

Buck, T. Lobster Tales, San Diego Bay— Haven For California Spiny Lobster. Outdoor California 2012 January-February: 14-20.



Look back 500 years and see a San Diego Bay where the horizon is framed with clouds of migrating waterfowl instead of massive glass and steel high risers, where gray whales instead of Navy SEALs dive in the chilled depths, and where

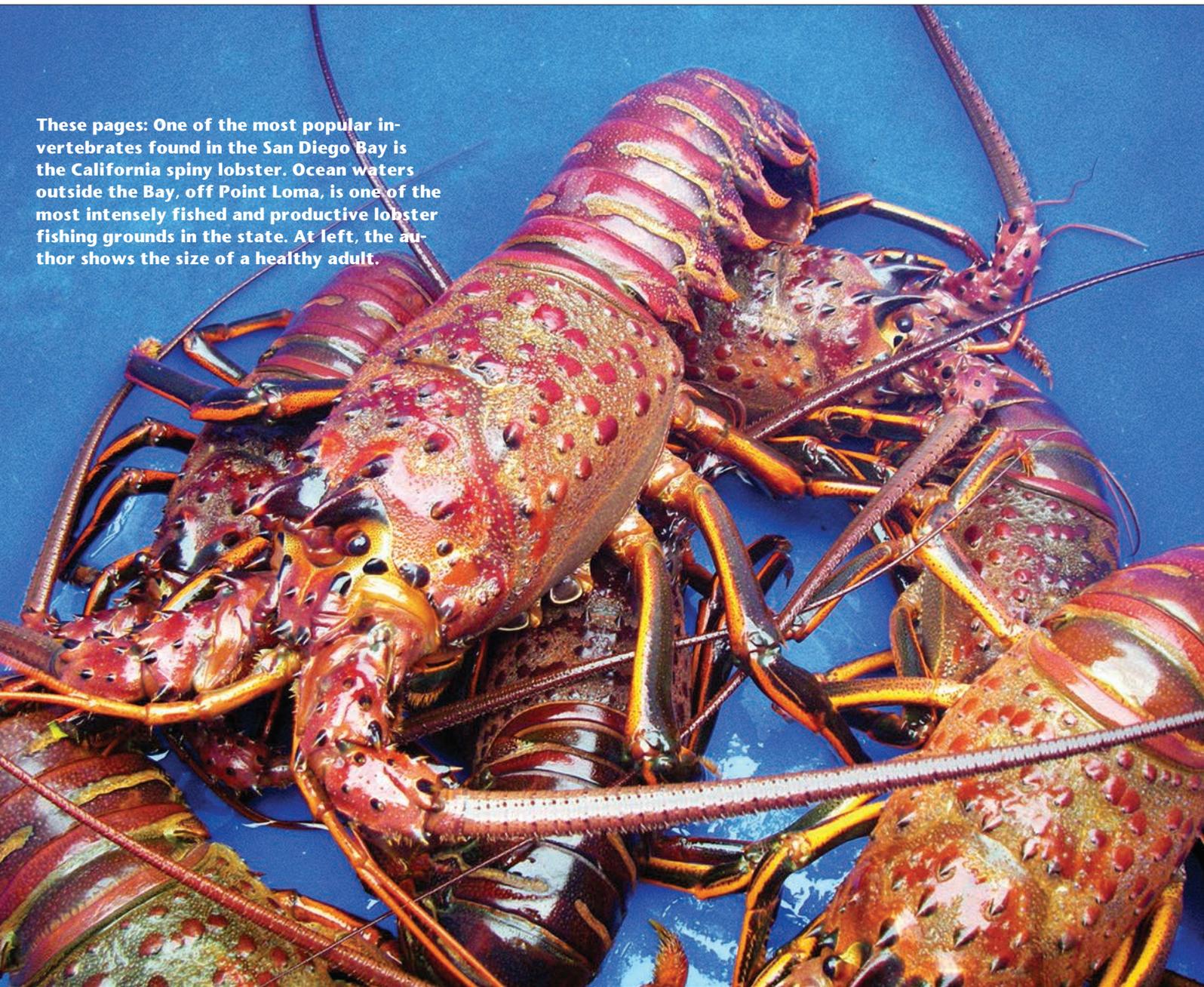


the only flotilla of fishing boats slicing through the waves are American Indians paddling rafts made of reeds seeking a catch from the Bay's bountiful fish and shellfish population.



San Diego Bay—Haven for

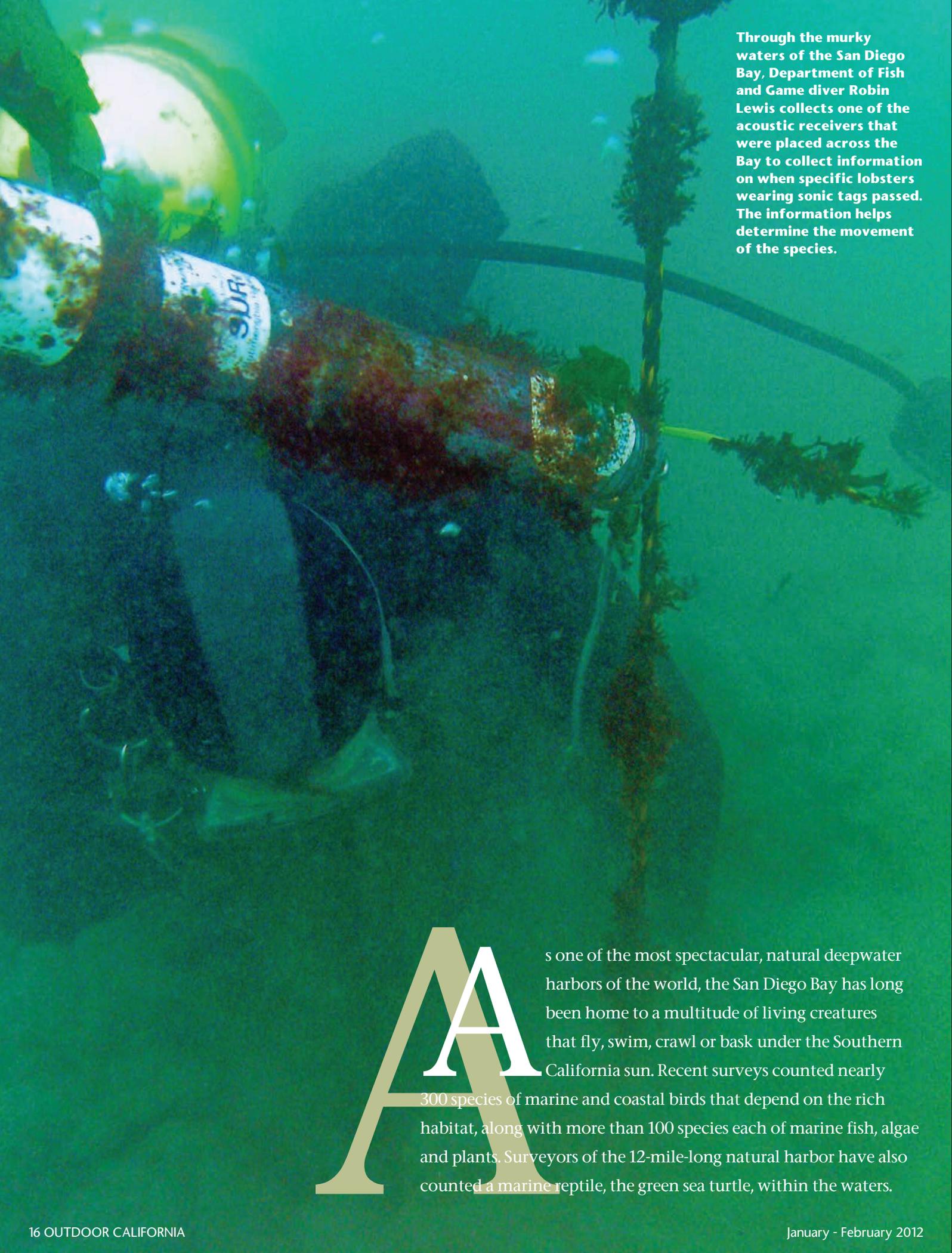
These pages: One of the most popular invertebrates found in the San Diego Bay is the California spiny lobster. Ocean waters outside the Bay, off Point Loma, is one of the most intensely fished and productive lobster fishing grounds in the state. At left, the author shows the size of a healthy adult.



STORY BY TRAVIS BUCK

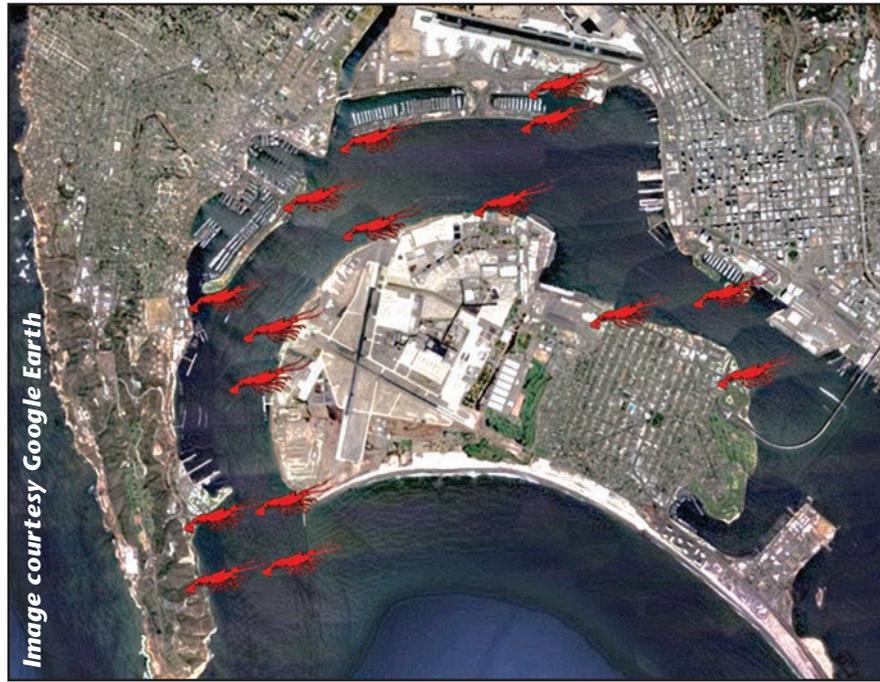
LOBSTER TALES

or California Spiny Lobsters



Through the murky waters of the San Diego Bay, Department of Fish and Game diver Robin Lewis collects one of the acoustic receivers that were placed across the Bay to collect information on when specific lobsters wearing sonic tags passed. The information helps determine the movement of the species.

As one of the most spectacular, natural deepwater harbors of the world, the San Diego Bay has long been home to a multitude of living creatures that fly, swim, crawl or bask under the Southern California sun. Recent surveys counted nearly 300 species of marine and coastal birds that depend on the rich habitat, along with more than 100 species each of marine fish, algae and plants. Surveyors of the 12-mile-long natural harbor have also counted a marine reptile, the green sea turtle, within the waters.



Clockwise from upper left: Researchers attach sonic transmitters to the shells of a pair of California spiny lobsters. Overhead image of San Diego Bay with lobster logos indicating location of traps. Listening stations were placed nearby so the machine could register when a tagged lobster passed. In order to determine a level of sustainable harvest, researchers require a good understanding of lobster movement and migration patterns. Aboard one of the research vessels, Emily Jones and the author record data from one of the study's subjects.

However, of all the Bay's native inhabitants, the invertebrates—animals that lack a backbone—are the most numerous. More than 600 species of marine invertebrates call the waters home. The most popular invertebrate of them among local fishermen and discerning diners is the California spiny lobster, *Panulirus interruptus*.

Both commercial and recreational fishermen pursue this particular species of lobster for its delicious tail meat. Lobster fisheries generate millions in annual revenue for commercial fishermen, as well as sport and commercial fishing businesses in Southern California's seaside communities and beyond.

The Pacific outside the Bay, off Point Loma, is one of the most intensely fished and productive lobster fishing grounds in

the state. Commercial fishermen have filed reports documenting substantial landings from this area since the early 20th century.

Yet even a hundred years' worth of landings data cannot explain some of the most fundamental workings of lobster populations. Historic data that came from commercial catches and non-fishery related research was limited to local studies so biologists simply didn't have adequate information to estimate the population.

To create a fuller, more complete picture, marine biologists with the Department of Fish and Game collaborated with scientists at San Diego State University to track the spiny crustaceans. The use of high-tech transmitters helped reveal some of the lobsters unknown habits. At the same time, DFG



began keeping closer tabs on the efforts of the recreational anglers and developed its spiny lobster report card in 2008. The report cards require sport divers and anyone using hoop nets to record the location, date, gear and the number of lobsters kept. The cards offered new information for fisheries management and the enforcement of bag limits.

A Known Unknown

To manage any species of wildlife—whether mammal, fish or invertebrate—the building block begins with knowing how many individuals exist in the population. For that information, researchers would need to know two important things: abundance and age (or size structure), according to Doug Neilson, a DFG associate biologist.

“There are a number of studies out there that provide abundance and size structure information for lobster at localized sites,” says Neilson. “This new study should expand our knowledge of lobster abundance and size structure to cover more of the California spiny lobster’s range.”

Another challenge in population estimates for wildlife and marine species managers is that such species don’t stay still—they move through their environments. Determining a level of sustainable harvest requires a good understanding of their movements and migration patterns.

When studying spiny lobsters, a relatively small creature that lives on the sea floor, collecting the information needed to protect and enhance their population proved challenging. Evidence suggested lobster populations thrived in San Diego Bay—an area where commercial fishing remains prohibited—and were healthy outside the Bay’s protection, in the heavily fished waters off Point Loma. Indeed, during the season from October through March, fishermen routinely reported pulling traps filled with lobsters.

It left scientists wondering; considering the annual take from the fishing grounds, how could the area sustain the high landings year after year? They questioned whether offspring from the protected Bay waters would migrate out to the Point Loma waters and supply

the abundant fishing grounds there.

More questions followed. Scientists wanted to know how far the lobsters moved in general. They began to wonder if it was possible that a regular migration of some sort existed.

Looking for the Keys

To answer these questions, Neilson teamed with Kevin Hovel, an associate professor of biology at San Diego State University, in a 2009 study on lobsters. The research focused on the size and movement of the lobster population within the San Diego Bay. They selected 16 sites inside the Bay and along the coastal kelp forests including the Point Loma fishing grounds, where they had set baited traps.

For six months, the researchers set and pulled traps every few days, recording each lobster’s sex and shell (carapace) length. In addition, researchers tagged the lobsters with coded strips of plastic before releasing them back to roam the Bay, a process known as “mark and recapture.”

Researchers allowed lengthy soak times—days, instead of hours—for

each trap, which permitted “mixing of animals,” Hovel explains.

“Extending the time allowed for mixing of animals, so that you had an equal chance of catching a tagged individual or an unmarked animal,” Hovel says.

The decision helped anchor the soundness of estimates made with the data.

On each of the plastic lobster tags, researchers had imprinted a phone number so that any fishermen who pulled the lobster from the waters could call and report the catch. Through this, researchers

Instead of checking lobster traps after one or two nights, the way the commercial industry does, researchers left traps in place for several days to allow a “mixing of animals.” The author, left, examines one of the subjects before recording the needed information. Below, researchers dive to the bottom of San Diego Bay where they are able to conduct maintenance on the specialized acoustic receivers.

continued for months to add to their data on movement and growth until the lobsters shed their shells, along with the tags. The information from recaptured, tagged lobsters allowed researchers to determine how far a particular lobster had traveled and how much it had grown, based on the distance from where the researchers had first tagged it. The data was included in a formal DFG stock assessment used to manage recreational and commercial fisheries.

Neilson and Hovel selected 79 lobsters and secured acoustic transmitters to the carapace. Each of the “sonic tags” emitted a uniquely coded pulse signal that identified the lobster. The leaders of the research team deployed 18 “listening stations” across the Bay, spaced evenly from the Coronado Bridge out to Point Loma. The stations detected when a tagged lobster came into range—about 250 meters, or 820 feet, in any direction from a listening station—and stored the time and date in its memory.

Every couple of months during the study period, DFG and university scuba

divers retrieved the listening stations and downloaded the stored information. The underwater work proved strenuous, with divers forced to fight strong currents and low visibility as they searched along the murky bottom for 30 to 40 minutes at a time to locate the stations. Once found, divers had to lift to the surface the hard plastic cylinders containing the receivers and the heavy disc-shaped cement anchors. On the surface, researchers could download the data onto a small laptop computer. The data revealed where, how often and how far lobsters moved.

During the course of the study, researchers captured more than 5,600 lobsters; they tagged nearly 5,000 with plastic and acoustic labels. One trap outperformed all the others, catching 95 lobsters at a site near the mouth of the Bay to the west. Some traps at sites in the east Bay turned up empty during the study. On one memorable occasion, researchers were surprised to find a trap full of stingrays.

“Preliminary population estimates suggest that there are in excess of 100,000 lobsters inhabiting the sites we sampled,”





Researcher Kevin Hovel, a professor with San Diego State University, releases one of the lobsters that is fitted with a sonic transmitter.

Cracking the Shell of the West Coast Spiny Lobster

California spiny lobsters lack the large pair of claws found on the Atlantic Coast's familiar American lobster, *Homarus americanus*. Rather, the spiny lobster, usually red in appearance, has five pairs of legs, a strong, flexible tail and sharp spines that are used for defense decorating its exoskeleton. It is the only species of spiny lobster found on the West Coast of the United States, and its range extends from Monterey Bay south to Magdalena Bay in Baja, Mexico. The great majority of the California lobster population, however, is concentrated from Point Conception to the Mexico Border, and off the Channel Islands.

Neilson revealed. When extrapolated over the entire Bay, the total population estimate will likely be far greater.

Researchers found 75 percent of the lobsters reside at the mouth of the Bay and alongside Zuniga Jetty. The rest of the population is spread inside the Bay. They also found researchers were able to catch lobsters in waters near the Coronado Bridge just a few feet from the busy streets of San Diego.

They found no evidence that lobsters traveled from the protected Bay to populate the fishing grounds off Point Loma. In fact, researchers documented the opposite trend. More than one lobster moved from the kelp forests of the fishing grounds into San Diego Bay. Curiously, researchers say they never saw one exiting the bay.

What the research team found was that lobsters are by no means sedentary. Following signals from tagged lobsters, researchers found they frequently crossed the mouth of the Bay and moved along Zuniga Jetty. Some lobsters took months to move several miles from the center of the Bay to the mouth. Researchers considered the journey a significant accomplishment for such a small spiny sea creature.

Some of the more extreme and interesting information came from the female subjects. Females undertook some of the longest migrations during the study and might have been part of a sexually driven migration.

During the first few months of summer, males made up the majority of the catch. As the summer wore on, the number of females caught in traps increased in an eastern progression. Researchers suggest a possible explanation is that traps repelled female lobsters in the spring and early summer months when they are busy with reproduction.

Repeating the study along the waters off Southern California could help researchers construct an accurate estimate of how many lobsters exist in the waters off California shores. An extended study could also reveal other facts about the lobster life cycle.

"Every bit of information helps to piece together a more complete picture of how lobsters live, which areas are most important to them and how to manage the sustainability," Neilson says.

In conjunction with commercial landings and report card data, fisheries studies fill information gaps to help resource managers understand the impact a surging human population has on lobster populations. The results of the studies improve DFG's ability to protect and enhance these populations in the San Diego Bay and beyond.



Travis Buck is a marine biologist and diver with the Invertebrate Management Prioject. He encourages the public to help in the conservation and recovery of our natural resources by reporting poaching at 1(888) DFG-CalTIP.