

MARINE REGION

2020 YEAR IN REVIEW



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CDFW diver Thomas Reviea holding abalone shells in 1963. CDFW diver Jenny Hoffmeister holding captive raised white abalone in 2020.

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CDFW scientific aid Dane McDermott dock sampling in 2019. CDFW warden talking with fishermen decades ago.



Message from the Regional Manager

2020 was a very difficult year. The COVID-19 pandemic turned our personal and professional lives upside down, we endured the worst fire season in California's history, and we experienced a politically divided culture and period of social unrest that rivals anything we have seen in a generation. While many suffered through extended periods of fear, grief, and hardship, the events of 2020 also brought out amazing feats of achievement, perseverance, unity, and success.

Time and time again, we heard about acts of heroism by our medical frontline workers, fire and law enforcement personnel, and those at the forefront of the fight against racial inequality and social injustice. At the same time, we observed heroic acts of our colleagues, friends, and family as we Zoomed our kids to school, helped others in need, and made sacrifices to curb the spread of COVID-19. I wish to specifically thank and acknowledge the heroic work of those who heeded the call to serve as contact tracers to help stem the spread of COVID-19, especially Marine Region staff [Loni Adams](#), [Tracey Farrelly-Sims](#), [Cindy LaFontaine](#), [Brian Owens](#), [Elizabeth Pope](#), [Mike Prall](#), and [Kim Walker](#). I also wish to thank our dedicated administrative team who remained in the office as essential workers – often by themselves in empty buildings – to literally keep the lights on, keep our packages and mail moving, and ensure our remote workforce was able to continue to do their jobs.

The unique events of 2020 shaped much of our work in Marine Region. We closely tracked and responded to the dramatic shifts in commercial and recreational fishing activity as behavior changed in response to the pandemic. We curtailed our field work and sampling programs to only focus on the most essential needs and developed new protocols and procedures to ensure the critical work could continue in a COVID-safe manner. In response to passage of the federal CARES Act, we quickly mobilized leadership across all commercial sectors to develop a spend plan and allocate the \$18.3 million of Fisheries Relief funds allocated to California.

Despite much of our workforce relocating to home offices, we accomplished a tremendous amount. We initiated a buyout program for the California drift gillnet fishery in partnership with the Ocean Protection Council and developed and implemented several new regulatory programs, including the Risk Assessment and Mitigation Program (RAMP) and the lost or abandoned commercial Dungeness crab gear retrieval program to further reduce the risk of whale and turtle entanglement. On the outreach front, we refreshed the Marine Region home page, launched the new Marine Species Portal, and published an article in Outdoor California magazine titled [Guarding the Deep - A Brief History of the Marine Region](#) to help commemorate our sesquicentennial, a celebration of 150 years of the Department and Fish and Game Commission working to achieve our missions.

Much will be said and written about the events of this past year and the term “20/20 hindsight” will forever take on new meaning. While we must not forget the sorrow, loss, and adversity of this past year, we can take pride in knowing that we joined together to persevere and will forever be stronger because of the hardships we overcame.

Dr. Craig Shuman

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COVID-19 Impacts

The impacts of the COVID-19 pandemic were felt throughout the California Department of Fish and Wildlife (Department) and among our constituents statewide. Beyond the direct impacts on individuals, COVID-19 affected the ability of some fisheries to operate, the supply chains that people rely on, the markets where California marine resources are bought and sold, and the Department's ability to achieve our mission.

In mid-March 2020, the majority of Department staff were redirected to home offices. Overnight, the Department was forced to rethink the way we work, how we communicate, and how work plans must change. In early summer, staff were notified of a salary reduction and associated leave program that further reduced capacity. This was compounded by staff participation in emergency leave programs to care for family members and the redirection of nearly 5% of the Marine Region workforce to contact tracing. These combined factors significantly reduced capacity throughout most of 2020, but staff rose to the occasion, developing effective solutions to the ever-changing challenges of the COVID-19 pandemic.

COVID-19 and the California Recreational Fisheries Survey

State and county health advisories and Stay Home Orders impacted the ability of California Recreational Fisheries Survey (CRFS) staff to conduct sampling. These orders varied by date and location creating a patchwork of rules until the initial statewide Stay Home Order was issued on March 19th. Although outdoor recreational activities, including recreational fishing, were allowed in most locations, CRFS interviews with anglers were initially discontinued until more information about COVID-19 transmission vectors was obtained and safety procedures developed.



2020 CDFW work fashion trends left to right, top to bottom: Environmental scientist Trung Nguyen at the docks. CRFS sampler Jennaca Hajek. Scientific aid Hannah Brown conducting Pismo clam outreach. CRFS sampler Terrance Manila with post sampling hand sanitizer. Environmental scientist Chelsea Protasio in the tidepools. Environmental scientist Derek Stein ready for masked Pismo clam outreach.

In an effort to stay aware of trends in recreational activities, CRFS implemented state-wide effort checks at fishing sites. More than 500 sites were surveyed at a distance to document status (open or closed to the public) and to gauge relative effort. In May, when California's party/charter boat fleet began operating under new COVID-19 health guidelines, CRFS resumed tracking the fleet's activities. While April through June monthly estimates were not produced, CRFS resumed sampling in July under newly developed sampling guidelines to comply with all state, county, and Department COVID-19 health advisories and best practices. The new guidelines reduced CRFS efficiency at intercepting anglers, but methods were



Morning light at Asilomar State Beach overlooking Asilomar State Marine Reserve during the River, Carmel, and Dolan fires in Monterey.



Offshore near San Francisco a fishing vessel at noon during September 2020 wildfires.



CDFW scientific aid Bill Doo wearing PPE while interviewing a crab hoop netter on the Fort Point Pier in San Francisco.

employed to compensate for the loss including doubling the number of party/charter boat dockside surveys and streamlining the angler interview process at launch ramps, piers, breakwaters, and jetties. The development of new sampling guidelines allowed CRFS to resume production of monthly estimates and meet its mission.

In November 2020, CRFS resumed sampling beaches and banks under the new COVID-19 safety protocols. This marked the first time CRFS was at full coverage since 2017. This sampling was made possible through additional funding received through the Modernizing Marine Recreational Fisheries Act. CRFS also resumed the Angler License Directory Telephone Survey to collect recreational fishery information. This technique is used where field intercept surveys are impractical, such as nighttime fishing and effort originating from private marinas or slips.

Changes in Licensing Trends

At a time when commercial fisheries, businesses, and recreational anglers would normally be planning for an upcoming 2020/2021 season (April 1, 2020 – March 31, 2021), there was uncertainty about what the season would look like. Markets were severely impacted by restaurant closures, export restrictions, declining foreign markets, and, in some locations, recreational anglers were restricted from accessing ports or launch ramps.

This uncertainty can be seen in patterns of license sales. In March, there was a large drop in the number of commercial fishing and business licenses and vessel registrations. This was followed by a large surge in April. Overall, the yearly total of 6,566 (\$1,137,916.50) commercial fishing licenses sold represents only a 0.8% decrease over the 2011 to 2019 average. Twenty three percent (1,517) of licenses were purchased by first-time licensees. This effect is also seen in sport fishing license sales, but with a longer delay. Sales were much reduced in the months of March and April, followed by a large surge May through July, as compared

to previous years. Unlike commercial licenses, the total yearly sales of 1,943,315 (\$69,596,854.50) sport fishing licenses represents a 9.7% increase over the 2011 to 2019 average.

As a result of market trends, some commercial permittees pivoted towards selling fish directly to the public. There was a large

increase in the number of new Fisherman's Retail Licenses issued by the Department, which allow commercial license holders to sell to the end consumer. 586 Fisherman's Retail Licenses were sold for the 2020 calendar year. In the prior decade, an average of 353 retailers were licensed each year.

Increased Recreational Intertidal Collecting

COVID-19 resulted in a loss of income for many Californians and forced many to seek new outdoor recreational activities. This led to a significant increase in people visiting tidepools and beaches and harvesting animals along the coast, which in turn led to public concerns for marine resources. The Department observed an extreme increase in tidepool visitation and collecting. Unfortunately, many tidepoolers did not know or follow take regulations. For example, in one Southern California location, wildlife officers issued 130 citations between March and October for tidepool take violations. Fewer than 10 citations were issued in the same area in 2019.

In response, the Marine Region worked with partners to create several new materials to educate the public about intertidal harvesting regulations, including flyers, posters, and new permanent signage. Marine Region staff coordinated multiple coastal outreach events in Los Angeles, San Luis Obispo, Monterey, and San Mateo counties during



Yelloweye rockfish caught in 2020 and processed by CRFS.



A fishing boat selling halibut directly to the public.



CDFW wardens checking tidepooler buckets as they leave Pillar Point.



Easy to collect mussels in the tidepools.



From top to bottom: New sign at Pillar Point describing tidepool take regulations. New Tidepool collecting sign to be posted. Aquarium leopard sharks getting ready to be released into the wild. Former Cabrillo Aquarium flatfish now gets to fend for itself in the wild. Cabrillo aquarium staff Jeff Landesman grants ocean freedom to another of the many recently released aquarium sharks.



low tide series. All COVID-19 safety protocols were followed, and members of the public were contacted from a safe distance and educated on species and regulations. These Department outreach efforts, along with partner agencies and organizations, educated large numbers of people and helped reduce unintentional violations in key intertidal areas.

Aquaria Impacts

Like all other businesses, aquariums throughout California experienced challenges with staffing and the ability to continue normal operations. This led to a need to relocate animals to ensure they were properly cared for. Staff aided six aquariums with the transfer of 41 animals to other aquariums and the

release of 221 animals into the wild that could no longer be maintained. The species moved ranged from anemones, sea urchins, and hermit crabs to rockfish, flatfish, rays, and juvenile sharks. All requests for relocation or release into the wild required a health inspection by the Department's Shellfish Health Pathologist to ensure the health of the captive animals and protect wild animals from introduced disease.

COVID-19 Effects on Commercial Fisheries

Commercial fisheries were impacted by COVID-19 infections among crews, changes in markets, the ability to obtain fisheries observers, and more. The changes were felt



in fisheries from squid and lobster – which rely heavily on exports – to tuna – which includes high-seas fisheries with foreign crews. The following examples from the California groundfish, salmon, and lobster fisheries show how the impacts were felt differently by different sectors. The federal government also responded to COVID, providing direct financial relief through the Coronavirus Aid, Relief, and Economic Security (CARES) Act.

Groundfish

When the State's first shelter in place order went into effect, commercial fisheries and processors were deemed essential businesses, meaning they could continue operations. According to California groundfish industry representatives and regional media reports, temporary restaurant closures and ongoing restrictions on indoor and outdoor dining resulted in a reduction in demand for fish supplied to restaurants. This included several species of California groundfish that are frequently purchased for sale in restaurants. Additionally, demand for exports continued to be lower in 2020. Cumulative monthly average ex-essel revenue for all non-whiting groundfish sectors across all West Coast states through September 2020 was significantly less than the 2015-2019 averages.

Sablefish, historically California's most valuable commercial groundfish species, experienced a 21% decline in pounds landed and 43% decline in revenue



Figure 1. Sablefish landings and value, 2015-2020.

generated in 2020 compared to the previous five-year average (2015-2019). The sablefish trawl sector incurred the most significant impacts, with the volume landed in 2020 11% lower than the five-year average, yet the average price paid falling to \$0.66 per pound which was 68% lower than the five-year average of \$2.08 (Figure 1). Industry leaders attributed the drop to increased catch as stocks increase coupled with trade issues with China and restaurant closures locally and abroad due to COVID-19.

In 2020, the number of Fisherman's Retail licensees selling groundfish doubled compared to 2019, with more than half of those being first time license holders. Direct sales of groundfish pounds to the consumer were up slightly in 2020, continuing a trend that began in 2019 when direct sales doubled over previous years. Although

CDFW John Fitch and assistant. CDFW scientific aid Benson Chow dissects and prepares white seabass ovaries for a maturity study in the San Carlos lab.



the greater San Francisco Bay Area had the most groundfish sales by Fisherman's Retail licensees in 2020, sales there dropped 20% compared to 2019. By contrast, Southern California groundfish sales more than doubled in 2020.

In response to California industry requests for near-term COVID-19 relief, commercial trip limit measures were successfully fast-tracked, and implemented in season in June 2020. Also, commercial fishing seasons for some sectors were extended past normal closure dates. These actions were recommended by the Department and made possible by the intensive efforts of Marine Region staff serving on the Pacific Fishery Management Council's Groundfish Management Team.

Salmon

COVID-19 also affected commercial salmon fisheries, buyers, and reliant businesses due to widespread impacts on the restaurant industry, which is usually a major consumer of fresh California Chinook salmon. Some salmon trollers adapted by pursuing new market opportunities - most notably, 2020 was marked by an unprecedented level of

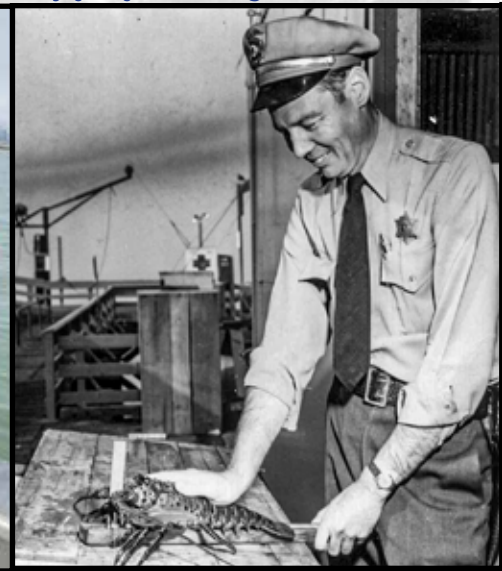
direct-to-consumer sales of salmon. Nearly 70,000 pounds were offloaded and sold at farmers markets, via door deliveries, and at the dock, more than double the average number of pounds documented over the past decade. Charter operators also adapted to the year's circumstances and generally ran with smaller passenger loads at all ports along the coast, to ensure compliance with local Health Department requirements.

Lobster

In the final months of the 2019-2020 commercial lobster fishing season, the average price per pound significantly decreased from \$13.92 during the first week of January 2020 to a closing average price of \$10.62 on March 18, 2020. This decrease was a direct result of the impact of the COVID-19 pandemic and the closing of international seafood markets. Though concern was raised about a depressed market and continued low price, when the 2020-2021 season opened in October 2020 spiny lobsters sold for an average of \$14.88 per pound during the first week of the season. By the end of December 2020, spiny lobsters were selling for a record high average price of \$38.70. This dramatic

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CRFS sampler Helen Acosta interviewing an angler on a beach south of Humboldt Bay. CDFW scientist Andrew Weltz conducting Rapid Spawn Assessment in San Francisco by sampling Pacific herring eggs on vegetation. Captain Putman joyfully measuring a lobster.



increase in price has been attributed to a trade war between China and Australia that has decreased spiny lobster supply to China, resulting in increased demand for California spiny lobster and subsequently increased price.

CARES Act Relief Funds

In early May the Secretary of Commerce announced allocation of \$300 million in fisheries assistance funding provided by the CARES Act. The funding was provided to states, Tribes, and territories with coastal and marine fishery participants, with the allocation for California's fishing industry being more than \$18 million.

The Department coordinated with the Pacific States Marine Fisheries Commission (PSMFC) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) to develop the California spend plan consistent with the CARES Act and NOAA Fisheries' guidance. Substantial coordination with the eligible fishery sectors was conducted to equitably and efficiently distribute California's allocation of relief funds. The Department identified more than 11,500 potential applicants comprising commercial fishermen, vessel owners, fish businesses, aquaculture operations, commercial passenger fishing vessel owners, and fishing guides targeting anadromous species. Applications were distributed in September with nearly 1,700 individuals and businesses qualifying for assistance and a

minimum payment of \$7,200.

Laboratory and Field Research During COVID

White Abalone Restoration

The Marine Region along with its White Abalone Restoration Consortium partners continued the important work to restore the endangered white abalone in Southern California waters. Following the 2019 first ever stocking of captive-bred white abalone into the wild, the consortium conducted a second COVID-19 delayed stocking in 2020. Staff developed safety protocols which allowed a second stocking event in fall 2020. More than 1,100 white abalone were stocked across two Southern California sites. Post stocking monitoring showed continued survival of individuals from both events, hopefully helping to increase the wild white abalone populations.

Salmon Sampling

Acting on advice from the Pacific Fishery Management Council's salmon industry advisors and the Department, NOAA Fisheries delayed the recreational salmon fishery opener. The April delay was a response to physical distancing requirements and widespread closures of launch ramp facilities, charter boat operations and restrictions to harbor and marina access due to the COVID-19 pandemic. Delaying the opener of the fishery was designed to reduce impacts to stocks of concern and provide

CDFW diver Jenny Hofmeister releasing hand raised white abalone into the wild. Luminary scientist Frances Clark carting fish samples.



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more fishing opportunity later in the summer months than would otherwise be possible.

The delay challenged Department staff to alter commercial and recreational fishery monitoring protocols to ensure staff were able to safely monitor catch and effort in port locations throughout California. Despite these setbacks, fisheries commenced in early May and staff were authorized to conduct dockside sampling shortly thereafter, with new measures in place to help ensure both the safety of staff and the fishing community.

Coastal Pelagic Species Age Determinations

Staff adapted to logistical challenges for compliance with social distancing and stay home orders that prevented traditional in person trainings, research, and aging workshop collaborations with NOAA's Southwest Fisheries Science Center. To support aging needs for Pacific anchovy, Pacific sardine, and other coastal pelagic species stock assessments, staff incorporated the use of high-definition microscope cameras to catalogue otolith images that could be shared through remote meeting tools, and set up mobile aging labs in their homes that allowed for continued work and collaboration.

Salmon sampled by masked PSMFC contractor Nadia El Adli in Fort Bragg. California Fish and Game divers Jack Carlisle and Jack Schott circa 1960 when short shorts were the height of dive fashion.

Department Diving Safety Program

The Diving Safety Program's core function shifted from diver training and field facilitation to internal administration in 2020. Due to COVID-19 restrictions on travel, field work, and safety concerns, nearly all dives were canceled or postponed in 2020. By the end of December only 300 dives were completed – a nearly 85% decline from the 4-year average of 1,830 dives for fisheries and conservation research and monitoring, enforcement, and light maintenance tasks.

Nonetheless, this limited achievement involved the collaborative efforts of three scientific diving organizations (agencies, and others) that provided approximately 15 visiting divers for work on a collaborative project. With cancellation of the annual Department diver certification course, no new Department divers were qualified this year, and the current roster of 66 active divers were provisionally re-qualified until full operations resume.

Research Vessel Operations

As with other field operations, Marine Region vessel operations were significantly curtailed due to COVID-19 safety concerns. Most of the Marine Region's 15 research vessels were prohibited from working due to limited space onboard and the inability for staff to maintain necessary physical distancing. Staff focused on ensuring the vessels were current on maintenance and repairs and ready to return



to sea when restrictions are lifted.

The Research Vessel (R/V) Garibaldi, the 45-foot-long flagship of the Marine Region, was able to complete one cruise with outside partners to conduct marine protected area (MPA) surveys before the COVID-19 restrictions went into effect. Once she was “grounded” Marine Region staff focused on maintenance, repairs and upgrades. The R/V Garibaldi now has a generator that complies with current emission standards and an electric scuba air compressor to replace the outdated gasoline powered unit. In September, the Garibaldi went back to sea to support white abalone restoration efforts. Due to the COVID-19 pandemic, the R/V Garibaldi and crew was only underway 13 days in 2020 and traveled approximately 650 nautical miles. This is a stark contrast to the vessel’s annual average of 126 days at sea and nearly 4,300 nautical miles traveled (previous 4-years).

Whale Safe Fisheries

Risk Assessment Mitigation Program

The Marine Region in collaboration with other Department staff developed new regulations (Section 132.8, Title 14, CCR) for the Risk Assessment and Mitigation Program (RAMP), which became effective November 1, 2020 for the commercial Dungeness crab fishery. Under RAMP the Department will evaluate marine life entanglement risk for six Fishing Zones at least monthly from November – June. If risk is elevated, the Director will determine an appropriate management action to minimize entanglement risk by zone.

Conservation Plan and Incidental Take Permit

Marine Region staff submitted a preliminary draft Conservation Plan to address protected species interactions in the commercial Dungeness crab fishery to National Marine Fisheries Service for review on May 15, 2020. Species of concern include humpback whales, blue whales and Pacific leatherback sea turtles. The Conservation Plan is one component of the Department’s application for an Incidental Take Permit under Section 10 of the federal Endangered Species Act.



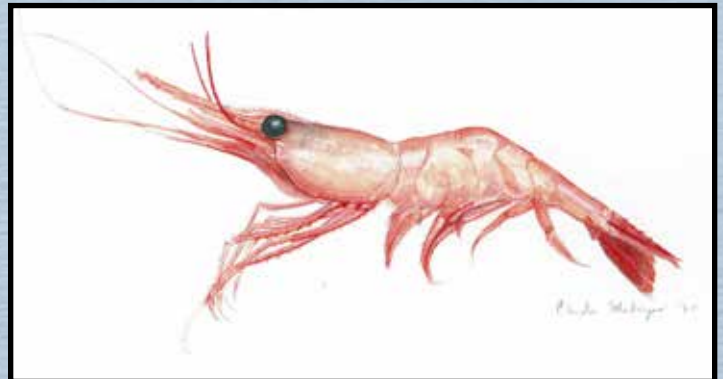
Clockwise: 1950’s CDFW diver Glenn Bickford. CDFW diver Briana Brady in modern dive gear off Catalina. Recovered Dungeness crab trap. CDFW divers aboard the RV Mollusk.



Research, Monitoring, & Management

Marine Life Management Act Master Plan

Implementation of the 2018 Marine Life Management Act (MLMA) Master Plan continued in 2020. Staff provided results on the scaled management process for 15 state-managed finfish to the Commission in early 2020. These results include an exploration into the steps needed to pursue a scaled-management process for California halibut and the development of new regulations for California grunion. Staff also finished the prioritization of 13 key state-managed invertebrate fisheries and presented these results to the Commission's Marine Resources Committee in November 2020. Implementation and development of Fishery Management Plans (FMPs) for several species also continued.



CDFW scientific illustration of a pink shrimp.

Pink Shrimp FMP

Marine Region staff began work on a Basic FMP for Ocean Pink Shrimp. Implementation of the Basic FMP will align management of the species with Oregon and Washington and may lead to the fishery achieving certification as sustainable by the Marine Stewardship Council, a first for California state-managed fisheries.



Young humpback whale breaching.

Commercial Dungeness Crab Trap Gear Retrieval Program

A program to allow retrieval of lost or abandoned commercial crab trap gear was implemented for the first time in 2020. The Department issued Retrieval Permits to qualified entities in seven ports (Crescent City, Trinidad, Eureka, Bodega Bay, San Francisco, Half Moon Bay, Monterey Bay) which allowed retrieval of lost or abandoned commercial Dungeness crab gear in exchange for compensation. More than 500 traps were retrieved, all of which were returned to the original owners.

Recreational Crab Trap Regulations

In December, the Fish and Game Commission (Commission) unanimously approved new regulations governing recreational crab trap fishing that incorporate whale safe fishing practices. In addition, a new validation requirement will allow the Department to identify crab trappers for targeted survey work to collect essential fishery information for the first time for this fishery. Regulations are expected to be effective for the 2021 season.

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Pacific Herring FMP

Regulations implementing the [California Pacific Herring FMP](#) became effective on March 1, 2020. The Herring FMP establishes a cohesive strategy to guide the sustainable management of California's commercial and recreational Pacific herring fisheries, as required by the MLMA. Staff completed a supplemental Herring FMP rulemaking to address issues relevant to the commercial Herring Eggs on Kelp (HEOK) sector of the herring fishery. These regulations became effective on November 30, 2020.

Recreational limits established by the Herring FMP have been in place since March. The 2020-21 commercial fishery season began in December 2020 with San Francisco Bay HEOK. It is the first season managed under the new permit structure and management strategy established by the Herring FMP. The Director set commercial quotas for the first time under the Herring FMP, establishing 2020-21 season quotas for all management areas of the commercial fishery. Gillnet quotas are set at 133 tons for Tomales Bay and 11 tons each for Humboldt Bay and Crescent City Harbor. In San Francisco Bay, the 2019-20 estimated stock fell below 15,000 tons. This triggered a tier 3 management approach, per the Herring FMP, resulting in a fishery closure (0-ton quota) for San Francisco Bay. The HEOK quota in San Francisco bay is set at 14 tons.

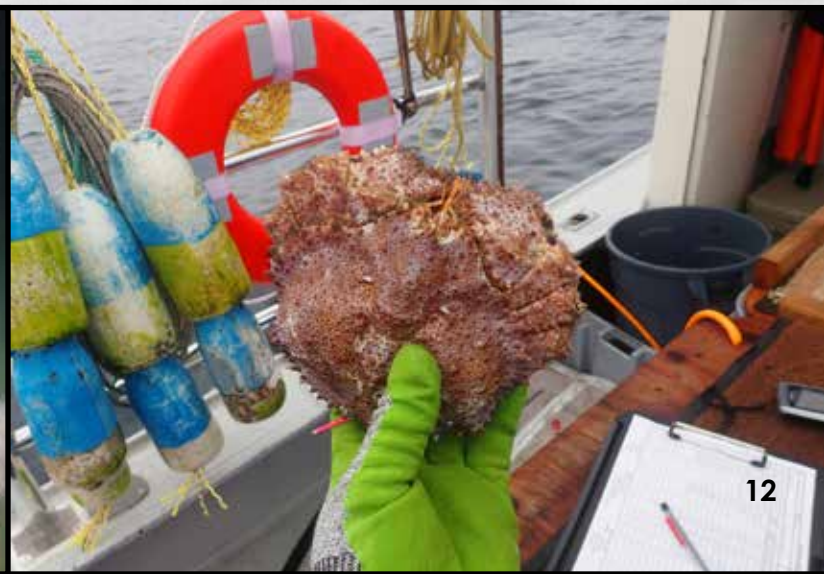
Box crabs feasting in their natural environment. Measuring and counting box crabs aboard a fishing vessel.

California Halibut Stock Assessment

The Department recently completed an update to the 2011 California halibut stock assessment. It draws on the prior modeling approach and considers recent data as well as recommendations from the 2011 review process. Facilitated by the Ocean Science Trust, an independent scientific peer review of the updated California halibut stock assessment was completed by a panel of experts in 2020. The review focused on whether the technical components, models, and analysis that underpin the stock assessment were applied in a manner that is scientifically sound, reasonable, and appropriate.

The Department is moving into an exploration phase of the scaled-management process for California halibut, which will identify goals and objectives for managing the fishery. This phase includes a scoping process to inform a draft scaled management roadmap and timeline, with community and stakeholder feedback. Additionally, the Department is actively working on a Management Strategy Evaluation (MSE), completing an Enhanced Status Report (ESR), and evaluating ecosystem and bycatch considerations.

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Management Strategy Evaluations

Staff led efforts to integrate MSEs into the science and management of our fisheries. MSE is a modeling approach that explores the future performance of fisheries under alternative management scenarios to identify those that achieve our goals despite multiple types of uncertainty. Staff finalized MSEs for eight case study fisheries and started three more. These will be shared with stakeholders and appended to ESRs in 2021. The Marine Region is innovating in this field by implementing MSEs that incorporate multiple stocks and multiple gear types into a single analysis, initially using the approach for California halibut.

Box Crab Experimental Fishery Permits

The brown box crab experimental fishery program continued into a second year despite challenges faced in 2020 by constraints on fieldwork and shifting to virtual trainings and no-contact electronic data collection methods. Strong interest in commercial harvest of brown box crab led the Marine Region to initiate a collaborative research program in 2019 to evaluate a potential fishery. In 2020, six experimental fishing permits were active in the program, landing 44,400 pounds of brown box crab with an ex-vessel value of nearly \$135,000. The Marine Region is working with permittees



1953 tagged and flying halibut. CDFW scientist Kristine Lesyna collecting life history information from a freshly caught halibut in 2020. An abundance of 2020 halibut caught by recreational anglers.

to gather essential fishery information using logbooks, trap surveys, and a mark-recapture study, while research partners at California Sea Grant are studying brown box crab life history. The California Ocean Protection Council and the PSMFC are supporting the use of electronic monitoring systems to monitor catch and effort. Data analyses will help evaluate the feasibility of a box crab fishery and explore the utility of electronic monitoring for other fixed-gear fisheries.

Below: CDFW wildlife technicians Terrance Manilla and David Astrue sampling a salmon boat at a safe distance. CDFW scientist Kristine Lesyna examines spawning condition of a female California halibut landed by a trawl vessel in Half Moon Bay. Halibut fin clips and otoliths in improvised home lab.



Climate Readiness

Marine Region staff continued to coordinate with various state and federal agencies on climate-related activities. These efforts included participation in a Pacific Fishery Management Council's Climate and Communities Initiative and a series of fisheries-climate scenario planning workshops. Staff also participated on an Ocean Protection Council (OPC) Science Advisory Team workgroup to develop a report describing the current understanding and research needs regarding marine protected areas and climate resilience. In addition, staff contributed to the climate chapter for the update to the Department's Biodiversity Atlas.

Marine Aquaculture

Aquaculture was the focus of increased interest at both the state and federal level as several new initiatives were launched in 2020. At the state level, staff worked with the State Aquaculture Coordinator, Commission staff, other agencies, and constituents on marine aquaculture leasing and permitting activities including lease amendments, consideration of new lease applications, reviewing CEQA documents, conducting lease inspections, and a variety of other administrative and oversight requests. Staff developed an informational report on [commercial marine aquaculture in California](#) for the Commission detailing the current status of aquaculture operations statewide. The report will inform the development of a Marine Aquaculture Action Plan initiated



The Marine Region advanced the development of a new climate ready Red Abalone FMP that responds to unprecedented climate driven declines in abalone stocks and integrates two draft plans that were submitted to the Commission in late 2019. The integration process is incorporating a number of key features including 1) developing indicators of kelp forest health (Part A), 2) incorporating multiple abalone indicators including abalone density and size from plans one and two (Part B), and 3) translation of indicators into Total Allowable Catches for potential future fisheries following resource recovery (Part C). The new draft FMP has benefited from an extensive 20-year time series of essential fishery information and a multi-stakeholder process.

by the OPC to serve as a comprehensive, science-based framework for marine aquaculture in California that balances ecosystem health with sustainable development.

At the federal level, aquaculture in Southern California was also put in the spotlight this year as NOAA Fisheries selected the region for consideration of an Aquaculture Opportunity Area (AOA) pursuant to an [Executive Order on Promoting American Seafood Competitiveness and Economic Growth](#). The Marine Region coordinated with NOAA and contributed data for their spatial analyses to evaluate the location of the AOA in Southern California. Marine Region staff also responded to a U.S. Army Corps of Engineers Public Notice for comment on

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a proposed offshore shellfish and seaweed farm, and a Notice of Intent to prepare an Environmental Impact Statement by NOAA for an offshore finfish farm proposed in federal waters.

California Endangered Species Act

Permitting

After years of coordination and work with CalTrans, Marine Region staff were able to complete the California Endangered Species

leatherback sea turtles as a candidate species in August. Marine Region staff are preparing a status review report to submit to the Commission in 2021.

Drift Gillnet Transition Program

In 2019, the Department began implementation of California Senate bill 1017 (Allen), which provides for the transition of the large-mesh drift gillnet (DGN) fishery to other gears with lower levels of protected species interactions. This year, the first component of SB 1017, a voluntary buy-back program, was initiated. The program compensates



Act Incidental Take Permit and mitigation for the San Francisco Oakland Bay Bridge East Span Seismic Safety Project.

Leatherback Sea Turtle CESA Petition

In January 2020 a petition to protect leatherback sea turtles under the California Endangered Species Act (CESA) was received by the Commission and referred to the Department. Marine Region staff prepared a petition evaluation that found merit to consider CESA listing. The evaluation was presented to the Commission in June and the Commission agreed the petitioned action may be warranted and designated

current DGN permit holders for surrendering their permits and nets. Permit holders were grouped into “active” and “inactive” categories based on their past fishing activity as defined by the bill. Of 68 current DGN permit holders, 44 submitted declarations of intent to participate in the program, including 28 of the 32 active participants in the fishery.

The bill required a mix of State and private funding to support the buy-back. In July, having received \$1 million from the California Ocean Protection Council and a matching \$1 million of non-state funds from Oceana, the Department notified the first 24 approved participants that they could proceed. As of

February 2021, 14 permit holders (ten active and four inactive) have completed the transition process and relinquished their nets and permits. Additional approved permittees are in contact with Net Destruction Entities, who work directly with participants to receive the nets and recycle them. The remaining participants will be notified they can participate if additional funding becomes available.

Ocean Resources Enhancement and Hatchery Program

Department staff, working with the Ocean Resources Enhancement Advisory Panel, continued to focus on white seabass enhancement while addressing administrative and research priorities for the [Ocean Resources Enhancement and Hatchery Program](#) (OREHP). On September 30, 2020, Governor Newsom signed [Assembly Bill 1949](#), which amends the OREHP statute (Fish and Game Code Section 6590). The amendment updates the OREHP's management processes and expands the program's capabilities and public-private partnerships by (1) updating the organizational structure of the OREHP and revising the criteria for membership of the Advisory Panel; (2) establishing an independent scientific advisory committee to prioritize OREHP research and review program findings; (3) mandating an annual public meeting to present OREHP research; and (4) requiring a legislative report by July 1, 2027, to track OREHP progress. As a result of the new amendments, staff began work to solicit Advisory Panel nominations from all interested stakeholders, including sport and commercial fishing industries, aquaculture, and non-governmental interests. The new Advisory Panel will be established in early spring 2021.



White seabass from San Francisco Bay measured on the dock.

Eelgrass

Despite curtailed field efforts, project staff continued work on eelgrass (*Zostera* spp.). Eelgrass expansion was again noted in Morro Bay, which is a good sign after years of decline for reasons yet identified. In addition, *Zostera pacifica*, a species specific to Southern California, is continuing to be identified in new locations, including Port San Luis and near Vandenberg Air Force Base. These observations will be added to the annual eelgrass surveys conducted by project staff in collaboration with the Nearshore and Bay Management Project.



Eelgrass held by CDFW scientist Frank Henry.

Kelp and Other Marine Algae

The Department partnered with California Sea Grant to hire a Kelp Management Extension Fellow to coordinate key kelp reports and projects, including a Giant and Bull Kelp Enhanced Status Report, and expanded its support for kelp restoration in 2020. Together with Sea Grant and OPC, the Department established a new Kelp Recovery Research Program to guide the allocation of nearly \$2 million of kelp restoration research essential to informing kelp management and recovery. Staff are working with OPC, Reef Check California, commercial urchin divers, and Moss Landing Marine Laboratory to implement priority actions in Mendocino County identified in the 2019 Bull Kelp Recovery Plan. Other partners important to the overall effort are the Noyo Center for Marine Science, Watermen's Alliance, Greater Farallones Association, and The Nature Conservancy.

The recovery efforts included removing purple urchins to restore kelp and testing kelp outplanting methods. In addition, staff worked with the recreational dive community evaluating the sport take of urchin as a

tool to promote kelp recovery. To facilitate this, an emergency rule allowing unlimited recreational collection of purple sea urchin in Caspar Cove (Mendocino County) was adopted in March 2020. The rule was adopted as a standard rule at the end of 2020, which also included an area at Tanker Reef (Monterey County) allowing unlimited take of both red and purple sea urchins. Staff are also working with NGO partners to explore urchin trapping as a method to reduce urchin density and promote kelp recovery. Staff are coordinating with OPC to develop a Kelp Action Plan, which will inform the development of a Statewide Kelp Restoration and Management Plan.

Invasive Sargassum in Monterey

Sargassum horneri is a large, annual brown seaweed, native from Japan to the Philippines. *S. horneri* is one of three species of sargassum that have become persistent in California. In 2003, *S. horneri* invaded Long Beach Harbor and rapidly spread to the California Channel Islands and as far south as Todos Santos, Mexico. Because sargassum can be locally very abundant, grow quickly, and potentially displace native algae, there are concerns about its potential to alter nearshore ecosystems.



Invasive algae, *Sargassum horneri*.

In June 2020, a Reef Check California volunteer diver spotted and photographed an individual sargassum plant attached to the seafloor at the Monterey Breakwater within the Edward F. Ricketts State Marine Conservation Area. Due to concerns about the potential spread of this invasive species into a new part of the state and within a marine protected area, the Marine Region deployed two Department divers to search for the algae on June 23, 2020. The one *S. horneri* specimen was located and successfully removed. In more than two hours

of searching during two dives, no other sargassum was located. The removed specimen was examined by Department staff and determined to be a non-reproductive juvenile. Any new observations of sargassum in the area should be reported to the Department. Removal of any algae, including invasive species, within a marine protected area is illegal unless specifically allowed in regulation.

White Seabass

As part of the annual review of the White Seabass Fishery Management Plan for the 2018-2019 season, staff collected and analyzed commercial and recreational data. Staff evaluated the numbers and sizes of white seabass landed, information on forage fish availability, and socioeconomic data to determine if the points of concern had been met. Relative to the 2017-2018 season, commercial pounds of white seabass landed decreased while recreationally caught numbers increased. None of the five main points of concern were met for the season and no further action was needed.

Salmon

The Marine Region completed both the 2016 and 2017 Constant Fractional Marking reports this year. The critical scientific compendiums detail hatchery contributions to Central Valley harvest, escapement, and ocean fisheries, and describe the effects of various hatchery release strategies on survival, contribution to fisheries, and fidelity to their river-of-origin. Constant Fractional Marking results are central to evaluations of hatchery programs, bay and coastal net pen programs, barge studies, restoration



Chinook Salmon being measured in Bodega Bay in 2020.

activities, recovery goals, and salmon lifecycle model calibrations.

Marine Region staff assisted in the development of a risk assessment analyzing the effects of ocean salmon fisheries on federally endangered southern resident killer whales (SRKW). This work resulted in the Pacific Fishery Management Council considering and adopting associated fishery constraints in 2020 to protect SRKW in future years of low salmon abundance.

Pacific Halibut

Marine Region staff continued to actively monitor recreational and commercial Pacific halibut fisheries in 2020, and track attainment of the annual recreational quota. The recreational Pacific halibut fishery was scheduled to be open from May 1 through October 31, or until the quota was met, whichever came earlier. Record breaking numbers of Pacific halibut were caught during 16 days at the end of July and beginning of August with more than 350 encountered by field staff at the docks. Typically, field staff see around 250 fish during an entire season. This unprecedented number of fish resulted in catch projections that rapidly exceeded the quota. The fishery closed for the year on August 11. Since active quota management began in 2015 the fishery has closed in August three times due to quota attainment, but August 11 is the earliest fishery closure on record.



Lingcod and vermilion rockfish hanging out at depth.

Groundfish

Marine Region staff developed and analyzed comprehensive plans for new groundfish management measures that were implemented January 1, 2021. Many of the new measures increase access and opportunities due to the successful rebuilding of many previously overfished groundfish stocks.

Marine Region staff contributed to a number of scientific advancements in 2020. Lingcod fin rays were collected and processed for age and growth rate analysis of lingcod populations along the West Coast. The results will be used to improve future stock assessments and management decisions. Additionally, staff collaborated to develop a method to generate population abundance information from remotely operated vehicles in nearshore surveys, which was validated and approved by the Pacific Fishery Management Council. This is a step forward to incorporate new data streams into stock assessments of some nearshore groundfish stocks. The methodology could also provide information on stock abundance inside areas where extractive surveys or harvest is not permitted (e.g., MPAs) in the future.



2020 otoliths. 1961 Robert Bell examining samples.

CalCOFI

The Marine Region continued as a partner with NOAA Fisheries and the University of California in the California Cooperative Oceanic Fisheries Investigations (CalCOFI) ecosystem monitoring program, which began in 1949. A new program coordinator was hired in 2020 using funds from all three partners to oversee and enhance communications, outreach, and research. The annual CalCOFI Conference was held online due to COVID, which allowed for

Data Modernization

E-Tix and Marine Landings Data System

2020 marked the first full year of mandatory electronic reporting of commercial landing receipts within 3 business days of landing. In 2020, the average number of business days between the landing and when the record was submitted was 2.34 business days, greatly enhancing our ability to engage in near real-time management. In October 2020, the Marine Landings Data System (MLDS) was fully developed through coordinated efforts between the Department's Data and Technology Division and Marine Region. MLDS is a web-based application allowing Department staff to access a full array of commercial fisheries records and reports needed for fisheries management and law enforcement purposes. Through the combination of MLDS and E-Tix, the 2020 summaries of commercial fishery landings were finalized and made available in early 2021.



1937 control panel for tabulating.

widespread participation and turned out to be a huge success with a five-fold increase in attendance (more than 500 registered participants). The conference explored our understanding of unprecedented changes in coastal and marine environments of the California Current Ecosystem. CalCOFI was highlighted as the longest marine ecosystem time series of coupled physical, chemical, and biological variables that provides essential information about ocean climate change. Check out the [website](#).



CDFW scientists using a variety of statistical equipment over the years. Above: 1952 statistical equipment sorting machine. Clockwise from top right: 1937 tabulator. 1937 statistical equipment key punchers. 1965 IBM 075 sorters.

Interactive Landings Data On The Web

As part of Marine Region efforts to modernize our data systems, current landings information for [market squid](#) and [several other commercial pelagic fisheries](#) were developed using new interactive tools. The market squid data include both a table and a heat map, showing landings by season. The table and map are updated quarterly on the website, or whenever significant new landings data become available. The commercial pelagic species data include interactive landings graphs for market squid, Pacific sardine, northern anchovy, Pacific mackerel, jack mackerel, and Pacific bluefin tuna. The effort is an important step towards modernizing Department fisheries data sharing on the internet.



Recreational angler with tuna. Vintage tuna research.

Improved Recreational Lobster Catch Estimates

Estimates of California spiny lobster recreational catch and effort rely on information reported on seasonal lobster report cards. However, it was suspected that assumptions of non-reported fishing data were biased, resulting in an overestimation of recreational catch.

A survey of lobster report card holders was conducted in summer 2019 to test the key underlying assumption that reported and non-reported catch and effort are the same. Survey responses indicated that a higher percentage of non-reporters did not fish (40%) compared to those that returned their report

cards (20%). The survey, in conjunction with a deeper analysis of past data, also revealed that recreational catch and effort increases with fishing participation level for both reporters and non-reporters, where participation level was determined based on each customer's report card purchasing history. Based on these findings, the Department developed an improved method for estimating the contribution of non-reported recreational catch and effort that accounts for differences in catch rate by participation level. Calculations for the 2019-2020 season revealed that the prior method of estimating non-reported catch would result in an over-estimate of total recreational catch by 27%. Having an accurate idea of recreational spiny lobster catch is important for managing the fishery and understanding the impact of both the commercial and recreational take on spiny lobster populations.



1952 CDFW staff entering data.



California spiny lobster.

Outreach and Data Sharing

New Marine Region Home Page

The Marine Region undertook a revamp of its web presence, with a new [home page](#) launched in September that makes it easier for the public to quickly find desired information. The new design focuses on four key areas of public interest: Regulations; Marine Protected Areas; Species Information; and Data, Management, and Research. Many Marine Region web pages were edited to increase clarity, and obsolete web pages were deleted. Updates will continue towards the goal of a streamlined and easily accessible website.

Marine Species Portal

New in 2020, the California [Marine Species Portal](#) was unveiled in July. The Portal provides searchable access to basic species information, as well as [Enhanced Status Reports](#) (ESRs) for select state-managed fisheries. The Portal is one of the tools described in the 2018 Marine Life Management Act Master Plan for providing information on California fisheries to the public. The Portal, based on a prototype design developed with stakeholder input, was funded by the OPC and constructed by a consultant with the support of staff from the Marine Region and the Data and Technology Division (DTD).

The Portal currently houses 32 ESRs covering 35 species. These ESRs contain information on the natural history of the species and the location, landings, and characteristics of the fishery along with details about bycatch, socioeconomics, research needs, opportunities for management changes, and climate readiness. Through additional modifications to the Portal by DTD and MR staff, the Portal also includes “Species-at-a-Glance” information for 73 non-ESR species, with more being added continuously. The Species-at-a-Glance provides summary information on the key life history aspects for each species.



New Marine Region home page buttons for Data & Research, Species information, Regulations, and MPAs.



Screen shots of the new searchable Marine Species Portal.



Marine Protected Areas

The Department manages California's 124 MPAs and 14 special closures as a statewide network using a partnership-based approach through the [MPA Management Program](#). The MPA Management Program is composed of four key focal areas: Outreach and Education, Research and Monitoring, Enforcement and Compliance, and Policy and Permitting.

Staff increased digital outreach efforts to keep stakeholders informed on notable MPA Management Program activities. Staff published more than 20 blogs highlighting [California's MPAs](#) and the individual county [Collaboratives](#) that make up the statewide MPA Collaborative Network. The new [MPA video playlist](#) on YouTube allows viewers to visually explore individual MPAs and the unique species and habitats they protect.

In early spring, all field-based [long-term monitoring project](#) activities to inform adaptive management of the MPA Network were halted due to the COVID-19 pandemic. Staff worked closely with monitoring project leads to shift project tasks to analyses of existing data until new data collection could continue. After implementing safety protocols, field-based projects resumed with modified data collection protocols to accommodate physical distancing. New monitoring projects that started in 2020 include a [Tribal Stewards Program](#) and the development of a cohesive statewide [monitoring program for estuarine MPAs](#).

Interest in conducting research in MPAs continued in 2020 with 144 scientific collecting permits issued for research and educational activities within 74 MPAs: 31 State Marine Reserves (SMR), 41 State Marine Conservation Areas (SMCA), and 2 State Marine Recreational Management Areas (SMRMA). The total number of projects for each MPA designation are 66 in SMRs, 103 in SMCAs and 8 in SMRMAs. The MPA Management Project and its partners continue to work towards achieving the goals and requirements of the Marine Life Protection Act (MLPA). Significant attention is now focused on preparing the first decadal management review (DMR) of the MPA Network and Management Program for the Commission,



Green anemone and chiton living in an MPA.

planned for the end of 2022. The DMR will focus on reviewing each of the four focal areas of the MPA Management Program and the evaluation of the MPA Network in meeting the goals of the MLPA, including adaptive management recommendations for the Commission's consideration.



MPA collaboratives featured in 2020 CDFW blogs.



Healthy tidepool creatures in the Russian Gulch State Marine Conservation Area.

Fishery Disaster Relief

Dungeness Crab

Mitigation funds from the 2015-16 California Crab Fisheries Disaster totaling more than \$3.3 million were awarded for research and testing this year. A portion of the funds were allocated to the California Department of Public Health for the purchase of laboratory supplies to support domoic acid testing of crabs. Research proposals were also solicited in early 2020 that aimed to better understand domoic acid and how the fishery can better respond to future domoic acid events. Three research grants were awarded focusing on the socioeconomic impacts of domoic acid on California crab fisheries and fishing communities, transfer and retention of domoic acid in California crab species, and development of predictive modeling tools to better inform the commercial crab fleet.

Salmon

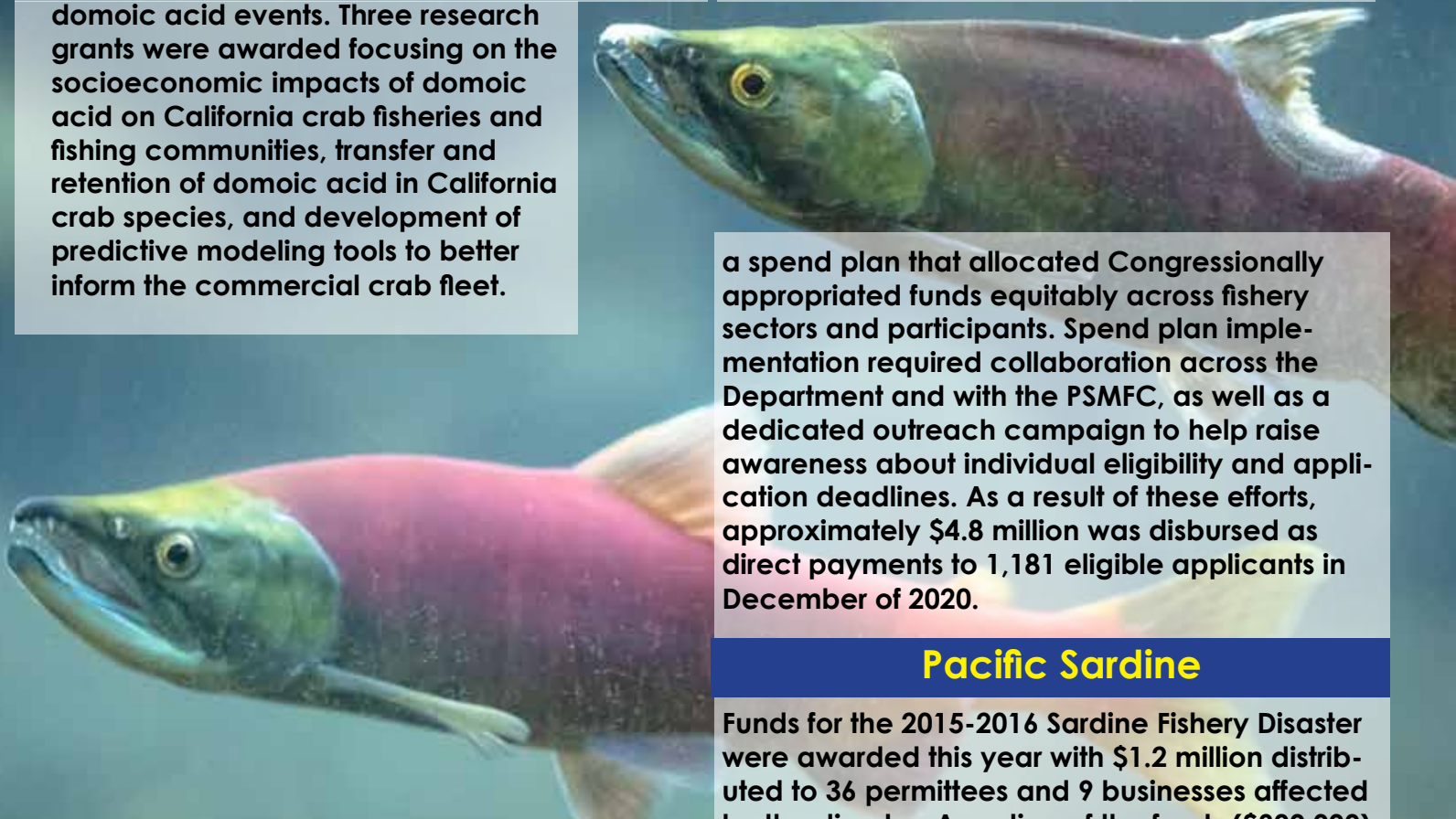
Marine Region staff assisted with the development and execution of the 2016-17 Klamath River Fall Chinook (KRFC) salmon disaster relief program, which aimed to help members of California's sport and commercial fishing industries who were impacted by the sharp decline in KRFC abundance during the 2016 and 2017 fishing seasons. Staff provided data and technical support to help industry partners develop

a spend plan that allocated Congressionally appropriated funds equitably across fishery sectors and participants. Spend plan implementation required collaboration across the Department and with the PSMFC, as well as a dedicated outreach campaign to help raise awareness about individual eligibility and application deadlines. As a result of these efforts, approximately \$4.8 million was disbursed as direct payments to 1,181 eligible applicants in December of 2020.

Pacific Sardine

Funds for the 2015-2016 Sardine Fishery Disaster were awarded this year with \$1.2 million distributed to 36 permittees and 9 businesses affected by the disaster. A portion of the funds (\$300,000) went to the nearshore collaborative research with industry partners. The research uses aircraft and industry fish observers to quantify the number of sardines and anchovies in nearshore areas inaccessible to vessel-based surveys.

Marine region staff completed the 2017-2019 Sardine Fishery Disaster proposal and submitted it to PSMFC for NOAA Fisheries approval. Approximately \$1.4 million will go to individuals and businesses affected by the disaster and \$700,000 will be used to continue the nearshore collaborative research with industry partners.



Warden aboard a salmon boat.



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