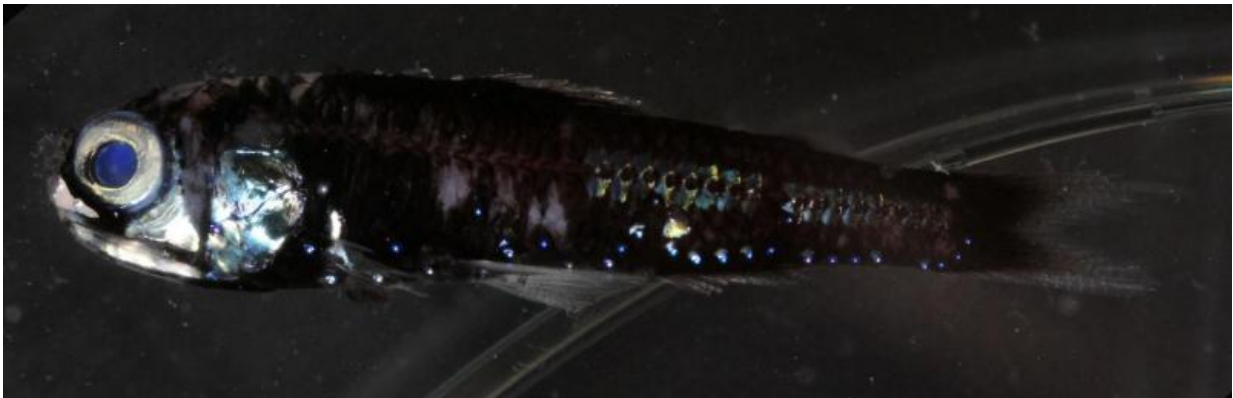


The ocean's Twilight Zone can feed the world, but at what cost ?

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The Twilight zone is the zone in the sea, where daylight can not reach. The most common fish here are lanternfish with one species of Bristlemouth Cyclothone, considered to be the most abundant vertebrate species on the planet. Credit: Peter Rask Møller, University of Copenhagen

Life in the Twilight Zone constitutes a huge potential source of fishmeal and omega 3 fatty acids that could feed the world's population. However, it exists in an unregulated space where there are no rules for fishing. And there exists a lack of understanding of the biological processes in the Twilight Zone making it impossible to accurately estimate the fishing pressure the stocks can sustain.

There are huge untapped resources of protein in the deep sea, but any potential exploitation should be done with caution, say researchers.

An international research group last year estimated that the so-called "Twilight Zone" (at 200 to 1000 meters) supports a community of fish, squid and crustaceans whose biomass far surpasses all the world's current fisheries. Furthermore, it is currently estimated that there are more than 1 million undescribed species in the Twilight Zone. According to the study, the Twilight Zone contains up to 90 percent of the world's total fish biomass. There are so many creatures here that if estimates hold, it would be equivalent to 1.3 tons of fish biomass per person on earth, and that excludes squid and krill.

In a Perspectives article in the open-access journal *Frontiers in Marine Science*, an international group of researchers from Denmark, the U.K., Portugal and Spain warn that a better understanding of the role of this community in the preservation of biodiversity and its influence on climate regulation is required if the Twilight Zone biome, presently one of the most understudied regions in the world oceans, is to be exploited in a sustainable manner.

In order to define the limits of sustainable exploitation of this community, fundamental knowledge is needed on everything from population biology and controls on recruitment success to its role in the [food web](#) and for climate regulation. The community provides food for other key species, such as tuna and sharks. However, the importance of this community in the food web is not yet fully quantified. Furthermore, the mesopelagic community plays an important role in climate regulation. During their daily migration to the upper layers, mesopelagic species feed on plankton, but release carbon at depth. The result is an additional mechanism for fast transport of carbon from the atmosphere to the ocean's interior, dampening the CO₂ contribution to global warming.

At present, this community is not commercially fished, although test fisheries are in progress. Existing techniques are economically unviable

for harvesting fish meal, but the high essential fatty acid content of some species makes exploitation more economically sound, suggest the authors.

Lead author, oceanographer Professor Michael St. John, from DTU Aqua in Denmark, says, "As coastal stocks are overexploited, alternative marine resources in the Twilight Zone will be of growing interest. There have already been several attempts to exploit the mesopelagic community, and the fear is that it may lead to an unregulated 'gold rush' as soon as the technology is available and the cost justified. Therefore, the world community is faced with a major challenge. Of all the research I've done in my career, this is the most important issue—of that, I'm sure."

What is the Twilight Zone?

The Twilight Zone refers to a sea zone depth that sunlight cannot reach. The most common fish here are lanternfish; one species of bristlemouth cyclothone is considered to be the most abundant vertebrate species on the planet. These fish are commonly called myctophiids, of which there are 245 species. They are 10 to 15 cm long, and are found throughout the ocean. Together with squid and crustaceans, they can be detected by acoustic surveys 500 meters under the surface over large areas during the day. At night, they migrate to the surface to feed.

More information: St. John MA, Borja A, G Chust, Heath M, Grigorov I, Martin AP, Serrão Santos R and P Mariani (2016). A Dark Hole in our Understanding of Marine Ecosystems and its Services: Perspectives from the mesopelagic community, *Front. Mar. Sci.* 3:31. [DOI: 10.3389/fmars.2016.00031](https://doi.org/10.3389/fmars.2016.00031)

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