White Abalone Research Plan

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# Executive Summary

**TBD**

# Background and purpose

## Population status

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## White Abalone Recovery Plan

In 2008, NOAA finalized the White Abalone Recovery Plan

## Species in the Spotlight

NOAA's [Species in the Spotlight](http://www.nmfs.noaa.gov/stories/2015/05/05_14_15species_in_the_spotlight.html) initiative is part of a strategy to marshal resources on species listed under the Endangered Species Act of 1973 (ESA) for which immediate, targeted efforts are vital for stabilizing their populations and preventing their extinction. Eight species were identified by the National Marine Fisheries Service (NMFS) as among the most at-risk of extinction, including [white abalone](http://www.nmfs.noaa.gov/stories/2015/08/spotlight_whiteabalone.html).

These species were identified as most at-risk of extinction based on three criteria (1) endangered listing, (2) declining populations, and (3) are considered a recovery priority #1[[1]](#footnote-31) . We know the threats facing these species and understand the management actions we can take that will have a high probability of success. The [5-Year Action Plan actions](http://www.nmfs.noaa.gov/stories/2016/02/docs/white__abalone_spotlight_species_5_year_action_plan_final_web.pdf) builds upon existing recovery or conservation plans and details the focused efforts needed over the next 5 years to reduce threats and stabilize population declines. We will engage our partners in the public and private sectors in actions they can take to support this important effort. We will report on our progress through the Biennial Report to Congress and post updates on our [website](http://www.nmfs.noaa.gov/pr/). This strategy will guide agency actions where we have the discretion to make critical investments to safeguard these most endangered species. The strategy will not divert resources away from the important and continued efforts to support all ESA-listed species under our authority. Many of our species have long-standing conservation programs supported by multiple partners. We remain committed to those programs. This action plan is designed to highlight the actions that can be taken by us, other federal and state resource agencies, environmental organizations, Native American Tribes and other partners to turn the trend around for this species from a declining trajectory to a trajectory towards recovery.

# Role of the Southwest Fisheries Science Center

# Research themes

## Research theme 1 - Remotely operated vehicle operations

### Research foci for Theme 1

#### Demography of deep-water populations in historically imporant areas

The SWFSC and its partners have used ROVs to survey white abalone at a number of historically important locations throughout the Southern California Bight (SCB) since 2000 (**Table: Survey site summary** ). Monitoring effort has been greatest at Tanner Bank, San Clemente Island, Santa Catalina Island, and Cortes Banks and has produced estimates of population size, size distribution, and seabed habitat at those sites (Butler *et al.*, 2006; Stierhoff *et al.*, 2014a, 2012, 2014b). Monitoring has focused primarily on the white abalone population Tanner Bank, which had the greatest density and largest estimated population size based on early surveys (Butler *et al.*, 2006), and at San Clemente Island where commercial landings were greatest (Hobday and Tegner, 2000; Hobday *et al.*, 2001).

**Table: Survey site summary.** A summary of remotely operated vehicle survey effort by site and year.

|  |  |  |
| --- | --- | --- |
| Survey site | Dives | Years |
| Tanner Bank | 138 | 2000, 2002, 2004, 2006, 2008, 2010, 2014 |
| San Clemente Island | 119 | 2000, 2004, 2007, 2012, 2016 |
| Santa Catalina Island | 37 | 2000, 2005, 2008, 2016 |
| Cortes Bank | 33 | 2003, 2014 |
| Palos Verdes | 20 | 2015 |
| Isla Natividad | 17 | 2006 |
| Punta San Jose | 17 | 2006 |
| Coronado Islands | 6 | 2006 |
| San Miguel Island | 6 | 2005 |
| San Nicolas Island | 5 | 2001 |
| Point Loma | 4 | 2005 |
| La Jolla Canyon | 3 | 2005 |
| Santa Cruz Island | 1 | 2011 |

#### Exporatory surveys in other potentially viable deep-water habitats

Exploratory ROV surveys of potential white abalone habitats have also been conducted in southern CA (most extensively near Palos Verdes, but also opportunistically at other sites in the SCB; **Table: Survey site summary**).

The delisting of white abalone under ESA requires consideration of the species' population status throughout its known geograpical range, which extends south to Punta Abreojos, Baja California, Mexico. Surveys were conducted, in cooperation with fishery managers and members of the local fishing coopertives (or cooperativos) off Punta San Jose (near Ensenada) and around Isla Natividad.

Following the First Binational Abalone Symposium hosted by CICESE in Ensenada, Baja California, renewed cooperation/enthusiasm...

In 2017, funding was received from the NMFS Office of Scientific and Technology International Research Program, the NMFS Office of Protected Resources, and the WCRO (**$XK** total) to conduct new surveys in cooperation with local fishermen and fishery scientists in high-probability white abalone habitats to provide critical information on the status of white abalone populations in Mexico, and to help them develop methods and monitoring programs for white abalone.

#### Improving assessments using advanced technology

**Design and development of visual survey tools** In 1999, a ROV (*Phantom 2+2*, Deep Ocean Engineering) was purchased to conduct visual surveys of white abalone and generate baseline population estimates soon after the species was listed as endangered under the ESA. The earliest configuration of this ROV was rated to a water depth of 500 m and had a standard definition video camera (NTSC, 520 x 480 lines of resolution), halogen lights, and four thrusters (two horizontal, two vert-trans). There was no means of tracking the location of the ROV from the ship, and no tether management. Over time, the ROV hull was upgraded to a *Phantom DS4* (2001), which added two horizontal thrusters and increased the depth rating. Furthermore, additional cameras and sensors were added to improve the quality and quantity of data and imagery collected during surveys including: a high-resolution (3 megapixel) digital still camera (2003; Scorpio Plus, Insite Pacific) and strobes; calibrated, high-intensity lasers for estimating the size and range of targets observed near the seabed; a Doppler velocity log (2005; 1200 kHz Workhourse Navigator, Teledyne) for precise estimation of speed, distance, and altitude; a conductivity-temperature-depth (2006; Citadel CTD, RDI Teledyne) probe and oxygen optode (Model 3975, Aanderaa); an ultrashort baseline acoustic tracking system (2002; TrackPoint-IIplus, ORE Offshore); and a forward-looking scanning sonar (2005; MS1000, Kongsberg-Simrad). In 2010, a more precise and user-friendly USBL (TrackLink 1500HA, LinkQuest) was added.

In 2011, the engineers and biologists at the SWFSC finalized the design and construction of a new high-definition (HD), high-voltage, DC-powered ROV ([HDHV-ROV](https://swfsc.noaa.gov/hdhv-rov/)) to improve the survey capabilities of the ROV program. The HDHV-ROV incorporated many of the instruments from the *Phantom DS4* ROV, and added: an HD (1080i) color video camera (Mini Zeus, Insite Pacific); LED lighting (LED Multi-SeaLite, Deep Sea Power & Light); a fiber-optic umbilical to increase bandwith for video and data transmission; and brushless DC trusters, which greatly reduced noise and eliminated laborious maintenance required by the *Phantom* trusters. In 2016, a calibrated stereo camera pair was installed to improve the measurement of targets observed during the surveys, and a multibeam imaging sonar (M3, Kongsberg-Simrad) was added to aid navigation, provide high-resolution maps of the seabed, or both. We continue to explore ways in which the survey capabilities of the SWFSC ROV can be improved.

**Improving visual survey methods**  
Accurate and precise measurements of transect length and width are critical to the estimation of abalone density and abundance. In 2016, a study was conducted to examine the accuracy and precision of distance estimates derived from different ROV instruments, and described a practical method to estimate transect width throughout surveys using standard survey equipment and analysital methods (Stierhoff *et al.*, 2016). That study found that transect distance measured using a Doppler velocity log were precise and accurate (**precision, accuracy**), and that transect area measured using the optical properties and orientation of the video camera were comparable to estimates derived using more laborious image analysis techniques. These methods significantly streamline and improve estimates of area searched during optical transect surveys, and will be employed during future surveys of abalone and other demersal fishes.

#### Improving assessments through habitat modeling

## Research theme 2 - SCUBA operations

### Research foci for Theme 2

#### Demography of shallow-water populations

#### Behavioral studies using acoustic telemetry

# Funding sources

## Discretionary NOAA funds

In 2000, soon after white abalone were listed as endangered under the ESA, the SWFSC received ~$200K to purchase an ROV (*Phantom*, Deep Ocean Engineering) for surveying deep-water white abalone populations throughout southern CA. Since then, the SWFSC has received between $15K-80K per year from West Coast Regional Office (WCRO, formerly the Southwest Regional Office) to support the costs of conducting field surveys, and improvements and repairs to the ROV system. These were typically discretionary funds and, therefore, the frequency and amount of funding were variable and unknown, and sometimes no funding was received. Nonetheless, the SWFSC was able to conduct meaningful surveys to monitor changes in white abalone populations at historically important locations every 2-4 years, an interval that is likely adequate to detect and track changes in population size. However, the level of funding received from the WCRO was not sufficient to survey all of the historically important sites, and the amount of survey effort (i.e., number of sea days) possible with the available funding was likely not optimal to minimize error in population estimates.

## Interagency Agreements

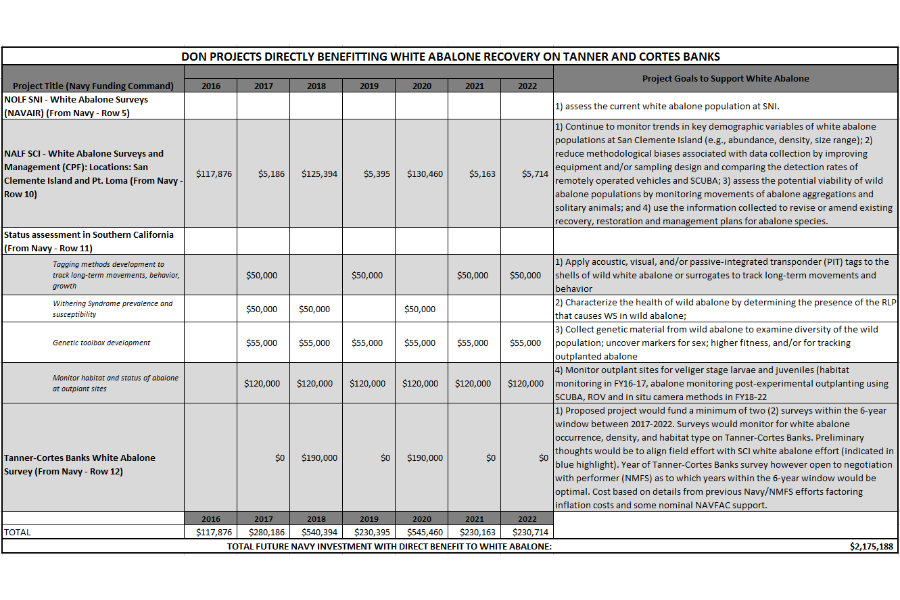
Given the limited amount of funding generally available, and the need to focus survey efforts at Tanner Bank, few surveys had been conducted at other historically significant areas, including San Clemente Island (SCI). In 2012, the SWFSC and WCRO entered into an interagency agreement with the Navy to conduct the first population assessment surveys of white abalone along the western shore of SCI since it was originally surveyed in 2004 (**Table: MIPR Funds**). In 2015, a second agreement provided funding to provide updated population estimates, but also for various projects aimed at improving survey methods and gaining a better understand of the behavior of white abalone and other abalone species that occur in the U.S. Navy's operational areas around San Clemente Island and Point Loma near San Diego, CA. All interagency agreements aimed to support the Navy's Integrated Natural Resources Management Plan for SCI and the State of CA's Abalone Recovery and Management Plan (ARMP).

**Table: MIPR Funds.** Funding year, amount ($), and agreement number for agreements between the Navy and NOAA.

|  |  |  |
| --- | --- | --- |
| Year | Amount | Agreement.number |
| FY12 | $76000 | US NAVY SWR-F147 |
| FY15-16 | $251237 | US NAVY WCR-F1404 |

## US Navy/NOAA Memorandum of Agreement

IN 2016, the Navy and NOAA entered into a Memorandum of Agreement (MOA) where the Navy would provide financial support for the recovery of critically endangered white abalone populations that occur at Tanner and Cortes Banks in exchange for the ability to continue conducting at-sea testing and training within the Navy's irreplaceable and strategically significant Southern California (SOCAL) Range Complex that are compatible with the recovery of the species (also called the Seven-Year Plan). The MOA will provide a total of ~$2,175,000 over the course of the Seven-Year Plan in support of efforts to monitor demography; improve survey methodology; develop methods to monitor behavior, disease prevalence, genetic diversity, demography; and monitor habitats and assess outplant sites (**Table: Navy Funds**). Approximately $1,495,000 of funding is allocated to ROV operations to survey white abalone populations and their offshore habitats at San Clemente Island, Tanner Bank, and Cortes Bank, and to explore and characterize and monitor potential outplant sites in nearshore habitats. Approximately ~$200,000 is allocated to the development and refinement of advanced technology (e.g., acoustic telemetry and time-lapse videography) for studying the movement and behavior white abalone and other closely related surrogate species. Total funding in any one year ranges from ~$118K-545K/year.



**Table: Navy Funds.** Funding allocation by year and research theme for the US Navy/NOAA Memorandum of Agreement and Seven-Year Plan.

# 5-year Research Plan

# Appendices

# Literature cited

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1. Priority #1 is defined as a species whose extinction is almost certain in the immediate future because of a rapid population decline or habitat destruction, whose limiting factors and threats are well understood and the needed management actions are known and have a high probability of success, and is a species that is in conflict with construction or other developmental projects or other forms of economic activity. NMFS Endangered and Threatened Listing Recovery Guidelines (55 FR 24296, June 15, 1990). [↑](#footnote-ref-31)