TRIATLAS

Newsletter Summer 2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817578.

Save the dates!

The **TRIATLAS 2nd General Assembly** will be virtual and take place **27 September - 1 October**, 2021, in the afternoon hours CEST.

Details soon to be published on the TRIATLAS website.

TRIATLAS researchers have been busy doing fieldwork; attending meetings, workshops and conferences; publishing journal articles and book chapters; building stakeholder networks; and more!

In this newsletter, we present you a small collection of their diverse efforts.

You can contact us by email at:
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Front page image: Swimming in cold water. The ocean outside Swakopmund, Namibia, the Benguela current flowing by. Photo: Sophia Louw, Unsplash.com

In short

TROPICAL AND SOUTH ATLANTIC CLIMATE-BASED MARINE ECOSYSTEM PREDICTION FOR SUSTAINABLE MANAGEMENT

- Gaps in our understanding of marine ecosystems and their future changes pose a major challenge for the sustainable management of human activities affecting them. Our knowledge of the status of the South and Tropical Atlantic marine ecosystems and their future evolution is particularly poor, especially in comparison to the North Atlantic.
- Sustainable management of human activities affecting Atlantic marine ecosystems is critical to maintain its health and to support the blue economy of the bordering countries.

In this issue:

The 33 TRIATLAS partners

TRIATLAS at the All-Atlantic 2021 Conference

All-Atlantic 2021 was held June 2-4, organized by the EU Commision, a conference for ministerial high-level & stakeholders. TRIATLAS participated in several side events throughout the conference:

The Future Atlantic Ocean: Forecasting Ecosystem Functioning from Microbiomes to Fisheries

Hosted by Professor Noel Keenlyside, UiB. Introduction by Sigi Gruber, DG Research and Innovation, European Commission.

"Management of human activities in the oceans towards sustainability must be evaluated on four dimensions: ecological, economic, socio-cultural and institutional," said Professor Astrid Jarre, with the University of Cape Town.

Although the four projects represented in this event are biased towards natural sciences, taken together, they also contribute new knowledge on socio-cultural, economic and institutional dimensions in case studies around the entire Atlantic, Jarre emphasised:

"To understand what is there and how it will change, both good data and good projection models are needed."

Organised by TRIATLAS, Blue-Action, MISSION ATLANTIC, and AtlantECO. With Astrid Jarre, Hugo Sarmento, Juliette Mignot, Mark Payne. Panel discussion with Jeroen Steenbeek, Monica Muelbert, and Romina Henriques, moderated by Thulani Makhalanyane.

- See the recording and presentations here

Atlantic Pole to Pole: Climate Science 2 Policy

CT2 Leader Elaine McDonagh spoke about Atlantic Climate-Based Marine Ecosystem Prediction for Sustainable Management.

Speakers: Andrei Polejack (Brazilian Ministry of Science, Technology and Innovations), Professor

Mary S. Wisz (World Maritime University), Dr. Elaine McDonagh (NORCE and BCCR), Dr. Gerard McCarthy (ICARUS, Maynooth University), Dr. Jean-Baptiste Sallée (IPSL climate research center), John Bell (European Commission), Professor Sheila Heymans (University of the Highlands and Islands).

Panel: Professor Evelia Rivera-Arriaga (Universidad Autónoma de Campeche), Dr. Jörn Schmidt (ICES), Professor Isabelle Ansorge (University of Cape Town).

- See the recording and presentations here

Showcasing Atlantic Ocean Capacity Building programmes in marine sciences

Professor José Muelbert in Brasilian TRIATLAS partner FURG, talked about the CANEMS Early-Career Researcher initiative in this presentation.

Professor José Muelbert, leader of work package 10 in TRIATLAS, presented the CANEMS initiative. CANEMS is intended to support young researchers not only during one certain period but to serve as network with a multi-year perspective so that several steps of their careers can be accomplished within the CANEMS community. This makes the CANEMS concept different to other interdisciplinary approaches which often have a stronger short-term component.

In this side several examples of Capacity Development programs was presented, showing different approaches of training and education in marine science. Also presented was the structure and goals of the Joint Action of Work package 3 of the AANChOR project and the outcome of the discussions during the preceding Workshop (31 May – 1 June) on the implementation of the Joint Action.

- See the recording and presentations here

What is CANEMS?

The Cross-Atlantic Network of Excellence in Marine Science (CANEMS) is an initiative developed by the TRIATLAS project under WP10.

This network combines summer schools, student exchange programmes, sea-going training and academic teaching in a highly interdisciplinary and sustainable context.

Early-Career Researcher Online Presentations

- Starting frequency: once a month (can be increased if there is interest).
- Fixed date: every first Monday of the month.
- Fixed time: 14:00 – 15:00 (UTC).
- Format: 2 presentations of 15 minutes (30 minutes) and an additional 30 minutes for discussion and questions and answers.
- Content: each presentation should, if possible, cover 2 Work Packages.
- You are a TRIATLAS Early-Career Researcher and you would like to make a presentation? Don't hesitate any longer, contact Nilgun Kulan (nilgun.kulan@uib.no)

See the array of Early-Career Scientists at the ECR CANEMS website!

– Andreas Hadsel Opsvik

2021 PIRATA FR31 cruise: February 22 – April 21, 2021

Due to the Covid19 pandemic, this cruise had to leave from France and to be back to France.

Consequently, it was a 57-days cruise, instead of 38 days usually, without any call. This cruise will thus also be a challenging "adventure" for every people on-board... The cruise was carried out onboard the R/V THALASSA (French National Research Fleet), with 12 scientists.

The main goal of the PIRATA FR31 cruise is to replace the six meteo-oceanic buoys at 10°W-0°N (ATLAS), 10°W-6°S (T-Flex), 10°W-10°S (T-Flex), 0°E-0°N (ATLAS), 23°W-0°N (T-Flex) and 20°S-10°W (ATLAS with additional T-Flex sensors), deployed in 2020 (when the 8°E-6°S was suspended due to fishing vandalism).

The two CO2 parameter sensors installed at 10°W-6°S and 10°W-0°N was replaced. Turbulence (Xpods) at 2 PIRATA sites (5 at 23°W-0°N and 5 at 10°W-0°N), and OTN sensors on the 6 buoys (one on each), was also replaced.

The ADCP currentmeter moorings at 10°W-0°N was replaced. About 70 CTD-O2/LADCP profiles was carried out along three sections at 10°W (repeated yearly), 0°E and 23°W.

TSG, ADCP, meteo, acoustic and pCO2 continuous measurements was carried out all along the trackline, and about 100 XBT profiles will be done every 1° of latitude/longitude during transits.

In addition to usual PIRATA "classical" operations: 31 Surface drifting buoys was deployed (18 SVPB and 5 SVPB-E SURFMAR provided by Meteo-France along with 8 SVP provided by NOAA/AOML).

As a contribution to a French national project (SEANOX), 1 BCG-ARGO and one DO-ARGO was deployed in the Guinea Dome area. As a contribution to the EU H2020 EuroSea project, 5 BCG-ARGO profilers was deployed close to the 10°W-6°S, 10°W-0°E and 23°W-0°N PIRATA buoys. As a contribution to a French national project (PODIOM), 5 ARVOR profilers was deployed close to the three equatorial PIRATA buoys. 2 long-duration stations (36h) were scheduled at 10°W-0°E and 23°W-0°N, with 0-200m CTDO2/LADCP casts every 3 hours.
Numerous seawater samplings (surface and during CTD-O2 casts) was done for the analysis of dissolved oxygen, salinity, nutrients, carbon parameters (DIC/TA), primary production (Chl pigments), C13/DIC, 18O isotopes, Particulate Organic Carbon and DNA.

When encountered, biological samplings was also done (eg: Sargassum algae -genetics & taxonomy-; tuna -Hg-; barnacles and shellfishes on buoys or on Sargassum slicks).

Finally, in the framework of potential collaborations with the Saint-Helena Islands scientifics, encountered during the last PIRATA-FR30 cruise, as a contribution to the Management Plan Marine Protected Areas and the Marine Blue Belt program, one expect to realize some specific bathymetric and oceanographic measurements around the Saint-Helena Island.

– Bernard Bourle

- Read more about TRIATLAS cruises

More info on PIRATA

- Webpage PIRATA-France
- Webpage PIRATA international
- R/V Thalassa route

Kirstin Petzer is the TRIATLAS Atlantic Ocean Youth Ambassador

UCT's trio of All-Atlantic Ocean Youth Ambassadors (from left) Kirstin Petzer, Thando Mazomba and Dr Marissa Brink-Hull, at the Two Oceans Aquarium, the 2020/2021 cohort of international All-Atlantic Ocean Youth Ambassadors who will build a network for knowledge-sharing and awareness of this ocean. Photo: JE'NINE MAY

"Kirstins project is at the heart of TRIATLAS Southern Africa effort," writes Professor Mathieu Rouault at the Nansen Tutu Center for Marine Environmental Research.

"She will start a master in 2021 sponsored by TRIATLAS South Africa Nansen Tutu Center, Although quite junior, she has shown exceptional scientific qualities during her mini thesis, and she has actually followed all online TRIATLAS and related project workshop while she was not required to do so."

Here is an excerpt from a University of Cape Town news article, written by Helen Swingler:

Helen Swingler (HS): What is your academic background, and what brought you to UCT?

Kirstin Petzer (KP): I've always had a passion for ocean and environmental issues. I decided on UCT because of the university's really great oceanography and environmental and geographical science majors.

...

HS: How do you view your ambassador role?

KP: There are many components to the role. The young ambassadors are involved in the All-Atlantic Ocean research community, global event planning, and raising social media awareness of their initiatives. In South Africa we aim to work with local organisations to raise awareness of and improve education about ocean issues.

...

HS: What does it mean to you to have been selected as an All-Atlantic Ocean Youth Ambassador?

KP: Personally, it's meaningful to be a South African All-Atlantic Ocean Youth Ambassador because I'm part of a team of young ambassadors who are actively participating in ocean solutions and research. Academically, I'm able to learn about several important and valuable research projects impacting the Atlantic that are being carried out in the Atlantic-surrounding continents. This provides a wonderful opportunity to broaden my knowledge of the Atlantic research community.

- Read the full article on the UCT website

Learn more

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Workshop sobre avaliação do progresso e definição de estrategias do projecto TRIATLAS

O INIP existe há 37 anos e tem como objectivo principal contribuir de forma determinante para a gestão sustentável dos recursos pesqueiros e conservação do ecossistema aquático e como missão fazer a avaliação dos recursos pesqueiros e das condições ambientais em águas marinhas e continentais, com base na investigação científica, bem como tecer recomendações ao Ministério de Tutela para garantir a qualidade sanitária dos produtos da pesca, aquicultura e seus derivados.

Os principais tópicos de investigação incluem a Circulação Oceânica e Dinâmica Climática, Dinâmica de Recursos Marinhos Vivos, Poluição e Biodiversidade. A instituição mantem cooperação estreita a nível nacional, regional e internacional com instituições e Programas como a Convenção da Corrente de Benguela (BCC), o Programa EAF- Nansen ao abrigo do apoio da FAO e do IMR entre outros
Instituto Nacional de Investigação Pesqueira e Marinha (INIP) é um das instituições parceira do Projecto TRIATLAS e nos dias 25 e 26 de Março de 2021 realizou um workshop como parte das suas actividades no âmbito do Projeto TRIATLAS
s objectivos do workshop realizado online e presencial com a participação de investigadores nacionais e internacionais, foram o de dar a conhecer o Projecto TRIATLAS à comunidade científica nacional, definir estratégias para o cumprimento dos objectivos do Projecto atendendo a situação de pandemia que assola o mundo, obter subsídios e compartilhar experiencias com especialistas das universidades e Instituições de pesquisa nomeadamente: Universidade Federal do Rio Grande (FURG) do Brasil o Centro de Pesquisa Oceanográfica (GEOMAR), o Instituto de Investigação Marinha da Noruega (IMR) e a Universidade de Las Palmas Gran Canárias (ULPGC).
A reunião teve como orador convidado Noel Keenlyside, Coordenador do Projecto, que fez a apresentação do mesmo de forma clara e objectiva. Os especialistas angolanos (Paulo Coelho, Pedro Tchipalanga, Sonia Silva, Marcelina Fernandes, Miguel António, e Filomena Vaz Velho) apresentaram temas relacionados com os pacotes de trabalho em que estão inseridos nomeadamente: WP1. Grande circulação, dinâmica e ressurgência e mistura do oceano WP2. Distribuição do fitoplâncton e zooplâncton, espectro de tamanho, produção primária e fluxos verticais. WP3. Pequenos pelágicos, fauna mesopelágica e predadores do topo. Os trabalhos apresentados suscitaram muito interesse e houve boa interação entre os investigadores do INIP e de outras instituições de investigação angolanas.

As comunicações dos especialistas internacionais: Marcus Dengler (Geomar) ; Rafael Mendes (FURG) Santiago Hernandez (ULPGC) e Bjoern Axelsen (IMR) foram importantes no enquadramento dos temas e na compreensão de alguns aspectos científicos e de desenvolvimento relacionados com os tópicos desenvolvidos pelos pesquisadores do INIP.

De uma forma geral podemos considerar que o workshop cumpriu com os seus objectivos. Foram recomendadas acções a serem implementadas a nível da programação para 2021. As Universidades Angolanas, nomeadamente o Departamento de Biologia da Faculdade de Ciências da Universidade Agostinho Neto e a e do Namibe mostraram interesse em colaborar na pesquisa cientifica na área de biologia marinha.

- Maria de Lourdes Sardinha, INIP

Close-up: Mesopelagic fish from the Northeastern Brazil

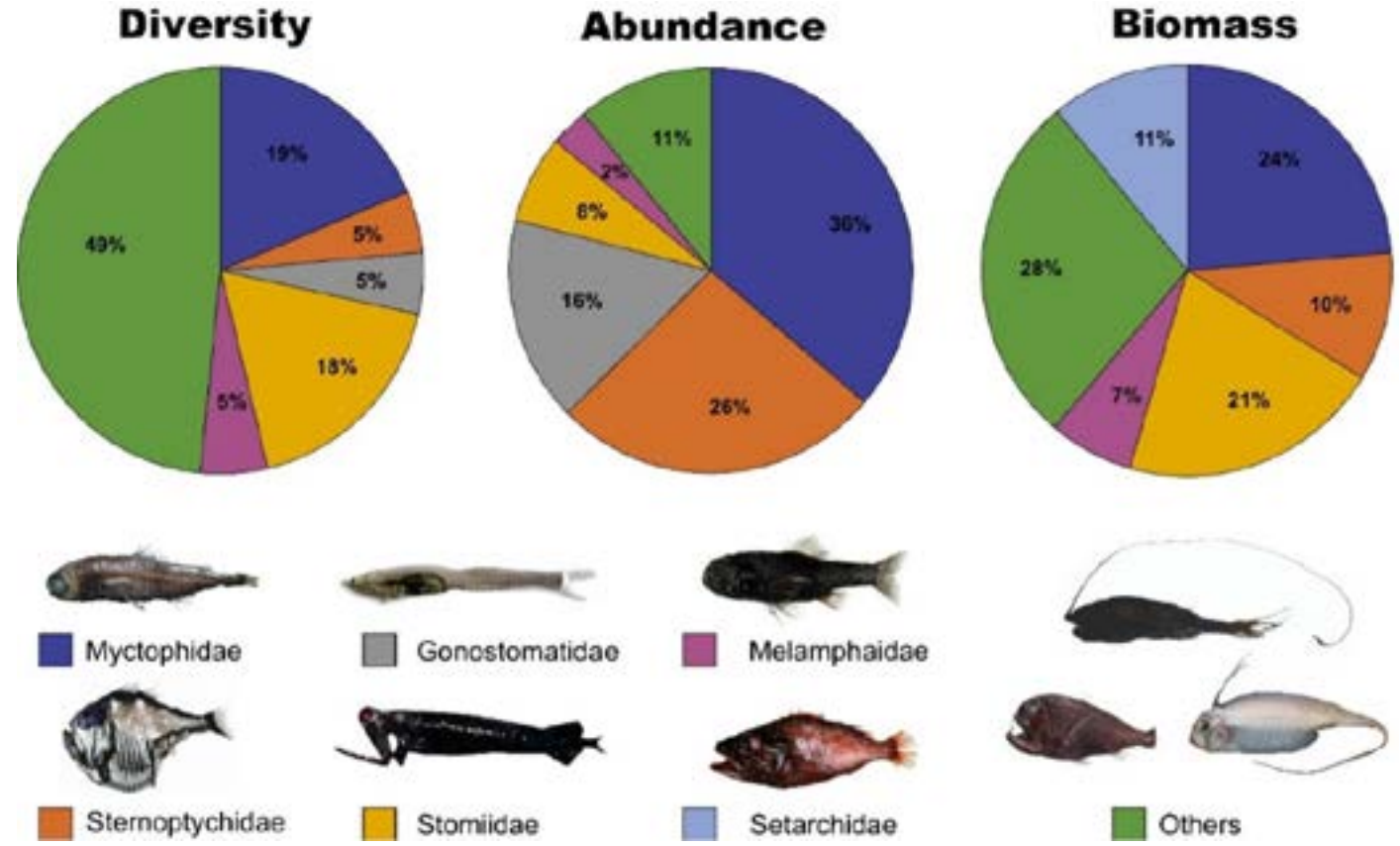


Fig 1. Diversity, abundance, and biomass of five main mesopelagic fish families of the Northeastern Brazil. Source: Eduardo et al. (In prep).

For more than 200 million years mesopelagic fishes have inhabited earth's oceans, where they lived, evolved, and acquired several adaptations to overcome challenges imposed by the deep-sea.

Over time, these species have become one of the most abundant and diverse fish groups of the world's ocean, contributing to several ecosystem processes (Pried, 2017).

Yet, this zone is poorly understood — physically, biogeochemically, and ecologically (Martin et al., 2020). Even the number of organisms that live there remains a mystery, letting alone their diversity and function. In an ecological context, four priority research areas have been listed to improve the understating of the mesopelagic zone: (i) biodiversity census; (ii) links between oceanographic regimes and mesopelagic biomass and biodiversity; (iii) the role of the mesopelagic community in the food web; and (iv) the role of individual species and the community in ecosystem processes.

In this context, a team of TRIATLAS researchers focused on answering these questions in the south-western Tropical Atlantic. For that, they took advantage of two scientific expeditions from the project ABRACOS, where for the first time the mesopelagic zone of Northeastern Brazil (NE) was extensively surveyed and thousands of mesopelagic specimens were collected. Here is a summary of their main findings:

(i) Biodiversity census

Prior to the project ABRACOS, only a few expeditions have been conducted on the deep-sea of NE. Although these works substantially contributed to the understanding of several species, they were highly sparse and mostly focused on demersal communities. For instance, mesopelagic fishes represented less than 20% of the species recorded on the NE. This picture evolved since we now know that a relatively high number of mesopelagic fishes occur in the NE, including at least 24 orders, 56 families, and 207 species. From those, nine (4%) are potentially

new species and 61 (30%) represented new records for Brazilian waters (e.g., Eduardo et al., 2018; 2019; Mincarone et al., 2019; in press). Additionally, several species collected are globally rare and had their distribution updated. Overall, five families accounted for 52% of the species diversity, 90% of the specimens collected, and 72% of the total biomass (Fig 1).

(ii) Links between oceanographic regimes and mesopelagic biomass and biodiversity

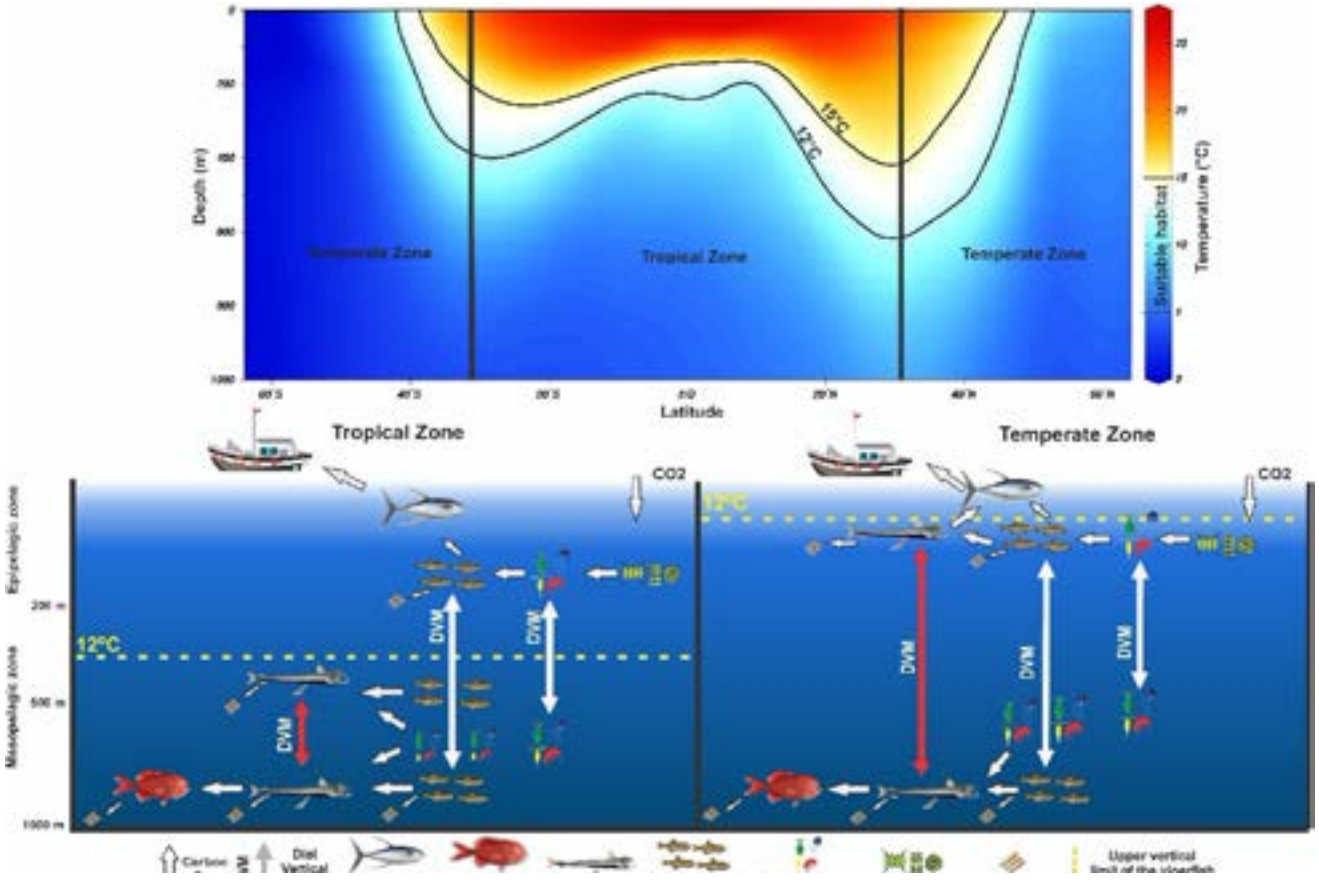
To investigate the influence of oceanographic features on the ecology and biodiversity of mesopelagic fishes, we combined information on the abundance, distribution, diversity, trophic ecology, and physical and chemical habitat of mesopelagic species. It revealed that hatchetfishes (Sternoptychidae) species respond differently to environmental constraints, including oxygen concentration and temperature (Eduardo et al., 2020a).

For instance, at daytime some species (e.g., Argyropelecus affinis and A. sladeni) were mostly distributed at 400–500 m depth, in the layer presenting the lower oxygen concentration. These species were likely in search for predator refuge and/or saving energy by resting in a water mass with low temperature and dissolved oxygen concentration. Moreover, several species were found in deep and cold waters (< 8°C) only, showing a strong correlation with the vertical thermal structure of the NE.

(iii) The role of the mesopelagic community in the food web

To explore the role of mesopelagic species in the food web, we combined gut content analyses with stable isotope data carried out on the main trophic links of mesopelagic species, including zooplankton, gelatinous organisms, crustaceans, fish larvae, and epipelagic and deep-sea predators. This allowed demonstrating that most hatchetfishes are acting as mixing of secondary and tertiary consumers, being important predators on the zooplankton community, especially on amphipods, euphausiids, ostracods, copepods, fish larvae, and chaetognaths (Eduardo et al., 2020a). Additionally, these species might be species-specific in feeding habits, demonstrating a high degree of resource partitioning. As consumers of Thaliacea and Siphonophorae organisms, these species also convert "gelatinous energy" into "fish energy" readably usable by higher trophic levels. This is a crucial trophic relationship that has been historically underestimated. Additionally, the viperfish was classified as a predator with a restricted niche

Fig 2. Conceptual model exhibiting global suitable vertical habitat of the viperfish Chauliodus sloani based on temperature profiles (Source: Word Ocean Atlas) and differences in the vertical migration and trophic interactions of this species in the tropical and temperate waters. Temperature information from the upper panel refers to the meridional Section at 30°W. Source: Eduardo et al. (2020b).



breadth that heavily feeds on zooplanktivorous fishes, especially myctophids (at least 50% of prey items) (Eduardo et al., 2020b).

(iv) The role of individual especies and community on ecosystem processes

Given their trophic and vertical behaviour, hatchetfishes contribute to several ecosystem processes of local and global significance. As an example, we identified the species vertically migrating to the surface to feed at night and actively transport the ingested carbon to deep waters during daylight, a pathway enhancing the ultimate oceanic carbon storage.

Moreover, it was demonstrated which species occupy important trophic positions by consuming zooplankton and providing forage for numerous epipelagic and deep-sea predators (Eduardo et al., 2020a). These processes, as an example, are crucial for the maintenance of harvestable fish stocks and the connection between shallow and deep-sea ecosystems. Additionally, we showed that the viperfish is amongst the most abundant mesopelagic micronektivores in the NE.

This species remains at deep waters full-time, is away from epipelagic predators, and heavily preys on migrant myctophids, which otherwise would return and release carbon in epipelagic waters. Therefore, the viperfish likely contributes to carbon storage, once it supports the storage of organic matter actively vertically transported through their prey (Eduardo et al., 2020b). Moreover, viperfish are preyed by higher trophic levels (e.g. Ectreposebastes imus) that perform diel migrations from bathypelagic depth to feed at the lower mesopelagic zone (500–1000 m). This relationship may also accelerates carbon sequestration into the deep-sea.

Combination of research questions

Together, these four priority research areas may also work synergistically and provide new approaches and insights in mesopelagic ecosystems. Indeed, by combining this information the researchers could reveal functional groups and better understand how mesopelagic species are scattered over different patterns of resource use (niche partitioning) and thereby avoiding competitive exclusion. As an example, for hatchetfishes five functional groups were defined with different diet preferences, isotopic composition, and vertical abundance peaks, revealing a possible high resource partitioning and several mechanisms to avoid competitive exclusion (Eduardo et al., 2020a).

In the study case of the viperfish, all priority research areas were combined to construct a conceptual model explaining how temperature might influence both trophic ecology and vertical movements of the viperfish (Fig. 2; Eduardo et al., 2020b). Temperature (12–15 °C) is likely restricting its upper limit of distribution, affecting its vertical habitat and trophodynamics. As a consequence, in the NE, and probably most of tropical waters, the viperfish likely stay full-time breathing, excreting, and serving as prey (e.g. for bathypelagic predators) at deep layers (below 400 m). In most temperate regions, however, they ascend to superficial waters where they are consumed by epipelagic predators and release carbon where its remineralization is the greatest (0–200 m). More broadly, based on the viperfish case, we show that the ecology and thus potential contribution of micronektivores to the carbon storage is expected to vary geographically, modulated by the latitudinal change in sea temperature.

– Leandro Nole Eduardo 1,3, Flávia Lucena-Frédou 1, Michael Maia Mincarone 2, Arnaud Bertrand 1,3.

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