

August 26, 2015 | By Christina Wu

DNA Sequencing Used to Identify Thousands of Fish Eggs

Study characterizes fish spawning and creates baseline for future studies

Using DNA sequencing, researchers have accurately painted a clear picture of fish spawning activities in a marine protected area (MPA) and have created a baseline for continuing studies on the effects of climate variability on fish populations.

A group of Scripps Institution of Oceanography at UC San Diego researchers led by Ron Burton and Alice Harada collected 260 samples off the Ellen Browning Scripps Memorial Pier over a two-year period and used DNA barcoding to accurately identify over 13,000 fish eggs.

This study was also a collaborative effort between the Scripps Coastal Observing Research and Development Center (CORDC), which is led by researcher and study co-author Eric Terrill and the Burton Laboratory, which is led by study co-author Ron Burton. This study leveraged a network of radar antennas that allowed the researchers to map out ocean surface currents off the coast.

The eggs of 39 different species were identified. Modeling of how surface currents move the floating eggs indicate that probably all these species spawn within the La Jolla MPAs. The most abundant species were Speckled Sanddabs and Señoritas, but other species observed included Giant Seabass, White Seabass, Barracuda, and Sheephead. Despite the extensive sampling, the researchers did not find many species that are commonly found offshore, such as yellowtail.



"Senorita" Oxyjulis californica

The study, "Monitoring spawning activity in a southern California marine protected area using molecular identification of fish eggs," appears in the August 26, 2015 issue of the Public Library of Science publication *PLoS One*.



"California tonguefish" *Symphurus atricaudus*

The researchers wanted to know which fish were spawning in the marine protected area by the Scripps Pier, when they were spawning, and which species were most abundant. Traditional studies of this type use visual characteristics to identify eggs but this study used DNA sequencing to more accurately distinguish fish eggs.

Previously, Scripps researchers used specimens from the Scripps Marine Vertebrate Collection to develop a catalog of DNA sequences of nearly all the marine fish species found in California waters. Through a process known as "DNA barcoding,"

each egg could be identified.

The results show that there was high consistency in the spawning patterns within the two-year period and reveals which fish are spawning locally and their breeding patterns. The researchers hope to use their results as a baseline for assessing future changes in spawning that may be caused by climate change and other factors.

"The primary purpose of this study was to provide a detailed picture of the species spawning in the MPAs in order to establish a baseline for future studies, which will allow us to examine the effects of climate change on the spawning patterns and fish species assemblage," said Harada, a Scripps PhD student. "In the future, we can also use our results to assess the efficacy of the MPAs."

The Coastal Observing Research and Development Center collects up-to-date oceanographic, weather, and water quality data. Using the CORDC data, researchers from the Burton Laboratory were able to map out the water conditions during the spawning stages to better understand when the fish laid the eggs, and how far the eggs may have traveled from their original spawning site.

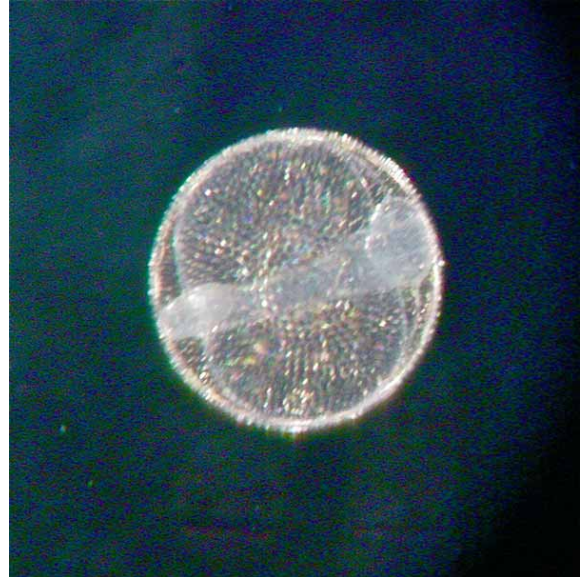
"This project is a great example of how the synthesis of ocean circulation can support the challenges that biologists face in unraveling the mysteries behind our coastal fish species," said Terrill. "Linking state-of-the-art DNA techniques with a high-tech ocean monitoring system is an

example of the ingenuity that takes place at Scripps.

“This study is a great example of interdisciplinary teamwork between two laboratories here at Scripps. We worked with the Terrill lab to use their data and expertise to calculate when and where the spawning occurred, and we were also able to determine where the hatched larvae might wind up using surface current data,” said Burton, a professor of marine biology.

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Other authors on this study include Elise Lindgren, Maiko Hermsmeier, Peter Rogowski, and Eric Terrill.



“C-O sole” *Pleuronichthys coenosus*

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