

SAN PEDRO BAY



A Look Beneath the Surface

WELCOME TO SAN PEDRO BAY — AMERICA'S BUSIEST TRADE GATEWAY AND HOME TO THE PORTS OF LOS ANGELES AND LONG BEACH.



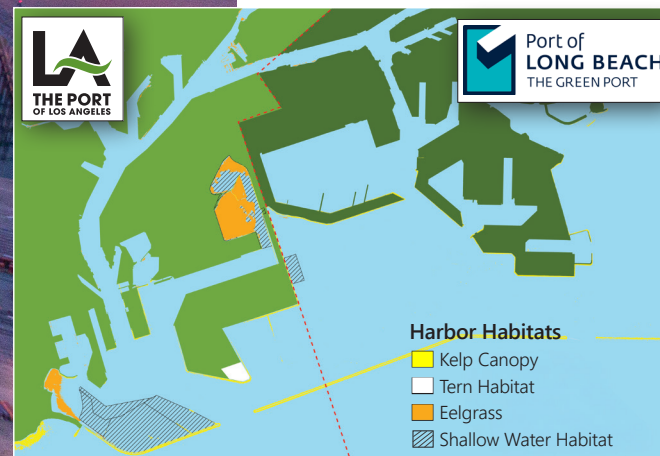
Economic Engines & Environmental Stewards

Along the southern coastline of Los Angeles County, there are two seaports: the Port of Los Angeles and Port of Long Beach. Located side by side, together these twin ports comprise the San Pedro Bay Port Complex, which encompasses more than 15,000 acres of land and water in San Pedro Bay. The ports play a vital role in the nation's economy, handling nearly 40% of all waterborne containers that are imported to the U.S. annually. The Port Complex is a major economic driver at the local, regional, and national levels, and a key generator of jobs, commerce, and tourism in Southern California.

In addition to cargo-handling facilities, the ports provide coastal recreational and educational resources and have a stewardship role as caretakers of San Pedro Bay's marine wildlife. The ports are charged with ensuring that port operations are compatible with the preservation of those natural resources.

Since 2000, the ports have performed four comprehensive biological surveys of the Port Complex, covering the entirety of both harbors, to evaluate the area's physical and ecological characteristics. The surveys also address seasonal variations, assess the presence of invasive species, and compare the ecological characteristics of the

various types of habitats found in the Port Complex. The latest survey confirms commercial port operations and critical habitat in San Pedro Bay can coexist and flourish. Water clarity continues to improve, special-status species are abundant, and non-native species do not appear to be disrupting the bay's ecosystem.



THE HARBOR IS HOME TO A VARIETY OF UNIQUE HABITATS — FROM THE OPEN WATER AREAS OF THE CHANNELS, TO THE MUD AND SAND OF THE SEA BOTTOM.



Top: Recovering a trawl net in Pier 300 channel; Bottom (left to right): California scorpionfish measured on deck, Processing beach seine catch at Pier 300, Surveying a piling in the outer harbor.



Satellite imagery, side-scan sonar, underwater photography, nets, bottom grabs, and diver transects are just some of the tools and methods the Biosurveys use to catalog harbor life.

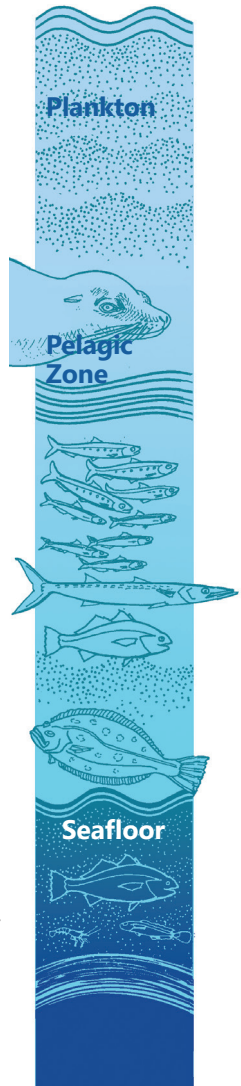


Learn more about our survey methods. [\(Click here\)](#)

Rich in Habitat, Rich in Diversity

The ports support abundant marine life in a variety of habitats: from sea lions to pelicans, anchovies to kelp, shrimp to eelgrass. Over 1,000 species of animals and plants live and thrive in the major habitats of Los Angeles-Long Beach Harbor, namely the **pelagic zone** (the open water column); the **seafloor** (the sand and mud harbor bottom, beaches, and eelgrass beds); and the **hard-substrate habitat** (rocky shoreline, dock pilings, and kelp beds).

The ports study these biological resources every five years in year-long, harborwide surveys of animals and plants, at more than 40 points throughout the two ports. During the latest 2023 Biosurvey, dozens of scientists and technicians collected and analyzed samples of fish eggs and larvae, adult and juvenile fish, bottom-dwelling (benthic) animals in the sediments, and scrapings of rocks and pilings. They also conducted diver surveys, measured the kelp and eelgrass beds, conducted bird surveys, and counted marine mammals. Over 110,000 fish and 63,000 birds were identified, and over 85,000 tiny animals were separated from sediment and scraping samples and then identified and weighed.



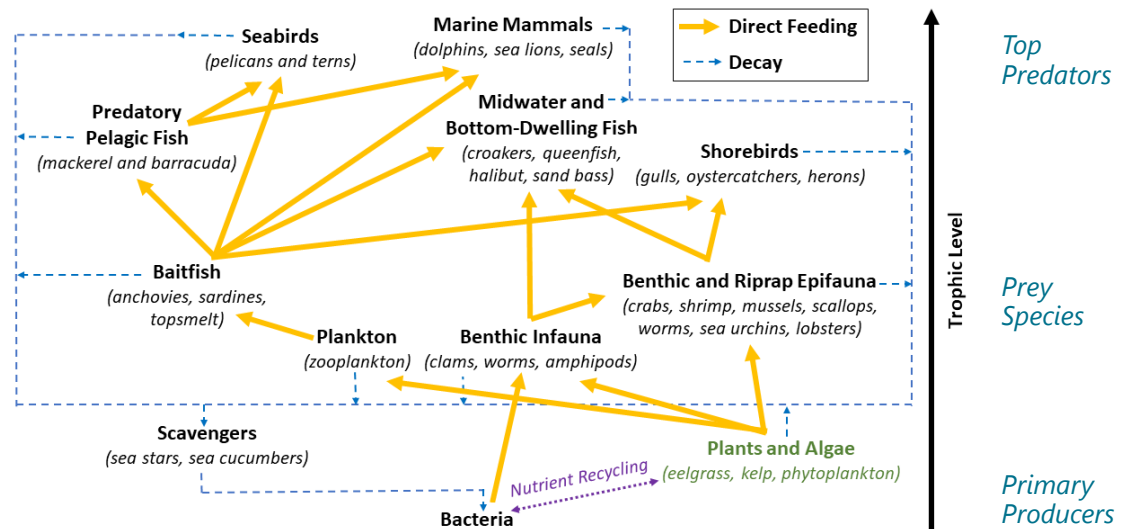
ANIMALS AND PLANTS INTERACT IN WHAT BIOLOGISTS CALL A FOOD WEB. ALL LIFE BECOMES FOOD FOR ANOTHER ORGANISM WITHIN THE WEB OF LIFE IN THE HARBOR.



Everything is Connected

The variety of harbor habitats support over 1,000 different species of fish, invertebrates, algae, birds, and marine mammals. The organisms that occupy each of these habitats are well adapted to the unique physical conditions in each habitat. For example, the organisms in the intertidal zone have evolved to handle wave action, bright sunlight, and exposure to the air during low tides, whereas animals that live in the deep, soft-bottom habitats (the benthos) have to handle dim or no light and variable food sources.

The proximity of habitats such as shallow eelgrass beds and kelp forests to these deep habitats help fuel food webs in these areas through 'detritus': pieces of organic matter such as blades of kelp and eelgrass that break off and decay as they settle to the bottom, similar to tree leaves that fall to the forest floor. Detritus is an important food source to bacteria and planktonic animals, invertebrates that live in (infauna) and on (epifauna) the seafloor. In turn, the animals that eat detritus become important food sources for larger animals such as shrimp, crabs, and fish. These, in turn, are eaten by larger fish, by birds, and by marine mammals. When animals die and settle to the bottom, they are consumed by scavengers such as sea stars and tiny benthic animals and eventually are entirely recycled by bacteria to return nutrients to the environment. Those nutrients are used by phytoplankton, algae, and seagrasses to start the cycle of production over again.

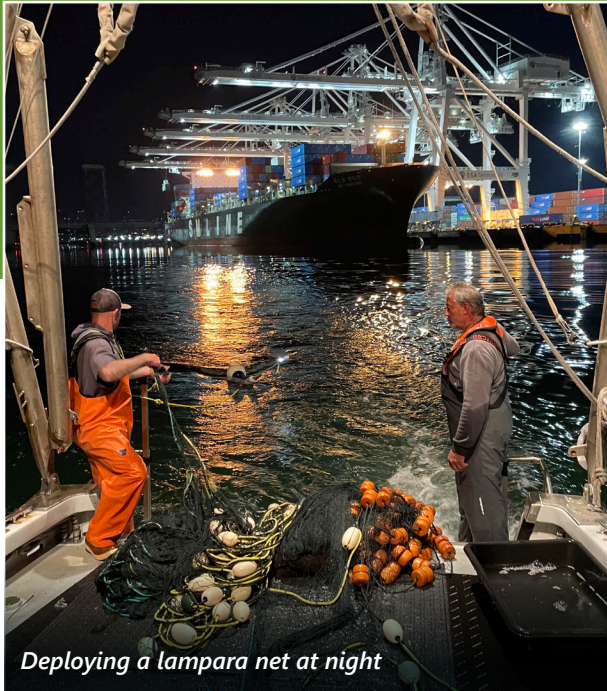


It's called a **food web** instead of a **food chain** because of the many directions of the interactions.



What makes habitats in the port diverse? [\(Click here\)](#)

WHAT LIVES HERE? THE HARBOR IS HOME TO A DIVERSE ARRAY OF ANIMALS THAT USE THE VARIOUS HABITATS FOR SHELTER, TO FIND FOOD, AND AS NURSERY AREAS.



Deploying a lampara net at night

THE PELAGIC ZONE

The 'pelagic zone' refers to the water that is not near the shoreline and stretches from the surface to the seafloor. This zone makes up the largest habitat type in the harbors. Animals living in the pelagic zone, such as plankton (tiny floating plants and animals) and fishes, move up and down in the water column to find food and avoid predation. They are camouflaged for their life in the open water because this zone is an important foraging habitat for larger predators such as barracuda, mackerel, dolphins, sea lions, harbor seals, and fish-eating birds such as terns, pelicans, and cormorants. The 2023 Biosurvey found 22 different species of fish in the pelagic zone.

Northern anchovy (12,551 caught) and topsmelt (8,590 caught) were the most common pelagic species found in the harbor. For both, over 90% of the fish caught were juveniles that appear to use the harbor as nursery habitat.

Pelagic Zone Fish

Northern Anchovy



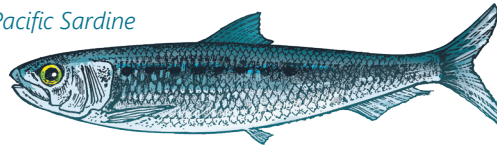
Topsmelt



California Grunion



Pacific Sardine



Jack Mackerel



Pacific Barracuda



Ichthyoplankton

Many marine animals spend a portion of their life cycle in a planktonic state before morphing into their adult form. The 2023 Biosurvey sampled the planktonic fish ('ichthyoplankton'), to assess the value of the harbor to larval and juvenile fishes. As adults these fish may remain in the harbor or travel out of the harbor into coastal habitats. Some fishes, such as gobies and blennies that burrow into the seafloor or hide in rock crevices, are hard to detect as adults and are only seen as larvae.



"Bongo" nets are used to collect ichthyoplankton

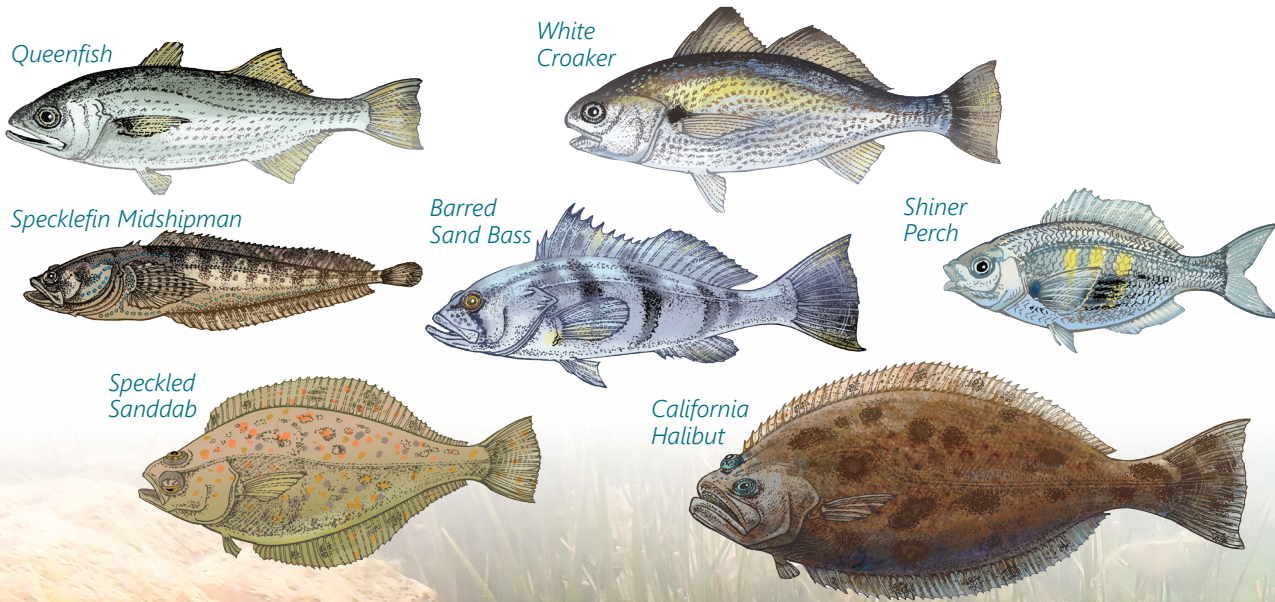
Gobies, blennies, and northern anchovies accounted for nearly 92% of the 13,302 larval fish captured during plankton surveys.



Larval Northern Anchovy

THE SEAFLOOR

The seafloor, called the benthic habitat, is the second largest harbor habitat and include open water areas with sandy sediments as well as more protected areas with silty sediments. Species living in soft-bottom habitats have evolved to thrive in the range of conditions found in the Port Complex, with subtly different communities found in inner and outer harbor areas.



Eelgrass Beds

Eelgrass was found in 13 locations throughout both harbors in 2023, but 94% of it was in the Cabrillo Beach area and the Pier 300 Basin. Eelgrass beds support a rich detrital food web and provide structure, food, and nursery habitat for many fish, invertebrates, and birds. The nursery habitat value of the Port Complex is evident by the fact that 90% of white croaker and 99% of barred sand bass captured were juveniles. Eelgrass reaches its maximum growth in the summer, with 165 acres of eelgrass present in the harbor in 2023. This was nearly twice the summer acreage measured in 2018.

The many survey methods employed allow for detection of non-native species during multiple life stages. Only three non-native fish species were detected in 2023 Biosurvey — the chameleon goby (adults only), the shimofuri goby (larvae only), and the yellowfin goby (adults and larvae).

Common Demersal Fish

The 2023 Biosurvey found a total of 84 species of 'demersal' fish (those living close to or on the seafloor). White croaker, queenfish, and shiner perch were the most abundant fish detected. Valuable commercial and recreational fish such as California halibut and four species of rockfish were found in demersal habitats throughout the harbor. The presence of top predator species, such as leopard sharks in shallow beach habitats and horn sharks on riprap and seafloor habitats, is a good indicator of ecosystem health. The 2023 survey captured more leopard sharks in the beach seines than in any previous survey year.



Invertebrates

Benthic invertebrates living in (the 'infauna') and on (the 'epifauna') the sediments at the bottom of the harbor are diverse and abundant. Infaunal communities are comprised of burrowing animals that feed by capturing floating specks of organic material (filter feeders) or material settled on the seafloor (deposit feeders). Stuck in one place and varying in their tolerance to stress, including pollution, these organisms can be valuable indicators of habitat quality. Epibenthic invertebrates include mobile animals such as shrimp, crabs, sea stars, and snails, and sessile animals such as sea squirts and soft corals. Benthic invertebrates are an important link between primary producers and higher trophic levels of the food web (e.g., fish, birds, and sea lions), and perform crucial ecological functions such as water filtration, nutrient cycling, and mixing of sediments.



Target Shrimp

Since the 2013 Biosurvey, the target rock shrimp has been the most abundant epibenthic invertebrate as the species shifted its distribution northward from its native Gulf of Mexico in response to warm water events.



The opalescent nudibranch on a piling

A primary goal of the Biosurveys is to track the presence and abundance of non-native species. Approximately 5% of the 979 species of fish, invertebrates, and algae were non-native, which is consistent with past surveys.

Epifauna

Trawls and beach seines captured more than 14,000 invertebrates composed of 98 different species. Target rock shrimp, Pacific rock shrimp, sea squirts, swimming crabs, and green shrimp were the most abundant.

Infauna

Sediment sampling throughout the harbor found 372 infauna species. Annelids (mostly marine worms known as polychaetes) were the most abundant group followed by crustaceans (mostly small crabs and amphipods), then molluscs (clams and snails), and finally echinoderms (sea stars and sea cucumbers). The past three Biosurveys (2013, 2018, and 2023) have found a sensitive, pollution-intolerant amphipod to be among the most abundant benthic infauna species, suggesting that **sediment quality continues to improve within the harbor.**



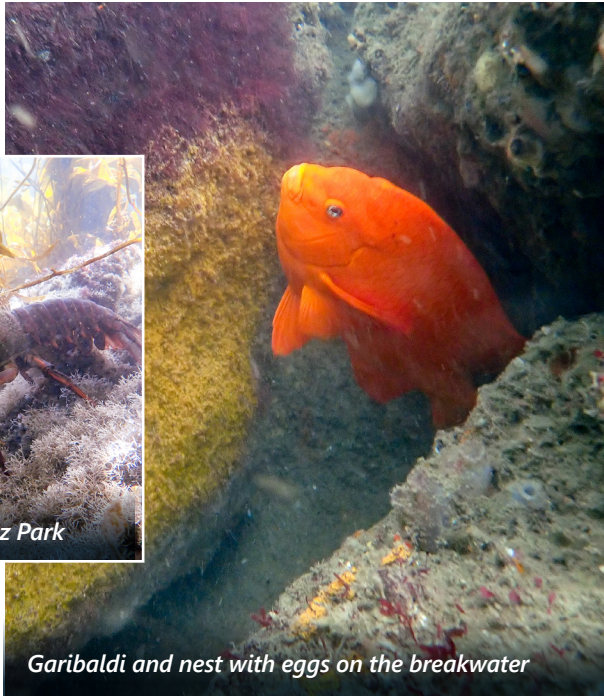
Two spot octopus

RIPRAP AND PILINGS

Most of the shoreline and the breakwaters of the Port Complex consist of rock dikes known as riprap, which provides nearly 50 miles of rocky habitat. There are also thousands of concrete, wood, and steel pilings that support the wharfs and docks of the marine terminals, marinas, and other infrastructure. These structures provide a large amount of habitat for animals that have adapted to life on rocky shorelines where they can tolerate pounding by waves, exposure to sun and air, and sharp fluctuations in temperature. The 2023 Biosurvey found 509 species of invertebrates and 39 species of algae on riprap and pilings within the harbor.



Spiny lobster near Nimitz Park



Garibaldi and nest with eggs on the breakwater

Kelp Forest and Subtidal

Kelp forest habitat that grows on riprap in the outer harbor is one of the most valuable habitat types in the harbor due to the variety of microhabitats that it creates. The large riprap boulders in these areas promote the attachment of giant kelp, sea fans and scallops and have large crevices and caves that provide refuge from predators for invertebrates like urchins, abalone, and lobsters as well as fish such as garibaldi and horn sharks. Giant kelp creates vertical habitat, similar to trees in a forest, that forms a canopy on the surface. The kelp forest provides extensive habitat for fishes like kelp bass, blacksmith, and rockfish while also creating a valuable feeding ground for birds and marine mammals.

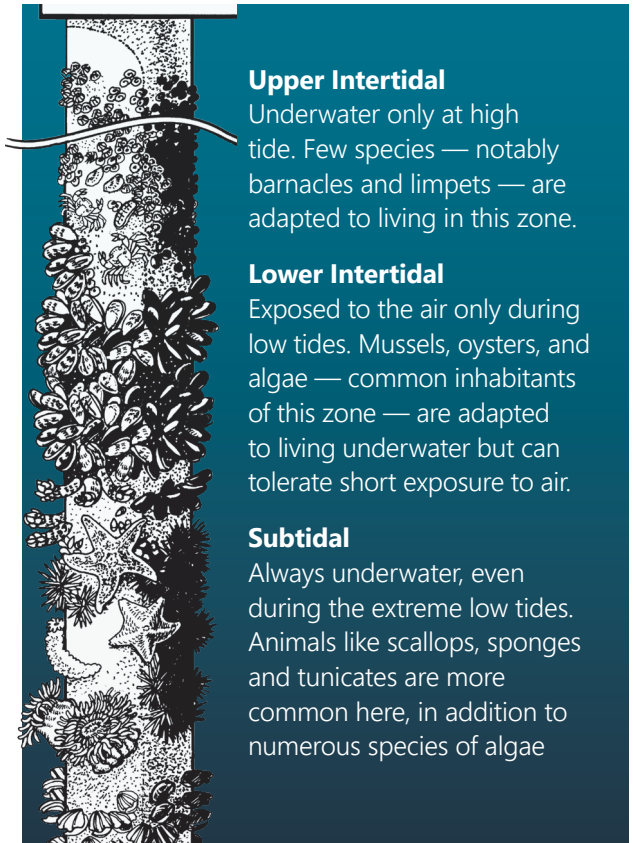


Kelp growing on piling in the outer harbor

Giant kelp is present on riprap in the outer harbor and can grow up to two feet per day in ideal conditions. In the summer of 2023, there were approximately 43 acres of kelp canopy within the harbor, providing abundant habitat for various species.

Intertidal Zones

The intertidal zone in Southern California shows strong vertical zonation — different species living at different levels — because of the tides that submerge and expose the shoreline each day. This is a harsh environment, but many species have adapted to it.



Giant spine sea star

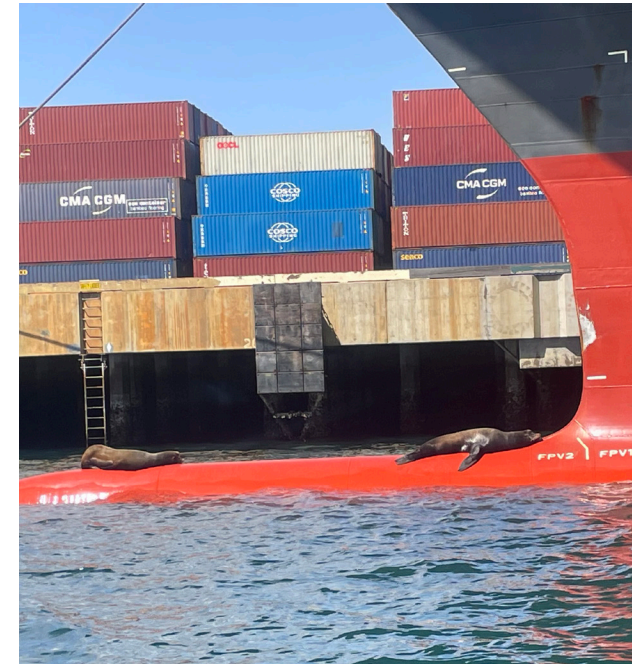
BIRDS AND MAMMALS

Hovering and darting overhead, resting on docks and boats, diving for fish, or begging for a handout, birds are everywhere in the harbor. In the 2023 Biosurveys scientists saw 110 species, including 23 special-status species, and an average of 5,296 birds during each of the monthly surveys. The bird community hasn't changed much in 25 years: in the 2023 study, gulls, grebes, terns, pelicans, and cormorants were again the most abundant birds. Some species, like gulls and cormorants, are year-round residents; others, like terns, ducks, and many shorebirds, are seasonal visitors.

The harbor provides marine mammals with a rich source of the fish and large invertebrates they depend on for feeding. The California sea lion is the most abundant marine mammal in the ports, but by no means the only one. In addition to 798 sea lions, in the 2023 Biosurvey scientists counted 238 harbor seals, 27 dolphins, and 3 gray whales.



Herring gull on riprap



Sea lions are a common sight in the ports, resting on docks and buoys and cruising the channels for food.



Top: Gray whale in outer harbor; Bottom (left to right): California sea lions on navigation buoy, Black-necked stilt on barge, American oystercatcher on breakwater, Harbor seal on riprap



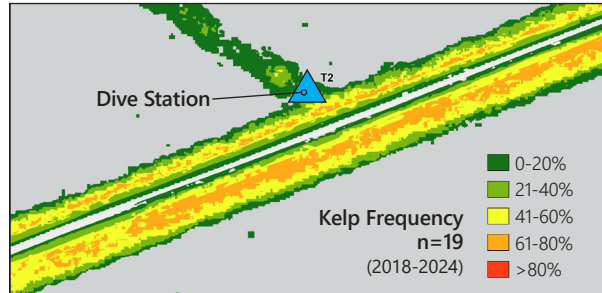
Bottlenose dolphins in outer harbor

ALWAYS EVOLVING: NEW APPROACHES BRING FRESH PERSPECTIVES AND INSIGHTS TO HARBOR HABITATS

Satellite Imagery

As part of these biological resource surveys, the ports map kelp canopy present on riprap embankments and the federal breakwater. Data from these surveys are used in environmental documents and biological mitigation planning to meet requirements of fishery management plans.

The 2023 Biosurvey is the first to use high resolution imagery from commercial satellites to estimate kelp canopy in the Port complex. In addition to mapping this critical habitat, monthly water quality parameters such as sea surface temperature, chlorophyll-a, and water clarity were also measured using satellite imagery, providing a port-wide look at physical characteristics that affect habitat and species distribution. Archived imagery from 2018 was also available for kelp canopy and water quality parameters, allowing for comparisons between the two most recent survey years.



Kelp frequency maps show maximum extent of kelp canopy and how often it is present at a given location.



Satellite imagery shows water quality patterns to visualize seasonal trends that affect habitat and animal distribution.



A green abalone and cabezon on riprap in the outer harbor

Fish and Port Infrastructure

The 2018 and 2023 biological surveys incorporated new visual diver survey methods similar to those used in regional rocky reef monitoring to characterize fish, invertebrates and algae communities on riprap embankments, the federal breakwater, and concrete pilings. These dive surveys have found over 40 species of fish utilizing these habitats, including over a dozen reef-associated fish catalogued for the first time in the port complex and eight managed fish species such as rockfish, cabezon and smelt.

In 2023, three of the 16 managed fish species across all surveys were only found during riprap and piling dive surveys, including cabezon, black-and-yellow rockfish, and olive/yellowtail rockfish. Additionally, the dive surveys have better characterized the distribution of kelp habitat and the presence of other protected species in the Port Complex such as green and pink abalone and the discovery of an endangered white abalone in 2018. The novel application of rocky reef monitoring methods on artificial structures allows for more rigorous comparison of the communities observed to nearby natural reefs, offshore oil and gas infrastructure, and existing coastal rocky reef mitigation projects to guide future recommendations.



Learn more about changes in communities across seasons and times. [\(Click here\)](#)

Kelp bass hiding in kelp at piling in outer harbor

THE PORTS CONTINUE TO MEET THE CHALLENGE OF ENVIRONMENTAL STEWARDSHIP: SUPPORTING MARITIME COMMERCE WHILE PROTECTING THE HARBOR'S NATURAL RESOURCES.

The 2023 Biosurveys found over 1,000 species within the harbor.



110
species of
birds



4
species of
marine mammals



842
species of
invertebrates



97
species of fish



40
species of algae
and eelgrass

Effective Pollution Control Efforts

In the 1970s, water quality in the harbors was so poor there was virtually zero oxygen and no marine life in some areas, and very reduced biological communities in others. Through their environmental programs — some of the first in the world among ports — the ports looked seriously at the environmental impacts of their operations, and have worked with state and federal wildlife agencies to develop and implement programs aimed at improving the quality of harbor waters, protecting aquatic wildlife, and ensuring that the ports comply with laws and regulations governing water quality and wildlife conservation and protection.

The ports have developed and are continuing to implement numerous programs to identify and eliminate remaining water and sediment pollution in the harbor in order to support the attainment of beneficial uses of harbor waters. These include programs for reducing storm water pollution and pollution from harbor maintenance and vessel activities, managing contaminated sediments, and controlling invasive species. Both ports have programs that include monitoring, education, and outreach, as well as cutting-edge structural controls. These programs help the ports meet their stewardship responsibilities — protecting the valuable biological resources of the harbor for the benefit of all of us.

All of the photographs of plants and animals in this publication were taken in the waters of Los Angeles-Long Beach Harbor, a testimony to the ports' stewardship of the natural resources of the harbor. The commitment by the ports to control water pollution and protect wildlife habitats has allowed the biological communities in the harbor to flourish despite the enormous growth in trade over recent decades.



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