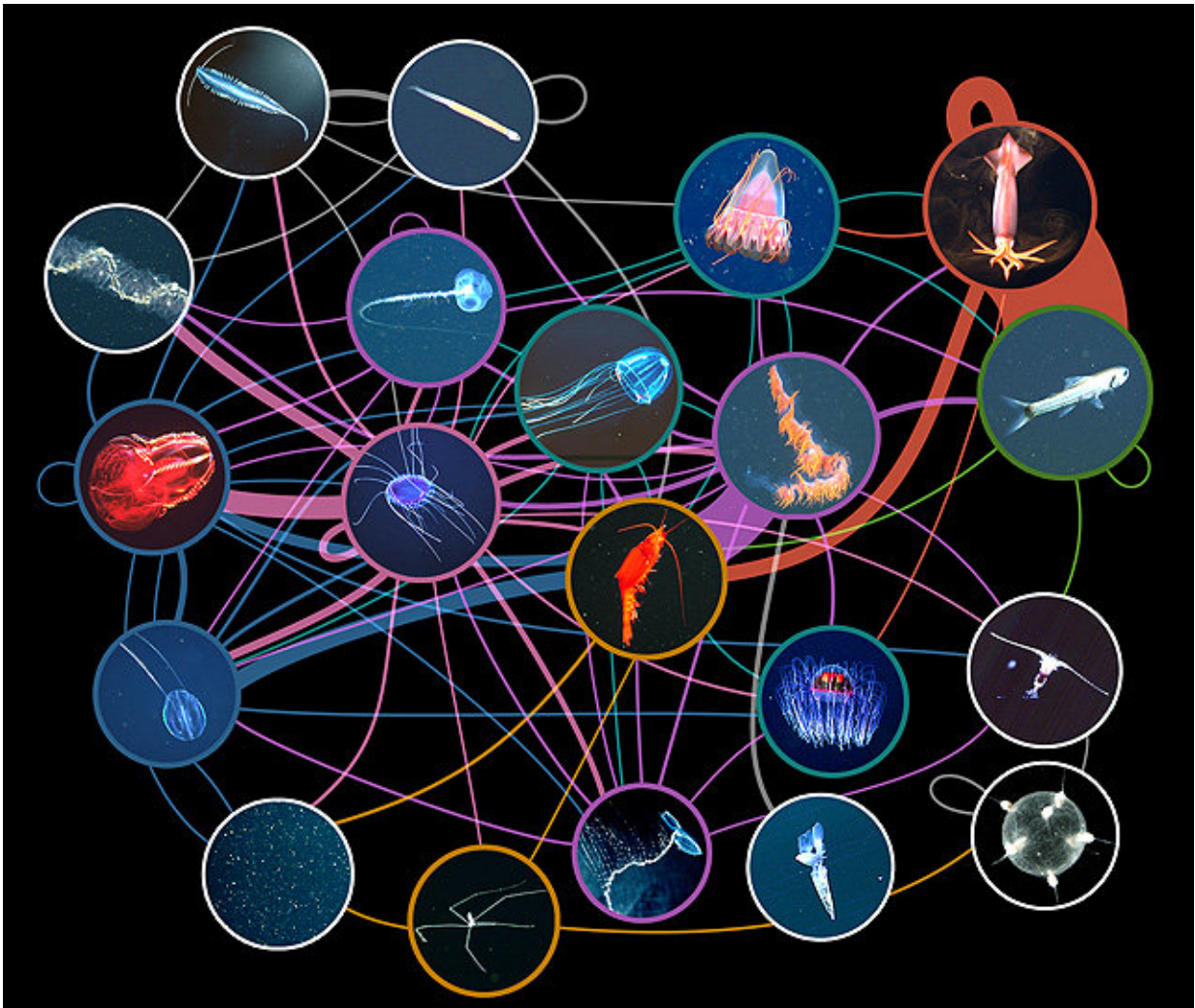


Unique field survey yields first big-picture view of deep-sea food webs

December 6 2017



his complex food web shows groups of animals (indicated by different colored circles and lines) that were observed eating each other during MBARI remotely operated vehicle dives. Thicker lines indicate more commonly observed

predator/prey interactions. Credit: © 2017 MBARI

Deep-sea animals have been systematically studied for over 100 years, yet scientists are still learning about what many of these animals eat. A new paper by MBARI researchers Anela Choy, Steve Haddock, and Bruce Robison documents the first comprehensive study of deep-sea food webs, using hundreds of video observations of animals caught in the act of feeding off the Central California coast. The study shows that deep-sea jellies are key predators, and provides new information on how deep-sea animals interact with life near the ocean surface.

Biologists usually figure out what [deep-sea animals](#) eat by collecting organisms, dissecting them, and looking at the contents of their stomachs. More recently, scientists have augmented this age-old approach by comparing the ratios of various chemicals in the flesh of deep-sea animals with ratios of these chemicals in their potential sources of food.

To use these methods, scientists must collect large numbers of animals—something that is difficult to do in the deep sea. In addition, soft-bodied, gelatinous animals decompose rapidly after being eaten and are often damaged or destroyed when they are collected using trawls or large nets.

The MBARI researchers took an entirely new, but relatively straightforward approach to this problem: they used deep-diving vehicles to observe animals feeding on one another in the deep sea. As Robison pointed out, "This direct approach has never been used systematically before. Unlike other methods, it involves no guesswork and provides very precise information about who eats whom in the deep-sea."

Since the late 1980s, MBARI researchers have used remotely operated vehicles (ROVs)—underwater robots operated from a ship at the surface—to study deep-sea animals in their own environment. In the process, MBARI has amassed over 23,000 hours of deep-sea video footage.

What makes this footage particularly useful is that technicians in the MBARI Video Lab have painstakingly analyzed virtually every minute of every deep ROV dive, identifying animals and their behaviors, and entering this information into MBARI's immense Video Annotation and Reference System (VARs) database.

Combing through the VARs database, MBARI Postdoctoral Fellow Anela Choy and her coauthors discovered almost 750 different video observations of animals eating one another.

"When I first came to MBARI, I was excited to see how our understanding of food webs might change as a result of making direct observations of deep-sea life using an ROV," Choy commented. "The most surprising thing to me was how important gelatinous animals were as predators, and how their unexpectedly complex food habits spanned the entire food web. Who would have thought that a deep-sea jelly that looks like a big dinner plate would eat 22 different types of animals?"

She continued, "Our video footage shows that jellies are definitely not the dietary "dead ends" we once thought. As key predators, they could have just as much impact as large fishes and squids in the deep sea!"

In fact, even when the researchers tallied just the animals they saw eating within 200 meters (660 feet) of the sea surface, the most common predators were not fishes or squids, but siphonophores—relatives of Portuguese man-of-war. Some large siphonophores create living drift nets up to 30 meters long, and were observed snagging a wide variety of

animals, including copepods, krill, ctenophores, medusae, and small to medium-sized fishes.

Conversely, a small but extremely common siphonophore, *Nanomia bijuga*, turned out to be a specialist, eating almost nothing except krill. It is essentially competing with blue whales for food.

As these examples suggest, jelly food webs encompass not just deep-sea animals, but also animals that live near the sea surface. Gelatinous animals have been found in the stomachs of animals ranging from penguins and albatrosses to well-known jelly eaters such as *Mola mola* (ocean sunfish) and leatherback sea turtles.

As Haddock noted, "There is a misconception that jellies are merely a nuisance and serve no real purpose in marine ecosystems. Our results and other studies around the world show that they are a common source of food for a diverse group of predators. Interactions involving gelatinous predators and prey create most of the complexity that we see in our new deep-sea food web."

ROV surveys provide a very different perspective on deep-sea food webs from the other research methods. However, as Haddock explained, "Our results don't replace the traditional ideas of a food web, but complement them. It's as if we had a transportation map that only showed train tracks, but now we can see the rest of the roads and paths."

This study serves as a reminder not just that marine food webs are extremely complex, but also that many deep-sea animals are eaten by animals near the ocean surface. According to the recent paper, deep-sea animals "form the principal forage base for many commercially-important meso-predators and apex species, such as marine mammals, sea birds, and tunas." In other words, if you eat a tuna sandwich for lunch, you too might be part of a deep-sea [food](#) web.

More information: C. Anela Choy et al, Deep pelagic food web structure as revealed by in situ feeding observations, *Proceedings of the Royal Society B: Biological Sciences* (2017). [DOI: 10.1098/rspb.2017.2116](https://doi.org/10.1098/rspb.2017.2116)

Provided by Monterey Bay Aquarium Research Institute

Citation: Unique field survey yields first big-picture view of deep-sea food webs (2017, December 6) retrieved 10 April 2024 from <https://phys.org/news/2017-12-unique-field-survey-yields-big-picture.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--