from transition area has a pattern globally similar to offshore one while inshore presented an inversed pattern. Analyse of annual change using EI descriptors reveal one common trait: the number of SSLs significantly increase whatever the depth strata considered. This study highlights differences and similarity in water column organization between depth strata.

Switching off the Sun to observe the twilight zone spatial dynamics across Saint-Paul and New-Amsterdam Islands, Southern Indian Ocean

L. Izard1, N. Fonvieille2, D. Nerini2, A. Lebourges-dhaussy3, G. Roudaut3, J. Habasque3, C. Cotté1

[1] *Sorbonne University, CNRS, IRD, MNHN, Oceanography and Climate Laboratory: Experiments and Numerical Approaches (LOCEAN-IPSL), Paris, France*

[2] *Aix-Marseille University, Toulon University, CNRS, IRD, Mediterranean Institute of Oceanography (MIO), Marseille, France*

[3] *Marine Environmental Sciences Laboratory (LEMAR), UBO-CNRS-IRD-Ifremer IUEM, Plouzané, France*

Information on micronekton (> 1 cm organisms) is globally scarce in the open ocean, and its vertical and horizontal distribution in relation to oceanographic structures is poorly known. The complex biodiversity composing micronektonic functional groups lead to even more challenging interpretations of their spatial dynamics. Advanced generations of echosounders emit simultaneously several acoustic signals (multi-frequency device), allowing a finer view of the micronektonic community. While data becomes more abundant and complex, it is crucial to develop statistical tools aiming to objectively extract key components of its variability. In this study, we analyse data recorded onboard the R/V Marion Dufresne from an EK80 echosounder emitting at 18, 38, 70, 120 and 200 kHz. We developed a Multivariate Functional Data Analysis method to identify patterns in micronekton structures across Saint-Paul and New Amsterdam economic exclusive zone, at the boundary between vast oceanic domains. This approach proposes an objective method to analyse the vertical backscatter distribution and quantify temporal and spatial modes of variability in multivariate acoustic data. By filtering the temporal mode, we uncovered a latitudinal acoustic pattern in concordance with hydrological features and biological samples distribution. Such methods could be implemented at a global or local scale and allow 3-D modelling of micronekton structuring.

A finer look into the twilight zone: comparing acoustic records from an animal-borne miniature sonar and a multifrequency echosounder

N. Fonvieille1*, L. Izard3, P. Goulet2, C. Guinet2, D. Nerini1, A. Lebourges, G. Roudaut, J. Habasque, J. Chevassu, C. Castrec, M. Tournier2, B. Picard2, M. Johnson and C. Cotté3

1 *Mediterranean Institute of Oceanography (MIO), Marseille, France,*

2 *Centre of Biological Studies Chizé, Villiers-en-Bois, France*

3 *Laboratory of Oceanography and Climate, Experiments and numerical Approaches (LOCEAN), Paris, France*

An animal-borne miniature active echo-sounder has been recently deployed on southern elephant seals (*Mirounga leonina*) from the Kerguelen and Argentinian colonies. This high frequency sonar (1.5 MHz) has shown a strong potential in detecting small mid-trophic level targets (zooplankton and micronekton). Relative abundance and distribution can be assessed, allowing to observe temporal (diel migration) and spatial patterns of plankton. However, the interpretation

of the collected data remains uncertain. To address this lack of information, we conducted *in situ* experiments onboard the Marion Dufresne vessel in the Southern Ocean (10th February to 6th March 2022). The microsonar was fixed on the rosette sampler at 13 locations and attached 16 times to a trawling net (4 mm mesh). Records will be analyzed applying a recent method developed on elephant seals data to detect targets in the beam and estimate organisms abundance. The result will be compared with biological samples and backscattering layers detected by a multifrequency EK80 echosounder (18, 38, 70, 120 and 200 kHz), offering an acoustic landscape of the seals foraging area. This study will benefit to ongoing research regarding biological fields visited by the elephant seals, bringing precision on microsonar target detection capacities.

Fish aggregation around North Sea oil and gas platforms

J. M. Lawrence[1] and P.G. Fernandes[1]

[1]*School of Biological Sciences, Tillydrone Avenue, University of Aberdeen, Scotland. AB24 2TZ*

Many offshore oil and gas rigs will soon require decommissioning. In northern Europe, current legislation requires their complete removal, but it is unclear what the environmental impacts of this will be. Fish aggregate at offshore structures, but the horizontal extent and strength of this aggregation remains unknown. Here, we use fisheries acoustic data collected during a bottom-trawl survey of the North Sea to investigate the relationship between fish distributions and rig densities. Acoustic backscatter from schooling fish was isolated and quantified, and echoes from individual, non-schooling, fish were processed to give relative areal fish densities. The distribution of offshore oil and gas rigs was estimated using a surface of rig kernel density. Parametric (generalised linear modelling) and non-parametric (random forests) modelling revealed relationships between rig density and the fish density of both schooling and individual fish, with higher densities of fish found in areas of higher rig density. However, very few data were collected within 500m of rigs due to the exclusion zones in force. Future work will address this by negotiating access to the exclusion zones with operators and using a novel platform (an uncrewed surface vehicle) which can safely survey much closer to rigs (within 10s of metres).

Characterizing predator dive patterns on a common prey base from stationary echosounders in Antarctica

A. P. Annasawmy[1], J. K. Horne[1], Christian S Reiss[2], and Gavin J Macaulay[3]

[1]*School of Aquatic and Fisheries Sciences (SAFS) and Cooperative Institute for Climate, Ocean and Ecosystem Studies (CICOES), University of Washington, Seattle, USA*

[2]*Antarctic Ecosystem Research Division, NOAA Southwest Fisheries Science Center, La Jolla, California, USA*

[3]*Institute of Marine Research, Norway*

The Antarctic Peninsula, which stretches from Antarctica towards South America, is a critical habitat to penguins and other seabirds, seals, and whales, with Antarctic krill (*Euphausia superba*) serving as a significant diet component. Kongsberg WBAT echosounders fixed on moorings were deployed close to Deception and Nelson Islands in Bransfield Strait. Aggregations of krill were detected using Echoview's school detection module and classified in three categories using hierarchical clustering on a metric suite including NASC, mean depth, center of mass, inertia, equivalent area, aggregation index, and proportion occupied. 'V', 'U' and 'W'- shaped predator dive profiles were visible in the echograms from the moorings at both sites. A dive consisted of a descent from the surface, time at depth and an ascent. Additional dive metrics related to the descent, bottom, and ascent durations, maximum dive depth and wiggle counts, were measured

WORKING GROUP OF FISHERIES ACOUSTICS, SCIENCE AND TECHNOLOGY (WGFAST)

VOLUME 4 | ISSUE 54

ICES Scientific Reports

WORKING GROUP OF FISHERIES ACOUSTICS, SCIENCE AND TECHNOLOGY (WGFAST)

Recommended format for purpose of citation:

Editor

Michael Jech

Author

Michael Jech

ICES
CIEM

International Council for
the Exploration of the Sea

Conseil International pour
l'Exploration de la Mer