Petursdottir, Stig Falk-Petersen, Haakon Hop, and Astthor Gislason

Fatty acid profiles and stable nitrogen and carbon isotopes values, $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$, of *Calanus finmarchicus* CV were studied in June 2004 along the northern Mid-Atlantic Ridge (MAR), extending from Iceland in the north to the Charlie–Gibbs Fracture Zone (CGFZ) in the south. There was a significant difference in fatty acid/alcohol composition between stations along the MAR with a latitudinal gradient. The sum of polyunsaturated fatty acids was higher in the northern area than in the southern area. Conversely, the long-chained fatty alcohols, 20:1n9 and 22:1n11, were found in lower amounts in the northern area than in the southern area. Interestingly, the fatty alcohol ratio 20:1n9/22:1n11 was relatively high in the northern area. The $\delta^{15}\text{N}$ values were highest in the CGFZ area, indicating higher trophic position. The results are discussed in the context of different environmental conditions and population structures of *Calanus finmarchicus* along the transect.

Keywords: *Calanus finmarchicus*, fatty acid, stable isotope, Mid-Atlantic Ridge.

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ICES CM 2008/C:09

Some data on the reproductive system conditions of Antarctic toothfish (*Dissostichus mawsoni*) males and females from the Indian Ocean area in summer

S. V. Piyanova

In this study the reproductive characteristics of the Antarctic toothfish caught in the seamounts of the Indian Ocean area of the Antarctic in the fishing period 2004–2005 were investigated. This species is an important deep-water resource of Antarctica and the study forms part of a complex investigation of its life history adaptations in different areas of Antarctica. The morphological parameters and indices of gonadal function have been described. Histological criteria for the assessment of ovary maturity and cytological parameters of oocytes and type of toothfish oogenesis have been determined. During maturation from stages II to IV, toothfish ovaries show a slow increase in oocyte diameter. During the fishing period, fish with gonads in stage III dominated. Their ovaries contained three size groups of oocytes: cytoplasmic group and two groups of vitellogenous oocytes. Antarctic toothfish did not mature for spawning in the Indian Ocean area of the Antarctica during the investigation period.

Keywords: Antarctic toothfish, seamounts, reproductive adaptations, gonads, oogenesis.

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ICES CM 2008/C:10

History of Russian seamount fisheries in the Atlantic

V. I. Vinnichenko and A. F. Kakora

Intensive exploitation of seamounts in the Atlantic Ocean was carried out by the former Soviet Union in the 1970s and 1980s. Large-scale exploratory fisheries were conducted on the northern Mid-Atlantic Ridge (MAR), Corner and Rio-Grande Rises, South Azores and Madeira–Canary Island areas, and the Vavilov, Walvis, and South Antilic Ridges. In some areas, seamounts with concentrations of roundnose grenadier, alfonsino, orange roughy, black scabbardfish, tusk, pelagic armorhead, horse mackerel, mackerel, and scabbardfish notothenids, patagonian toothfish, and other species were found. The highest Soviet annual catches in most seamount areas were between 1000 and 10 000 t, with the exception of the MAR catches (29 900 t). The total cumulative catch from the Atlantic seamounts amounted to about 0.5 million tonnes. The history of fisheries indicates a vulnerability of fish stocks inhabiting the seamounts. The highest catches and fleet efficiency were observed during the first few years after the start of the fishery. Later, these rates decreased substantially and remained low over a long period. In some cases even small catches caused lower density and stability of aggregations and consequently reduced catches. In some areas catches increased again after several years but they never regained the initial level. As a result of intensive fishing most of the stocks are severely depressed.

Keywords: Atlantic seamount areas, catches, species, stocks, vulnerability.

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ICES CM 2008/C:11

The structure of the water column, flow patterns and pelagic backscatter responses around the Vema Seamount during a passage of an Agulhas ring

M. Ostrowski, Ø. Skagseth, and L. Nøttestad

We report results of bathymetric, oceanographic, and acoustic backscatter studies around the slopes of the Vema Seamount (31°30'S 8°20'E) in the southeastern Atlantic during March 2008. Altimetry revealed the passage of an anticyclonic eddy south of the seamount at the time of the survey. The seasonal pycnocline was at the depth of the top plateau of the seamount and the incident current was westward. The layer above the thermocline was advected over the summit whereas the subthermocline flow was deflected along its rim. In the wake of the seamount, the flow followed the contours across the entire depth range, suggesting closed circulation over the summit area. The migration pattern observed acoustically was related to the current. During daytime, the strongest backscatter at 200 kHz formed a narrow layer just below the surface current. During the night, it migrated to the surface, becoming exposed to the advection with the surface current. At 38 kHz the backscatter cycled between the thermocline depth (night-time) and deep waters (daytime), avoiding surface advection. On the downstream side, a threefold increase in backscatter was observed in the overlapping depth range at both frequencies. This suggests retention of zooplankton on the lee side of the seamount due to well-known ocean current mechanisms (200 kHz), and presumably an increase in concentrations of pelagic fish feeding on the accumulated zooplankton (38 kHz). Given the exposure to the Agulhas rings and the associated strong currents, similar events may occur frequently over the Vema Seamount.

Keywords: Vema Seamount, Agulhas rings, biophysical interactions.

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ICES CM 2008/C:12

Abundance and productivity of the pelagic ecosystem along a transect across the northern Mid-Atlantic Ridge in June 2003

Hafsteinn G. Gudfinnson, Hogni Debes, Tone Falkenhaus, Eilif Gaard, Ástthor Gislason, Hildur Petursdottir, Thorsteinn Sigurdsson, and Hedinn Valdimarsson

This study reports investigations undertaken on a research cruise in the Irminger Sea west and southwest of Iceland and adjacent water on the Icelandic vessel “Árni Friðriksson”, 4–30 June 2003, investigating redfish, *Sebastes mentella*, other pelagic fish, zooplankton, phytoplankton, and the hydrography of the area. Part of the cruise was devoted to a special study on the physical and chemical factors as well as the abundance of phytoplankton, micro- and mesozooplankton, and planktivorous fish on a transect across the northern part of the Mid-Atlantic Ridge (MAR). This research is a part of the MAR-ECO project, which aims to study the ecosystem associated with the northern MAR. In this paper we analyse the organization of the pelagic ecosystem on the transect over the northern MAR, from phytoplankton to fish as apex predators.

Keywords: Mid-Atlantic-Ridge, hydrography, nutrients, plankton, fish, pelagic ecosystem.

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ICES CM 2008/C:13

Seasonal distribution of sperm whales (*Physeter macrocephalus*) around Kelvin Seamount

Sarah N. P. Wong and Hal Whitehead

Sperm whales (*Physeter macrocephalus*) are widely distributed in all oceans, but they are clumped geographically, generally in areas associated with high primary and secondary productivity. The warm, clear waters of the Sargasso Sea are traditionally thought to be low in productivity, but recent surveys have found large numbers of sperm whales there. The New England Seamount Chain bisects the northwestern portion of the Sargasso Sea, and might influence the mesoscale eddies associated with the Gulf Stream, thus creating areas of higher productivity within the Sargasso Sea. We investigated the abundance and distribution of sperm whales in relation to Gulf Stream currents and seamounts. An autonomous recording device was deployed over the Kelvin Seamount (part of the New England Seamount Chain) from May to June 2006 and November 2006 to June 2007. Hourly two-minute recordings were examined for the presence of sperm whale echolocation clicks. Sperm whales were more prevalent around Kelvin in spring (May to June: mean 46% of recordings contained clicks) than winter (November to March: mean 7% of recordings contained clicks). Sperm whale prevalence at Kelvin was significantly correlated with distance to Gulf Stream, but independent of ocean temperature or chlorophyll *a* (measured using MODIS satellite images). In addition, vessel-based

acoustic surveys were conducted between 2005 and 2008 to examine the distribution and abundance of sperm whales around the New England Seamount Chain compared with that of the continental slope and the deep ocean.

Keywords: sperm whales, Kelvin Seamount, New England Seamount Chain, seasonal distribution, abundance.

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ICES CM 2008/C:14

Length structure of deep-pelagic fish sheds new light to their life histories

Mikko Heino, David S. Boukal, Tone Falkenhaus, Uwe Piatkowski, Filipe M. Porteiro, and Tracey T. Sutton

Here we use a new technique to study life history variation in deep-pelagic fish 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 characterized 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 fish have a low mortality rate relative to the rate at which they grow towards their asymptotic size.

Keywords: life history, growth trajectory, mortality.

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ICES CM 2008/C:15

Movements and dynamic habitat use of fish around seamounts and islands of the Mid-Atlantic Ridge

Pedro Afonso, Gui Menezes, F. Tempera, Jorge Fontes, Mário R. Pinho, and Ricardo S. Santos

Marine protected areas (MPAs), either used to protect biodiversity or to manage fisheries, are commonly established on the assumption that they will be able to protect core populations of target and/or non-target species within their boundaries. In addition, the beneficial spillover potential of MPAs is directly dependent on the capacity of the protected populations to migrate and relocate. However, habitat use, movements, and their relationships with the life history of each species or population remain poorly documented. This is especially true in the case of species inhabiting oceanic seamounts and island slopes, whether they are supposed resident bottom fish or pelagic migratory predators. Such information is critical to optimally design the size, shape, and location of MPAs. We present an analysis of fish movements and habitat use in a region of high habitat heterogeneity, the Azores Islands, combining novel data from capture-mark-recapture, passive acoustic telemetry, and abundance estimates for several target species of contrasting life histories, including *Pagellus bogaraveo*, *Seriola rivoliana*, and *Helycolenus dactylopterus*. Preliminary results show a large variability in site fidelity, migratory habits, and habitat use within this set of species alone. Such results point the need to use a multiscale approach when designing an MPA network for the effective protection and spatial management of such fisheries.

Keywords: Marine Reserves, telemetry, seamounts, movements.

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ICES CM 2008/C:16

Vertical and horizontal distribution of mesopelagic fish along a transect across the northern Mid-Atlantic Ridge in June 2003

Tracey Sutton and Thorsteinn Sigurðsson

This paper reports on the results of a research cruise in the Irminger Sea west and southwest of Iceland and adjacent waters on the Icelandic vessel "Árni Friðriksson" from 4 to 30 June 2003. The main purpose was to study the distribution and abundance of deep-water redfish, *Sebastes mentella*, other pelagic fish, zooplankton, phytoplankton, and the hydrography of the area. Part of the cruise was devoted to a special study on community structure at a transect over the northern part of the Mid-Atlantic Ridge (Reykjanes

Ridge). Here, an overview is given on the composition of the pelagic fish community, both vertically and horizontally, over the northern part of the Reykjanes Ridge. In total, nine trawl hauls were made with a Gloria midwater trawl fitted with a small-mesh-size (9 mm) codend. Three hauls were made at three different depths west of the Ridge, three above it, and three east of it. A total of 230 nautical miles separated hauls taken west of the Ridge and those east of it. A total of 49 species were identified from 21 families. Lanternfish (Myctophidae), pearlshades (Sternoptychidae), barracudinas (Paralepididae), dragonfish (Stomiidae), and deep-sea smelts (Microstomatidae) dominated the fish catches. The results show that the total number of fish caught was lowest east of the Ridge, coinciding with warmer deep waters. At all positions both number of species and families increased with depth and the number of individuals decreased with depth.

Keywords: mesopelagic, fishes, MAR-ECO, Mid-Atlantic Ridge.

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ICES CM 2008/C:17

Ecology of the midwater fish family Melamphaidae over the Mid-Atlantic Ridge

Kyle A. Bartow and Tracey T. Sutton

The 2004 MAR-ECO expedition over the northern Mid-Atlantic Ridge aimed, in part, to describe the overlying pelagic macro- and megafauna and their roles in mid-ocean ecosystems. The month-long cruise sampled portions of the ridge between Iceland and the Azores at 36 stations. One of the dominant pelagic fish families along the sampled segment of the ridge was the family Melamphaidae. The abundance and biomass data for Melamphaid species were analysed with respect to depth, altitude above the ridge, and local area (Reykjanes Ridge, Charlie–Gibbs Fracture Zone, Faraday Seamount Zone, or Azorean Zone). Highest species numbers and abundances occurred at depths between 750 and 1500 m. Some individuals were found above 200 m, setting new minimum depth of occurrence records for the family. Large-scale shifts in species composition were observed relative to physical oceanographic features; for example, the genus *Scopelogadus* shifted from *S. beanii* dominance north of the Subpolar Front to *S. m. mizolepis* southwards. Trawls less than 400 m above the bottom depth showed higher melamphaid abundance in southern stations than in northern stations. Given the high relative abundance in this survey, and their reported consumption of gelatinous prey, the Melamphaidae may represent a previously unknown trophic linkage between fish and gelata in bathypelagic systems. Results of ongoing trophic analyses will be presented to assess the magnitude of this linkage along the northern Mid-Atlantic Ridge.

Keywords: Mid-Atlantic Ridge, Melamphaidae, relative abundance, species composition, mesopelagic, bathypelagic.

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ICES CM 2008/C:18

Deep-sea bamboo corals from the Tasmanian seamounts: isotopic evidence for benthic–pelagic coupling

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Bamboo corals (family Isididae) are an important component of seamount benthos in the Tasman Sea. Apart from a lifespan of nearly 400 years, little is known about their basic ecology, nor how to decode potential climate signals contained in their skeletons. We explored the stable C and N isotopic and radiocarbon composition of the organic fraction of bamboo coral skeletons collected from three seamounts off southeast Australia: Cascade Plateau (43°58'S 150°22'E, 900–1100 m water depth) Dory Hill (44°33'N 147°14'E, 1075–1656 m), and an unnamed seamount (44°19'S 146°20'E, 1050–1230 m). Analyses were performed on tissues and organic node growth rings sampled at a temporal resolution of 1–4 years. Radiocarbon chronologies exhibited bomb signals characteristic of surface waters, reconfirming that the skeletal organics are derived from recently fixed and exported organic matter. Radiocarbon chronologies constrained radial growth rates to around 100 μm per year. $\delta^{15}\text{N}$ values of the living tissue and underlying gorgonin were similar and averaged 12‰. Compared with previously published values for suspended and sinking particulate organic matter collected in nearby waters the corals do not appear to feed directly on these food sources, but rather on higher trophic level intermediaries. Records of $\delta^{15}\text{N}$ showed good reproducibility both within and among colonies collected from the same seamounts. Among different seamounts, there were slight differences in the mean and amplitude of the $\delta^{15}\text{N}$ records; however all of the $\delta^{15}\text{N}$ records exhibited similar quasi-decadal (10–15 years) variability. Although the causal mechanisms remain obscure, this suggests the pervasive influence of regional climate variability on seamount biogeochemistry.

Keywords: Tasmanian seamounts, deep-sea corals, stable isotopes, biogeochemistry.

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ICES CM 2008/C:20**Distribution and abundance of the sawtooth eel, *Serrivomer beanii*, a biomass-dominant bathypelagic fish over the northern Mid-Atlantic Ridge**

Megan E. Geidner and Tracey T. Sutton

Leg 1 of the 2004 MAR-ECO expedition aboard the RV "G. O. Sars" sampled the pelagic fauna from 0 to 3000+ m along the northern Mid-Atlantic Ridge (MAR). The expedition found the sawtooth eel (*Serrivomer beanii*, family Serrivomeridae) to be a numerical and biomass dominant fish over the MAR. Further spatial analyses of *S. beanii* and *S. lanceolotooides* were conducted to determine abundance and biomass with respect to depth, distance above the ridge, and ridge section. Geographically, the ridge was divided into four zones: Reykjanes Ridge (RR), Charlie-Gibbs Fracture Zone (CGFZ), Faraday Seamount Zone (FSZ), and Azorean Zone (AZ). *Serrivomer beanii* exhibited a six-fold decrease in total abundance from the northernmost zone (RR) to the southernmost zone (AZ). *Serrivomer lanceolotooides* was only collected in the AZ, at low abundances. Trawls occurred within five depth ranges: 0–200 m, 200–750 m, 750–1500 m, 1500–2300 m, and >2300 m. *Serrivomer beanii* increased with depth through the first three depth ranges, with a maximum between 750 and 1500 m. Abundances declined sharply below 1500 m. *Serrivomer lanceolotooides* exhibited a similar pattern, but less drastic. Unlike the primarily piscivorous mesopelagic top predators (e.g. dragonfish, family Stomiidae), preliminary feeding data suggest *S. beanii* to be more opportunistic, feeding on crustaceans, cephalopods, and fish. Abundance and trophic results from this study suggest this species to be an important component in bathypelagic foodwebs along the northern MAR.

Keywords: Serrivomeridae, Mid-Atlantic Ridge, bathypelagic, relative abundance, trophic ecology.

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ICES CM 2008/C:21 Poster**Gelatinous macrozooplankton on the Mid-Atlantic Ridge. Distribution patterns of trawl-collected planktonic cnidarians**

Tone Falkenhaus, Aino Hosia, and Francisc Pages

The composition, abundance, and vertical distribution of medusae and siphonophores collected along the northern Mid-Atlantic Ridge (MAR) are presented. Planktonic cnidarians were analysed in catches from three different midwater trawls (mesh size 3–50 mm) on a cruise conducted as a part of the Census of Marine Life field project MAR-ECO. Depth-stratified sampling from 18 positions from Iceland to the Azores (~60–44°N, 25–35°W) covered the full depth range, revealing information on vertical distributions from 0 to >3000 m. The most important contributors to the cnidarians biomass (WW) north of the Subpolar Front was the scyphomedusan *Periphylla periphylla* and *Atolla* sp. The vertical distributions of *P. periphylla* and *Atolla* were deeper at day than at night. The bulk of the *Atolla* population usually resided deeper in the water column than *P. periphylla*. Other commonly observed species in the samples were *Colobonema sericeum*, *Halicreas minimum*, *Aeginura grimaldii*, *Chromatonema rubrum*, and *Solmissus incisa*. An increase of species richness towards lower latitudes was found and the Subpolar Front is the major biogeographic boundary in the studied area. The geographical and vertical distributions of species assemblages were associated with the main water masses in the area.

Keywords: Zooplankton, Cnidaria, Mid-Atlantic Ridge.

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ICES CM 2008/C:22 Poster**Deep-sea fishing on four Atlantic seamounts located south of the Azores**

Gui Menezes, Diana Catarino, and Sergio Stefanni

Deep-sea living resources have gained importance over the last decades in commercial fisheries as a result of overexploitation of the coastal stocks. In order to manage these fisheries properly it is essential to understand the demographic and life history characteristics of the poorly studied deep-sea species. The 2007 DEECON cruise, organized within the DEECON project ("Unravelling population connectivity for sustainable fisheries in the deep sea"), aimed to study the deep-sea fishery on four Atlantic seamounts located south of the Azores (Great Meteor, Irving, Plato, and Atlantis) using two longline designs adapted to the collection of black scabbardfish, deep-sea sharks, and shallower demersal species. The seven longline sets were deployed along

a bathymetric gradient between 250 and 2000 m. During the cruise, survey data were collected on fishing effort, catches by species, and various biological parameters. A total of 34 teleosts and 19 elasmobranch species were collected. Teleost fish clearly dominated the catches by number, but although *Helicolenus dactylopterus dactylopterus* was the predominant species, with increasing depth the elasmobranch catches became more relevant. *Deania calcea* and *Centroscymnus coelolepis* were the main species caught at greater depths. Several invertebrates, such as cold water corals, sponges, crustaceans, echinoderms, and molluscs, were caught as bycatch. Most of them were identified and preserved for future studies.

Keywords: Atlantic seamounts, longline fishing, demersal fish, deep-sea sharks.

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Comparison of specific structures of fish in early ontogeny of seamounts in Central-east and Northeast Atlantic Ocean

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The study of the early ontogeny of fish (eggs, larvae, and fry periods) is one of the most important areas of research in present-day ichthyology. In this work we matched specific structures of fish at early stages of their development (i.e. in ichthyoplankton community) in the area of the Rockall-Hatton Seamounts (54°00'–60°00'N 14°00'–19°00'W) (Northeast Atlantic) and the Azores Banks (29°00'–46°00'N 26°00'–33°00'W) (Central-east Atlantic). The materials were collected from 2000 to 2006 in different seasons of the year with “Bongo-20” nets during complex studies conducted by AtlantNIRO. To analyse the data Sorensen’s aspectual resemblance factor (K) was used, defined as: $K = 2c \times 100\% / (a + b)$, where a and b are the number of species in the compared regions, c is the number of coinciding or similar species. Eggs and larvae of 34 fish species from 19 families were recorded on the Rockall-Hatton seamounts, and 60 species from 26 families on the Azores banks. Determination of the representatives of some families to the species level presented some difficulties. Using the equation above, $K = 2 \times 12 \times 100\% / (34 + 60) = 25.5\%$, indicating that ichthyoplankton communities have few common species in the regions under consideration, and their specific similarity is low. These results are indicative of various zoogeographic relationships. The Rockall-Hatton Seamounts are inhabited by boreal and low-boreal fish species, and the Azores Banks by boreal–subtropical and East Atlantic species.

Keywords: Azores Banks, ichthyoplankton community, eggs, larvae, Rockall-Hatton Seamounts.

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Meso- and bathypelagic cephalopods sampled by large midwater trawls along the Biskay-Azores Ridge and the Mid-Atlantic Ridge north of the Azores

Cornelia Warneke-Cremer and Uwe Piatkowski

In June 1982 the FRV “Walther Herwig II” sampled the bathy- and benthopelagic fish fauna along the Biskay-Azores Ridge and the Mid-Atlantic Ridge north of the Azores (WH II 52). Pelagic sampling was conducted with a big Engel midwater trawl (MT 1600; net opening 600 m²) at a depth between 250 m and 3200 m. Most of the pelagic hauls went deeper than 800 m, reaching the scattered echo layer of daylight time or going beyond this layer. All cephalopods were collected from the bycatch, fixed and stored in the Zoological Museum of the University of Hamburg. Here we report on this cephalopod collection and provide information on the abundance, distribution, and sizes of the species. We further relate the distribution patterns to hydrographic conditions in the region and compare the results with a similar cephalopod collection sampled during a recent cruise in the summer of 2004 of RV “G. O. Sars” along the Mid-Atlantic Ridge. In total, 675 cephalopods resembling 13 families were caught. The Cranchiidae (145 specimens), with *Galiteuthis armata*, *Teuthowenia megalops*, *Helicocranchia pfefferi*, and *Taonius pavo*, was the dominant family and widely distributed, followed by the Histioteuthidae (135 specimens) and the Mastigoteuthidae (104 specimens), with *Mastigoteuthis agassizi* and *M. magna*. Other important families in terms of numbers were the Octopoteuthidae (68 specimens), Chiroteuthidae (38 specimens), with *Chiroteuthis mega* and *C. veranyi*, Bathyteuthidae (31 specimens), Onychoteuthidae (24 specimens), Ommastrephidae (21 specimens), with only *Todarodes sagittatus*, and Gonatidae (13 specimens) with only *Gonatus steenstrupi*. Other families were the Enoploteuthidae (8 specimens), Pyroteuthidae (8 specimens), Ctenopterygidae (5 specimens), and Lepidoteuthidae (2 specimens).

Keywords: Mid-Atlantic Ridge, cephalopods, bathypelagic, mesopelagic.

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Abundance and distribution patterns of fish larvae at Senghor Seamount, Cape Verde Islands

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Senghor Seamount, rising up to 93 m in depth, lies within the Cape Verde Frontal Zone (CVFZ), and within the North Equatorial Current (NEC), which flows to the southwest. In April 2005, a zooplankton/micronekton survey was conducted across this seamount (RV "Poseidon" cruise no. POS 320/2). Sampling was performed by Multinet (mesh size 500 µm) and Isaacs-Kidd midwater trawl (IKMT) (mesh size 4 mm). Gross fish larval abundance (median 35.5 specimens per m²), composition, and vertical distribution of most taxa were in accordance with historical literature data from adjacent waters and seamounts north of the CVFZ. The fish larval community was highly diverse and mainly composed of larvae of meso- to bathypelagic species (91.5%). Although the Multinet yielded 76 and the IKMT 37 taxa, strong positive correlations between number of specimens and taxa per tow indicated that the survey sampled only a minor fraction of the community. Myctophidae dominated the MCN catches (64.5%). Among them ubiquitous species were most numerous, but two tropical myctophids were on rank places 2 and 4, and some mesopelagic, tropical species generally found south of the CVFZ were also encountered, indicating that Senghor Seamount lies in the faunistic boundary between the subtropical and tropical East Atlantic. Oceanic-epipelagic, as well as demersal taxa (4.3%), were scarce in MCN catches. IKMT samples yielded poor catches (median 7.7 fish per 100 m²), but demersal species contributed 44.1%, causing a maximum gross diversity ($H' = 3.296$). Myctophids contributed only 22.1%. Our study provides first data on fish larvae at Senghor Seamount and adds quantitative data for the scarcely investigated Cape Verde Archipelago.

Keywords: Senghor, Cape Verde Islands, seamount, fish larvae.

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Microscopical and molecular trophic analysis of fishes from the family Microstomatidae associated with the Mid-Atlantic Ridge

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Understanding the foodweb structure and organic cycling of deep-pelagic ecosystems requires integrated methods in order to identify and quantify the gut contents of a species in question. Due to the rapid digestion rate of zooplankton in predatory fish, the role of the former in deep-pelagic ecosystems is poorly understood. The remains of some prey may be identified taxonomically, but not all predatory fish consume only "hard part" prey. The fish family Microstomatidae are known consumers of gelatinous zooplankton and were found to be a biomass-dominant family during the 2004 MAR-ECO research cruise along the northern Mid-Atlantic Ridge. Using the ribosomal 28S gene, five species of microstomatid fish were sequenced along with 68 gelatinous zooplankton species from three phyla: Ctenophora, Cnidaria, and Thaliacea. Group-specific primers were then created to amplify the DNA from the gut contents of the microstomatid fish. The primers used in this study were designed to amplify DNA only if the target phylum's DNA was detected in the gut contents of the fish. Using the likely degraded prey DNA sequence, it is then possible to match the molecular fingerprints of the prey with sequences readily available in the previously compiled gelatinous zooplankton sequence database and the established GenBank sequence database. Based on the percentage similarity, the identity of the gut contents can be established to the lowest taxonomic level possible. The ability to identify gut contents molecularly will greatly increase our understanding of the deep-pelagic ecosystem and the role that gelatinous zooplankton play in it.

Keywords: ribosomal 28S, Microstomatidae, gelatinous zooplankton, gut content.

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Ontogenetic habitat shifts and stock assessment of the orange roughy

M. R. Dunn and A. McKenzie

We describe ontogenetic habitat shifts in orange roughy (*Hoplostethus atlanticus*) on the east coast of New Zealand. The dataset consists of 167 000 measured fish from 1755 research and commercial bottom trawls,

sampled throughout the year and at depths from 200 to 1500 m. Median length and length range were analysed using cross-validated regression trees. Both males and females showed similar patterns of distribution with fish size: the smallest fish were predominant in relatively shallow and flat areas (depths <915 m); intermediate-sized fish were predominant in relatively deep and flat areas; and the largest fish were predominant on hills (within 8 km of the summit). Stock assessment models were then used to investigate possible hypotheses of spatial structure and movement, including age-specific and density-dependent movements. Results show the hypothesized spatial structure can help to explain the rapid decline in catch per unit of effort which is usually observed at the start of orange roughy hill fisheries, a phenomenon which has been described as hyperdepletion (where catch rates apparently decline faster than can be explained by fish removals). The spatial structure can also explain observations of cryptic spawning biomass, where the age at entry of the fishery is later than the age at maturity resulting in mature fish which are unavailable to the fishery, but only in cases where the fishery focuses on hills.

Keywords: deep-water fish, orange roughy, size-related catchability, migration.

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Poster

Species composition and distribution of North Atlantic deep demersal fish captured by longlines, with spatial and temporal comparisons of assemblages

Charles F. Cotton, Inge Fossen, Jan Erik Dyb, and John A. Musick

Surveys of deep-sea fish communities are rare and most of these surveys are conducted with trawl gear, which underrepresent many large demersal predators because of gear limitations and the avoidance capabilities of these fish. Sampling with longlines yields a better representation of these important members of the deep-sea community. Longline catch data were compiled from several cruises, covering a variety of habitat types (canyon, mid-ocean ridge, continental slope, island slope). Chondrichthyans, particularly sharks, dominated the catch from these cruises. In this study, we present species composition and distributional data for fish captured by longlines in several areas of the North Atlantic Ocean. Areas sampled include the Mid-Atlantic Ridge (north of the Azores and across the Charlie–Gibbs Fracture Zone), Hatton Bank, Canary Islands, Norfolk Canyon (off Virginia, USA), and the Gulf of Mexico (off Florida, USA). Differences in gear types, time of sampling, and sampling effort prevent a strictly quantitative comparison of these data, but we present general trends of relative abundance and diversity, as well as sex ratios, maturity, and maternity ogives, where possible.

Keywords: demersal fish, community, assemblage, distribution, longline, Mid-Atlantic Ridge, slope, canyon.

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Poster

Distribution and biology of the shrimp *Plesionika edwardsii* (Brandt, 1851) off the Azores

O. Melo, M. R. Pinho, A. Aranha, J. Gonçalves, G. Menezes, and E. Isidro

Traditional demersal stocks from the Azores (ICES Subarea Xa2) are intensively exploited. Crustaceans are virgin stocks and may be alternative resources to explore. The shrimp *Plesionika edwardsii* is thought to have commercial potential, but biological information on this species is scarce. To address this, survey data collected in the Azorean archipelago, with a systematic random stratified design and using two different types of traps (suspended and bottom), were analysed. Results show that this species occurs on coastal areas, banks, and seamounts at depths between 50 and 650 m with a mode on the 200–400 m depth strata. Catch rates are much bigger on suspended traps and there is almost no bycatch. A patchy distribution for the species is suggested. Seasonal vertical migration is observed with individuals concentrated on shallow depths during spring and summer and in deeper water during autumn and winter. The size composition of *P. edwardsii* is bimodal, ranging from 8.3 to 31.3 mm cephalothoracic length (CL). Females are more abundant than males and predominate in the shallow and deep strata. Ovigerous females occur throughout the year but a peak of spawning activity seems to occur during spring and summer. Estimated female size at first maturity was 20.21 mm (CL). Modal progression shows different values for CL_{∞} (27.20 and 26.51 mm) and growth rate “ k ” (0.85 e 0.59 ano⁻¹), [?Q1] respectively for females and males. The fishery potential and sustainability of this resource is discussed in the context of the Azorean fleet and ecosystem type.

Keywords: shrimp, biology, *Plesionika edwardsii*, Azores, seamounts.

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Abundance and biology of deep-water red crab (*Chaceon affinis*) from Voador and Gigante seamounts off the Azores

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Although seamounts are common topographic features in the Azores and have great importance for commercial fisheries, information on their ecology remains scarce. This has important implications for their assessment and management. New fisheries still developing in seamount areas, such as those targeting deep-water crabs and other deep-water species. In this study, two seamounts off the Azores region, Voador and Gigante, were sampled for the red crab (*Chaceon affinis*). Two trap surveys on the RV “Arquipélago” were made during July and August 2005. A randomly stratified design by depth was used to prospect a layer between 600 and 900 m depth. Abundance by depth and seamount as well as the structure of the populations (by sex and length) and prevalence of parasitism on this species was analysed and discussed in a regional context. Results show that red crabs from the seamounts have the same general structure of distribution by depth as is found in the other sampled areas of the archipelago (such as coastal islands and hydrothermal areas) but with significantly higher abundance (five individuals per trap on Voador Seamount and nine on Gigante Seamount). The general structure of the population by length and sex is also similar to that in the other areas, although an unusual abundance of juveniles were caught. Few large individuals (CL >150 mm) were caught on these seamounts.

Keywords: *Chaceon affinis*, seamounts, deep water, biology, abundance.

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