Black Abalone Recovery Plan: Five-Year Recovery Implementation Strategy (RIS)
Updated: August 23, 2023

This Recovery Implementation Strategy (RIS) identifies updated priorities for implementing the black abalone recovery actions over the next five years. The activities listed in this RIS fit within the long-term implementation strategy and site-specific recovery actions identified in the Final Black Abalone Recovery Plan. This RIS is made available for informational purposes. NMFS WCR will regularly update the RIS.

1 ASSESS AND MONITOR BLACK ABALONE POPULATIONS THROUGHOUT THEIR RANGE IN THE WILD.

Priority Recovery Activities	Recovery Action Addressed	Implementation Leads
Maintain updated table and maps of all survey sites, including sites for long-term surveys, abalone habitat assessments, project- or event-related surveys, and historical surveys.	1.1.3. Develop a plan and process to manage, analyze, and share population monitoring data.	Monitoring program leads
Evaluate existing monitoring programs: - Effectiveness/efficiency to address recovery criteria; including the utility of data collected (e.g., nearest neighbor, habitat, size) and additional data to collect (e.g., to quantify biological fouling). - Design, gaps, redundancies, health/genetics monitoring. - Potentially expand abalone habitat assessment surveys.	1.1 Continue support for existing and expanded long-term monitoring programs to evaluate population trends over time. 1.1.1. Evaluate existing monitoring programs and identify modifications needed to improve the effectiveness and efficiency of survey methods. 1.1.2. Evaluate existing monitoring efforts to identify areas of overlapping effort that can be combined and where additional monitoring is needed.	Monitoring program leads

2 EVALUATE GENETIC STRUCTURE AND DIVERSITY OF WILD BLACK ABALONE POPULATIONS ACROSS LOCAL AND BROAD SPATIAL SCALES.

Priority Recovery Activities	Recovery Action Addressed	Implementation Leads
Characterize population structure throughout the species' range: Collect and analyze genetic samples throughout California and Mexico.	2.1. Develop plan for assessing the genetic structure of black abalone across the species' range.	UCSC Raimondi and Shapiro labs
Develop long-term plan to evaluate and monitor genetic diversity, using information from the population structure characterization to inform and refine the plan.	2.2. Develop plan for resampling of black abalone for long-term monitoring and temporal studies.	SWFSC Hyde lab and UCSC Raimondi lab

Acronyms List – CDFW: California Department of Fish and Wildlife; CICESE: Center for Scientific Research and Higher Education; MARINe: Multi-Agency Rocky Intertidal Network; NMFS: National Marine Fisheries Service; NMS: National Marine Sanctuaries; NPS: National Park Service; SWFSC: NMFS Southwest Fisheries Science Center; UCSC: University of California, Santa Cruz; UW: University of Washington; USCG: U.S. Coast Guard

3 RESTORE BLACK ABALONE POPULATIONS NOT CURRENTLY MEETING THE DEMOGRAPHIC RECOVERY CRITERIA, BY ENHANCING LOCAL POPULATIONS AND SUPPORTING NATURAL RECOVERY.

Priority Recovery Activities	Recovery Action Addressed		Implementation Leads
Characterize juvenile recruitment habitat and develop survey protocols targeting juvenile abalone.	3.2.1.	Determine the value and efficacy of habitat restoration to enhance recruitment success, and conduct habitat restoration if appropriate.	UCSC Raimondi lab; Monitoring program leads
Abalone recruitment modules: Experimentally test and improve module designs.	3.2.1.	Determine the value and efficacy of habitat restoration to enhance recruitment success, and conduct habitat restoration if appropriate.	UCSC Raimondi lab; Monitoring program leads
Conduct pilot studies to evaluate the efficacy of transplanting to establish and enhance wild black abalone populations.	3.2.3	Determine the value and efficacy of translocation to establish viable populations, and translocate if appropriate.	UCSC Raimondi lab; Monitoring program leads
Restoration plan development: Identify prioritized list of potential restoration and donor sites for each Region and the data, resources, coordination, and authorizations needed.	3.2.3	Determine the value and efficacy of translocation to establish viable populations, and translocate if appropriate.	Monitoring program leads
Evaluate the feasibility of captive propagation as a recovery tool for black abalone.	3.2.4.	Continue research and development of captive propagation and outplanting of black abalone.	SWFSC Hyde lab; UCSC Raimondi lab

4 *DEVELOP A PLAN TO REMOVE BLACK ABALONE IN RESPONSE TO EVENTS SUCH AS OIL SPILLS, LANDSLIDES, AND VESSEL GROUNDINGS.*

Priority Recovery Activities	Recovery Action Addressed		Implementation Leads
Identify range of spill response actions and develop best management practices for USCG and OSPR.	4.1.	Identify and conduct research to develop the tools, guidance, and protocols needed to remove black abalone from the wild.	NMFS, CDFW, NMS, USCG, UCSC
Evaluate the effects of oil and dispersants on abalone: Identify range of oils and dispersants to study and existing studies and information on oil and dispersant effects on abalone.	4.1.1.	Evaluate the effects of oil and dispersants on black abalone.	NMFS, CDFW, NMS, UCSC
Develop emergency response plans and protocols, to include decision-making guidance, methods, and best practices.	4.2	Develop protocols for removing black abalone from the wild.	NMFS, CDFW, NMS, UCSC

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5 PROTECT AND RESTORE BLACK ABALONE HABITAT FROM THREATS SUCH AS OIL SPILLS, SEDIMENTATION, AND COMMUNITY SHIFTS THAT OCCUR IN THE ABSENCE OF BLACK ABALONE.

Priority Recovery Activities	Recovery Action Addressed		Implementation Leads
Evaluate existing monitoring programs (see RA1): • Evaluate the frequency and scope of abalone habitat assessments to evaluate habitat quality. • Identify additional data needs and compile data sources to inform habitat characterization.	5.1.	Assess the quality and quantity of black abalone habitat throughout their range.	NMFS, CDFW, MARINe, Navy, NMS
Develop and implement response plans to address effects on black abalone and their habitat (e.g., sedimentation and water quality monitoring, abalone rescue and relocation)	5.2.	Develop and implement a plan to protect black abalone habitat in response to episodic events, such as oil spills and vessel groundings, and to coastal development plans that may affect black abalone habitat.	NMFS, CDFW, MARINe, NMS

6 CONTINUE, REFINE, AND EXPAND RESEARCH ON WITHERING SYNDROME, OTHER DISEASES, AND OCEAN ACIDIFICATION.

Priority Recovery Activities	Recovery Action Addressed		Implementation Leads
Develop non-lethal methods to evaluate infection levels of individual abalone with the withering syndrome (WS) pathogen.	6.1	Continue and expand research on withering syndrome and its effects on black abalone.	CICESE Cruz Lab; CDFW Shellfish Health lab.
Develop and conduct field-based studies to: • Document the proportion of populations with visible signs of disease. • Assess WS infection levels in individuals. • Evaluate genetic resistance: relate temperature data to recruitment, health, and disease.	6.2	Develop model(s) to evaluate withering syndrome transmission dynamics, including the influence of climate, density, genetically-based disease resistance, phage intervention, and species interactions.	Monitoring program leads; UCSC Shapiro lab; SWFSC Hyde lab; CICESE Cruz lab.
Ocean acidification: evaluate the effects of pH on black abalone populations.	6.6	Evaluate pH tolerance and the effects of decreasing pH on various life stages of black abalone.	CICESE Cruz lab

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7 MAINTAIN AND ENHANCE BINATIONAL COORDINATION WITH MEXICO.

Priority Recovery Activities	Recovery Action Addressed		Implementation Leads
Establish regular meetings with collaborators in Mexico: • Annual meetings (online). • Seminar series to build collaborations.	7.1	Develop opportunities for information exchange on a regular basis, such as annual or biennial workshops/meetings.	NMFS, CICESE, NPS, SWFSC Hyde Lab
Identify existing/current research collaborations. Identify additional research topics for collaboration and potential collaborators.	7.2	Coordinate and collaborate on monitoring, research, and funding opportunities.	NMFS, CICESE, NPS, SWFSC Hyde Lab

8 DEVELOP AND IMPLEMENT ENFORCEMENT, PUBLIC OUTREACH, AND EDUCATION PLANS.

Priority Recovery Activities	Recovery Action Addressed		Implementation Leads
Facilitate continued coordination among enforcement agencies using existing forums to share resources and information to ensure consistent application of regulations.	8.1	Coordinate on enforcement issues to enforce existing State and Federal protections and recommend new protections, if needed.	CDFW, NMFS, NMS Enforcement
Develop protocol for handling confiscated black abalone (live or dead).	8.1	Coordinate on enforcement issues to enforce existing State and Federal protections and recommend new protections, if needed.	CDFW, NMFS, NMS, Enforcement
CDFW poaching database: Develop database and regular reporting of black abalone enforcement cases.	8.1.1	Refine CDFW database to track past and current illegal take cases and violations.	CDFW, NMFS, NMS Enforcement
Identify audiences and key messages regarding black abalone and their recovery.	8.2	Develop key, unified messaging in collaboration with partners to share in public outreach and education efforts, highlighting the biological, cultural, and economic importance of abalone in California and Mexico.	NMS, CDFW Outreach & Education leads
Identify desired outcomes, assess existing programs/materials, and develop new tools/materials to share key messages.	8.2.2	Identify and bring together key partners through an outreach workshop to review existing resources and to discuss and develop signage, educational displays, and other outreach materials.	NMS, CDFW Outreach & Education leads

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