UC SANTA BARBARA

THE Current

May 15, 2025

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Community science helps reveal population growth among SoCal's endangered giant sea bass

Nicknamed the "king of the kelp forest," giant sea bass are among scuba divers' favorite characters to spot off the California Coast. But very few of these charismatic fish remain.

A team led by researchers at UC Santa Barbara has conducted the first direct population estimate of this critically endangered species in Southern California. Using photos sourced from the diving community, they found slightly more than 1,200 adult giant sea bass within Southern California waters from 2015 to 2022. The results, published in the Marine Ecology Progress Series represent an increasing trend in their numbers, suggesting that current conservation efforts are helping the species recover from decades of overfishing. That said, SoCal's giant sea bass population is still far below its historical level, and recovery will take a while for this slow-growing species.

"It's reassuring to see things moving in the right direction in Southern California," said lead author Andrew Pettit, a recently graduated master's student in UCSB's Benioff Ocean Science Laboratory. "This project, with its continually growing dataset, is a huge step forward in understanding and protecting this remarkable species."

Population crash and conservation

Giant sea bass can reach lengths greater than seven feet, weigh over 550 pounds and live as long as 76 years. These characteristics make them one of the top predators in their ecosystem, where they play a crucial role in maintaining the health of kelp forests and rocky reefs by regulating prey species.

Unfortunately, these characteristics also make them particularly vulnerable to impacts from human activities. The slow-growing species was fished to near extinction from the late 1800s until 1981, when California closed the fishery due to a total collapse. Commercial landings had declined by 95% in Mexico and California between 1932 and 1980. In 1996, the International Union for Conservation of Nature listed giant sea bass as critically endangered.

Since then, California has banned set gillnets within three nautical miles of the mainland and one nautical mile of the Channel Islands. The state has also reduced incidental take allowances to one fish in California waters per vessel per trip. Mexico hasn't yet enacted any regulations for the commercial fishery, and scientists know very little about the species' status south of the border.

"A few recent studies have hinted at a population increase in giant sea bass numbers since the nearshore gillnet closure," said Pettit, now a doctoral student at University of Hawaii, Manoa's Hawai'i Institute of Marine Biology. So he and his co-authors sought to estimate the species' population size and trends in Southern California.

A community initiative

Despite their size and appetite, the kings of the kelp forest are rather gentle and very curious animals. They will often approach and investigate divers like curious puppies. A previous study out of UCSB estimated that the fish contribute over $2.3 million to the recreational diving industry each year.

The authors harnessed the community's enthusiasm for giant sea bass, sourcing more than 1,600 photos from divers and fishermen through UCSB's Spotting Giant Sea Bass Project. The initiative grew from a collaboration between the Benioff Ocean

Science Lab and Professor Milton Love's lab back in 2016, and now has contributions from over 420 citizen scientists.

Giant sea bass have unique spot patterns that remain consistent throughout their adult lives, making it straightforward to recognize specific fish from photographs. The team used pattern-recognition software to identify individuals based on their spot patterns, and statistical methods to extrapolate population sizes from re-sightings. Based on their results, the authors estimate just over 1,220 adult giant sea bass called Southern California home between 2015 and 2022.

"I'm encouraged to see evidence that the population is increasing, but there's still a long way to go before we can celebrate," Pettit said. "The population is still far below historical levels, and I'm particularly concerned about long-term genetic connectivity and diversity, especially since we have so little data from Northern California and Mexico."

Unfortunately, this is still far below their numbers in even the 1930s, when commercial landings alone could exceed 4,500 individuals per year, with most activity concentrated in Southern California. "And this would have been after 62 years of intense commercial fishing," Pettit said. Sadly, the current incidental take allowance means that, on average, 126 giant sea bass were landed by gill-netter fishermen each year from 1994 to 2022. And the trend is increasing, with 180 caught and sold in 2022.

Giant homebodies

The photos revealed that the fish like to stick close to their homes with the exception of a few intrepid individuals. The researchers found only eight instances of fish traveling across islands or more than 30 miles. Giant sea bass also aggregate seasonally in predictable locations, which historically made them easy targets for fishers. But it makes them a favorite of divers, who will often encounter the same fish on successive visits to a given spot.

While the giant sea bass' high site fidelity may have contributed to their precipitous decline, it also presents opportunities for conservation. "Their recovery is highly dependent on protecting key habitats where they aggregate," Pettit said. And given the limited genetic exchange between fish in different areas, this is essential for the

species’ recovery and long-term genetic diversity.

The fish’s tendency to stay put also made photo identification easier, freeing the team from relying on more traditional surveying techniques, such as catch-and-release tagging. These are not only labor-intensive and expensive but also stressful for the fish, Pettit explained. In addition to the stress of being on the line and then handled, giant sea bass are also susceptible to injury from pressure change when brought to the surface. The popularity of diving across Southern California, combined with the gentle, curious nature of giant sea bass, made photo identification a far better option for the study.

"By utilizing community science, we not only avoid these risks but also create a platform for public engagement,” Pettit said. “This approach empowers the community to actively participate in conservation, fostering stewardship of the ocean and its vital resources.”

This approach did run the risk of potentially undersampling areas where diving is less frequent. So the team incorporated key variables to account for that in their model, such as annual identification rates, the number of encounters per year, and the number of days with reported encounters per year.

The authors supplemented community science data with photos and videos of giant sea bass from research divers and baited underwater cameras, which can be placed at depths unreachable by recreational divers, explained co-author Molly Morse, senior manager of UCSB’s Benioff Ocean Science Laboratory. They also analyzed incidental landings from commercial gillnets, which bore out the population growth.

The researchers plan to extend the Spotting Giant Sea Bass Project to encompass more of the species’ range. “We know a large proportion of the population lives in Mexican waters,” Morse said, “which were outside the scope of this study, and likely some of the fish found in Southern California waters travel across the border.”

They also aim to expand the program’s community engagement from Northern California to Mexico. The Spotting Giant Sea Bass dataset is now open access, and the team will update it annually to invite further exploration by the research community. The dive community is invited to submit photos of their encounters with giant sea bass to the Spotting Giant Sea Bass project. Community participation is

critical, Morse said, for the projects' continuation and its impact on management and conservation of this flagship species.

Tags
Ocean and Beaches

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