MARINE REGION

2017 YEAR IN REVIEW

Palos Verdes Peninsula
in southern California
photo courtesy BL M

A Message From Craig Shuman, Marine Region Manager

Our charge to protect, maintain, enhance, and restore California's marine ecosystems often ends up being a balancing act. Sometimes taking a "hands off" approach achieves our goal, while at other times we find it necessary to intervene.

One of our ongoing efforts to intervene continues to pit Region scientists and many of our partners against the extinction of a species, the white abalone (*Haliotis sorenseni*). In 2017, over 16,000 white abalone raised in a captive breeding program reached their first birthday, a milestone we celebrated with multiple agencies and institutions. These young mollusks may help increase the numbers of this federally listed endangered species.

It has been a rough year for more than one species of California abalone. Red abalone in northern California continued to struggle in starvation conditions brought about by large-scale ecological changes. California Department of Fish and Wildlife scientific divers, university divers, and others surveyed the equivalent of 4½ football fields across 11 northern California underwater sites in a heroic effort to gauge the status of red abalone and its habitat. Their findings led to an unprecedented recommendation to close the fishery.

For the third year in a row, high levels of domoic acid delayed parts of the commercial Dungeness crab season, and, for the first time, closed the commercial spiny lobster fishery in some areas off the northern Channel Islands for three months. The recreational razor clam fishery remained closed in 2017 due to elevated domoic acid levels.

The sometimes gloomy developments of 2017 were balanced by a variety of positive events. Monitoring surveys found large numbers of young California Halibut, especially in San Francisco Bay – good news for fishermen in years to come. Seven new state saltwater angling records were set in 2017, with two brand new species entering the record books. Strict protections for rockfish were in part responsible for Bocaccio and Darkblotched Rockfish stocks being declared rebuilt and healthy in 2017 – a testament to the hard work and sacrifice of all those involved in the rebuilding plans for these species. Staff who monitor and manage the state's marine protected areas shifting their focus from initial surveys to long-term monitoring, and the approaching deployment of improved fishery data collection systems were all welcome signs of progress.

For myself and Marine Region staff, striving for balance across the many facets of our charge is a daily challenge we celebrate, learn from, and almost always welcome. In 2017 we continued sampling, testing, calculating, communicating, and monitoring to take stock of multiple situations, fisheries, and habitats, with an overarching goal of safeguarding the ocean environment for its ecological value and for everyone's use and enjoyment.

Marine Region Mission: 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.

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2017 Region-Wide Accomplishments, By The Numbers...

Sampled over **700 Kelp Bass** and **150 Barred Sand Bass** to evaluate sport fishing regulation changes

Processed **19,250** commercial passenger fishing vessel e-log submissions on the new electronic log system

Helped to produce **16,000 1-year-old white abalone**, a federally listed endangered species, as part of a joint captive breeding program

Contacted over **138,000** saltwater angling parties. Observed and identified almost **196,000** fish and invertebrates, and measured almost **100,000** fish and invertebrates

Registered **7** new state diving and angling records

Entered about **53,000** commercial landing receipts

Sampled **nearly 28,000** salmon in the sport and commercial ocean salmon fisheries and processed **about 7,500** tags to determine the age, origin and other information for hatchery fish

Reviewed over **650** environmental documents

Helped to rebuild **2 groundfish stocks** - Bocaccio and Darkblotched Rockfish - to healthy status

State-Managed Marine Species Programs

These programs are responsible for fisheries managed by the State alone.

Abalone –
Recreational Red Abalone Fishery **–** Ocean conditions continued to negatively impact abalone resources in northern California. Ocean warming, coupled with a disease that affected sea star populations and a massive purple sea urchin population explosion, took their toll on red abalone in 2017 despite the return of cooler water temperatures.

The spring of 2017 saw continued starvation conditions for red abalone. Fishery-wide, 25 percent of the catch exhibited shrunken foot/body size with little reproductive tissue. Reproduction was poor in the fishery with few larvae or newly settled red abalone found during the summer of 2017. Dive survey efforts were stepped up in 2017, with divers surveying more than the equivalent of 4½ football fields of area across 10 fished sites and one marine protected area site.

Surveys revealed that the poor kelp and algal conditions along with large numbers of herbivorous purple sea urchins resulted in major mortality of red abalone in 2017. Red abalone densities dropped below the fishery closure level prescribed in the Abalone Recovery and Management Plan (less than 0.3 abalone per square meter). Average overall density for the 10 fished sites was 0.15 abalone per square meter, with an average 37 percent mortality rate across the fishery.

These dire, unprecedented results forced the California Department of Fish and Wildlife (CDFW) to recommend fishery closure to the California Fish and Game Commission in August 2017. After a meeting to discuss the findings in October, the Commission voted to close the 2018 fishery on December 7, 2017 with a one year sunset period, during which the Commission will revisit the fishery closure for 2019 and beyond.

A draft red abalone management framework developed in conjunction with fishery partners was presented to the Commission in December. The Nature Conservancy also developed a draft management framework. Both draft frameworks will be shared with the Recreational Abalone Advisory Committee and undergo independent scientific review in 2018.

Staff co-authored a paper published in scientific literature on the impacts of climate change on red abalone settlement and recruitment (*O'Leary, J.K., Barry, J.P., Gabrielson, P.W., Rogers-Bennett, L., Potts, D.C., Palumbi, S.R., F. Micheli 2017.* Calcifying algae maintain settlement cues to larval abalone following algal exposure to extreme ocean acidification. *Scientific Reports. 7: article 5774 doi:10.1038/s41598-017-05502-x*). The team worked with researchers at Stanford's Hopkins Marine Station to investigate the possible impacts of ocean acidification on the productivity of red abalone.

Abalone Restoration - Captive Breeding Program for Endangered White Abalone **–** The White Abalone Restoration Consortium (consisting of CDFW, university, federal, and aquarium scientists), which focuses on restoration of the critically endangered white abalone, continued their very successful work in 2017. The captive breeding program housed at the Bodega Marine Lab had its most productive year in 2017, producing twice as many 1-year-old white abalone (16,000) as the year before. The project also secured approval from NOAA

Empty red abalone shells off the town of Elk in northern California bear witness to an ongoing major mortality event
photo by K. Joe

Preparing a net for a Longfin Smelt survey in Humboldt Bay.
CDFW photo by K. Ramey

Fisheries to collect 10 additional wild adult white abalone to supplement the broodstock for the 2018 spring spawn.

As part of this work, staff have been modeling restoration options to help determine factors affecting the success of white abalone restoration, such as abalone density, habitat quality, ocean warming, and poaching, and have published a paper on the work (see *Li, Y. and Rogers-Bennett, L. 2017.* Evaluating factors affecting restoration of an endangered marine broadcast-spawning invertebrate using an individual-based model of white abalone. *Endangered Species Res. 32:293-308. doi:10.3354/esr00804).*

Restoration of Abalone in Southern California – Staff led the effort to test methods for successful white abalone stocking and restoration, while also working towards restoring red abalone stocks in southern California in support of Abalone Recovery and Management Plan goals. The work is primarily designed to inform methods for future stocking and restoration of critically endangered white abalone, as well as aid in the restoration of red abalone, which once formed the basis for important fisheries in the region. Juvenile red abalone produced in aquaculture facilities were purchased, tagged and released into suitable habitat at two sites along the mainland coast: 3,200 juveniles off Los Angeles (January 2016) and 6,400 juveniles off San Diego (February 2017). In 2017, staff conducted surveys to check on the growth and survival of the red abalone stocked at the two sites.

For more information about abalone, visit the CDFW website at *wildlife.ca.gov/Conservation/Marine/Invertebrates/Abalone*.

Barred Sand Bass and Kelp Bass – To help evaluate the 2013 regulation changes for the basses, staff completed 14 sampling trips aboard commercial passenger fishing vessels to collect information on numbers, sizes, and mortality of released fish. Staff collected data on over 700 Kelp Bass and 150 Barred Sand Bass.

Between June and August 2017, staff completed sampling for a study on Kelp Bass that assesses food web dynamics as an indicator of ecosystem health in marine protected areas. Fin and muscle tissue samples were taken from a total of 63 Kelp Bass in marine protected areas and control sites at Anacapa and Santa Cruz islands, in addition to 85 Kelp Bass sampled at Catalina Island in 2016. Staff analyzed both tissue types to create estimates of the feeding level of Kelp Bass within the ecosystem.

Staff completed all field and laboratory work on age and growth for both Kelp Bass and Barred Sand Bass. The oldest aged fish was also the largest in our sample at 25 years old and 23.6 inches (600 mm) total length. Growth did not differ between males and females. Staff completed a pilot study to develop a new fishery-independent monitoring plan for Barred Sand Bass during the summer. Staff using scuba completed monthly fish surveys between June and October at natural and artificial reefs near Los Angeles Harbor and the Palos Verdes Peninsula. In addition, baited remote underwater video stations were constructed and deployed at each site over the same time frame. Both divers and the video stations successfully recorded Barred Sand Bass. Staff presented preliminary results at CDFW's Science Symposium in November.

For more information about bass research and management, visit the CDFW website at *wildlife.ca.gov/Conservation/Marine/SCFRMP*.

Bay Management – Staff conducted two onboard observations of the commercial bay shrimp fishery in San Francisco Bay, documenting the trawling process, catch, bycatch, and fishing locations. Participation in the bay shrimp fishery is increasing.

As part of a multi-year ecological study in Drakes Estero, Point Reyes National Seashore, staff divers conducted the first round of post-restoration surveys following removal of the wooden rack infrastructure that was associated with a decades-long oyster operation.

Staff collaborated with tthe Environmental Review and Water Quality Project staff to survey the Russian and Navarro river estuaries (Estero Americano and Estero San Antonio) for eelgrass, which completes a three-year effort to update the statewide eelgrass spatial database.

Staff assisted the Invertebrate Management Project in coordinating the collection of Dungeness crab from commercial fishermen in Crescent City, Trinidad, and Eureka for domoic acid testing. Staff also collected and shipped razor clam samples for domoic acid testing. Razor clams continued to test above the alert level for domoic acid, and the fishery remained closed in northern California.

Staff actively sampled for Longfin Smelt in Humboldt Bay and two main tributaries to the bay as part of a State Wildlife Grant Program-funded project to evaluate the spawning and larval distribution of Longfin Smelt in the bay and tributaries.

Staff collaborated with various researchers throughout the year on studies focused on Humboldt Bay including the following: Dr. John Chapman from Oregon State University sampling for the presence of the mud shrimp, *Upogebia pugettensis*, as part of his research; Jim Kaldy of the U.S. Environmental Protection Agency and visiting Chinese scientists in their efforts to collect samples of the non-native eelgrass, *Zostera japonica*, as part of a West Coast genetic study; and researchers from Humboldt State University, California Sea Grant, and the Wiyot Tribe who are expanding the ongoing eelgrass monitoring study as part of an eelgrass/ocean acidification project in the bay.

For more information about saltwater bay management, visit the CDFW website at wildlife.ca.gov/Conservation/Marine/ABMP.

Box Crab – Landings of box crab incidental to other targeted trap fisheries increased dramatically in 2017. The California Fish and Game Commission received two petitions for experimental gear permits to target box crab in 2017. CDFW staff presented the best available information on the species and its regulatory status to the Commission's Marine Resources Committee at its November meeting. As directed by the Commission at its December meeting, staff are working on a two-step process to manage the increase in landings and to determine sustainability. First, a regulatory proposal to limit incidental take in other fisheries is in development. Second, staff are working with fishermen and other partners to explore the feasibility and potential outcomes of an experimental gear permit and associated research.

For more information about box crab, read this NOAA Fisheries report on underutilized species: https://swfsc.noaa.gov/publications/CR/1992/9248.PDF.

California Halibut – Staff continued observations and sampling of the California Halibut fisheries in central California. Fishing effort and success increased in 2017 compared with the recent past. Commercial landings were sampled dockside, bycatch samples collected, and observations made onboard commercial hook-and-line vessels, commercial trawl vessels, and commercial passenger fishing vessels. Staff also continued sampling from a fishery-independent research trawl vessel and sampled at a halibut derby. Due to recent episodes of good recruitment likely associated with prolonged warm water events, increased encounters with undersized California Halibut occurred in the hook-and-line fisheries, particularly inside San Francisco Bay. Staff worked with

California Halibut and other bottom fishes on the deck of the trawler *F/V Verona* in the Gulf of the Farallones.
CDFW photo by K. Lesyna

CDFW Scientific Aid Marisa Morse measures a spiny lobster taken off Anacapa Island for domoic acid testing
photo by D. Stein

recreational and commercial fishermen to create a guide outlining the best methods for handling and releasing undersized fish.

Using the assessment program Stock Synthesis, staff worked towards completing two separate stock assessments for California Halibut: one north and one south of Point Conception. Staff analyzed over three million CPFV logbook records and produced a model that generated a relative abundance index for six regions along the California coast. Staff also analyzed length composition data from the recreational and commercial fisheries dating back to 1971 and produced figures that summarize changes in length composition.

In Southern California a total of 36 California Halibut were sampled from commercial markets, recreational launch ramps, fishing derbies, and fishery-independent trawl surveys; the largest weighed 28 pounds. Additionally, 122 juvenile California Halibut were caught during a research trawl as part of a pilot study to acquire an index of juvenile California Halibut abundance across multiple embayments and offshore locations in Southern California.

For more information about California Halibut, visit the CDFW website at *wildlife.ca.gov/Conservation/Marine/NCCFRMP/Halibut-Studies*.

California Spiny Lobster – The 2016-17 lobster fishing season saw nearly 670,000 pounds of lobster landed by the commercial fishery, a 16 percent decline from the previous season. The 2016-17 recreational lobster season saw a lobster report card return rate of 50 percent. The estimated catch for the recreational fishery was approximately 271,000 pounds, or 29 percent of the total (commercial plus recreational) catch.

New regulations for the commercial and recreational fisheries went into effect on April 1, 2017, to implement the Spiny Lobster Fishery Management Plan. Regulation changes include a new commercial lobster trap limit and trap tag program as well as new recreational gear marking requirements beginning with the 2017-18 season. Staff answered a variety of questions from the public regarding the new trap tag program and regulations.

Staff observed a decline in commercial catch-per-unit-effort (CPUE). For the 2016-17 season, the average catch was 0.41 legal-sized lobster per trap pull, while the 2015-16 season average catch was 0.47 legal-sized lobster per trap pull. Staff also observed a significant shift in commercial fishing effort to the Santa Barbara-Ventura area and the northern Channel Islands from the rest of southern California. Further adjustments within the commercial fishery are expected with the implementation of the new trap limit. Staff will continue to monitor and manage the fishery as prescribed by the Spiny Lobster Fishery Management Plan harvest control rules, in response to changes in the fishery and ocean conditions.

As part of the continuing effort to implement the Spiny Lobster Fishery Management Plan, staff and a team of CDFW Natural Resource Volunteers completed a first-ever survey of lobster report card purchasers to help evaluate report card data. The survey concluded that while report card data provide a reliable estimate in terms of catch, overall effort may be underestimated. Staff will assess how future surveys can be refined to improve effort estimates for the recreational fishery.

Due to human health concerns caused by high levels of domoic acid in lobster, waters around Anacapa Island, Ventura County, the east end of Santa Cruz Island, Santa Barbara County were closed to the commercial take of spiny lobster on October 24, 2017, as recommended by state health agencies. Staff coordinated with the California Department of Public Health and the Office of Environmental Health Hazard Assessment to inform the public and commercial fishery participants of the area

closures via press releases and updates on the CDFW California Spiny Lobster website. Staff provided lobster samples to the California Department of Public Health from November to December. The commercial spiny lobster fishery closure was lifted on January 25, 2018.

For more information about California spiny lobster, visit the Marine Region website at *wildlife.ca.gov/Conservation/Marine/Invertebrates/Lobster*.

Clams – Northern California supports active recreational clam fisheries that primarily target Pacific gaper clam. CDFW conducted four days of creel surveys in the spring of 2017 at Tomales Bay, the largest site in the fishery. Samplers conducted 114 interviews and measured 6,496 clams of eight different species, with Pacific gaper clams making up 92 percent of the catch. Samplers also interviewed clammers at Bodega Harbor (Bodega Bay) on the same low tide, conducting 57 interviews and measuring 1,035 clams comprised of eight species. Both Pacific gaper clams and Washington/butter clams (*Saxidomus nuttalli*) were targeted at Bodega Harbor, with the two species accounting for 63 percent and 23 percent of the catch, respectively.

Razor Clams – The recreational razor clam fishery closure in Humboldt and Del Norte counties continued in 2017 due to high levels of domoic acid. Staff and volunteers carried out opportunistic sampling during good weather windows and minus tides throughout the year. In Humboldt County, samples were collected monthly during the first part of the year where tissue samples continued to exceed the alert level for domoic acid of 20 parts per million (ppm). Samples were generally greater than 100 ppm. During the last two months of the year, samples tested high with many clams over 100 ppm and one sample testing as high as 390 ppm. In Del Norte County, samples were only collected in November and all tested above 100 ppm.

For more information about clams, visit the Marine Region website at *wildlife.ca.gov/Conservation/Marine/Invertebrates/Bivalves*.

Diving Safety Program – CDFW divers completed more than 3,000 scuba dives in 2017, which equaled 63 days of bottom time. This is the greatest level of diver activity recorded in more than 10 years. Driving the increased activity were law enforcement staff conducting patrol-related diving work, and biological staff continuing research and monitoring efforts for fisheries management and conservation work. CDFW divers also participated in annual continuing education and requalification workshops held at three locations statewide. In addition, six new candidates qualified as CDFW scientific divers following successful completion of the 100-hour CDFW training held at Catalina Island. The year also saw an unprecedented level of collaboration underwater among universities and agencies, with nineteen organizations providing more than 70 visiting divers to CDFW for collaborative field projects.

For more information about the Diving Safety Program, visit the CDFW website at *wildlife.ca.gov/Conservation/Marine/Diving-Safety*.

Dungeness Crab – Although the commercial fishery began on time at the start of the 2016-17 Dungeness crab season, some areas continued to be subject to domoic acid delays, with the last area opening to fishing on January 16, 2017. The California Fish and Game Commission, in consultation with the California Department of Public Health and the Office of Environmental Health Hazard Assessment, recommended opening the recreational fishery on time with a health advisory in place for these same areas. Commercial landings for the season, at 22.7 million pounds, are the highest in recent seasons. However, 2016-17 landings are only slightly above the 10-season average of 18.4 million pounds. Both management areas, divided at the Sonoma/Mendocino county line, contributed equally to the 2016-17 landings total.

Razor clam tissue samples tested by the California Department of Public Health continued to exceed the alert level for domoic acid in 2017, and the fishery remained closed.
CDFW photo by J. Ray

Fisherman brings aboard a pot full of Dungeness crab
CDFW photo

A new approach to declaring fishery delays and closures was enacted by the adoption of California Fish and Game Code Section 5523 on January 1, 2017. The new legislation authorizes the CDFW Director to close and restrict any fishery in state waters if the Director of the Office of Environmental Health Hazard Assessment, in consultation with the California Department of Public Health, determines that any species of fish is likely to pose a human health risk due to high levels of toxic substances. Conversely, when the Office of Environmental Health Hazard Assessment determines that a health risk no longer exists in a closed area, the CDFW Director must open the fishery and lift any restrictions. With this new authority in place, the Director is responsible for declaring fishery closures for both the recreational and commercial fisheries.

The Dungeness Crab Fishing Gear Working Group met several times throughout the year to continue to focus on whale entanglement risk and reducing interactions with Dungeness crab fishing gear. New research supported by the working group has shown that the presence of certain forage species can be predicted by observing ocean conditions. If conditions are optimal for krill, the preferred forage species for humpback whales, the whales will feed offshore and potentially have a lower risk of interacting with Dungeness crab gear, which is set near shore. However, if the whales switch to anchovies because ocean conditions favor anchovies over krill, whales will feed closer to shore and entanglement risk will likely increase.

This new information prompted the group to create the Risk Assessment Mitigation Program as a risk assessment tool that uses scoring factors such as whale presence, forage species and fishing effort at key time periods during the fishing season to assess whale entanglement risk and provide the fleet with management measures that adaptively respond to increased risk scenarios. The Dungeness Crab Fishing Gear Working Group began piloting the Risk Assessment Mitigation Program at the start of the 2017-18 season in November, with the intention of incorporating it as a permanent strategy to combat whale entanglements in the Dungeness crab fishery.

In addition, the Dungeness Crab Fishing Gear Working Group released an updated Best Practices Guide for the current fishing season. The Guide raises awareness within the fishing fleet by highlighting voluntary measures that fishermen can observe, such as maintaining gear in good working condition and shortening surface lines, in an effort to reduce the risk of whale entanglements.

No delays occurred in the Central Management Area (south of the Sonoma/Mendocino county line) for the start of the 2017-18 commercial season, while the Northern Management Area was delayed due to pre-season quality test results indicating that crab were not yet filled out following the molting period. The area opening was delayed until January 15, 2018, the latest the season can be delayed by poor quality test results. By that time, any northern California health advisories for the recreational fishery due to domoic acid had cleared, so the commercial season was not further delayed.

In 2017, staff sampled two locations in central California daily for Dungeness crab larvae during the spring months. These samples contained the lowest cumulative totals yet recorded in the 11-year time series. The data collected from the sampling is helping CDFW scientists understand the recruitment dynamics of the crab fishery. This was also the fifth year of collaboration with California State University Monterey Bay undergraduates, who conducted the sampling at Moss Landing.

For more information about Dungeness crab, visit the CDFW website at *wildlife.ca.gov/Crabs*.

Giant Red Sea Cucumber and Ridgeback Prawn – Staff continued to assist in assessing the spatial distribution of trawl activity to inform the essential

fisheries habitat knowledge base, and other conservation area designations. Staff also continued to assist NOAA Fisheries with observation of invertebrate trawl activities.

For more information about giant red sea cucumber and ridgeback prawn, visit the CDFW Invertebrates web pages at *wildlife.ca.gov/Conservation/Marine/Invertebrates*.

Giant Sea Bass – Staff completed analyses that assessed the incidental catch of Giant Sea Bass in both the recreational and commercial fisheries. Although prohibited to take since 1981, regulations allow one Giant Sea Bass to be retained per vessel when incidentally caught in gill nets. Giant Sea Bass incidental gill net catch has declined dramatically since 1994 when gill netting was banned in state waters, and has continued to decline with decreasing gill net fishing pressure.

For more information about Giant Sea Bass, read this chapter in the CDFW *Status of the Fisheries* report.

Kelp and Other Marine Algae – Staff continued work on commercial kelp and other marine algae rulemaking activities, including: providing notification of the rulemaking to Tribes, kelp harvest permittees, and interested stakeholders; researching marine algae life histories and sustainable harvest methods; presenting updates to the California Fish and Game Commission's Marine Resources and Tribal committees, and meeting with the InterTribal Sinkyone Wilderness Council to discuss Tribal concerns regarding the rulemaking.

Staff finalized the 2016 aerial kelp survey shapefiles and posted them on CDFW's MarineBIOS, a marine and coastal data viewer. The 2016 aerial kelp survey data was also featured in a CDFW *Science Spotlight* article.

Staff provided reviews and feedback on various projects involving kelp and marine algae, including a request from Catalina Sea Ranch to collect giant kelp, *Gracilaria*, and dulse for their offshore mariculture farm, and review of The Bay Foundation's urchin suppression/kelp restoration study at Palos Verdes. Letters of Authorization were issued to the Wrigley Institute of Environmental Studies to outplant kelp for a biofuel study, and to the Partnership for the Interdisciplinary Studies of Coastal Oceans to conduct ongoing *Fucus* sp. transplant and restoration work in San Francisco Bay.

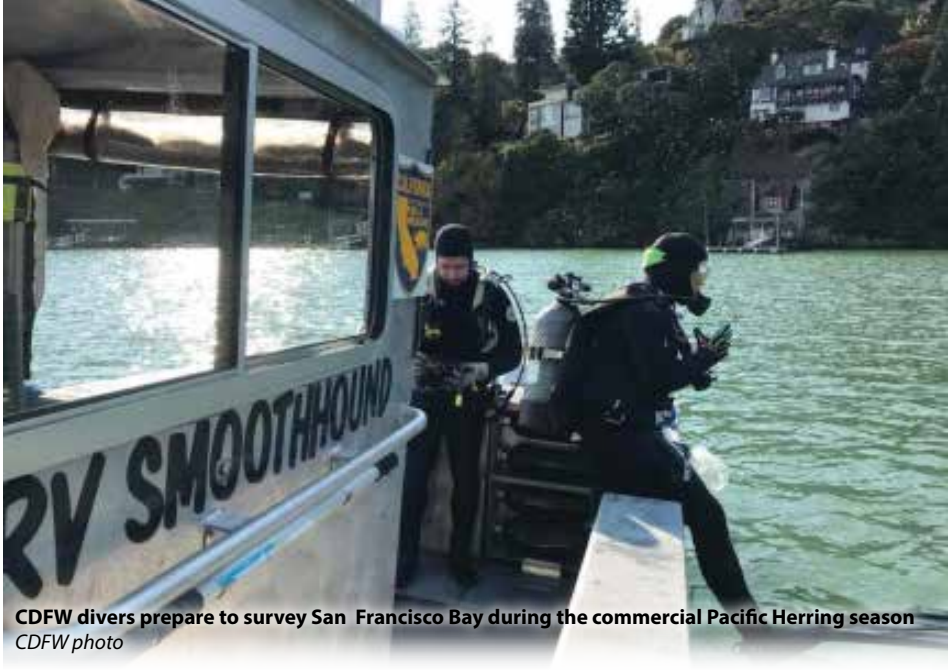
For more information about kelp and other marine algae, visit the CDFW website at *wildlife.ca.gov/Conservation/Marine/Kelp*.

Marine Aquaculture – Staff compiled a variety of aquaculture-related data in response to multiple Public Records Act and other requests. With assistance from the Environmental Review and Water Quality Project, staff completed several lease inspections to document existing aquaculture infrastructure in Tomales Bay, in an effort to develop a baseline map for clean-up cost estimates for all state-managed leases. Staff engaged in a California Fish and Game Commission rulemaking effort to develop best management practices for mariculture activities in the state, and participated in a stakeholder meeting at Tomales Bay. Staff processed, reviewed, and approved 52 Live Importation Permits, reviewed and approved 60 Aquaculture Registrations and one Private Stocking Permit, prepared four Wild Broodstock Collecting Permits, prepared four Letters of Authorization, and reviewed and approved eight Restricted Species Permits.

For more information about marine aquaculture, visit the CDFW website at *wildlife.ca.gov/Conservation/Marine/ABMP/Aquaculture*.

Marine Life Management Master Plan – In collaboration with Tribes and stakeholders, CDFW continued to make progress on the amendment of the Marine Life Management Act (MLMA) Master Plan for Fisheries. A series of stakeholder discussions via webinars and informational updates at Marine Resources Committee and Fish and Game Commission meetings were held

Giant red sea cucumber
photo by C. Bauder



CDFW divers prepare to survey San Francisco Bay during the commercial Pacific Herring season
CDFW photo

to inform the development of the draft framework for MLMA-based management, the draft 2018 Master Plan, and associated Information-gathering projects. Feedback from Tribes was solicited through letters and updates at the Commission's Tribal Committee meetings. An initial draft of the 2018 Master Plan was released for Tribal and stakeholder review and comment in Fall 2017. It is anticipated the Commission will adopt the 2018 MLMA Master Plan in mid-2018.

For more information about the MLMA Master Plan amendment process, visit the CDFW website at *wildlife.ca.gov/Conservation/Marine/MLMA/Master-Plan*.

Ocean Resources Enhancement and Hatchery Program – In collaboration with California Sea Grant, staff completed the multi-year evaluation of the Ocean Resources Enhancement and Hatchery Program. The evaluation report concluded that while the program has significantly contributed to the scientific understanding of marine enhancement science, it has not substantially increased the abundance of legal-sized White Seabass. The information generated by the program can be used as a learning experience for enhancement of wild populations, whether focusing on White Seabass or other species. CDFW will use this information along with public input to guide decisions regarding the future of the program. Additionally, staff worked with the CDFW's Office of General Council, Redondo SEA Lab, and the King Harbor Growout Facility to update the memorandum of agreement to allow continued use of the SEA Lab's facility for White Seabass growout.

For more information about the Ocean Resources Enhancement and Hatchery Program, visit the CDFW website at *wildlife.ca.gov/Conservation/Marine/ABMP/OREHP*.

Pacific Hagfish – Program staff sampled the Pacific Hagfish fishery at Port San Luis, Morro Bay, Moss Landing, and Eureka. Despite market demand fluctuations, commercial landings for Pacific Hagfish have remained relatively stable since 2007, ranging from one to two million pounds annually. In 2017, market orders from Korean importers were reduced, causing exporters to place limits on their fishermen or to change practices. While California-caught Pacific Hagfish are normally exported live to Korea, exporters are experimenting with packaging frozen Pacific Hagfish. Effort and demand is driven by external market conditions such as the South Korean economy and the fishing activities of Oregon and Washington.

For more information about Pacific Hagfish, visit the CDFW website at *wildlife.ca.gov/Conservation/Marine/NCCFRMP#29429329-hagfish*.

Pacific Herring – Staff finalized the stock assessment model for the Pacific Herring population in San Francisco Bay, which will be used to support aspects of the Pacific Herring Fishery Management Plan, now in development. Staff continued to work on various aspects of the plan, including: soliciting feedback from permittees through a survey focused on permit structure, developing a collaborative research protocol, considering harvest control rules and a management strategy evaluation, and reviewing an ecosystem model that was developed by the Farallon Institute.

The 2016-17 Pacific Herring season in San Francisco Bay ended with a below average spawning biomass estimate of 18,300 tons. This was the third year in a row below the 40-year average of 49,400 tons, but an increase from the 2014-15 and 2015-16 seasons. There were 13 spawn events throughout the season, with the first recorded spawn of the season on December 14, 2016, and the last recorded spawn on February 27, 2017. The total fishery quota for San Francisco Bay was set at 834 short tons for the 2016-17 season. The gill net fishing fleet landed less

than five percent (37 short tons) of the San Francisco Bay quota during the commercial season. Staff monitored the Pacific Herring spawning population in Humboldt Bay and Crescent City and documented three and two spawn events there, respectively.

For more information about Pacific Herring, visit the Pacific Herring Management News blogsite at *cdfwherring.wordpress.com* and the CDFW website at *wildlife.ca.gov/Fishing/Commercial/Herring*.

Pacific Ocean (Pink) Shrimp – As directed by the California Fish and Game Commission, staff conducted a review of capacity for the northern fishery and presented findings to the Commission's Marine Resources Committee at its November meeting. As part of that review, staff joined their Oregon and Washington fisheries management counterparts, and representatives of the Marine Stewardship Council, to better understand the dynamics of the pink shrimp stock as a whole, seek opportunities for collaboration among the states, and promote potential certification for California. The Commission directed CDFW to propose new regulations to improve management of the fishery without increasing the number of permits at this time. Staff will work to bring a regulatory package to notice within the coming year. Staff also continued to bring fisheries-dependent datastreams up to date.

For more information about Pacific ocean shrimp, read this chapter from CDFW's *Status of the Fisheries* report.

Research Vessel Operations – The R/V *Garibaldi* assisted in a variety of CDFW research studies as well as collaborative studies, from San Diego to Point Conception, including the Channel Islands. The vessel was at sea for 120 days on 32 cruises, traveled 4,165 nautical miles, and used 6,634 gallons of fuel. The R/V *Garibaldi* was in the boatyard for 63 days for routine maintenance and repairs to address hydraulic and steering issues.

An initiative to improve the Marine Region's capacity for research and monitoring was undertaken in 2017. With support from the Ocean Protection Council, the Region moved forward with needed research vessel repairs and replacements, and improvements to scientific diving infrastructure. Improvements to the aging research vessel fleet included:

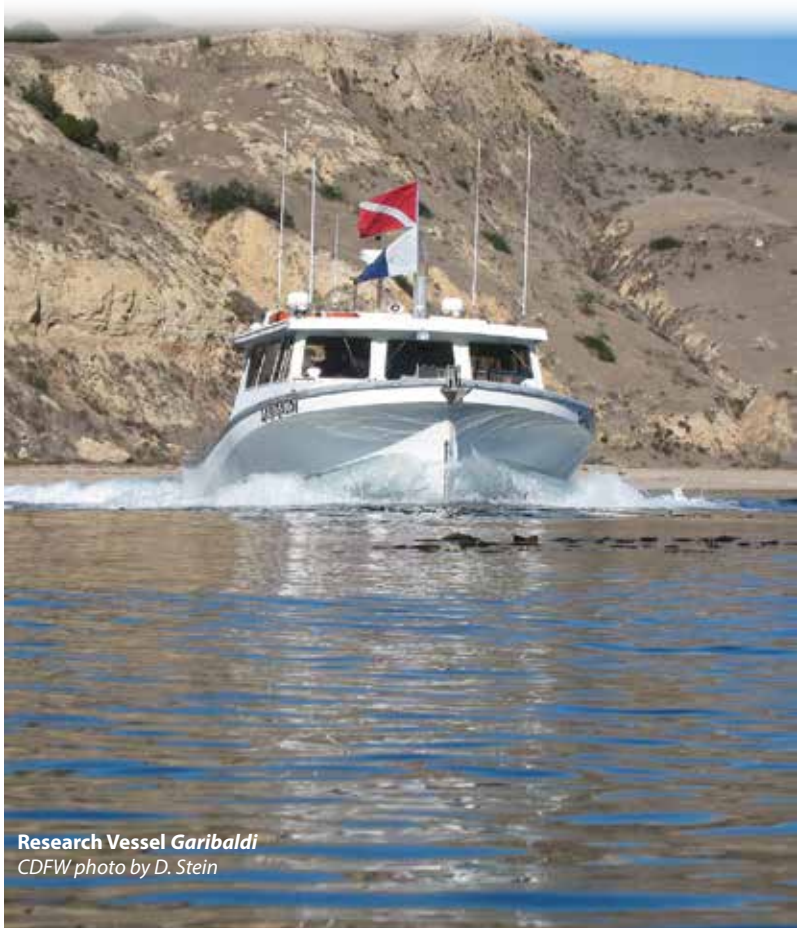
- R/V *Garibaldi*, 45 ft., San Pedro - safety and operational improvements
- R/V *Irish Lord*, 26 ft., Ventura - operational improvements and repower
- New research vessel, 22 ft., San Diego - replaced non-functioning vessel
- New research vessel, 29 ft., Monterey - replaced aging vessel

Support for scientific diving projects was provided by the acquisition of two new breathing air compressor systems. All repairs and acquisitions will be completed and placed into service in 2018 and will be used to support ongoing fishery management and marine protected area monitoring efforts in northern and southern California.

For more information about research vessel operations, visit the CDFW website at *wildlife.ca.gov/Regions/Marine/Projects#29376852-research-vessel-operations-project-rvop*.

Saltwater Angling and Diving Records – Seven new saltwater angling and diving records were accepted in 2017 (previous records in parenthesis):

- **Monkeyface Prickleback** angling record: 6 lb. 6 oz. (6 lb. 1 oz.)
- **Yellowfin Tuna** angling record: 265 lb. 0 oz. (239 lb. 0 oz.)



Research Vessel *Garibaldi*
CDFW photo by D. Stein

Daniel Silveira with his state diving record Bocaccio, the first state diving record for this species
photo courtesy D. Silveira

- **Soupfin Shark** (Tope) angling record: 38 lb. 4 oz. (first state angling record for this species)
- **Blue Rockfish** diving record: 4 lb. 7 oz. (3 lb. 6 oz.)
- **Bocaccio** diving record: 4 lb. 9 oz. (first state diving record for this species)
- **Shortfin Mako Shark** diving record: 484 lb. 4 oz. (426 lb. 0 oz.)
- **Calico Surfperch** angling record: 1 lb. 14 oz. (tie with previous record)

For more information about record saltwater fish and invertebrates, visit the CDFW website at *wildlife.ca.gov/Fishing/Ocean/Records*.

Sea Urchin – Staff worked collaboratively with the California Sea Urchin Commission to propose new sea urchin regulations for the 2018 season. The new regulations are designed to reduce the number of permits from 300 to 150, institute a preference draw system for new entrants, and add Friday to the fishing season from June through October in the southern part of the fishery. In December, the California Fish and Game Commission unanimously adopted the proposed changes. Sea urchin harvest for both the north and south areas of the state are still far below the average catch in the last decade, and staff continue to watch this fishery to determine if additional management measures are necessary.

For more information about sea urchin, visit the Marine Region website at *wildlife.ca.gov/Conservation/Marine/Invertebrates/Sea-Urchin*

Surfperch and Other Surf Fishes – Program staff continued to monitor commercial and recreational surfperch hook-and-line fisheries in central and northern California. Barred Surfperch and Redtail Surfperch continued to dominate commercial landings and recreational catch. The Morro Bay port complex is the hub of the Barred Surfperch commercial fishery, while Redtail Surfperch are landed primarily in Eureka. Preliminary statewide Barred Surfperch annual landings remained above the 13-year average from 2005 to 2017. Improved catches in 2017 south of San Luis Obispo County are attributed to a return to favorable conditions (lower water temperatures) in the Southern California Bight following the 2014-2016 El Niño event. Redtail Surfperch recreational catch and commercial landings continued to trend upward, reaching a 5-year high. Of note, 2017 marked the emergence of a hook-and-line live surfperch fishery in the Fort Bragg port complex. Landings there were comprised of Redtail Surfperch and Calico Surfperch.

Staff continued collecting essential fisheries information using fishery-independent surveys with hook-and-line gear from San Luis Obispo to Mendocino counties and progressive angler surveys to document angler effort along Monterey County sandy beaches. Staff completed a pilot study examining daily growth rings in Redtail Surfperch otoliths in collaboration with Humboldt Area Saltwater Anglers, a sportfishing group. In collaboration with the Marine Science Institute in Redwood City, staff completed the field portion of an age validation study using Barred Surfperch treated with oxytetracycline, an otolith marker. A fluorescence laser microscope was used to observe and photograph the surfperch otoliths at San Francisco State University.

Staff continue to analyze data from a 2007-2009 study of surf fishes in Southern California, when over 400 beach seine hauls were completed. The catch was dominated by surfperches, croakers, and silversides; preliminary

analyses focused primarily on Barred Surfperch, Walleye Surfperch, California Corbina, Spotfin Croaker, and Yellowfin Croaker. Surfperches were more abundant at sites with greater exposure and wave action, while Yellowfin Croaker preferred calmer, more protected sites. Most of these species appear to prefer the low- to mid-range height of the tidal cycle, while tidal flux (ebb/flow) appears to be much less important.

For more information about surfperch and surf fish studies, visit the CDFW website at *wildlife.ca.gov/Conservation/Marine/SCFRMP/Surf-Fish* and *www.wildlife.ca.gov/Conservation/Marine/NCCFRMP/Surfperch-Studies*.

True Smelts – Preliminary commercial Night Smelt landings totaled 289,488 pounds in 2017, increasing just over five percent from 2016. Despite a return to favorable environmental conditions in 2017 with the abatement of the 2014-2016 El Niño, Surf Smelt or "Day Fish" landings continued to decline to an all-time low of 688 pounds, down from 5,854 pounds in 2016—a decline of over 88 percent. Historically, both species were targeted in California from Monterey County to the Oregon border; however, most landings originate in northern California. These fisheries, commercial and recreational, are shore-based. Fishermen use A-frame dip nets for taking Night Smelt and Surf Smelt, although casting nets are now popular for Surf Smelt.

For more information about true smelts, visit the CDFW website at *www.wildlife.ca.gov/Conservation/Marine/NCCFRMP/True-Smelts.*

Warty Sea Cucumber – Staff worked with the commercial dive fishery to develop a seasonal closure to protect spawning groups of warty sea cucumber. The seasonal closure starts in 2018 and extends from March 1-June 14.

Staff completed the fourth consecutive year of dive and laboratory research to collect essential fishery information for warty sea cucumber populations at the northern Channel Islands. Staff performed seasonal dive surveys at six different locations (inside and outside of marine protected areas) to measure seasonal changes in density and to characterize size distributions. To date, 2,182 sea cucumbers have been collected and dissected to determine spawning condition, sex ratio, fecundity, and length/weight relationships. Findings from CDFW research along with other independent monitoring have highlighted concerns about the sustainability of the resource. CDFW plans to monitor populations during the first seasonal closure period to measure the degree to which this new regulation is protecting spawning groups. CDFW is currently prioritizing future management measures that will assist this fishery in reaching sustainable harvest levels.

For more information about warty sea cucumber, read this entry in the CDFW *Status of the Fisheries* report.

White Seabass – Continued collaboration with recreational anglers provided staff with five additional samples for a study updating the age at maturity for White Seabass. Staff have now sampled 31 individual fish. As part of the annual review of the White Seabass Fishery Management Plan for the 2016-2017 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 points of concern had been met. None of the five main points of concern were met for the season and no further action was needed.

For more information about White Seabass, visit the CDFW website at *www.wildlife.ca.gov/Conservation/Marine/NCCFRMP/White-Seabass*.

Using an A-frame dip net to collect samples of Night Smelt in Pacifica, San Mateo County.
CDFW photo by K. Lesyna

State/Federal Marine Species Programs

These programs are responsible for fisheries jointly managed by state and federal entities.

Coastal Pelagic Species (CPS - market squid, anchovy, mackerel, sardine) – In 2017, CPS staff were actively involved with federal fisheries management as members of the Pacific Fishery Management Council and the CPS Management Team. Staff attended meetings and helped prepare reports on topics related to Pacific Sardine harvest specifications, Northern Anchovy management status, the federal acoustic trawl survey methodology review, regulatory provisions for small-scale take of CPS finfish during closures, and exempted fishing permit evaluations. The annual stock assessment for Pacific Sardine resulted in a low biomass estimate resulting in closure of the directed commercial Pacific Sardine fishery for another fishing season. Incidental Pacific Sardine take was allowed in other CPS landings.

In addition, staff from CDFW and the California Wetfish Producers Association conducted the California Coastal Pelagic Species Aerial Survey. Summer surveys occurred between Point Arena and Morro Bay with approximately 350 survey miles flown. The aerial survey was conditionally approved for use in future CPS stock assessments in a methodology review by the Pacific Fishery Management Council. Work next year will help address some of the questions from the review.

For more information about coastal pelagic species, visit the CDFW website at *www.wildlife.ca.gov/Conservation/Marine/Pelagic*.

Groundfish –
Management and Research – Due to active monitoring and management by state and partner agencies and stakeholders, California's sport and commercial groundfish fisheries (which include over 90 species of rockfish, roundfish, ratfish, skates and sharks) remained within prescribed annual catch limits and accountability measures in 2017.

Staff co-authored a stock assessment on California Scorpionfish that showed the stock to be healthy, and recommended harvest levels for upcoming years.

Two important stocks that were previously designated "overfished"— Bocaccio and Darkblotched Rockfish — have rebuilt to healthy levels ahead of schedule.

Rebuilding of overfished groundfish stocks is proceeding more quickly than projected, in part due to strict protections and favorable ocean conditions that resulted in successful reproduction, as well as management and outreach efforts to avoid and minimize discard mortality for species of concern. Only two of the nine overfished stocks are still considered overfished, Yelloweye Rockfish and Cowcod.

Staff provided guidance in development of a federal exempted fishing permit for the trawl fishery to allow targeting of midwater rockfish inside rockfish conservation areas with midwater trawl gear. This exempted fishing permit is expected to provide data that will inform future management changes, including re-establishment of a historical midwater rockfish fishery.

Evan Brunsvold weighs and measures market squid collected in Monterey.
CDFW photo by C. Protasio

Staff participated in an extensive analysis and review of the Trawl Catch Share Program with federal agency partners. The review identified program challenges and areas for future improvement.

In collaboration with federal agency partners, staff provided guidance on final electronic monitoring regulations in the Pacific Whiting midwater trawl, fixed gear, non-Pacific Whiting midwater trawl, and bottom trawl fisheries. This would allow for use of video cameras in lieu of the mandatory 100 percent human observer requirement in the Trawl Catch Share Program. The electronic monitoring program is expected to increase flexibility and reduce operating costs for some of the fleet while still achieving overall program goals.

Cabezon, one of over 90 species of groundfish found off California
CDFW photo by D. Stein

Staff provided analyses to inform two Endangered Species Act Biological Opinions related to take of listed salmon in the Pacific coast groundfish fishery and the Pacific Halibut fishery. Staff also developed recommendations regarding the threshold for incidental catch levels and mitigation measures for 2019-2020, including those that can be implemented in-season to prevent thresholds from being exceeded.

Staff participated in reviews of the non-salmon, Endangered Species Act-listed species in the groundfish fishery. Staff reviewed new analyses to improve bycatch estimates, considered whether Incidental Take Statement amounts were appropriate, and recommended conservation and management measures to minimize bycatch of listed species where appropriate.

In collaboration with federal agency partners and non-governmental agencies, staff provided guidance on alternatives to evaluate modifications for essential fish habitat for groundfish, and adjust the trawl rockfish conservation area. The goal was to minimize adverse effects on sensitive habitat that can occur when fishing with trawl gear, allow increased access to productive fishing grounds, and increase resource-use efficiency.

Staff completed a California Fish and Game Commission regulatory change to modify transfer requirements for Nearshore Fishery Permits and Deeper Nearshore Fishery Permits. Starting in 2018, only one Nearshore Fishery Permit or one Deeper Nearshore Fishery Permit will be required to transfer a permit from one person to another. Previously, the Nearshore Fishery Permit required two permits for transfer, and no transfers were allowed for the Deeper Nearshore Fishery Permit. In the last 14 years, the number of nearshore permits has declined 35 percent due to permit transfers and attrition. These changes will make it easier for new entrants to get into the fishery and older participants to retire.

Staff are leading efforts to incorporate data into stock assessments that has been collected by visual surveys in nearshore waters during remotely operated vehicle studies. Developing a fishery-independent method for determining groundfish abundance in nearshore waters will be useful for many stock assessments. The data could provide estimates of abundance inside marine protected areas where extractive surveys or harvest are prohibited, and help to inform the status of nearshore stocks.

Education and Outreach – With help from the California Recreational Fisheries Survey project, staff completed 30 outreach assignments during season-opening weekends in the Northern, Mendocino, San Francisco and Central recreational groundfish management areas. Staff provided anglers with over 4,500 packets containing the 2017 recreational groundfish regulations, species identification flyers, and information on the CalTIP program. Staff also distributed approximately 100 descending devices (donated for this purpose by the National Marine Fisheries Service) and educated anglers regarding the importance of using a descending device when discarding fish suffering from barotrauma.

For more information about groundfish, visit the CDFW website at *www.wildlife.ca.gov/conservation/marine/groundfish*.

CRFS Sampler Torrey Soland measures Pacific Halibut
CDFW photo by E. W. Roberts III

Highly Migratory Species (tuna, swordfish, etc.) – The CDFW Pelagic Fisheries and Ecosystems Program enhanced quality control procedures for highly migratory species' commercial landings data. Staff developed an automated error-checking program that flags potential outliers within the Commercial Fishery Information System database. Staff participated directly in the Pacific Fishery Management Council process and on the Council's Highly Migratory Species Management Team. Staff provided leadership in pursuing policies and analyzing options to manage highly migratory species fisheries off California.

Staff coordinated with NOAA Fisheries to collect biological samples and monitor commercial and recreational take of Bluefin Tuna in accordance with international treaty agreements. Throughout 2017, staff visited southern California ports to collect Bluefin Tuna samples from five commercial purse seine landings, obtaining biological data from more than 100 fish. Staff collected fin clips for NOAA Fisheries' close-kin mark-recapture genetic testing study. Staff conducted in-season tracking of Bluefin Tuna landing receipts with cooperation from fishery participants.

CDFW staff on the Council's Ecosystem Workgroup developed the next ecosystem initiative, "Climate Shift and Fishing Communities". The initiative will review Council decision-making and how it might be improved to account for increased variability and uncertainty. The initiative is scheduled for completion in 2019.

For more information about highly migratory species, visit the CDFW website at *www.wildlife.ca.gov/Conservation/Marine/Pelagic*.

Pacific Halibut – CDFW continues to actively manage the recreational Pacific Halibut fishery in California waters. The 2017 open season was scheduled for May 1-June 15, July 1-15, August 1-15, and September 1-October 31 dependent upon available quota. However, based on projected early attainment of the 2017 California quota, an in-season fishery closure was implemented on September 11, following discussions with the International Pacific Halibut Commission (IPHC), Pacific Fishery Management Council and National Marine Fisheries Service. Final 2017 recreational catch estimates totaled 30,541 net pounds, 88 percent of the quota. The average net weight per kept fish in 2017 was approximately 19 pounds, one pound greater than the average weight of fish taken in California's 2016 fishery.

In 2017, five vessels participated across three of the opening days in the commercial directed fishery; the preliminary landings were 3,872 net pounds. CDFW staff were present at the offloads to conduct biological sampling in coordination with the IPHC's commercial fishery sampling program.

The IPHC expanded its fishery-independent setline survey into California in 2017, this time surveying southward to waters just north of San Francisco. Previous surveys in 2013 and 2014 in California reached as far south as Cape Mendocino and Point Arena, respectively. CDFW coordinated with the IPHC to ensure survey stations did not impact marine protected areas and other protected areas.

For more information about Pacific Halibut, visit the CDFW website at *www.wildlife.ca.gov/Conservation/Marine/Pacific-Halibut*.

Salmon – Project staff organized the annual California Ocean Salmon Information Meeting, which attracted about 100 interested stakeholders. At the meeting, staff provided information on 2016 ocean salmon fisheries, spawning escapement, stock-specific abundance forecasts, and the outlook for 2017 sport and commercial

ocean salmon fisheries. Members of the public provided input to a panel of California salmon scientists, managers, and representatives for consideration in the development of 2017 ocean salmon regulations.

Project staff involved on the Klamath River Technical Team coordinated with federal, tribal, and other state agencies to consolidate and summarize catch and other survey information on Klamath River fall Chinook Salmon for use in the 2017 management cycle.

Staff participated in the process of drafting 2017 ocean salmon seasons with the Pacific Fishery Management Council and collaborated with federal, tribal, and other state agencies to produce the *Review of 2016 Ocean Salmon Fisheries* report and several other pre-season reports. These documents include information on ocean harvest, inland escapement, abundance forecasts, regulatory season alternatives, and final ocean salmon fisheries regulations.

CDFW and the Pacific Fishery Management Council worked together to take additional actions to protect endangered Sacramento River winter Chinook Salmon, which have been impacted by California's severe drought. Commercial and recreational industry representatives on the Council's Salmon Advisory Subpanel also recognized the need for additional protections. As a result of this cooperation between industry representatives and regulatory bodies, fishing seasons were curtailed to reduce fishery impact rates on this endangered stock.

During the ocean salmon fishing season, recreational and commercial fisheries were monitored at approximately 20 ports along the California coast. In the commercial fishery, staff sampled approximately 12,200 salmon, and collected snouts from more than 2,800 adipose fin-clipped (or "ad-clipped") salmon for subsequent coded-wire tag processing. In the recreational fishery, field staff coordinated with California Recreational Fisheries Survey staff to sample nearly 15,700 Chinook Salmon caught by 17,500 anglers and collect approximately 4,500 heads from ad-clipped salmon. Staff used these sample data to produce annual ocean catch and effort estimates by fishery, management area, and half-month period.

Staff processed approximately 7,500 coded-wire tags from ocean salmon fisheries and uploaded these data, along with their respective catch-sample data, to the Regional Mark Processing Center in Portland, Oregon. Staff and others use these data to determine stock contributions and fishery impacts, information needed to sustainably manage West Coast fisheries and protect California salmon stocks. The majority of salmon caught in California ocean fisheries are of hatchery origin, with almost all fish produced, raised, and released in the Central Valley and Klamath-Trinity river basins. In 2017, over half (54 percent) of the sampled ad-clipped fish were Sacramento River fall Chinook Salmon.

Staff responded to nearly 115 public inquiries received through the Ocean Salmon Courtesy Request Program. Recreational anglers and commercial trollers may request information about ad-clipped salmon sampled by project staff. Based on the unique head-tag number assigned to each fish and submitted by the requestor, staff provided information obtained from the coded-wire tag recoveries, including hatchery of origin, brood year, stock name, run type, release date, and location.

For more information about ocean salmon, visit the CDFW website at www.wildlife.ca.gov/oceansalmon.

A large Chinook salmon caught outside of Bodega Bay
CDFW photo

Resource Assessment Program

This program is responsible for collecting and disseminating recreational and commercial fishery-dependent data.

California Recreational Fisheries Survey (CRFS) – CRFS field operations are supported by 15 permanent staff and, on average, 75 temporary Fish and Wildlife scientific aids. CRFS collected data on the catch of over 138,000 angling parties in 2017. Those anglers caught about 577,000 fish and invertebrates, and CRFS samplers examined nearly 196,000 of the retained fish and invertebrates. In addition, CRFS samplers measured almost 100,000 fish. CRFS staff entered the data collected during the field surveys into the CRFS data system (see *Recreational Fisheries Data Project*, pg. 19).

California Recreational Fisheries Survey Outreach – CRFS field staff provide outreach to the recreational fishing community by sharing informational materials on sportfishing regulations, species identification, marine protected areas, barotrauma and the use of descending devices, whale entanglement, and domoic acid. In addition, staff solicited volunteers for the NOAA Fisheries National Economic Survey conducted by CIC Research Inc. For more information about the California Recreational Fisheries Survey, visit the CDFW website at *www.wildlife.ca.gov/Conservation/Marine/CRFS*.

Marine Fisheries Statistical Unit – Staff collects, processes, and audits commercial fishery landings data, including landing receipts, commercial passenger fishing vessel logbooks, spiny lobster logbooks, and transportation receipts. Staff design, order, and distribute all paper landing receipts and commercial passenger fishing vessel logs for our constituents. In addition, Marine Fisheries Statistical Unit staff process all commercial fishery data requests received from commercial fishing license holders and other authorized requestors. The Marine Fisheries Statistical Unit received and keyed approximately 53,000 commercial landing receipts for 2017.

CRFS Sampler Cari Williams recording data.
photo by E. W. Roberts III

For more information about the Marine Fisheries Statistical Unit, visit the CDFW website at *www.wildlife.ca.gov/Conservation/Marine/MFSU*.

Pacific Recreational Fisheries Information Network (RecFIN) – The Marine Region submits all CRFS estimates to RecFIN on a monthly basis. RecFIN provides a centralized data system to house recreational fisheries information from California, Oregon, and Washington. CRFS and Recreational Fisheries Data Project staff represented California on the RecFIN Technical Committee and Data and Technology Subcommittee, and chaired the Statistical Subcommittee. Through these committees, staff support RecFIN efforts to coordinate the coastwide collection of marine recreational finfish data and procedures for estimating catch, effort and participation. CRFS and the Recreational Fisheries Data Project also collaborated with RecFIN programmers validating estimates and routines on the new RecFIN database, which was launched in spring, 2017.

For more information about RecFIN, visit their website at *www.recfin.org*.

Recreational Fisheries Data Project – The Recreational Fisheries Data Project and Data and Technology Division staff continued to develop and maintain a data system for CRFS catch, effort, and biological and spatial data and estimates.

The system includes a centralized relational database to store information, a data entry system with built-in error checks, validation routines to improve data accuracy, and automated reports. The data system increased CDFW efficiency, improved data accuracy and provided the flexibility to align data capture with changing management needs.

CRFS data and estimates are essential for managing California's diverse marine fisheries. CDFW, the California Fish and Game Commission, the Pacific Fishery Management Council, the International Pacific Halibut Commission and National Marine Fisheries Service used CRFS data and estimates for fishery management in 2017. These uses included: in-season monitoring for species of concern such as Cowcod, Yelloweye Rockfish and Pacific Halibut; developing harvest guidelines; conducting regulatory analyses, and making other critical management decisions. CRFS data and estimates were used in stock assessments conducted in 2017 for Blue Rockfish, Bocaccio, California Scorpionfish, Cowcod, Lingcod, Yelloweye Rockfish and Yellowtail Rockfish. In addition, CRFS data were used for spatial planning and evaluation of marine protected areas.

Improving Data Systems – In addition to the recreational fisheries data system described above, CDFW's Marine Region and Data and Technology Division have made progress on developing two very important commercial fisheries data systems: the Marine Log System and the Marine Landings Database System. These data systems will provide CDFW with modern fisheries-dependent data systems that ensure secure, centralized, and easily accessible data. The goal is to move towards electronic reporting such that near real-time data will be available for fishery managers to use in decision making. The e-log application continues to be improved as enhancements are implemented. In 2017, 19,250 commercial passenger fishing vessel logs were submitted electronically. This represents approximately 60 percent of the 33,954 commercial passenger fishing vessel logs submitted in 2017. There are 239 commercial passenger fishing vessels and 316 operators signed up to submit logs electronically.

Development of the Marine Landings Data System is now in its final phase, and initial implementation will take

CRFS Sampler Travis Massey
photo by E. W. Roberts III

place by July 1, 2018. The Marine Landings Data System will replace the Commercial Fisheries Information System and will integrate with the federal commercial fisheries reporting system known as E-Tix, which is required for the groundfish trawl individual quota program and for all sablefish landings. The benefits to fish businesses will be the use of a single reporting system to meet both state and federal reporting requirements for all landings. Benefits to CDFW staff include a data warehouse and a robust set of reports to extract and analyze Marine Landings Data System data.

Statistical and Technical Support – Recreational Fisheries Data Project staff provided statistical and technical support to various projects related to the management and restoration of fish stocks. These included:

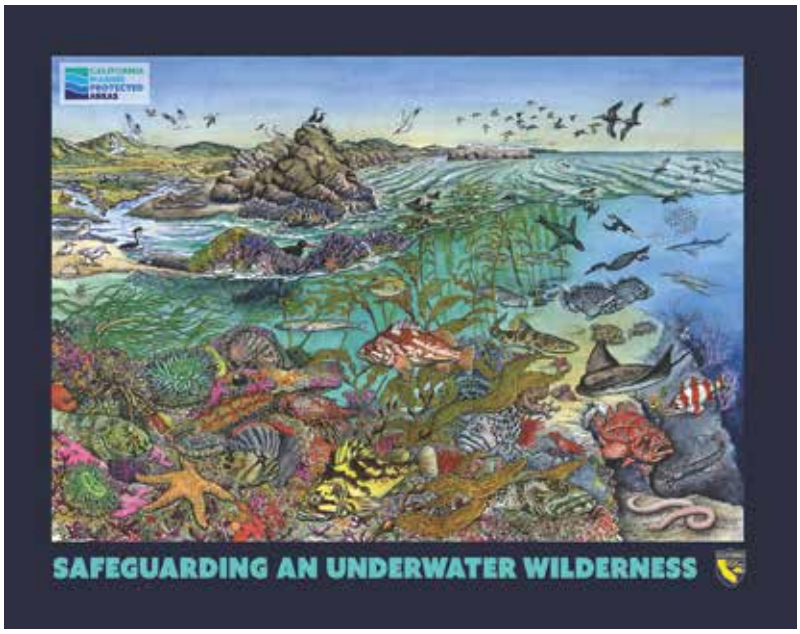
- Providing advice on use of CRFS data and estimates
- Conducting GIS analyses using CRFS spatial data and reviewing spatial analyses conducted by other researchers (for example, see MarineBIOS)
- Providing data and data summaries to various CDFW projects, stock assessors, university researchers, graduate students, and the U.S. Navy
- Providing statistical advice on survey design and estimation procedures for sardine biomass aerial surveys
- Updating the CRFS methods document, which provides the sampling design, survey methods and estimation procedures for each of CRFS' eight component surveys.

For more information about the Recreational Fisheries Data Project, visit the CDFW website at *www.wildlife.ca.gov/Conservation/Marine/Recreational-Fisheries-Data*

Habitat Conservation Program

Environmental Review – In 2017, the Environmental Review and Water Quality Project continued to work on a wide variety of statewide plans, permits, and projects. Staff participated in over 65 pre-project review meetings and reviewed over 650 environmental documents. The review effort included over 80 California Environmental Quality Act documents, 180 U.S. Army Corps of Engineers Public Notices, 175 monitoring reports, 35 invasive species survey reports, and 60 permits from various agencies. Topics reviewed included: wave energy, desalination plant impacts, power plant impacts, dredging impacts, beach nourishment projects, contaminant site remediation, mitigation projects, California Endangered Species Act impacts, Tribal concerns, State Water Resources Control Board policy review, artificial reefs, mitigation proposals, eelgrass restoration, invasive species control projects, Scientific Collecting Permits, aquaculture projects, and dock and pier construction impacts. In addition, staff participated in the review and development of several U.S. Navy, U.S. Marines and U.S. Air Force Integrated Natural Resource Management Plans.

For more information about environmental review, visit the CDFW website at *www.wildlife.ca.gov/Regions/Marine/Projects#29376850-environmental-review-and-water-quality-project*



Marine Protected Area Habitats and Species Most Likely to Benefit poster

Statewide Marine Protected Area (MPA) Management – The Statewide MPA Management Project facilitates the monitoring and ongoing adaptive management of California's MPA Network to meet the goals of the Marine Life Protection Act. The California MPA network is the largest scientifically designed MPA network in North America, including 124 MPAs and 15 special closures encompassing approximately 16 percent of state waters.

Outreach and Education – In 2017, efforts continued to focus on encouraging compliance with MPA regulations, including increasing public understanding and awareness of California's MPA network. Regional MPA guidebooks and brochures with MPA-specific maps and regulations and MPA network posters were distributed at public presentations, outreach events, distribution locations, and by request. Staff also presented information about MPA management and research activities at many academic, public, Tribal, and agency events in 2017.

Staff responded to email correspondence, wrote MPA-related articles for NOAA Fisheries, the MPA Collaborative Network, and CDFW blogsites, reviewed onsite MPA signage produced by partners, and helped to develop MPA video-conferencing classroom programs. Staff also spearheaded efforts to produce an MPA informational video, a poster highlighting the habitats and marine life likely to benefit from MPA protection, and a comprehensive MPA network brochure, for planned distribution in 2018. Staff also increased participation in MPA Collaborative Network meetings and launched a new MPA Management Program listserv to help stakeholders stay informed of MPA management activities.

Monitoring and Research – CDFW, the Ocean Protection Council, and the California Fish and Game Commission collaboratively led the MPA Monitoring Program, which consists of two phases- Phase One: Regional Baseline Monitoring, and Phase Two: Statewide Long-Term Monitoring.

South Coast: In March, CDFW and partners held five community gatherings in each of the South Coast's counties (Santa Barbara, Ventura, Los

Angeles, Orange, and San Diego), to share and discuss baseline information and next steps.

North Coast: Key products developed for Phase One in the North Coast include peer-reviewed technical reports, completed by each of the baseline projects in the spring, the *State of the California North Coast* report, and the North Coast MPA Monitoring Plan. In November, CDFW and partners also held community gatherings in Crescent City, Eureka, and Fort Bragg to share and discuss baseline information and next steps. The final step for Phase One in the North Coast is for CDFW to inform the Commission about the state of the North Coast MPAs, including the initial five-year management review, anticipated for early 2018.

Researchers from CDFW and UC Santa Cruz, with help from local volunteers, conduct rocky intertidal long-term monitoring at Del Mar Landing State Marine Reserve.
photo by D. Lohse

With the completion of Phase One for all regions, CDFW, the Ocean Protection Council, and the Commission began to develop Phase Two: Long-Term Monitoring. Phase Two will leverage cost-effective and sustainable strategies for long term MPA monitoring to evaluate the efficacy of the statewide MPA network relative to Marine Life Protection Act goals. In partnership with the Ocean Protection Council, staff began to develop the Statewide MPA Monitoring Action Plan which will draw from regional baseline monitoring, and incorporate additional expert input and analyses, peer review, and public input to identify long term monitoring priorities and strategies. Staff worked with partners to develop quantitative and expert approaches to inform the Statewide MPA Monitoring Action Plan. These approaches included co-mentoring three UC Davis post-doctoral researchers, and tailoring the Regional Oceanographic Modeling System with researchers at UC Santa Cruz to help prioritize monitoring sites.

In collaboration with the Partnership for Interdisciplinary Studies of Coastal Oceans and Reef Check California, CDFW research vessels and scientific divers conducted subtidal nearshore census counts to assist those organizations in implementing state-funded MPA monitoring work in the central, north central, and south coast regions. Staff also participated in rocky intertidal MPA long-term monitoring surveys in the north central and central coast regions, and assisted the National Parks Service with their annual kelp forest monitoring cruise within the Channel Islands National Park off the south coast.

Policy and Permitting – Staff continued to represent CDFW on the MPA Statewide Leadership Team, an advisory body convened by the Ocean Protection Council to ensure communication and collaboration among entities that have significant authority, mandates, or interests that relate to the MPA network. Notable MPA Statewide Leadership Team accomplishments in 2017 included formalizing the state's partnership with the MPA Collaborative Network through signing a Memorandum of Understanding, and working with California Tribes to include Tribal representation on the Leadership Team.

In April 2017, staff presented a five-year management review regarding the south coast MPAs along with the *State of the California South Coast* report to the Commission. CDFW recommended that no regulatory changes be made at that time, given that baseline monitoring data can only provide a characterization of conditions and not an assessment of MPA efficacy. However, staff provided recommendations to help effectively manage and facilitate adaptive management of the MPA network based on lessons learned from baseline monitoring.

CDFW staff and the Ocean Protection Council's Science Advisory Team developed an ecologically based decision framework that uses an ecological impact assessment tool to estimate impacts of scientific collecting in MPAs. The goal of this work is to shield MPAs against cumulative impacts from educational and research activities. The Science Advisory team published a technical report detailing the four steps used to inform permitting decisions for scientific research within MPAs. Beta testing of the assessment tool on a variety of MPA-related projects is ongoing, and full implementation will take place by the end of 2018.

For more information about California's marine protected areas, visit the CDFW website at *www.wildlife.ca.gov/MPAs*

Administration

Marine Region administrative staff bind together all the working parts of the expansive Marine Region, which extends from the border with Mexico all the way to the Oregon state line, through administrative guidance and support. It is no easy task. Administrative staff work tirelessly behind the scenes to support Region staff and make sure they have the tools they need to get the job done.

Administrative staff help to hire all of the Marine Region's temporary and permanent staff, manage storage and office facilities for staff and vessels, procure all supplies for field work, scientific cruises, offices and laboratories, and track and process all out-of-state travel and training requests, while managing and staying within the Region's budget.

Administrative staff also help various staff conform to state laws and CDFW policies as they work to achieve their project goals. From San Diego to Crescent City, Marine Region scientists, biologists, and others rely on the services provided by Marine Region administrative staff — without whose help it would be a much tougher job to protect, maintain, enhance, and restore California's marine ecosystems for all to enjoy.

Marine Region Mission: 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.

For more information about CDFW's Marine Region, visit the CDFW website at wildlife.ca.gov/regions/marine