

2014 CALIFORNIA LEGISLATIVE FISHERIES FORUM

Annual Marine Fisheries Report



F/V Hyak fishing herring along the Sausalito waterfront. Photo: R. Bartling, CDFW



Prepared by
Department of Fish and Wildlife
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Executive Summary

There are over 250 species of finfish and invertebrates that comprise California's coastal commercial and recreational fisheries. Commercial fishery landings can be grouped into five main types: Pacific salmon, groundfishes, coastal pelagic fishes, highly migratory fishes, and invertebrates. Within these five broad groupings, there are about 17 recognized fisheries, including approximately 145 species of finfish and invertebrates that have a history of directed management actions and consistently account for large commercial landing volumes and values.

Management of California's marine fisheries is coordinated among the multiple lead regulatory entities including the State Legislature, the California Fish and Game Commission (Commission), the Department of Fish and Wildlife (Department), and the Federal Government. State fisheries management policy is guided by the Marine Life Management Act (MLMA) and focuses on sustainable use, conservation (including habitat protection), rebuilding depressed stocks, preventing overfishing, and establishing a scientific foundation for management decisions. Federal fisheries management is guided by the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Fishery management plans (FMPs) are a fundamental mechanism for implementing management policies of the MLMA and MSA. To date, eight FMPs have been adopted pursuant to the MLMA and MSA, which in combination encompass well over 100 different species. The Department is also nearing completion of a spiny lobster FMP, which has been a multi-year collaborative process, due for consideration by the Commission in 2015. Numerous other fisheries are actively managed without an FMP, and in those cases the same standards of sustainability, conservation, and science-based information are applied. The result is that the majority of California's marine fisheries are sustainably managed, and for those comparatively few that have been found to be depleted, such as the southern California abalone species, recovery efforts have been the overriding management objective.

The Department periodically produces fishery status reports documenting the health of California's fisheries and the effectiveness of regulatory measures. Regulatory changes are routinely recommended, if warranted, in response to new information and changing fishery conditions. Management considerations include the life history and biology of the species being harvested, stock population dynamics and abundance, the size and growth characteristics of the fishery, the vessels and gear used in the fishery, and impacts to the industry and local communities. Typical management measures include seasonal closures, size limits, fishing area and gear restrictions, permit limits, and specific catch limits. Regulations are crafted using different combinations of these and other tools in order to provide conservation safeguards and reduce the risk of overexploitation, while at the same time not overly limiting access for recreational anglers and commercial fishermen.

- **In 2013, preliminary statewide commercial landings totaled 361 million pounds worth \$257 million to fishermen. In 2012, the most recent complete year for commercial fishing records, 352 million pounds of finfish and shellfish were landed in California ports worth \$232 million to fishermen, with a total economic output of \$472 million and 9,500 jobs¹²³. Market squid accounted for 215 million pounds valued at \$64 million ex-vessel and Dungeness crabbers landed 26 million pounds valued at \$86 million ex-vessel.**
- **Marine recreational fishing activities support approximately 10,000 full- and part-time jobs in California and contribute \$2.8 billion to the California economy annually⁴.**

Some highlights in marine resources management during the past 12 months include the abalone, spiny lobster and Dungeness crab fisheries. Other important fisheries which show evidence of sustainability under present management include Chinook salmon and Pacific herring. For example, over the past four seasons the herring population has shown signs of recovery following a historic population low of 4,800 tons during the 2008-09 spawning season. The population rebounded during the 2009-10 season to 38,400 tons, increased during the 2010-11 season to 57,100 tons, and increased again in the 2011-12 season to 61,000 tons. The most recent biomass estimate during the 2012-13 season was 79,500 tons, well above the historical average (1979-80 season to present) of 52,000 tons.

Statewide commercial salmon landings (number of Chinook) and total fishing effort (boat-days fished) increased in 2013 compared to 2012. The commercial fleet landed 1,900 tons of dressed Chinook (297,400 fish) during 17,300 boat-days fished in 2013; compared to 1,300 tons of dressed Chinook (215,600 fish) during 14,500 boat-days fished in 2012.

In 2012, the Department and industry collaborated on creating the implementing rules necessary for the Dungeness crab trap program developed pursuant to SB 269 (Evans). The trap program went into effect during the 2013-14 season and thus far appears to have proceeded without significant problems. The industry and Department will meet in April 2014 as the Dungeness Crab Task Force begins evaluating the program in preparation for a report back to the Legislature.

Department subtidal SCUBA surveys at index sites along the northcoast revealed red abalone populations to be below the threshold for management action established in the Abalone and Recovery and Management Plan (ARMP). The

¹ California Fisheries Information System, CDFW, 2014

² Economic Structure of CA Commercial Fisheries. CDFG, 2009.

<http://www.dfg.ca.gov/marine/economicstructure.asp>

³ U.S Bureau of Economic Analysis (2014). www.bea.gov

⁴ National Marine Fisheries Survey. 2012. Fisheries Economics of the United States, 2011. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-F/SPO-128. 175 p.

http://www.st.nmfs.noaa.gov/economics/publications/feus/fisheries_economics_2011

areas of greatest concern were along the Sonoma County coast and were brought about by a combination of a severe 'red tide'-like event in the fall of 2011 and heavy fishing pressure at popular fishing access points. Department staff recommended the Commission reduce sport abalone catch by 25 percent, based upon the management framework prescribed in the ARMP. In response, the Commission adopted a series of regulation changes, including lower annual limits, to reduce catch as prescribed in the ARMP.

This report highlights selected California recreational and commercial fisheries with the most up to date information through 2013.

Fisheries Reports

PACIFIC SALMON

The Pacific Fishery Management Council's (Council) Salmon FMP was developed in 1977 and was the first FMP implemented by this entity. Each year, the Council develops management measures that establish fishing areas, season dates, harvest quotas, legal fishing gear, minimum size lengths, and possession and landing restrictions for salmon fisheries in federal waters off California, Oregon, and Washington. These measures must meet the goals of the FMP that address spawning escapement needs, allow for freshwater fisheries, allow for Federally-recognized Tribal fishery rights, in addition to meeting the needs of salmon species listed under the federal Endangered Species Act (ESA). Of the five species of Pacific salmon found on the West Coast, Chinook and coho are most frequently encountered off California; however, the retention of coho salmon has been prohibited in all California fisheries since 1993.

Reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act and federal guidelines on Annual Catch Limits and Accountability Measures required changes to the Salmon FMP in 2011. Amendment 16 to the Salmon FMP features an updated science-based conservation objective for Klamath River fall Chinook (KRFC), guidelines for establishing ocean fisheries during periods of very low salmon abundance, and provides clear definitions of reference points to be used by the Council to determine the status (e.g., overfished, rebuilt) of specific salmon stocks. The new requirements of the FMP were implemented in 2012.

The ESA requires that the National Marine Fisheries Service (NMFS) assess the impact of ocean fisheries on listed salmon populations and develop standards that avoid the likelihood of jeopardizing their continued existence. Sacramento River winter Chinook (SRWC), Central Valley spring Chinook, California Coastal Chinook (CC-Chinook), and all California coho salmon stocks are listed under federal and state ESAs. Consequently, the Commission, the Council, and the National Marine Fisheries Service (NMFS) have developed management objectives to reduce fishery impacts on these stocks.

Since the late 1980's, California ocean salmon fisheries have been constrained to reduce impacts on ESA-listed SRWC. Endangered SRWC are incidentally harvested in ocean salmon fisheries, primarily by sport anglers fishing south of Point Arena (Mendocino County) that are targeting more abundant Central Valley stocks. In April 2010, the NMFS issued an updated Biological Opinion (BO) with the conclusion that ocean salmon fisheries continue to jeopardize the continued existence of this depressed stock in spite of fishing area closures and size limit restrictions. A new requirement of the 2010 BO was to develop methods to quantify impacts of fisheries on SRWC and assess potential impacts of proposed fisheries. As a result, new analytical tools were developed and approved by the

Council for use in fishery management; however, the available data suggests that downward trends in SRWC cannot be readily explained by ocean harvest, especially since California fisheries were completely closed in 2008 and 2009. In 2012, the NMFS introduced a maximum ocean fishery impact rate on SRWC based on current population status, in addition to fishing area closures and minimum size limit restrictions. In 2013, the maximum ocean impact rate on SRWC was 12.9 percent. Management strategies in place to protect SRWC are considered sufficient by the NMFS to also protect ESA-threatened Central Valley spring Chinook.

Since 2000, California ocean salmon fisheries have also been constrained to reduce impacts on ESA-listed CC-Chinook. This threatened stock includes all coastal Chinook populations between, and including, Redwood Creek (Humboldt County) and the Russian River (Sonoma County). No hatchery component exists for this stock and genetic stock identification data is limited, making it difficult to assess total ocean harvest rates. Furthermore, spawning escapement data is lacking and the limited data available do not allow for estimation of abundance nor provide an applicable index of abundance. Inadequate ocean fishery and spawner data have precluded development of a CC-Chinook specific management strategy, requiring the use of age-4 KRFC as a proxy. The NMFS 2000 BO designated a maximum forecasted ocean harvest rate of 17 percent on age-4 KRFC, which was later reduced to 16 percent in 2002 based on data from a new KRFC cohort reconstruction model.

In 2007, a Constant Fractional Marking program was initiated in California to increase the mark and coded-wire tag (CWT) rate of hatchery produced fall Chinook. Each release group is tagged representatively with at least 25 percent of all fall Chinook releases being adipose fin-clipped and implanted with a microscopic (≤ 1 mm) CWT. This CWT is imprinted with a unique code that provides release information such as hatchery of origin, brood year, release location, and release strategy (e.g., bay net pens, direct bay release, direct river release). The primary goal of this program is to estimate a statistically-valid relative contribution of hatchery production to harvest and escapement, and to evaluate release strategies being employed throughout California. In 2013, approximately 23,000 CWTs were collected from the commercial and recreational ocean salmon fisheries. Hatchery-origin Chinook comprised approximately 47 percent of the commercial harvest and 57 percent of the recreational harvest. Of those hatchery-origin Chinook, Sacramento River fall Chinook contributed over 80 percent to ocean salmon fisheries, with the remainder comprised of other Central Valley and Klamath-Trinity stocks, as well as a very small contribution of Oregon and Washington stocks.

Spawning escapement, in conjunction with harvest data is used to predict the ocean abundance of Klamath River and Sacramento River fall Chinook available to ocean salmon fisheries. Spawning escapement of both stocks in 2012 resulted in ocean abundance forecasts that allowed for substantial commercial and recreational fisheries in 2013. Fisheries in 2013 were primarily constrained by restrictions to protect ESA-listed stocks.

In 2013, commercial salmon fisheries were allowed from May through October, with variable open dates within management areas to meet the NMFS guidance and FMP conservation objectives. The ocean area between the Oregon/California border and Humboldt South Jetty (Klamath Management Zone) had the most commercial salmon fishing opportunity since 1984, with small monthly quotas occurring from May through September. The ocean management area between Horse Mountain and Point Arena had the most commercial fishing opportunity in a decade.

- **Statewide commercial landings (number of Chinook) and total fishing effort (boat-days fished) increased in 2013 compared to 2012. The commercial fleet landed 1,900 tons of dressed Chinook (297,400 fish) during 17,300 boat-days fished in 2013; compared to 1,300 tons of dressed Chinook (215,600 fish) during 14,500 boat-days fished in 2012. Ex-vessel prices for dressed salmon averaged \$6.23 per pound and the nominal ex-vessel value of the commercial salmon fishery was over \$23.6 million in 2013.**

The 2013 recreational season also satisfied the NMFS ESA consultation standards and FMP management objectives for relevant Chinook stocks. Restrictions to protect ESA-listed SRWC primarily affected the recreational fishery, and included a larger minimum size limit (24 inches total length) through July in areas between Point Arena and Pigeon Point, and for the entire season south of Pigeon Point. The number of Chinook landed and fishing effort in the 2013 California recreational fishery was similar to 2012.

- **Recreational anglers landed approximately 113,300 Chinook during 143,800 angler-trips in 2013 compared to 123,900 Chinook landed during 148,000 angler-trips in 2012.**

The Fishery Economic Assessment Model (FEAM) estimated that California personal income impacts for the 2013 ocean salmon fishery exceeded \$51 million, with approximately \$39 million from the commercial fishery and \$12 million from the recreational fishery. This is an increase from the 2012 FEAM estimate that was in excess of \$34 million, with approximately \$22 million from the commercial fishery and \$12 million from the recreational fishery.

More information on the upcoming 2014 ocean salmon season can be found on the Department's Marine Region website:

www.dfg.ca.gov/marine/oceansalmon.asp, or the Pacific Fishery Management Council website: www.pcouncil.org/salmon/current-season-management.

GROUND FISH FISHERIES

Approximately 92 species of bottom-dwelling marine fishes are included in the federal Groundfish Fisheries Management Plan (GFMP) implemented by the Council in 1982. Since then, these species have been managed under the joint jurisdiction of the state and federal government. Species and species complexes managed under the GFMP include all rockfishes (about 60 species), sablefish, thornyheads, lingcod, Dover sole and selected other flatfishes (not including California or Pacific halibut), Pacific whiting, and some sharks and skates. Federally designated “overfished” groundfish species including bocaccio, canary, cowcod and yelloweye rockfishes are protected with very low catch limits (bycatch only) while those stocks rebuild. Low bycatch limits also constrain recreational and commercial fishing opportunities for healthy fish stocks found in association with the overfished species. New assessment results in 2013 indicated that several overfished species are rebuilding on-track or ahead of schedule. Seventeen species included in the GFMP are also included in California’s Nearshore Fishery Management Plan.

The commercial fishery is generally regulated by a combination of allowable fishing depths, trip limits, permit and gear restrictions, and season adjustments to prevent landings from exceeding catch limits. Beginning in 2011, an Individual Quota system was implemented for managing the commercial trawl fishery for federal groundfish (see the Trawl Individual Quota section below). The recreational fishery is regulated using daily bag limits, seasons, area closures, size limits, gear, and depth restrictions.

- **Preliminary 2013 commercial groundfish landings for all gears in California totaled 14.4 million pounds (5,188 metric tons) with an ex-vessel value of approximately \$17.7 million.**
- **Preliminary 2013 recreational groundfish catch in California totaled 4.6 million pounds (2,085 metric tons).**

Depth-based Rockfish Conservation Areas (RCAs) implemented in 2003 continue to be used to protect rebuilding overfished species by closing their primary depth range to groundfish fishing. The RCA closures are expected to remain in place until overfished stocks are rebuilt or an alternative management approach is adopted. The RCA depth boundaries have been modified to accommodate healthy fisheries as much as possible, and change throughout the year to increase or restrict access as needed. However, fishing on healthy stocks remains constrained.

Trawl Individual Quota Program

In 2011, a new program was implemented for the West Coast Groundfish Trawl fleet which changed how fish are harvested in California. The Trawl Individual Quota (TIQ) program was developed over several years with input from state and federal governments, non-governmental organizations, fishing communities and

the public. Under the TIQ program, limited entry trawl permits are allocated quota shares and corresponding quota pounds for target groundfish species and species complexes based upon past fishery participation. Quota pounds are assigned to a vessel, and may be leased to individuals/entities for use. The TIQ program encompasses 21 species and three species complexes and allows for the use of non-trawl gears making it one of the most complex programs of its kind in the nation.

One of the unique components of the TIQ program is electronic fish tickets (also known as e-tickets). The TIQ program requires that a completed e-ticket be submitted to Pacific States Marine Fisheries Commission for every landing within 24 hours of offloading. E-tickets allow for near real time reporting of landings and discards which is important to both fishermen and fishery managers. The use of e-tickets and its successful application in the TIQ program is also being used as a model for other highly valuable groundfish fisheries where accurate recordkeeping is essential to ensure that landings stay within allowable limits.

As with any new program, it can be difficult to fully understand and evaluate fishery trends in the early years after implementation. Preliminary data suggest though that this program is having positive benefits. Since transitioning to the new program, there has already been a substantial reduction in bycatch of overfished species compared to years prior to TIQ and increased utilization of target species.

One of the anticipated results of the TIQ is that fleet capacity will be reduced as less efficient vessels leave the fishery. This trend has not yet occurred in California and vessel participation has remained constant since program implementation. This trend may change in future years once quota shares can be sold and fishermen can leave the fishery.

In 2013, a total of 11.4 million pounds were landed in California under the TIQ program, an increase of 1.3 million pounds compared to 2012. Ex-vessel value also increased by \$0.5 million dollars in 2013 to \$8.2 million dollars. Although TIQ landings comprise the majority of commercial groundfish landings in California by volume (11.4 million pounds out of 14.4 million pounds), they account for less than half of the overall value (\$8.2 million out of \$17.7 million).

Given the complexity of this program, not all program elements could be completed in time to meet the January 2011 implementation deadline. Therefore, the Council initiated a series of ongoing trailing regulatory actions to address outstanding components, emerging issues and program enhancements. As a result, fishery management resources continue to be required to analyze and complete the TIQ program⁵. Given the number of trailing actions needed to address those issues which have been identified, it is unlikely that management

⁵ Once implemented, the TIQ program was expected to be self-sustaining and require less input to address management issues in the long term. Given the number of ongoing trailing actions to address various components of the TIQ program, the anticipated long term workload savings will likely not materialize.

requirements will decrease in the foreseeable future. In fact workload may increase as the program continues to evolve and further enhancements are identified.

More information on the TIQ program can be found on the Pacific Fishery Management Council website:

www.pcouncil.org/groundfish/fishery-management-plan/fmp-amendment-20/

More information on groundfish can be found on the Department's Marine Region website: www.dfg.ca.gov/marine/groundfishcentral/index.asp

Vessel Monitoring System

Vessel Monitoring System (VMS) is a satellite based surveillance system implemented by the NMFS to monitor location and movement of commercial fishing vessels in the U.S. Exclusive Economic Zone (EEZ, 3 to 200 miles). The VMS consists of an on-board receiver unit, which is permanently attached to a vessel. The unit sends reports to NMFS on a pre-determined frequency (e.g., hourly), which includes information on vessel identification, time, date, and location. VMS requires a subscription plan (similar to a cell phone plan), and the cost varies depending on the provider. Once activated, the system operates 24 hours a day. This program currently monitors over 4,000 vessels nationwide.

VMS is a useful tool to support law enforcement activities and fishery management needs. It helps focus patrol efforts and has been an effective tool to monitor compliance, track violators, and provide evidence for prosecution of many environmental laws and regulations. For fishery management, it helps predict fishing effort and activity, and verify/validate data used in management. Response from industry is mixed; some view it as a relatively low cost option for monitoring fishing activity, although the majority of fishery participants are not in favor of the program as it adds costs to their operations and is often considered to be an intrusion on privacy.

VMS is a federally mandated program and is only required when fishing in or transiting through federal waters. It is not currently a requirement for individuals who fish exclusively in state waters (0 to 3 miles). However, once the unit is activated, it cannot be turned off. When vessels are not targeting groundfish, they are still required to make a declaration to NMFS as to the nature of their activity.

A requirement for VMS in the Limited Entry groundfish fishery was implemented in 2004 as a means to monitor compliance with large-scale depth-based restrictions that had been recently implemented (i.e., Rockfish Conservation Areas). In 2008, the VMS requirement was also expanded to include open access groundfish vessels operating in the EEZ. VMS is currently required for those vessels that take and retain groundfish in the EEZ, possess groundfish while operating in the EEZ (including transiting), or landing groundfish taken in the EEZ. In addition, any vessel that fishes in the EEZ with non-groundfish trawl gear or other non-trawl gear, such as set gill net, is also required to have a VMS

unit. The operators of these vessels must provide NMFS with a declaration report before the vessel leaves port on a trip in which the vessel may take and retain or possess groundfish in the EEZ, or land groundfish taken in the EEZ.

COASTAL PELAGIC FISHERIES

Pacific Sardine

Pacific sardine (*Sardinops sagax*) is a major component of California's commercial fisheries. The historic sardine fishery began in the early 1900's, declined in the 1940s, and saw resurgence in the late 1980s. In 2013, sardine was California's fourth largest fishery by volume and 13th in ex-vessel value. Statewide landings in 2013 were 15.5 million pounds (7,033 metric tons) with an ex-vessel value of approximately \$1.6 million. Landings occurred mainly in the San Pedro-Terminal Island port complex with smaller amounts landed in the Ventura-Port Hueneme and Monterey-Moss Landing port complexes. The 2013 Federal Coastal Pelagic Species limited entry fleet consisted of 61 permits with 33 of those permitted vessels landing sardine in California.

The U.S. Pacific sardine fishery extends from California to Washington and is managed with the federal Coastal Pelagic Species Fishery Management Plan (CPS FMP) adopted by the Council. In November 2012, the Council adopted a Harvest Guideline (HG) of 66,495 metric tons (mt) for the 2013 Pacific sardine fishery based on a biomass estimate of 659,539 mt. To allow fishing access to all of the fleets in the west coast fishery, the Council allocates the HG in three time periods based on an annual (January 1 – December 31) management cycle. These fishing periods close early if catch allocations are met. The 1st and 3rd allocations were not closed early in 2013; the 2nd allocation period closed early and lasted 52 days.

At the November 2013 Council meeting, the start date of the 12 month Pacific sardine fishery was changed from January 1 to July 1; this changed the fishing season from one based on a calendar year (January 1 – December 31) management cycle to a fishing season (July 1 – June 30) cycle. This change will better align the timing of the research and science required for annual stock assessments with the annual management schedule. A one-time interim harvest period from January 1, 2014 through June 30, 2014 was established to allow targeted fishing to continue during the transition to the new management cycle. For the interim harvest period the Council adopted an annual HG of 29,770 mt with an Annual Catch Target (ACT) of 19,846 mt. The Council adopted an adjusted directed allocation of 5,446 mt for the January 1 to July 30, 2014 period. This allocation incorporates a 1,000 mt set-aside for potential harvest by the Quinault Indian Nation and a 500 mt set-aside for incidental take. A full stock assessment and Council action will set a new HG for the July 1, 2014 - June 30, 2015 management cycle at the April 2014 Council meeting.

More information on Pacific sardine can be found on the Department's Marine Region website: www.dfg.ca.gov/marine/cpshms/pacificsardine.asp

Northern Anchovy

Northern anchovy (*Engraulis mordax*) has been a target of California's commercial fisheries since the early 1900's. Through the development of a Northern Anchovy FMP, Agency responsibility for management of northern anchovy was transferred from the Department to the NMFS under the auspices of the Council on September 13, 1978. In January 2000, The Northern Anchovy FMP was amended to include all targeted Coastal Pelagic Species resources (CPS: northern anchovy, Pacific Sardine, Pacific (chub) mackerel, jack mackerel and market squid). The amendment also changed the name of the Northern Anchovy FMP to the Coastal Pelagic Species FMP.

From the 1900's to the late 1970's, northern anchovy was a major component of California's commercial CPS fisheries. Commercial landings of northern anchovy have remained low since the 1980's due to market constraints. In 2013, Northern anchovy was California's 6th largest fishery by volume and 18th in ex-vessel value. Statewide landings in 2013 were 12.7 million pounds (5,742 metric tons) with an ex-vessel value of approximately \$1 million. Landings occurred mainly in the Monterey-Moss Landing port complex with smaller amounts landed in southern California. The 2013 Federal Coastal Pelagic Species limited entry fleet consisted of 61 permits; 11 of those permitted vessels landed Northern anchovy in California.

The Department collected anchovy samples for biological data through a dockside sampling program from 1965 to 1982. In January 2014 the Department began another routine port sampling program of northern anchovy and will collaborate with the NMFS in informing future northern anchovy stock assessments.

More information on northern anchovy can be found on the Department's Marine Region website: www.dfg.ca.gov/marine/cpshms/northernanchovy.asp

Pacific Herring

San Francisco Bay has the largest herring spawning stock south of British Columbia and historically produced more than 90 percent of California's herring catch. Currently, San Francisco Bay has the only active commercial herring fishery in California. The majority of herring landed along the west coast of North America is exported to Japanese markets. The California commercial herring fisheries are regulated primarily through a catch quota system to provide sustainable fisheries as well as adequate protection and utilization of the herring resource. Each year the Department recommends a harvest quota that is based upon modeling results that take into account data collected each season, including ocean productivity and bay conditions, growth rates of herring, strength of individual year-classes, and predicted size of incoming year-classes (i.e., recruitment). In response to poor recruitment or indication of population stress and/or unfavorable oceanographic conditions, harvest percentages for the past ten years have been set at or below 10 percent of the San Francisco Bay spawning biomass. The average over this period has been six percent and actual exploitation rates (catch percentage) have been approximately four percent.

The Department conducts annual assessments of the herring spawning population size (spawning biomass) in San Francisco Bay. Over the past four seasons the population has shown signs of recovery since it reached a historic population low of 4,800 tons during the 2008-09 spawning season. The population rebounded during the 2009-10 season to 38,400 tons, increased during the 2010-11 season to 57,100 tons, and increased again in the 2011-12 season to 61,000 tons. The biomass estimate during the 2012-13 season was 79,500 tons, well above the historical average (1979-80 season to present) of 52,000 tons.

California's Pacific herring fisheries have historically been limited to the four largest spawning locations: San Francisco Bay, Tomales Bay, Humboldt Bay, and Crescent City Harbor. Commercial fishing effort for Pacific herring has decreased significantly in California during the past decade. During the 1990s, the number of herring permits peaked at over 450 with over 120 vessels participating in the San Francisco Bay fishery. In contrast, during the 2012-2013 season, there were 184 herring permit renewals and 33 vessels elected to participate in the gill net fishery. Decreased effort has affected the other fisheries outside San Francisco Bay as well with no commercial fishing activity having occurred in Tomales Bay since 2007, in Humboldt Bay since 2005 and in Crescent City Harbor since 2002.

In California, Pacific herring are fished primarily for the ripe female gonad, referred to as "sac-roe". The average "roe count" for the 2012-13 season was 14.6 percent, which is slightly above the average for the San Francisco Bay fishery of 14 percent. The ex-vessel price paid is based on a 10 percent yield by weight, and is adjusted for percentage points above or below. The ex-vessel price for herring sac-roe in 2012-13 was \$730 per ton; just above the 10-year

average of \$696 per ton. Over the last decade the value has fluctuated between a high of \$946 per ton and a low of \$302 per ton. This fluctuating value can be attributed to changing market conditions in Japan, where herring sac-roe has shifted from being a traditional holiday gift to an everyday consumer product. There has also been increased competition from Russia, Canada, Alaska, and Europe which has contributed to a lower ex-vessel price for California herring sac-roe. There is however, an increasing demand by new markets in other Asian countries, which could raise prices in the future. In addition, there is a growing interest for locally and sustainably harvested fresh fish in California, particularly in the San Francisco Bay area. This desire for local fish recently brought about the creation of an Annual Sausalito Herring Festival to celebrate the herring fishery and introduce the public to a local, sustainable food source. An emerging fresh fish fishery for herring could bolster future markets.

- **Approximately 88 percent of the San Francisco Bay gill net quota (2,332 tons) was landed by the combined fishing platoons during the 2012-13 commercial herring season with an ex-vessel value of approximately \$1.7 million**

Another component of California's herring industry is the herring-eggs-on-kelp fishery. Giant kelp is harvested from the Channel Islands off southern California and the Monterey Bay area, brought to San Francisco Bay, and suspended from floating rafts or lines hung beneath piers. Rafts are anchored in locations where herring spawning is expected to occur. Once spawning has commenced, suspended kelp is left in the water until egg coverage has reached one to three layers, after which the kelp with herring eggs attached is harvested. Landings from the 2012-13 San Francisco herring-eggs-on-kelp fishery were approximately 78,000 pounds, with a value of \$11.50 per pound.

- **Approximately 97 percent of the San Francisco Bay herring-eggs-on-kelp quota (39 tons) was landed during the 2012-13 season with an ex-vessel value of \$897,000.**

The Commission adopted a 3,737 ton quota for the 2013-14 San Francisco Bay herring season. Preliminary data from the 2013-14 season indicate Pacific herring are returning to the bay in good numbers and the season closed early with the fleet landing approximately 93 percent of their quota.

More information can be found on the Department's Marine Region website: www.dfg.ca.gov/marine/herring/index.asp

HIGHLY MIGRATORY SPECIES

Albacore

Both commercial and recreational albacore (*Thunnus alalunga*) landings have been declining since the last Fisheries Forum update for this species in 2007. Commercial landings in California averaged 1.15 million pounds per year since then, although preliminary landings from 2013 are only 710 thousand pounds. Income received by commercial fishermen for their albacore catch was about half that of 2012 at \$1.1 million, although price was similar at \$1.55/lb.

Final recreational landing figures were not yet available for commercial passenger fishing vessels (CPFVs) for 2013, but preliminary data indicate a total catch of only 2,823 fish, about one third of 2012 CPFV caught fish (6,036 albacore taken); both down from a high of 105,321 fish caught in 2007. Less than one percent of the albacore taken in 2013 were taken in Mexico, compared to 28 percent in 2012.

Prior to 2011, the albacore commercial fishing industry (including a number of participating California vessels) registered a number of complaints with the U.S. State Department about unfairness in the reciprocal fishing regime. Previously, this regime allowed U.S. and Canadian vessels to fish in each other's waters and to land and ship albacore, exchange crews, refuel and resupply from each other's ports (including California ports). In recent years, however, nearly all of the fishing took place in U.S. waters, with very few U.S. boats fishing in Canadian waters. U.S. fishermen protested that Canadian boats used aggressive fishing methods, increased vessel size, and crowded U.S. ports. Treaty negotiations took place during 2012 and in 2013 a limited number of Canadian boats were allowed to fish in U.S. waters. However, the U.S. industry supports ending reciprocal fishing and ongoing negotiations call for a multi-year phase out of the reciprocal fishing agreement.

Albacore is managed internationally by a number of regional fishery management organizations in which the U.S. participates as a member, both in negotiating conservation measures and collaborating in fisheries science such as stock assessments. In 2011, the Council tasked the Highly Migratory Species Management Team (HMSMT) with developing a precautionary management framework for domestic measures and for recommendations at the international level for North Pacific albacore management, in the event of future poor stock assessments. No biological reference has been decided as yet for this species as the stock has been above maximum sustainable yield (MSY); however, fishing effort has been very high internationally. The Council directed the HMSMT to develop a range of options that could be used in the case of varying scenarios. The Council forwarded the HMSMT's recommendations to the U.S. delegation to the Western and Central Pacific fisheries Commission's Northern Committee (NC) in 2013. The Inter-American Tropical Tuna Commission may consider

developing a similar framework at their July 2014 meeting. Once international measures are decided, the HMSMT will make recommendations to the Council towards domestic options if there is a need to limit effort or catch.

Swordfish

Swordfish (*Xiphias gladius*) is landed in California by participants in three main fisheries: harpoon, drift gill net (DGN), and longline. The harpoon fishery is small and often considered artisanal in nature. In 2013, harpoon landings were 9,300 pounds, a 75 percent decrease from 2011 (but a 16 percent increase from 2012). The DGN fleet, the largest California-based fishery for swordfish, has experienced dramatic declines since the 1990's mainly due to time and area closures and the resulting lack of participation in the fishery. The fishery landed 135,000 pounds in 2013, nearly 17 percent less than 2012. The longline fishery mainly operates out of Hawaii in international waters beyond the west-coast EEZ; however, this fishery lands the majority of swordfish in California. In 2013, it brought in 576,000 pounds, a 44 percent increase from the previous year.

- **The ex-vessel value of all swordfish landed in California in 2013 was \$2.6 million. Of this, DGN landings were valued at \$586,000; harpoon at \$82,000; and longline at \$1.7 million. The average price per pound was \$4.34, \$8.93, and \$3.03 for DGN, harpoon, and longline, respectively.**

Swordfish stocks off the West Coast are considered healthy and underutilized. However, the major west coast fishery for them using DGN gear has been steadily declining since 2001, mainly due to the enactment of the Pacific Leatherback Turtle Conservation Area (PLCA), which closed a majority of the DGN fishing area during the peak of the season. In 2009, the Council explored the possibility of a small longline fishery outside the U.S. Exclusive Economic Zone that might serve as an option for DGN vessels to transition into; however, the fishery was not approved due to concerns over bycatch. Following this action, NMFS held a Swordfish Workshop in 2011 to collect information from scientists, environmental groups and the fishing industry with a goal of revitalizing the fishery. In light of new data collected since the closure, the Council directed the Highly Migratory Species Management Team to perform an analysis to explore whether a small portion of the PLCA might be reopened.

In the meantime, the DGN fishery experienced several substantial events in 2013. Due to the accidental catch of two sperm whales in 2010, the Pacific Offshore Cetacean Take Reduction Team recommended that NMFS implement emergency regulations on the swordfish DGN fleet, which mandated both 100 percent observer coverage for vessels fishing on the seaward side of the main 1,100 fathom bathymetric contour, and vessel monitoring on all DGN vessels. The emergency rule also specified that if the fleet took one additional sperm whale during the 2013 season, the entire fishery was to be shut down immediately for the remainder of the season.

Originally managed by the state, several spatial and temporal closures were enacted in the early 1990's to manage the fishery. When the federal West Coast Highly Migratory Species FMP (HMS FMP) was enacted in 2004, it incorporated the state's existing time and area closures but deferred to the state's existing permit program. Other federal regulations have created additional closures, both temporal and spatial (e.g., PLCA), and made DGN gear modifications mandatory. The DGN fishery is limited entry, and has been experiencing a steady decline since its peak in the mid-1980s, when over 261 vessels were active. In 2013, 73 DGN permits were issued by the Department, but only 19 of the permittees were active in the fishery.

White shark

In August 2012, Oceana, Center for Biological Diversity, and Shark Stewards filed a joint petition with the Commission requesting to list the Northeastern Pacific (NEP) population of white shark (*Carcharodon carcharias*) as endangered or threatened under the California Endangered Species Act (CESA) (Fish and Game Code Section 2050 et seq.). The Department's Marine Region prepared a petition evaluation report, per Fish and Game Code Section 2073.5, which was submitted to the Commission in January 2013 indicating that there was sufficient scientific information to indicate that the petition action may be warranted. At the February 2013 Commission meeting, the Commission declared white shark a candidate species under CESA.

Following the Commission's action to designate the NEP population of white shark as a candidate species pursuant to CESA, the Department embarked on a 12-month status review of the species in California waters. The Department solicited information from the public, the scientific community, and government agencies for relevant information on white shark. This status review reflects the Department's scientific assessment to date of the status of the NEP population of white shark. The Department primarily relied on published, peer reviewed, scientific papers. The report has also undergone independent peer review by scientists with expertise relevant to the status of the NEP white shark. The Department transmitted the status review to the Commission prior to their April 2014 meeting.

Once declared a candidate species, the take of white shark became prohibited except under a CESA permit issued by the Department. A 2081(a) permit authorizes take of CESA-listed species for scientific, educational, or management purposes and can be issued to public agencies, universities, zoological gardens, or scientific or educational institutions. A 2081(a) permit is a MOU that allows directed take under specified conditions and reporting that allows the Department to monitor activity. There is no permit fee for a 2081(a) permit.

- **In 2013, the Department issued nine 2081(a) permits. Four 2081(a) permits were issued to researchers conducting studies on species other than white shark but operating in areas where white shark concentrate or using gears known to take white shark (e.g., long line, gill net). None of the researchers reported any interactions with white sharks.**

One 2081(a) permit was issued to the adult white shark research group to continue their tag and release studies. Another 2081(a) permit was issued to the juvenile research group to continue their tag and release studies. Eighteen adult and one juvenile white shark were tagged in 2013. The three remaining 2081(a) permits were issued to companies that provide white shark viewing opportunities to divers and topside observers out at Southeast Farallon Island. Prior to 2013, these companies were never subject to permitting by the State, although they have been permitted by the Gulf of the Farallones National Marine Sanctuary for at least the last 5 years.

More information on white shark can be found on the Department's Marine Region website: www.dfg.ca.gov/marine/whiteshark.asp

Vessel Monitoring System (VMS)

In 2013, the Pacific Offshore Cetacean Take Reduction Team enacted temporary emergency regulations in the drift gill net (DGN) fishery for shark and swordfish, in response to take of two sperm whales in 2010. One hundred percent observer coverage of shark/swordfish DGN vessels fishing seaward of the main 1,100 fathom bathymetric line was required in addition to the use of VMS by all DGN vessels. The VMS was used to monitor compliance of the new depth restriction. At the March 2014 Pacific Fishery Management Council meeting in Sacramento, NMFS recommended that these temporary regulations were adopted as permanent.

Additionally, due to an Inter-American Tropical Tuna Commission resolution, all vessels over 24 meters in length targeting tuna species have a VMS requirement. The federal government is promulgating this rule under the Tuna Conventions Act. This requirement affects about six vessels in California in the albacore troll and purse seine fleets when those vessels are targeting tunas.

SURFPERCH

There are 18 species of surfperch, seaperch, and perch (collectively known as surfperch) found in California's coastal waters, many of which support a small-scale commercial fishery in central and northern California, and a popular state-wide sport fishery. Surfperch species can be found in a variety of habitats that include sandy beaches, rocky reefs, the intertidal zone, and subtidal kelp beds. Commercial landings are eclipsed by estimates of recreational landings, though both fisheries are primarily shore-based and use similar hook-and-line gear. Catch for both fisheries peaks during the mating and parturition (birthing) seasons when surfperch are aggregated in the late fall through early summer, respectively. There are no species of surfperch that have been identified as overfished, and although no formal assessments have been conducted for surfperch to date, there is no indication of decline in the population at present.

The commercial surfperch fishery mainly consists of shore-based hook-and-line fishermen targeting redbtail surfperch in Humboldt and Del Norte counties, and barred surfperch in Monterey and San Luis Obispo counties. Bared and redbtail surfperch continued to dominate surfperch landings in the 1990's through the 2000's, comprising approximately 37 and 57 percent, respectively, of all specified surfperch landings. In central and south San Francisco Bay, a variety of species including striped seaperch, rubberlip seaperch, black perch, and pile perch are taken by fishermen operating skiffs fishing along rocky shoreline and man-made structures.

- **Total commercial surfperch landings for all species combined in 2013 were 24,827 pounds, generating a total of \$71,480 in ex-vessel revenue.**

Annual commercial landings have continuously declined over the past several decades, most likely a reflection of a reduction in overall effort rather than a decline in fishery productivity. Commercial fishing capacity has been adversely affected by a combination of factors, which may include a decline in market demand for surfperch species and an increased prohibition in the use of four-wheel drive vehicles on many beaches (a necessity for some commercial surfperch fishermen). Currently, vehicle access is limited to Oceano Dunes State Park in San Luis Obispo County, and several beaches in Humboldt and Del Norte counties. More recently, certain Marine Protected Areas (MPAs), such as the Point Buchon State Marine Reserve, Samoa State Marine Conservation Area (SMCA), Reading Rock SMCA and Pyramid Point SMCA may have displaced some local commercial fishermen. These factors in combination may have contributed to decreased interest in surfperch fishery participation.

The recreational fishery for surfperch is substantial and estimated catches far surpass those of the commercial fishery. The vast majority of the recreational surfperch catch is taken from sandy beaches and rocky banks that are accessible from the shore. By weight, the most abundant surfperch species

comprising the recreational take statewide are barred surfperch, black perch, redbtail surfperch, walleye surfperch, and striped seaperch (in descending order).

- **An estimated 736,346 pounds of combined surfperch were landed statewide by recreational anglers in 2013 – a 30 fold increase over commercial landings.**

The recreational fishery is managed using a combination of bag limits, area closures, and a size limit for redbtail surfperch, while the commercial fishery is managed using season and area closures. The commercial fishing season is closed to fishing from May 1 through July 31 with the exception of shiner perch, which may be taken at any time. The take of barred, calico, and redbtail surfperch for commercial purposes is prohibited south of Point Arguello. Certain MPAs also specifically prohibit the take of surfperch species in both the commercial and recreational fisheries. Recreational anglers are subject to a daily bag limit of 10 surfperch of a given species with the exception of shiner surfperch (20 allowed), and not more than 20 surfperch in total. There is a recreational season closure in San Francisco and San Pablo bays from April 1 through July 31, and a reduced bag limit of five of any individual species (except shiner) within these bays. The minimum legal size for redbtail surfperch is 10.5 inches total length.

Analyses of all available data provide no indication of declines of any specific surfperch population. Despite low commercial landings in recent years, the average number of pounds landed per receipt for surfperch, a rough approximation of catch per unit effort (CPUE), has remained relatively stable over the past few decades. A time-series of recreational CPUE for barred surfperch in central and southern California, the most numerous species landed in those regions, has also remained relatively constant since 2004. CPUE for redbtail surfperch, the predominant species landed in northern California, has exhibited an increasing trend over approximately the past 10 years.

More information on California's surfperch can be found on the Department's Marine Region website: www.dfg.ca.gov/marine/sfmp/surfperch-studies.asp

INVERTEBRATE FISHERIES

California Spiny Lobster

Commercial spiny lobster fishermen in southern California use baited traps to target lobster along the mainland coast from Point Conception to the Mexico border and at all the offshore islands. There is also a large recreational fishery in the same area, involving skin and scuba divers, and fishermen using hoop nets. The commercial lobster season opens the first Wednesday in October and closes the first Wednesday after the 15th of March, while the recreational season opens the weekend before the commercial opener.

The California spiny lobster fishery has been sustainably managed, with regulations that include: a minimum size limit; a closed season during spawning; escape ports on commercial traps to allow undersized lobsters to exit freely; a recreational daily bag and possession limit; and a limit on the number of recreational hoop nets. There is also a restricted access program for the commercial fishery (currently numbering 192 permits). There are no restrictions on the number of recreational participants, but recreational fishermen are required to record their catch, location and gear type information on a lobster report card. In 2012 calendar year, the Department estimated that the recreational fishery took 28 percent of the total catch (recreational + commercial landings).

- **The 2012-13 commercial lobster season landings totaled 867,500 pounds, with an ex-vessel value of \$14.3 million.**

Commercial landings (by weight) were split in roughly even amounts between ports in San Diego County (34 percent), Los Angeles/Orange counties (31 percent), and Santa Barbara/Ventura counties (35 percent), similar to the previous season. The mid-February total for 2013-14 commercial landings was 709,000 pounds. By season end the total landings weight is expected to approximate other recent seasons. The 10-year average catch for the commercial fishery is 765,000 pounds. Lobster is a high value product. The median price paid to fishermen at the dock (ex-vessel) in the 2012-13 season was \$17.00 per pound. This season (2013-14) the price paid started at \$12.00 - \$15.00 a pound in October, but by January 2014 reached as much as \$22.00 - \$24.00 a pound, making it one of the highest valued species in California.

The commercial lobster catch is primarily exported to Asian markets, with prices dependent on market demand. In recent years, fishermen have been trying to develop local markets. They have had limited success because of the widespread availability of less expensive American (Maine) lobsters and cheaper imported spiny lobster tails (tropical species).

The Department's 2011 lobster stock assessment concluded that the fishery is relatively stable. The Department started work on the development of a spiny lobster FMP in 2012 as part of the ongoing effort to improve management under the Marine Life Management Act. The Department convened a Lobster Advisory Committee consisting of stakeholder representatives to provide guidance and recommendations on FMP objectives and end products, as well as provide ideas for management options that address the key issues put forth by constituents and members of the public. This FMP will also establish harvest control rules for the fishery to respond to possible future declines. A draft FMP document is currently under development and will be submitted to the Commission in 2015.

More information on California spiny lobster can be found on the Department's Marine Region website: www.dfg.ca.gov/marine/invertebrate/lobster.asp.

To follow the FMP process and to view the stock assessment, please visit the Department's lobster fishery management plan website: www.dfg.ca.gov/marine/lobsterfmp/

Dungeness crab

In the past decade, the Dungeness crab fishery has secured its place among California's most valued fisheries, second to the market squid fishery in ex-vessel value and third in pounds landed. The fishery has brought in record landings in recent seasons including both the 2010-11 and 2011-12 seasons, with 27.5 and 31.9 million pounds landed, respectively. Although not record breaking, the 2012-13 crab season remained relatively high with 24.4 million pounds landed state-wide, with an ex-vessel value of \$68.9 million. Dungeness crab was California's highest valued fishery in recent years, bringing in record annual revenues of \$85.6 million in 2012 and \$84.0 million in 2013. There are two management areas separated at the Sonoma/Mendocino county line. Historically, the northern area has contributed the majority of total pounds landed state-wide. The 2012-13 season was no exception with 68 percent derived from the northern ports from Crescent City to Fort Bragg, and 32 percent landed from Bodega Bay south to Morro Bay. Landings in the southern range of the fishery, which extends from Santa Cruz to Morro Bay, set a record for the area of 1.2 million pounds during the 2012-13 season. Four of the five highest recorded seasons for the entire fishery have occurred in the last eight seasons starting with the 2004-05 season, ranking fourth, and include this most recent 2012-13 season, ranking fifth in total Dungeness crab catch. This past season also ranks second in ex-vessel value for the fishery. Average ex-vessel value from the past 10 seasons of \$44 million has been steadily increasing over time during this period of high landings.

- **Dungeness crab was California's highest valued fishery for the 2012 and 2013 calendar years. Landings for the 2012-13 season totaled 24.4 million pounds with an ex-vessel value of \$68.9 million.**

Estimates for the current season of 2013-14 are preliminary. As of February 2014, a total of 14.5 million pounds were landed valued at \$46.2 million. Central and southern California accounted for 8.7 million pounds of the total, continuing a divergent trend of recent seasons where this region of the fishery exceeds the northern region in catch and value. The northern management region opened on its traditional December 1 opening day for the first time in three seasons. However, fishermen ended up waiting until December 15 to land their catch to match the delayed Oregon opening day. This season's total landings are trending lower than the preceding several seasons; however landings in the central area are already higher this season compared to 2012-13. Many vessels have already pulled in traps for the season, but total ex-vessel value is expected to exceed \$50 million since fishermen are receiving a consistently high average price of \$3.00 per pound or higher.

Management

The Dungeness crab fishery is one of California's last major commercial fisheries managed by the Legislature rather than the Commission or Council. The two management areas have slightly different fishing seasons, the fishery opens earlier on November 15 in the central area and ends June 30, while in the northern area the season may open December 1, dependent on crab quality test results, and runs until July 15. In 2012-13, the season was extended by order of the director in the northern management area until August 14 under authority of Section 8277 of the Fish and Game Code. Reasons for the extension included steady market demand coupled with the late 2012-13 season opener of January 15. This was the second consecutive season to be extended to August 14, which helped to mitigate the delayed opening in those seasons that was due to pre-season crab testing results indicating late molting of crab.

The 2013-14 Dungeness crab season is the first to employ trap limits, implementing a program created by SB 369 (Evans) passed in 2011. The trap limit program now enforces a cap on the number of traps a vessel can fish dependent on a vessel permit's tier. The highest tier is set at a maximum of 500 traps while the lowest tier is set at 175 traps. Permit holders were required to purchase Department-issued trap tags for each trap in their tier and an additional biennial permit before the start of this current season. If a permit holder fails to purchase trap tags and a permit, their commercial Dungeness crab permit will no longer be valid, potentially removing latent permits from the fishery. With trap limits in place there may be an observable effect to the derby style nature of the fishery, the rush at the start of the season to catch as much crab as possible when about 80 percent of the catch occurs in the first six to eight weeks of the fishery. It is anticipated that trap limits will be a useful tool in tracking effort among fishery participants. The deadline for an individual to file an appeal to revise upward or downward their initial trap tier assignment was March 31, 2014. Appeals to revise upward are decided by an administrative law judge from the Office of Administrative Hearing, and those ruling in favor of the defendant have

resulted in increases to the number of permit holders in the highest tier, originally assigned to 55 permits.

In 2008, legislation created the Dungeness Crab Task Force (task force), an advisory group comprised of Dungeness crab fishers from the major fishing ports, members from the Department, and non-governmental organizations. The task force was reinstated with SB 369 and one of their many objectives is to evaluate the trap limit program. A task force meeting is scheduled for April 2014 where other California industry concerns will be addressed along with the inclusion of fishing grounds to the south of the Sonoma/Mendocino county line in the pre-season testing protocol. The task force is set to report initial recommendations to the Joint Committee on Fisheries and Aquaculture by January 2015 with final recommendations set for January 2017.

More information on Dungeness crab can be found on the Department's Marine Region website:

www.dfg.ca.gov/marine/invertebrate/management_com.asp#crab

Dungeness Crab Trap Limit Program Information website:

www.dfg.ca.gov/marine/invertebrate/traplimit.asp

Abalone

Seven species of abalone are found in California: red, white, black, green, pink, pinto, and flat. Currently, only red abalone can be taken in a recreational free-diving fishery north of San Francisco Bay. Ninety-six percent of the catch comes from the two counties of Sonoma and Mendocino. Commercial abalone fishing was not historically significant north of San Francisco and has been banned since 1949. The commercial and recreational abalone fisheries south of San Francisco were closed by the Legislature in 1997 due to declines in the populations. The causes of the declines vary by species, but include overfishing, disease, and poaching. Recovery of abalone populations in the closed areas has been slow and both white and black abalones are now listed as endangered under the federal Endangered Species Act.

The Abalone Recovery and Management Plan (ARMP), approved by the Commission in December 2005, outlines restoration strategies for depressed abalone stocks in central and southern California and the fishery management strategy for northern California red abalone. Restoration strategies include aggregating adults as well as stocking juveniles reared in captivity. The ARMP is an adaptive management plan with prescribed regulatory responses based on changes in resource abundance as measured by subtidal surveys of abalone density on the fishing grounds. The ARMP has provisions to reduce the fishery when densities fall below pre-determined thresholds. In 2013 two such thresholds were reached, one resulting in a reduction in the fishery as a whole by lowering the annual catch, and the second triggering a site closure for the Fort

Ross area in Sonoma County. Coupled with these two new regulations adopted by the Commission and slated to begin in April 2014 another management measure will reduce the number of fishing hours in the day. In addition to the reduction in the total annual catch limit per fisher there will also be a limit in the number of abalone taken from the southern portion of the fishery in Sonoma and Marin Counties.

Northern California Red Abalone Fishery

- **The north coast recreational red abalone fishery is a large and popular 'world class' fishery, and an important economic driver for northern coastal communities. In 2013, over 30,000 fishers participated in the sport. Annual catch estimates from 2002 to 2012 averaged 256,000 abalone.**

The cost of an abalone report card, including 24 tags (the annual limit), was \$21.86 in 2013. Funds collected from abalone card sales are used to help fund the Department's abalone fishery science, monitoring of the fishing grounds, and enforcement of abalone regulations.

In 2014, a suite of new abalone management measures adopted by the Commission will go into effect. These measures are designed to reduce take in the fishery in response to reduced density estimates found during the dive surveys of the fishing grounds. High population density is important to maintain in abalone populations to ensure successful reproduction. High densities of abalone also help to ensure a quality fishery experience and the sustainability of the fishery through time. The new management measures will take effect on opening day of the 2014 season (April 1, 2014) and include: 1) a reduction in the annual limit from 24 to 18 per person, 2) of these 18 per year only 9 of these can be taken from Marin and Sonoma Co., 3) Fort Ross will be closed since densities at the site have fallen below the site closure trigger density of 0.25 abalone/m², and 4) the start time has been set back to 8:00AM from the previous half hour before sunrise start time, which will reduce the number of abalone taken at early morning low tides when they are most vulnerable to the fishery.

The reduction in the annual limit was instituted in response to the densities in the fishery falling below the 0.5 abalone/m² sustainable population level outlined in the ARMP. The average density for surveys in the 2009-2012 survey cycle was 0.47 abalone/m², representing a 35 percent decline from previous surveys. The ARMP prescribes a 25 percent catch reduction when the average density in the fishery index sites falls 25 percent from the baseline to the 0.5 abalone/m² trigger. The fishery wide reduction is implemented so that there are no dramatic shifts in effort (in this case shifting effort to Mendocino Co.), to encourage resource recovery, and to maintain a sustainable fishery. Other options to reduce take in the fishery, including reductions in the daily take limit and reductions in the number of open fishing months were considered but not selected by the Commission. The Department is currently drafting brochures,

flyers and updating the web site as well as meeting with constituents to educate them on the new abalone regulations for 2014.

These new regulations are partly in response to an unprecedented mass mortality of red abalone that occurred along the Sonoma County coast in August of 2011. Coincident with this die off was a harmful algal bloom (red tide) of a species of dinoflagellate, *Gonyaulax membranacea*, which is known to produce a toxin. Multiple lines of evidence including plankton sampling, toxicity testing and genetics suggest this toxin, Yessotoxin, was the cause of the die-off. Surveys after the 2011 die-off showed densities had declined by 60 percent compared with previous surveys in Sonoma County sites. Fort Ross, which was hard hit by the harmful algal bloom, had been the most popular site in the fishery, but densities have fallen below the ARMP trigger to close the site. The harmful algal bloom was localized to Sonoma County and red abalone in Mendocino did not suffer from any unusual mortality events. In 2012 and 2013, there was no evidence of an abalone mortality event in northern California.

More information on the new regulations for abalone in 2014 can be found on the Department's Marine Region web site:

www.dfg.ca.gov/marine/invertebrate/abalone.asp

New Department work on red abalone this year examined the incidence of a small parasitic snail on red abalone in northern California. Little is known about this parasitic snail however, it was found to be common on red abalone in the Sonoma County region. In the laboratory starved snails were observed elongating their proboscis and piercing mouth parts to feed on the blood of adult and juvenile abalone. The snails did not feed on dead abalone meat or move toward empty abalone shells.

Southern California Red Abalone

The southern California abalone fisheries were closed in 1997. The Department and Commission recently completed a six year fishery consideration process to assess the viability of reopening a red abalone fishery at San Miguel Island (SMI), the most westerly of the northern Channel Islands. Much information was gathered and collected during the process, including three years of extensive subtidal density surveys at SMI which were done collaboratively with fishery constituent partners. Results from these surveys indicated that average densities in all zones of the island were <2,000 abalone/ha, which is the ARMP Minimum Viable Population (MVP) density level. The Commission decided in 2013 to maintain the fishery closure at SMI based on the information gathered during the fishery consideration process. The primary reason for the decision was the low stock abundance at the island which did not fulfill the minimum requirements for considering a fishery (greater than MVP level).

White and Black Abalones

The Department continues its white abalone restoration studies under a grant from the NMFS Protected Species Cooperative Conservation Program (Section 6). The core of this program is a white abalone captive rearing program which is funded by the section 6 grant (\$759,100 total) and other NMFS funds, as well as Department in-kind support. The program is a collaboration with UC Davis, Bodega Marine Laboratory, UC Santa Barbara, and three aquaria in southern California which hold the breeding adults. The adults are spawned in the spring to generate larvae which are reared to the juvenile stage. The spring spawning of the adults and experimental stocking studies are used to determine optimal out-planting for abalone species restoration. In the spring of 2012 and 2013, the captive breeding program was successful at spawning and rearing juvenile white abalone. Today, growing in captivity, there are more than a dozen juvenile white abalone from the 2012 spawning averaging 30mm in shell length and more than 100 juvenile abalone from the 2013 spawning averaging 15mm. The Department is currently working with its partners to plan for, and assist in, the spring 2014 spawning season.

There has been little evidence of natural recruitment of white abalone in the wild. Most populations are made up of large animals which may be very old. Given these dire population conditions it is important to know the life span of this endangered species. In 2013 the Department partnered with NMFS staff to determine the age of large old white abalone shells using bomb radiocarbon dating methods. It was found that the life span of white abalone is about 27-30 years. This information will help to plan recovery strategies in the captive breeding program and help to provide accurate estimates of the time horizon for population declines of this species in the wild.

Black Abalone was listed as endangered under the federal Endangered Species Act in 2009. The Department collaborates with researchers and NMFS on black abalone restoration and recovery monitoring. Department staff participated in the NMFS Black Abalone Recovery Team which will develop a federal recovery plan for the species. The gradual recovery of black abalone populations continues in southern California. The Department began monitoring several black abalone rocky intertidal sites at San Nicolas Island in 2010. One site was previously monitored by the Department in the early 1990s during the time Withering Syndrome spread and nearly extirpated the island abalone populations. The site was abandoned after 1996 partly due to very low numbers of black abalone. Since restarting its monitoring at the island, Department staff has established intertidal transects to track black abalone density. There has been a constant increase in abalone density over the past three years from 0.35 abalone per square meter in 2011 to 0.74 abalone per square meter in 2013. Most of the abalone seen during the surveys have been smaller than 70 millimeters, which is an indication that significant recruitment, and thus recovery, is happening. Our monitoring data corroborates increases in abalone density seen at other monitoring sites around San Nicolas Island.

Pink and Green Abalones

The recovery of pink and green abalone species continues to be slow, although there are signs of improvement in specific areas. Abalone populations at the southern Channel Islands and along the mainland appear to be recovering faster than at the northern Channel Islands, with more incidences of recreational divers encountering abalone. However, the populations are still below the historic observations prior to population declines. The Department has taken the lead in researching the recovery potential and feasibility of restoration actions for these two species. Department research has recently shown that diminished reproduction in the population greatly impacts the recovery potential of the stocks. A method of restoration designed to improve reproduction through artificial aggregation of adults was field-tested. It was found that pink abalone stay within aggregations while green abalone are highly mobile, suggesting this approach may not be as effective for green abalone. Published research findings by Department staff add to our existing knowledge regarding the recovery of depleted abalone species in southern California, and will aid in conducting future recovery research and restoration projects.

The Department is also involved in a collaborative effort with a consortium of public and private organizations on restoring green abalone in southern California. The primary goal is to determine if outplanting captive-reared abalone is feasible for restoring species such as green, black and white abalone. The project is using green abalone because they are readily available from established aquaculture facilities and are a good surrogate for testing outplanting feasibility for other listed species. The Department's role in this collaboration has been to provide guidance and oversight of various planned public outplanting projects. The Department performs this role by insuring each project's objectives fulfill the State's ARMP goals for recovery through conditions for receiving permits for scientific collection and stocking permits. The first project for testing the feasibility of outplanting abalone for restoration began in the spring of 2013. This study is looking at the feasibility of out planting adult size green abalone for recovery in Orange County. A second project looking at the feasibility of stocking larval and juvenile green abalone in Los Angeles County was approved for a stocking permit in the fall of 2013.

More information on abalone can be found on the Department's Marine Region website: www.dfg.ca.gov/marine/abalone.asp

OCEAN MANAGEMENT AND DATA PROGRAM

California Recreational Fisheries Survey

Marine finfish in California's bays, estuaries and coastal and offshore waters are diverse and comprise one of the nation's largest and most heavily used sport fishery resources.

- **In 2013, recreational finfish anglers took more than 5.3 million fishing trips in California's marine waters and landed about 8.4 million fish.**
- **Marine recreational fishing activities support approximately 10,000 full- and part-time jobs in California, and contribute \$2.8 billion to the California economy annually⁶.**

The California Recreational Fisheries Survey (CRFS) was initiated in 2004 to provide the data needed to sustainably manage recreational finfish fisheries. Invertebrate sport fisheries are not included in CRFS due to federal funding constraints, so the Department employs other methods to track those activities. CRFS collects essential fishery information for all marine recreational finfish fisheries managed by the state as required by the Marine Life Management Act. State and federal managers use the data to track catch and make in-season responses if catches are projected to be higher or lower than expected before the end of the fishery year. Managers examine catch rates, average fish lengths and weights, and other fishery information collected by CRFS to monitor changes in the fisheries. Managers also use the data to help determine if catch and season limits need to be adjusted.

The field sampling is conducted during daylight hours at publicly-accessible sites. Samplers intercept anglers upon the completion of fishing trip at beaches, piers, jetties, onboard commercial passenger fishing vessels (CPFVs), and at public launch ramps. Samplers ask the anglers questions about their fishing activities, examine their catch to determine the number and kinds of fish kept, and weigh and measure the catch. At the public launch ramp sites, anglers who fished aboard private skiffs are asked to provide fishing location and depth information. In addition, samplers ride aboard CPFVs and record fishing location, depth, species kept and species released at each stop or drift on the CPFV trip. Additional fishing effort information is obtained from a telephone survey of

⁶ National Marine Fisheries Survey. 2012. Fisheries Economics of the United States, 2011. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-F/SPO-128. 175 p.
http://www.st.nmfs.noaa.gov/economics/publications/feus/fisheries_economics_2011

licensed anglers and from mandatory fishing logs from CPFV operators. The field sampling, angler telephone survey, CPFV fishing activity logs, and sport fishing license sales data are combined to make monthly estimates of total catch and effort (number of fishing trips) by species for six geographical districts along the California coast.

- **In 2013, CRFS samplers interviewed nearly 61,000 anglers about their fishing activities, and examined the catch of more than 101,000 anglers. Samplers examined and identified about 223,000 fish, and measured nearly 123,000 fish. The telephone survey completed more than 26,000 interviews with licensed anglers about their fishing effort.**

About 70 percent of the fishing effort occurred in southern California (counties from San Diego to Santa Barbara) in 2013. Much of this area is highly urbanized and has many harbors, marinas and launch ramps for anglers fishing from boats and it also has many piers, jetties and beaches for shore anglers. In addition, the weather and sea conditions are conducive to year-round fishing. Commonly caught fish in this region are rockfishes, mackerel, sardine and surfperches. By weight, rockfishes and scorpionfish dominated the catch in southern California; followed by kelp and sand basses and flatfish such as California halibut and Pacific sanddabs.

About 30 percent of the fishing trips took place in central and northern California (counties from San Luis Obispo to Del Norte including the counties surrounding San Francisco Bay). Rockfishes and salmon are major fisheries in this region with rockfishes dominating the catch in terms of number of fish caught and total weight of the catch. Other commonly caught fishes include surfperches, herring and lingcod. Lingcod, albacore tuna and California halibut were major contributors to the total weight of the catch in 2013.

The composition of the catch varies by the mode of fishing. Fish commonly caught on both private boats and CPFVs include: rockfishes, kelp and sand basses, salmon and flatfishes such as California halibut and sanddabs. Anglers fishing from man-made structures such as piers and jetties frequently catch sardine, herring, mackerel and surfperches while the catches at beach sites are dominated by surfperches.

More information on the CRFS program can be found on the Department's Marine Region website: www.dfg.ca.gov/marine/crfs.asp