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CELEBRATION
CONTINUES

Guarding the Deep

A Brief History of the Marine Region

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Photographs provided by Marine Region

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The

variety and variability of marine life that thrives along California's Pacific Coast has embedded both scientist and storyteller alike with a deep appreciation for the sea—while at the same time providing them a cache of its secrets. For more than 150 years, ocean-faring businesses grew wherever access could be forged to the sea, and great industries expanded to fish the ocean's plentiful resources.

The world knows of these times through the literary tales published about the men and women who stood out. Readers became fascinated with the California fishing industry through the literary works of writers like John Steinbeck. It was Steinbeck's 1945 classic, *Cannery Row*, that offered passionate accounts of California's fisheries and marine wonders—dedicated to the marine biologist, Ed Ricketts, who inspired one of its characters—that captivated a nation. The libraries of such saltwater stories are a testament to the fascination shown to the unique ocean life found along the Golden State's coastline.

It was in this spirit that the California Department of Fish and Wildlife established the Marine Region. The Marine Region manages the marine ecosystems and fisheries found along California's entire coastline. Over the decades, the Marine Region has played a major role in the efforts to ensure sustainable ocean resources through ever-evolving scientific research. The mission of the Marine Region remains simple and powerful: To protect, maintain, enhance and restore California's marine ecosystems for their ecological values and their use and enjoyment by the public through good science and effective communication.

PACIFIC SARDINE FISHERY— STORY OF BOOM AND BUST

Since the early 1900s, the Pacific sardine fishery has been one of the largest commercial fisheries in the state. With such an abundant and lucrative bounty from the sea, fishermen grew more enthusiastic and efficient in their methods to harvest these tiny pelagic fish. By the late



1920s, fishermen used a technique called purse-seining, in which they would wrap an entire school of fish in a long net and then pull a line on the bottom to entrap the fish as they pulled the net onto the deck for processing. This practice allowed the industry to harvest a seemingly inexhaustible supply of sardines.

The fishery peaked in the late 1930s. During World War II, Monterey became the sole provider of sardines to soldiers and was known as the "Sardine Capital of the World," according to the Cannery Row Foundation. Tragically, the fishery was soon to discover that the sardine schools were not infinite. The fishery had declined due to natural ocean changes and overharvest. Fishery managers responded to



Opposite page, top, a Marine Resources Division biologist wearing a California Division of Fish and Game shoulder patch collects abalone from the Great Tide Pool, located in Pacific Grove, west of Point Pinos Lighthouse. Author John Steinbeck included these sites in his classic, *Cannery Row*. The area has since been turned into a marine conservation area. Abalone on the move, opposite page, bottom, are almost a cultural icon along California coastal areas, but the fishery collapsed in the mid-1980s as disease compounded the pressures of overfishing. Present stressors on abalone include a lack of kelp and a crowding by purple sea urchins. Above, an urchin field with garibaldi and warty sea cucumber.

the empty nets by imposing a moratorium on the Pacific sardine fishery from 1967 to 1987.

By the time the moratorium lifted, the fishery had recovered to higher population levels. Unfortunately for those that harvested them, Pacific sardine are a cyclical species, and by 2019, negative oceanic and environmental conditions drove numbers down again to the point where

the National Marine Fisheries Service (NMFS), the federal agency responsible for the stewardship of ocean resources, again declared sardine overfished.

Marine Region scientists continue to collect data on Pacific sardines to stay up to date on the species and the current population size off the California coast. Current surveys include both at-sea efforts using sonar to track



Fishermen offload a day's catch (left) during the first half of the 20th century. In 1954, (center) before the fisheries collapsed, workers offloaded sardines and mackerel for processing at canneries in Monterey. CDFW marine biologists (right) sample bluefin tuna during survey studies.

schools of fish and aircraft to document schools of sardine from the air.

DIVING SAFETY PROGRAM

Beginning in 1939, the state hired commercial deep sea divers to survey abalone populations along the central coast. At the same time, marine scientists received training and made their first research dives in the heavy-gear diving suits. Hard hat diving continued until scuba equipment was introduced in the 1950s. The lighter, self-contained gear was a big improvement over the former bulky suits. Instructors from the U.S. Navy and Scripps Institution of Oceanography held their first scuba training for Marine Region divers in 1958.

Shortly afterwards, the newly trained divers conducted their first research dives in support of Southern California sportfish investigations, kelp forest research projects, artificial reef projects and the abalone project.

By 1960, a diving safety manual was in place and two years later the first scuba certification school was held for

Marine Region scientists have monitored California's abalone populations over the years through countless scuba and intertidal surveys. That collective research will document the status of populations and help forecast when abalone have recovered.

Department divers at Avalon, Catalina Island. The Diving Certification Board was organized shortly thereafter to administer the program and ensure safe diving practices for all Department divers.

Today's Diving Safety Program administers CDFW's compressed gas diving activities, oversees dive planning, supports field projects and provides ongoing training statewide. Currently, more than 60 certified CDFW divers—including scientists, law enforcement officers, engineers and select volunteers—log an average of 2,200 dives annually. Based in more than 15 locations around the state, the program's certified divers support a variety of underwater research and maintenance projects in the ocean, rivers, lakes and reservoirs.

ABALONE THROUGH THE AGES

For as far back as anyone can remember, abalone have been one of California's most prized delicacies. In addition to how much people enjoy their flavor, coastal Native



Americans prized the shells as a source of tools, jewelry and even fishing hooks, and abalone achieved iconic cultural status with religious connotations. A booming fishing industry grew with the seemingly endless supply of mollusks, which supported a lucrative export industry to Asia as a popular delicacy. Over the years, the fishery fed a constant demand from Californians who lived beyond coastal communities. Unfortunately, in the mid-1980s disease coupled with continued fishing pressure on abalone resulted in the entire fishery nearly collapsing. In some areas, a bacterium identified as withering syndrome caused a greater than 99 percent decline in populations of abalone species.

Because of the declining populations, the federal government in 2001 listed white abalone as the first marine invertebrate under the Endangered Species Act. Prior to the listing, Marine Region scientists, in collaboration with other federal and academic partners, began work to recover the species. They successfully spawned white abalone for the first time in the laboratory the same year it was listed. This monumental accomplishment increased the numbers of white abalone spawned and held in captivity from less than 60 to more than 1,000 individuals. Since then, the white abalone captive breeding program has steadily increased production. In 2019, Marine Region scientists and partners released captive-raised endangered white abalone back into the wild for the first time. Expectations are that continued releases will have a positive effect on the numbers of endangered white abalone in the wild.

Chronology of Marine Region's Ocean Vessels

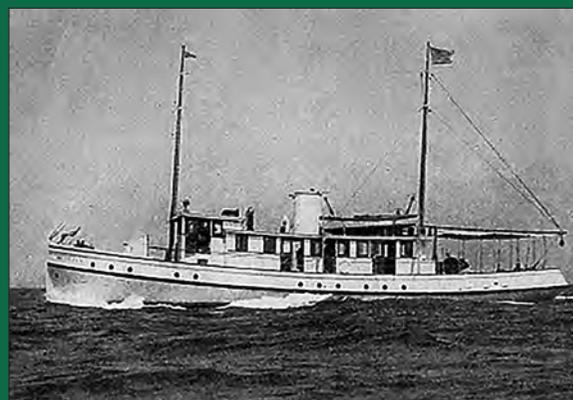
In 1917, Southern California's growing commercial fisheries prompted the Fish and Game Commission to provide support for patrol and biological investigation vessels of the burgeoning tuna fishery. Patrol boat *Albacore* was the first vessel delivered in San Pedro in December 1918.

Today the Marine Region has a fleet of 15 vessels, dedicated solely to research and monitoring. Most are considered small—the two largest are the 29-foot *Mystinus* and the 45-foot *Garibaldi*. The fleet has a relatively small "footprint" with respect to operational costs, maintenance and staffing while supporting a variety of research needs for projects from Eureka to San Diego and offshore islands. When additional range or capacity is required, Marine Region often partners with the Law Enforcement Division to leverage the capacity of their fleet of larger vessels.

(The following images do not include current patrol boats.)



1918—The *Albacore*, a wooden 60-foot research vessel, based in San Pedro before moving to Monterey.



1930—The *Bluefin*, an 86-foot research vessel based in San Pedro for offshore marine patrol and scientific operations from Southern California to Monterey Bay, up to 200 miles offshore.



Diver Glen Bickford, above left, wears the bulky standard diving dress of the time, 1950. A crew member will assist Bickford with the rigid dome helmet he wears and then will monitor the air hose attached to it. Above right, CDFW's Dennis Bedford conducts scuba surveys.

Of the seven species of abalone found in California, only the flat and red have not been listed as endangered or considered a species of concern by the NMFS. However, due to a combination of unprecedented environmental conditions in the last decade, red abalone are now also in peril (see “Perfect Storm,” below). Marine Region scientists have monitored California’s abalone populations over the years through countless scuba and intertidal surveys. That collective research will document the status of populations and help forecast when abalone have recovered.

THE PERFECT STORM

A combination of large-scale environmental events along the northern California coast began in 2011. A toxic algal bloom off the Sonoma County coast devastated the nearshore marine environment, killing thousands of marine invertebrates, including abalone. In 2013, a widespread sea star wasting disease was experienced along the entire west coast of North America, from Alaska to Mexico. With the absence of sea stars, a major urchin predator, purple sea urchin densities exploded, multiplying to more than 60

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times their historical density in northern California waters. Without a balanced ecosystem to keep their populations in check, these small but hardy herbivores can decimate

What's in a Name When a Name Keeps Changing?

1870—The California Board of Fish Commissioners is formed and becomes the nation's first wildlife conservation agency. The name changes to the Fish and Game Commission in 1909.

1926—The role of the California Board of Fish Commissioners shifts to setting broad general policy. The reorganization establishes the Bureau of Commercial Fisheries.

1936—The first of many name changes occurs when the Bureau of Commercial Fisheries is changed to the Bureau of Marine Fisheries.

1951—The Marine Fisheries Branch forms under the newly named Department of Fish and Game.

1957—The Marine Resources Operations, a regional subsidiary to the fisheries branch, encompasses all waters from Crescent City to San Diego and runs all operations except marine patrol.

1969—Reorganization adds a law enforcement function and two new name changes. The new Marine Resources Region becomes an official ocean management unit for the first time since 1926. Soon after, headquarters moves to Sacramento and the name changes again, this time to the Marine Resources Branch.

1969 to 1985—Several significant structural changes occur. Biological staff are split into either research or management units, and port units expand to include San Diego, Los Angeles, Santa Barbara, Morro Bay, Monterey Bay and Fort Bragg.

1985—Renamed as the Marine Resources Division.

1997—Renamed again as the Marine Resources Region—the same name it had in 1969.

1999—Final name change to Marine Region.

entire kelp forests, causing other species like abalone to starve.

By 2015, the usually common bull kelp on the northern California coast declined dramatically. Northern California kelp forests were estimated to be 93 percent smaller compared to previous years, thus increasing starvation conditions for native kelp forest herbivores that included the red sea urchin. The red sea urchin fishery experienced a huge drop in catch and economic value due to the poor quality of the urchin roe.

Marine Region scientists conducted scuba surveys and documented dramatic changes in ecosystems off California's north coast. This prompted the Fish and Game Commission in 2017 to close the recreational red abalone fishery entirely until conditions improve and populations recover. The decision marked the first time since World



1938—The 100-foot *N.B. Scofield* was the state's flagship research vessel based in San Pedro. It supported fisheries research along the coast from Alaska to the Sea of Cortez in Mexico, as well as the Galapagos Islands and Hawaii through the mid-1970s.



1949—The *Yellowfin* was a 114-foot marine vessel out of San Pedro that supported high-seas fishery and oceanographic research.



1950—The *Mollusk*, a 26-foot research vessel, supported marine surveys off California's southern and central coasts. Based in San Pedro, the small, wooden vessel was often towed to dive sites by larger mother ships to support the diving operations.



1950—Piloted from topside or from inside the cabin, the 36-foot research vessel *Broadbill* was used in abalone, crab and salmon studies in San Francisco, Bolinas and Fort Bragg. It had a 106-horsepowered engine and a cruising speed of about 8 knots.



1954—Northern California marine research ship *Nautilus* was the most electronically equipped science vessel for its size in the United States. The 50-foot survey trawler was used on abalone, salmon, crab, herring and bottom fish investigations.



1958—The *Alaska* was a 100-foot steel-hulled research vessel out of San Pedro. The floating marine laboratory had four 1-inch-thick crystal glass viewing ports installed 6 feet below the water line to provide a wide-angled view.

During the 1960s through the 1980s, a variety of smaller vessels were acquired and used for nearshore research. These vessels were beneficial to marine research efforts involving abalone, artificial reefs and kelp forests, herring and rockfishes.

War II that such drastic measures were necessary. Marine Region scientists dubbed all of this the “Perfect Storm” of ecological impacts.

FROM DISASTER TO REBUILDING— A GROUNDFISH STORY

The West Coast groundfish fishery was declared an economic disaster by the federal government in January 2000. Nine bottom-dwelling groundfish species were eventually assessed as overfished, meaning their stock size was too small to sustain any significant harvest. The decline in many groundfish stocks was the result of decades of poor reproduction due to adverse ocean conditions, as well as overfishing during the 1980s and 1990s. During those decades, relatively little information on the groundfish stocks’ status was available to guide any management. Because most of the species affected were long-lived and late maturing with infrequent reproductive success, it was expected to take decades to rebuild these overfished stocks.

Fishery managers responded by limiting recreational and commercial harvest through restrictive fishing regulations and closures of large areas along the continental shelf at depths where the overfished species are found in greatest abundance.

CDFW and partners have also promoted and widely distributed descending devices to recreational fishermen for use in returning prohibited or unwanted rockfish to the sea floor. Barotrauma-related injuries occur when a fish is reeled up from deep water and the rapid change in pressure causes gases in its body to expand. When fish are caught in deep waters, anglers using these devices can return the fish to depth, reducing injury and improving their chances of survival.

Today, these efforts are paying off. Commercial and recreational fisheries have experienced incremental increases in limits and fishing areas during the past few years, in response to more abundant and healthy stocks. Thanks to the conservation efforts of CDFW and its partners using the best available science to make management deci-

Opposite page, upper right: Clams make up an important part of the web of life that keeps the seas functioning, both as filter feeders and as a food source for both humans and many different animals. A marine scientist measures a stack of the bivalve mollusks that have been offloaded from a commercial vessel. At right: a CDFW scientist samples the commercial catch of northern anchovies. The research has seen vast improvements in the process from the 1960s. Now, each commercial vessel logs its catch as it lands. The faster and more accurate system allows CDFW to better document the overall population.



sions, and to more favorable environmental conditions, the federal groundfish fishery recovered more quickly than predicted. Today, only the yelloweye rockfish is considered overfished but is on course to being rebuilt.

MARINE PROTECTED AREAS

Marine protected areas (MPAs) are a cornerstone of the Marine Region and offer critical protection to safeguard the long-term health of California's marine life. Early conservationists recognized certain areas along the coast were over-utilized and protection was needed to prevent overharvest of marine life.



1970—The research vessel *Ophiodon* was the boat used by Monterey area's marine biologists for their research.



1990—The *Mako*, an 80-foot, long-range steel hulled trawler, custom built with A-frame, dual winches and doors for mid-water bottom trawling and longline research fishing. Transferred in 2009 to the California Maritime Academy as a training vessel.



1982—The *Huachinango*, a 25-foot Pacific research boat in San Francisco Bay from the late 1980s through the 1990s. A Radon-built craft, it surveyed and sampled schools of herring.



1987—The 25-foot *Melanops* out of Monterey supported research diving operations, monitored marine protected areas and conducted fishery research south along the coast until 2017.



1987—The *Irish Lord* is a 26-foot Radon, repowered and refitted in 2018 in Ventura to support the Invertebrate Program’s work at the Northern Channel Islands.



2000—*Garibaldi*, a 45-foot research vessel out of San Pedro that operates from Santa Barbara to San Diego including the northern and southern Channel Islands. The current flagship of the fleet, it provides diving support for a variety of projects including the monitoring of marine protected areas.



2009—The *Smoothhound*, a 25-foot research vessel that works the San Francisco Bay. *Smoothhound* supports the Pacific herring research project’s seasonal intertidal and subtidal surveys.



2018—The 29-foot research vessel *Mystinus* is ported in Monterey and provides diving support for marine protected areas monitoring, research fishing and light oceanographic work.



Above: Processing abalone as a favored delicacy to the palates of Californians and for export to Asia. Opposite page: Scientists and the crew aboard the research vessel *Mollusk* prepare to survey kelp beds off the Central Coast in search for red abalone.

California’s first officially designated MPA was established in Monterey Bay in 1907 to protect shellfish and invertebrates in the great tidepool area of Pacific Grove. Over the next six years, additional MPAs were designated in Humboldt, San Diego and Mendocino counties, as well as Santa Catalina Island. Each MPA was unique in the specific species and habitat it protected.

All of these historic MPAs were repealed by the legislature in 1933, in the same action that established the Fish and Game Code. In 1957, with the San Diego Marine Life Refuge in La Jolla, California again began establishing MPAs. Many of the new areas, while small and established without significant scientific input, were found to provide amazing examples of marine life. By the 1990s, there was an array of 53 MPAs across the state, but many provided little protection and only 10 were designated as no-take areas.

In 1999, the California Legislature passed the Marine Life Protection Act to protect the diversity and abundance of California’s marine life, the habitats they depend on and the integrity of marine ecosystems. The law required California to re-think the existing MPAs and create a program to ensure they provided real protection. After 20 years of phased planning, the largest science-based stakeholder driven network of MPAs in the world was adopted. The network now includes 124 MPAs covering 16 percent of state waters, with nearly 9 percent in no-take state marine reserves.

To evaluate the success of these MPAs and the numbers and species of fish and invertebrates that each contains, Marine Region scientists conduct scuba surveys



with partner agencies and universities throughout the state and have deployed remotely operated vehicles both inside and outside of the Southern California and Channel Islands MPAs. Thanks to the strong science-based design and protection of marine ecosystems and biodiversity around the Northern Channel Islands, California received the prestigious Blue Parks Award from the Marine Conservation Institute, as well as international recognition at the Our Ocean 2019 conference in Oslo, Norway.

CONCLUSION

Since its establishment, CDFW's Marine Region has played a critical role in monitoring, managing and protecting California's marine resources. Although its name has changed many times over the decades, the mission to protect the state's marine ecosystems for their ecological value and the public's use has remained essentially the same.

This year the Marine Region celebrates the management successes achieved with numerous partners over the last 94 years. California's sardines, abalone, MPAs and multitude of groundfish species are examples of the marine resources it has managed. With such an inspiring history, the Marine Region is positioned to oversee a new library of saltwater stories and marine science narratives for the next 94 years. 🐻



Carrie Wilson is a California Department of Fish and Wildlife environmental scientist with the Marine Region. She is based in Monterey and enjoys highlighting and promoting work done by marine scientists. Her stories have appeared before in Outdoor California.

California Wildlife PHOTO OF THE YEAR CONTEST



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