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Interpreting the Spatial Distribution of Bathypelagic Nekton Along the Mid-Atlantic Ridge

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estimates. Our aim is to investigate the uncertainty of Scottish herring acoustic survey estimates. Therefore, a specific multivariate geostatistical model is used to describe the structural relationships, which includes highly skewed distributions for the acoustic backscatter data and incorporates relations between depth, mean fish length and proportion at age. Conditional simulations, i.e. simulations which honour the data values known at the data points, are used to generate multiple realisations for acoustic backscatter, mean fish length and proportion at age. These are combined to produce multiple realisations of herring density over the sampled domain. All realisations are then used to provide the error structure for the global abundance estimate at age. The method is used to assess the uncertainty from acoustic surveys on herring in the example year of 2005, and more generally for each year during the period 1989-2005 to track significant variations of abundance over the time series.

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5.07

Efficiency of different acoustic survey designs for schooling fish with highly skewed sampling distributions

Alf Harbitz, Egil Ona and Michael Pennington

High-resolution, acoustic transect-data for herring (*Clupea harengus*) and sandeel (*Ammodytes marinus*) were analysed. Both species are characterized by a dominant schooling behaviour, extremely skewed density distributions, many zero observations and diel variation. Geostatistical and point-process (Neyman-Scott) models were fitted to the survey data for comparison of two different approaches to model spatial structure. To improve the current survey design, simulations were employed to explore the potential use of adaptive designs. In the adaptive setting, the key principle is to increase effort when a predetermined density level is exceeded, which seems feasible even with one ship. The main line of attack for the dynamic herring stock was to consider a parallel-transect design with a stochastic model for abundance. Sandeel are surveyed in predetermined strata. Therefore for sandeel, the efficiency of a random, systematic, zig-zag survey was compared with a random, systematic, parallel-line survey.

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5.08

Interpreting the spatial distribution of bathypelagic nekton along the Mid-Atlantic Ridge

Cairistiona I.H. Anderson, John K. Horne and Tracey T. Sutton

The spatial distribution of organisms plays a key role in facilitating biological processes, such as trophic interactions, which govern ecosystem structure and function. Attempts to understand bathypelagic (1000-4000 m depth) ecosystem dynamics have been hampered by the coarse temporal-spatial resolution and static nature of most sampling strategies. This study combines a traditional approach, based on discrete net trawls sampling small volumes, with the continuous full water column coverage provided by fisheries acoustics to investigate the distribution of biomass along the Mid-Atlantic Ridge (MAR). The limited trawl samples have been interpreted as showing a positive relationship between the presence of the MAR in the bathypelagic depth zone and biomass of bathypelagic fish species. Using 18 kHz echosounder data we explored this apparent association, and used comparisons of trawl data with the acoustic backscatter distribution to provide insights into how the distribution of biomass may influence trophic interactions in the bathypelagos. As such, this research provides a valuable case study of the potential contribution of acoustics to ecosystem studies, both within fisheries management and in a wider biological context.

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5.09

A time-series of Antarctic krill biomass estimates; implications of changes in TS and target identification techniques

Sophie Fielding, Jon Watkins, Peter Enderlein, Phil Trathan, Eugene Murphy

Antarctic krill, *Euphausia superba*, play a pivotal role in the ecology of the Southern Ocean. They are dominant primary consumers, a crucial food source for mammalian and avian predators, and are the largest catch of Antarctic commercial fisheries. Inter-annual variability in the abundance of krill at South Georgia (Southern Atlantic Ocean) has been observed in commercial and scientific surveys since the 1920s. A detailed understanding of the frequency and magnitude of this variation is