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Who Is Eating Most of the Zooplankton in the Oceanic Gulf of Mexico? The Impact of Mesopelagic Fishes

Tracey Sutton
Harbor Branch Oceanographic Institution, Inc, tsutton1@nova.edu

Scott E. Burghart
University of South Florida

Stowasser[1], G., R. McAllen[2], G.J. Pierce[1], C.F. Moffat[3], M.A. Collins[4], and I.G. Priede[1]
[1]Zoology Deparment, University of Aberdeen, Aberdeen, U.K.; [2]Zoology Department, University of Cork, Cork, Ireland; [3]FRS Marine Laboratory, Aberdeen, U.K.; and [4]British Antarctic Survey, Cambridge, U.K.

FATTY ACIDS AND STABLE ISOTOPES: A NEW APPROACH TO THE TROPHIC ECOLOGY OF THE DEEP-SEA ICHTHYOFAUNA

Despite the importance of fish in the trophic ecology of the deep-sea as predators, scavengers and in the dispersal of large food falls, relationships between fish species and their prey remain largely undescribed and little is known about their role in benthopelagic food webs.

Previous studies on diets of deep-sea fish have relied on conventional stomach content analysis. However trawl feeding and regurgitation of prey, resulting from hydrostatic decompression, have largely compromised such studies. Fatty acids remain relatively unchanged as they pass from prey to predator while stable isotope ratios tend to change up food webs. As such, fatty acids and stable isotopes have the potential to be used as trophic markers.

Fatty acid and stable isotope analyses were applied to quantitatively investigate the trophic ecology of five species within the two dominant families of deep-sea fish (Macrouridae and Moridae) at the Porcupine Abyssal Slope and Plain (NE Atlantic). Both fish and a variety of potential prey species were sampled so as to determine the fatty acid and stable isotope signatures.

Preliminary fatty acid data show significant differences between fish species, indicating species relying on different food sources. Within species, changes in fatty acid profiles were found with increasing body size and between bathymetric zones. Results will be used to assess the importance of seasonality and scavenging on trophic relationships within these fish communities.

This combination of fatty acid and stable isotope analysis has not previously been applied to deep-sea ichthyofauna. These results offer the prospect of a significant advance in understanding the role of fish in benthopelagic food webs of the deep sea allowing a greater understanding of fundamental processes in this environment.

Sutton[1], T., T. Hopkins[2], and S. Burghart[2]
[1]Division of Marine Science, Harbor Branch Oceanographic Institution, Fort Pierce, FL, U.S.A. and [2]College of Marine Science, University of South Florida. Tampa, FL, U.S.A.

WHO IS EATING MOST OF THE ZOOPLANKTON IN THE OCEANIC GULF OF MEXICO? THE IMPACT OF MESOPELAGIC FISHES

Deep-sea pelagic fishes are the most abundant vertebrates on Earth, yet their role in the overall economy of the sea is poorly known. Low latitude oligotrophic regimes, typified by the eastern Gulf of Mexico, constitute most of the world ocean and consequently support the largest global ecosystems. Thus, we have little information on the trophic role of most of Earth's vertebrates. To address this, the diets of an entire midwater fish assemblage (164 species, constituting > 99% of assemblage numbers) were analyzed to assess feeding guilds and predation impact. Zooplanktivory was the dominant feeding mode (80% of prey biomass taken), followed by piscivory. However, the entire fish assemblage predation impact on zooplankton was only 5-10% of daily production. This points to critical limitations in our understanding of how tropical-subtropical regimes, the largest of global ecosystems, function and which taxonomic groups are the most important zooplanktivores. Regarding the latter, the obvious candidate is other zooplankton, including large gelatinous predators.

Thiel, H.
Universität Hamurg, Hamburg, Germany

PROTECTION OF HIGH SEA AREAS - STATUS REPORT

Between 2001 and 2003, three workshops have been held to discuss the protection of certain species and communities in deep-water regions. A fourth workshop will be conducted towards the end of this year. Scientists, non-governmental organizations and a few governments are the driving power behind this development. Lawyers and legal officers always delivering essential contributions.

Protected areas have been established in Exclusive Economic Zones under national laws, but the United Nations Law of the Sea (UNCLOS) does not provide the legal basis for conservation measures on the high seas, i. e. beyond national jurisdiction. However, where deep-sea mining is concerned, UNCLOS has entrusted the International Seabed Authority with the responsibility for safeguarding the environment. This should result in an undisturbed seafloor network to conserve biodiversity, interrupted by isolated mining blocks. For support of such a concept, scientists are requested to study species distributions on scales of kilometers. This approach should be applicable also to other human impacts on the deep seafloor.

Discussions aim at regional regulations, particularly to overcome the intensive overfishing of deep-water fish stocks, and at ammendments to UNCLOS through the United Nations Consultative Informal Process (CIP). High seas protected areas have been proposed particularly by non-governmental organizations.

Scientists should be aware that intrusion into the deep sea by various societal activities may severely disturb the research work they conduct in the interest of human society. Conflicting interests may develop between stakeholders, and scientists should realize that they are among the stakeholders. The establishment of Unique Science Priority Areas (USPAs) to safeguard scientific activities in the deep sea would also provide certain protection to species diversity and communities.