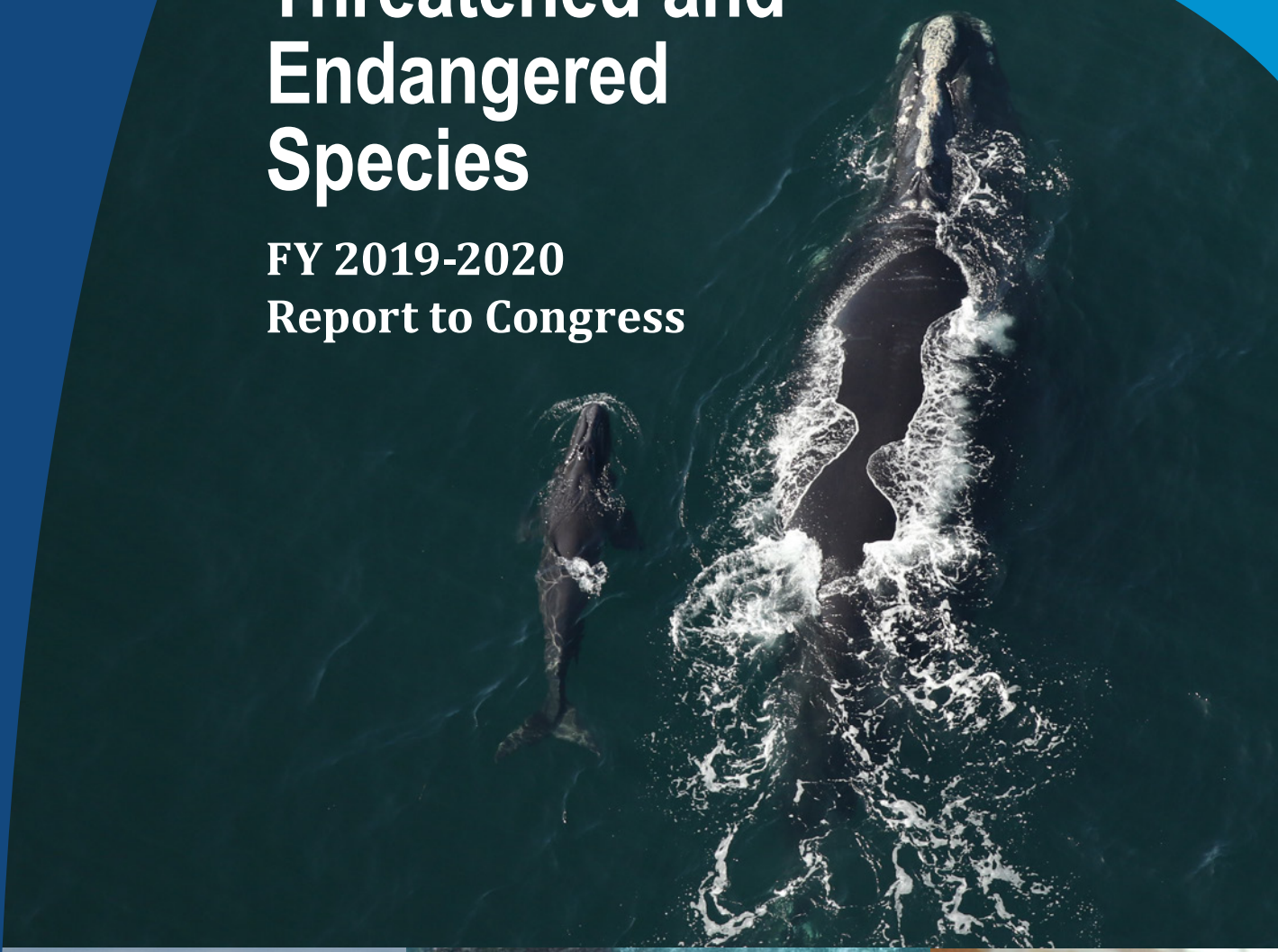


Recovering Threatened and Endangered Species

FY 2019-2020
Report to Congress



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NOAA Fisheries is responsible for the stewardship of the nation's ocean resources and their habitat. We provide vital services for the nation: productive and sustainable fisheries, safe sources of seafood, the recovery and conservation of protected resources, and healthy ecosystems—all backed by sound science and an ecosystem-based approach to management.

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Front cover: North Atlantic right whales—Florida Fish and Wildlife Conservation Commission, NMFS permit 20556-01; Cook Inlet beluga whale, Paul Wade, NMFS permit 20465; Atlantic salmon—Bob Michelson; White abalone—Athena Maguire. Back cover: Southern resident killer whale—NMFS/Brad Hanson, NMFS permit 16163

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Black abalone (*Haliotis cracherodii*)
Credit: NMFS



Acropora globiceps colony, photographed off the coast of Rota, Commonwealth of the Northern Mariana Islands. Credit: Doug Fenner

LIST OF ACRONYMS

ADF&G	Alaska Department of Fish and Game	NASA	National Aeronautics and Space Administration
AKBMP	Alaska Beluga Monitoring Partnership	NASCO	North Atlantic Salmon Conservation Organization
AoP	Aquarium of the Pacific	NAVTEX	Navigational Telex
ASF	Atlantic Salmon Federation	NFWF	National Fish and Wildlife Foundation
BCRP	Battle Creek Salmon and Steelhead Restoration Project	NGO	Non-Governmental Organization
BML	Bodega Marine Laboratory	NMFS	National Marine Fisheries Service
BOEM	Bureau of Ocean Energy Management	NOAA	National Oceanic and Atmospheric Administration
Caltrans	California Department of Transportation	NWFSC	Northwest Fisheries Science Center
CCC	Central California Coast	PET	Population Evaluation Tool
CDFW	California Department of Fish and Wildlife	PIFSC	Pacific Islands Fisheries Science Center
CDWR	California Department of Water Resources	PIRO	Pacific Islands Regional Office
CFR	Code of Federal Regulations	PMRG	Paua Marine Research Group
COVID-19	Coronavirus Disease 2019	PSA	Public Service Announcement
CSAMP	Collaborative Science and Adaptive Management Program	RCD	Resource Conservation District
DEIS	Draft Environmental Impact Statement	Reclamation	U.S. Bureau of Reclamation
DFO	Fisheries and Oceans Canada	RFMO	Regional Fisheries Management Organization
DLNR	Department of Land and Natural Resources	ROV	Remotely Operated Vehicle
DMA	Dynamic Area Management	SCUBA	Self-Contained Underwater Breathing Apparatus
DPS	Distinct Population Segment	SHARE	Salmon Habitat and River Enhancement
DST	Decision Support Tool	SMA	Seasonal Management Areas
ECHO	Enhancing Cetacean Habitat and Observation	SRSP	Sacramento River Science Partnership
EEZ	Exclusive Economic Zone	SWFSC	Southwest Fisheries Science Center
ESA	Endangered Species Act	TBF	The Bay Foundation
ESU	Evolutionarily Significant Unit	TDA	Tetepare Descendants' Association
FAR	Friends of the Anchorage Coastal Wildlife Refuge	TNC	The Nature Conservancy
FR	Federal Register	UME	Unusual Mortality Event
FWS	U.S. Fish and Wildlife Service	USACE	U.S. Army Corps of Engineers
FY	Fiscal Year	USCG	U.S. Coast Guard
HMAR	Hawaii Marine Animal Response	WCPFC	Western and Central Pacific Fisheries Commission
IATTC	Inter-American Tropical Tuna Commission	WWF	World Wildlife Fund for Nature
MBSTP	Monterey Bay Salmon and Trout Project		
MMPA	Marine Mammal Protection Act		

Letter from the Assistant Administrator



Over the course of nearly 50 years of implementing the Endangered Species Act, we have learned that the successful recovery of our nation's threatened and endangered species requires adaptive management strategies that allow us to respond to evolving threats and changing conditions. In 2020 and into 2021, the COVID-19 pandemic tested our ability to adapt to new ways of carrying out our mission.

While obstacles such as travel and quarantine restrictions created setbacks to some of our recovery activities and efforts, they also opened the door to new opportunities. We used drone technology to monitor Pacific salmon habitat restoration projects when site visits were not possible. By moving educational programs and scientific seminars to a virtual platform, we dramatically expanded the reach of our outreach programs for species such as North Pacific right whales and Southern Resident killer whales. We took advantage of the greater numbers of people engaging in outdoor recreation to expand citizen science programs for Main Hawaiian Islands insular false killer whales, which helped to fill data gaps left by cancelled research expeditions. We were also able to join forces with our partners, often in new and innovative ways, to ensure critical activities could continue. Partners at the University of Washington and the Woods Hole Oceanographic Institution were able to step in and deploy acoustic moorings in the Bering and Chukchi seas, enabling us to continue collecting data on North Pacific right whales and other marine mammals. A new partnership with LightHawk, an international nonprofit that pairs pilots with environmental causes, ensured that we were able to transport thousands of baby white abalone from the labs in northern California where they were grown to the sites in southern California where they could be outplanted into the wild. Transporting the abalone by air increased our efficiency and decreased transit time (and stress) for the abalone, while allowing people to maintain social distancing.

In addition, much of our day-to-day work was able to continue without impact. We developed recovery plans for the blue whale, black abalone, and the Main Hawaiian Islands insular false killer whale. Recovery workshops and stakeholder meetings were held virtually. We listed the Gulf of Mexico population of the Bryde's whale as endangered in 2019, and in 2020 NOAA scientists were able to confirm that this population of whales is actually a new species, the Rice's whale. This exciting discovery improves our understanding of this rare baleen whale and will help inform our recovery planning efforts for the species moving forward.

In this biennial report, we provide a snapshot of our efforts over the past two years to conserve and recover marine species listed as threatened or endangered under the ESA. We also highlight the progress we have made with our partners toward stabilizing the declining populations of our nine *Species in the Spotlight*. Through targeted research and management actions to address the most urgent threats, we achieved some important milestones. For example, we enhanced over 200 miles of streams for Central California Coast coho salmon, and improved access to approximately 250 miles of streams and rivers for Atlantic salmon. We launched the first-ever effort to vaccinate a wild population of Hawaiian monk seals against morbillivirus, and as a result of these and other efforts we are starting to see a slow increase in the population. To build

on these successes and sustain our momentum in recovering these nine species, we recently announced the renewal of the *Species in the Spotlight* initiative and developed new 2021-2025 Priority Action Plans that highlight the most vital actions NMFS and our partners can take over the next five years to reverse the decline of these species. Of particular note, we developed our first action plan for the North Atlantic right whale, which we added to the initiative in 2019. The *Species in the Spotlight* stories in this biennial report describe key accomplishments and highlight the extraordinary contributions of our Partners in the Spotlight, demonstrating what we can achieve when we focus efforts around a common cause.

Although the 2019-2020 biennium challenged us in ways we never could have anticipated, I am proud of the resilience we have shown in our ability to fulfill our mission. As we look ahead to a return to “normal,” the themes of resilience and adaptation will remain at the forefront as we sharpen our focus on tackling the challenge of recovering threatened and endangered species in the face of climate change. The species that NMFS conserves and protects are already compromised as reflected by their endangered or threatened status. To fulfill our stewardship responsibility, there are a number of strategies we can use to help protected species and their habitats better adapt and be resilient to climate change. For example, reducing localized non-climate stressors on threatened corals—such as sedimentation, contaminants, and overfishing—can enhance the ability of the species or ecosystem to withstand climatic events. We are also working to reintroduce Sacramento River winter-run Chinook salmon into historically occupied river systems that are fed by high-elevation snowmelt and cold-water springs and are thus more resilient to drought and warming water temperatures. We will continue to build our toolkit for assessing how to be more climate-informed in our actions. Conducting climate vulnerability assessments will help us identify which protected species are most vulnerable and why, and where additional research and action are needed to reduce risks. Scenario planning exercises will help us better account for uncertainty by preparing for a range of plausible climate futures, and will help us understand how we may need to modify our management strategies to prepare for these scenarios.

Addressing the impacts of climate change on our nation’s threatened and endangered species is a daunting challenge, but one that we can overcome with persistence, dedication, and focus. We are grateful for the support of Congress and all of our partners as we continue to advance the recovery of marine species that are of great interest to the public and are a vital part of a healthy marine ecosystem.

Finally, I would like to thank Donna Wieting for her 32 years of service to NOAA, 17 of which were dedicated to the conservation, protection, and recovery of species under the Endangered Species Act and the Marine Mammal Protection Act. As the Director of the NMFS Office of Protected Resources, Donna was the visionary behind the *Species in the Spotlight* initiative, which has been an enormous success for the conservation and recovery of species at risk of extinction. She has been a transformative leader for both the agency and the species we are entrusted with protecting on behalf of the people of the United States. We wish her well in her retirement.



Background

The primary purpose of the Endangered Species Act (ESA), as amended (16 United States Code sections 1531–1544) is the conservation of endangered and threatened species and the ecosystems on which they depend. Conservation is defined, in part, as “...the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary.” As one means of achieving recovery, the ESA requires the development of recovery plans for listed endangered or threatened species (except those species for which it is determined that such a plan will not promote the conservation of the species). Recovery plans organize and guide the recovery process, but are not regulatory documents.

Oceanic whitetip shark (*Carcharhinus longimanus*)
Credit: NMFS

We monitor recovery progress by conducting a review of the species’ status at least once every five years (5-year review) to determine, on the basis of such review, whether the species should be reclassified or removed from the List of Threatened and Endangered Species (ESA section 4(c)(2)).

The ESA amendments of 1988 added a requirement that the Secretaries of Commerce and the Interior report to Congress every two years on the status of efforts to develop and implement recovery plans, and on the status of all species for which recovery plans have been developed (ESA section 4(f)(3)). The Secretary of Commerce has delegated responsibility for endangered and threatened species recovery to the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA). This is NMFS’ 16th Report to Congress on the status of the recovery program for species under its jurisdiction.



Overview

Recovery is the process of restoring listed species to the point they no longer require the protections of the ESA. A recovery plan serves as a road map for species recovery—it lays out where to go and how to get there. Without a plan to organize, coordinate, and prioritize recovery actions, the efforts by so many federal agencies, states, non-governmental organizations (NGOs), tribal entities, stakeholders, and citizens may be inefficient, ineffective, or misdirected. The ESA envisions recovery plans as the central organizing tool guiding each species' progress toward recovery.

This report summarizes efforts to recover all domestic and transnational species¹ under NMFS' jurisdiction in Fiscal Year (FY) 2019-2020 (from October 1, 2018, through September 30, 2020). It includes a summary table (Table 1) providing information such as the status of each species, the status of the recovery plan, and the date the last 5-year review was completed or initiated.

With this report, NMFS also is updating progress made on the *Species in the Spotlight* initiative launched in 2015. The initiative is a strategic approach to endangered species recovery that focuses agency resources on species for which immediate, targeted efforts are needed to stabilize their populations and prevent extinction. This report highlights progress made on recovery efforts for the eight species originally identified in the *Species in the Spotlight* and the North Atlantic right whale, which was added to the initiative in 2019.

During the two years covered in this report (October 1, 2018–September 30, 2020), we managed 99 domestic (includes some transnational) and 66 foreign marine and anadromous species—including salmon, sturgeon, sawfish, sharks, rays, seagrass, mollusks, sea turtles, corals, and marine mammals. In this report, we address the 99 species² for which a recovery plan would promote their conservation, including one newly listed species:

- Gulf of Mexico Bryde's Whale (*Balaenoptera edeni*, *Gulf of Mexico subspecies*) listed as endangered on April 15, 2019 (84 FR 15446)³.

Between October 1, 2018, and September 30, 2020, of the 99 domestic or transnational listed species for which a recovery plan would promote its conservation, 55 had final recovery plans, two had a draft recovery plan, 31 plans were in development, and 11 species recovery plans had not been started.

Between October 1, 2018, and September 30, 2020, the status of the 99 endangered or threatened species for which recovery plans have or will be developed was:

- 25 (25.3%) were stabilized or increasing.
- 11 (11.1%) were declining.
- 17 (17.2%) were mixed, with their status varying by population location.
- 46 (46.5%) were unknown, because we lacked sufficient trend data to make a determination.

A list of the domestic and transnational species managed by NMFS and for which recovery plans would provide a conservation benefit (99 species) is provided

1 Transnational species are those ESA-listed species with current/and or historical geographical ranges both within the United States, the U.S. exclusive economic zone (EEZ), and/or the high seas, and within the waters or the EEZ of one or more foreign country.

2 The ESA defines a species to include any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature.

3 In 2021, the Society for Marine Mammalogy Committee on Taxonomy recognized the Gulf of Mexico Bryde's Whale as a new whale species, the Rice's whale (*Balaenoptera ricei*). The ESA listing was updated (August 23, 2021; 86 FR 47022) to reflect the scientifically accepted taxonomy and nomenclature of this species. The common name was revised to Rice's whale, the scientific name to *Balaenoptera ricei*, and the description of the listed entity to entire species.



A Rice's whale (*Balaenoptera ricei*) surfaces in the Gulf of Mexico. Credit: NMFS, NMFS permit 21938

in Table 1. For each species/subspecies/evolutionarily significant unit (ESU)⁴/DPS, the table lists the population trend (unknown, decreasing, mixed, stable, or increasing), the recovery priority number⁵, the status of the recovery plan, and the date the last 5-year review was completed or initiated. Additional information on these species is available online at <http://www.fisheries.noaa.gov/species-directory/threatened-endangered>.

Recovery plans are available online at:

http://www.fisheries.noaa.gov/resources/documents?title=&field_category_document_value%5Brecovery_plan%5D=recovery_plan&sort_by=created

Recovery plans may also be requested by writing to:

Endangered Species Division–Recovery Plans
Office of Protected Resources–F/PR3
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3226

This report is available online via the NMFS Office of Protected Resources website at: <https://www.fisheries.noaa.gov/resource/document/recovering-threatened-and-endangered-species-report-congress-fy-2019-2020>

4 An ESU is a listable entity under the ESA that is (1) substantially reproductively isolated from other conspecific units and (2) represents an important component of the evolutionary legacy of the species; this is a designation used only for Pacific salmonids.
5 The recovery priority number is used to prioritize limited agency resources for recovery plan development and implementation and is assigned based on the application of the Endangered and Threatened Species Listing and Recovery Priority Guidelines (April 30, 2019; 84 FR 18243). <https://www.federalregister.gov/documents/2019/04/30/2019-08656/endangered-and-threatened-species-listing-and-recovery-priority-guidelines>

TABLE 1. ESA-listed species under NMFS jurisdiction through September 30, 2020, where recovery plans are either complete, in progress, or planned. Information includes the listing status, population trend, recovery priority number, recovery plan status, and most recent 5-year review completion or initiation. (ESA status: T = Threatened; E = Endangered).

Species/Subspecies ESU/DPS	Date Listed/ Reclassified	ESA Status	Trend	Recovery Priority Number ⁶	Status of Recovery Plan	Date 5-Year Review Completed or Initiated ⁷
SEA TURTLES						
Hawksbill Sea Turtle	06/1970	E	Mixed	3C	Completed 01/1998 (Pacific): 12/1993 (Atlantic)	Initiated 03/2020
Kemp's Ridley Sea Turtle	12/1970	E	Unknown	1C	Completed 08/1992: Revision Completed 09/2011	07/2015
Leatherback Sea Turtle	06/1970	E	Decreasing	3C	Completed 01/1998 (Pacific); 04/1992 (Atlantic)	08/2020
GREEN SEA TURTLE						
Central North Pacific DPS	07/1978 04/2016	T	Unknown	3C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015
Central West Pacific DPS	07/1978 04/2016	E	Unknown	3C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015
Central South Pacific DPS	07/1978 04/2016	E	Unknown	3C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015
South Atlantic DPS	07/1978 04/2016	T	Mixed	5C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015
East Pacific DPS	07/1978 04/2016	T	Mixed	5C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015
North Atlantic DPS	07/1978 04/2016	T	Increasing	5C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015

Species/Subspecies ESU/DPS	Date Listed/Reclassified	ESA Status	Trend	Recovery Priority Number ⁶	Status of Recovery Plan	Date 5-Year Review Completed or Initiated ⁷
LOGGERHEAD SEA TURTLE						
Northwest Atlantic Ocean DPS	07/1978 09/2011	T	Stable	5C	Completed 12/1991; Revision Completed 01/2009	08/2009 (Full status review); 5-Year Review initiated 12/2019
North Pacific Ocean DPS	07/1978 09/2011	E	Unknown	3C	Completed 01/1998; Revision Under Development	04/2020
OLIVE RIDLEY SEA TURTLE						
Breeding colony populations of Pacific coast Mexico	07/1978	E	Increasing	5C	Completed 01/1998	06/2014
Rangewide	07/1978	T	Mixed	5C	Completed 01/1998	06/2014
PACIFIC SALMON						
CHINOOK						
Chinook, Puget Sound ESU	03/1999 06/2005 ⁸	T	Stable	3C	Completed 01/2007	Initiated 10/2019
Chinook, Lower Columbia River ESU	06/2005 ⁸	T	Stable	3C	Completed 07/2013	Initiated 10/2019
Chinook, Upper Columbia River, Spring-run ESU	03/1999 06/2005 ⁸	E	Stable	1C	Completed 10/2007	Initiated 10/2019
Chinook, Snake River Fall-run ESU	04/1992 06/2005 ⁸	T	Increasing	5C	Completed 12/2017	Initiated 10/2019
Chinook, Snake River Spring/Summer-run ESU	04/1992 06/2005 ⁸	T	Stable	3C	Completed 12/2017	Initiated 10/2019
Chinook, Upper Willamette River ESU	03/1999 06/2005 ⁸	T	Decreasing	3C	Completed 08/2011	Initiated 10/2019
Chinook, California Coastal ESU	09/1999 06/2005 ⁸	T	Unknown	3C	Completed 10/2016	Initiated 10/2019
Chinook, Central Valley Spring-run ESU	09/1999 06/2005 ⁸	T	Stable	3C	Complete 07/2014	Initiated 10/2019
Chinook, Sacramento River Winter-run ESU	11/1990 1/1994 ⁹ 06/2005 ⁸	E	Stable	1C	Completed 07/2014	Initiated 10/2019

Species/Subspecies ESU/DPS	Date Listed/ Reclassified	ESA Status	Trend	Recovery Priority Number ⁶	Status of Recovery Plan	Date 5-Year Review Completed or Initiated ⁷
CHUM						
Chum, Hood Canal Summer-run ESU	03/1999 06/2005 ⁸	T	Increasing	5C	Completed 05/2007	Initiated 10/2019
Chum, Columbia River ESU	03/1999 06/2005 ⁸	T	Stable	3C	Completed 07/2013	Initiated 10/2019
COHO						
Coho, Lower Columbia River ESU	03/1999 06/2005 ⁸	T	Stable	3C	Completed 07/2013	Initiated 10/2019
Coho, Oregon Coast ESU	08/1998 ⁸ 02/2008	T	Increasing	5C	Completed 12/2016	Initiated 10/2019
Coho, Southern Oregon/ Northern California Coast ESU	05/1997 06/2005 ⁸	T	Unknown	3C	Completed 09/2014	Initiated 10/2019
Coho, Central California Coast ESU	10/1996 06/2005 ⁸	E	Unknown	1C	Completed 09/2012	Initiated 10/2019
SOCKEYE						
Sockeye, Ozette Lake ESU	03/1999 06/2005 ⁸	T	Stable	7C	Completed 05/2009	Initiated 10/2019
Sockeye, Snake River ESU	11/1991 06/2005 ⁸	E	Increasing	1C	Completed 06/2015	Initiated 10/2019
STEELHEAD						
Steelhead, Puget Sound DPS	05/2007	T	Stable	7C	Completed 12/2019	Initiated 10/2019
Steelhead, Lower Columbia River DPS	03/1998 01/2006 ⁸	T	Stable	3C	Completed 07/2013	Initiated 10/2019
Steelhead, Upper Columbia River DPS	08/1997 01/2006 ⁸	T	Increasing	3C	Completed 10/2007	Initiated 10/2019
Steelhead, Middle Columbia River DPS	03/1999 01/2006 ⁸	T	Stable	3C	Completed 09/2009	Initiated 10/2019
Steelhead, Upper Willamette River DPS	03/1999 01/2006 ⁸	T	Decreasing	3C	Completed 08/2011	Initiated 10/2019
Steelhead, Snake River Basin DPS	08/1997 01/2006 ⁸	T	Stable	3C	Completed 12/2017	Initiated 10/2019
Steelhead, Northern California DPS	06/2000 01/2006 ⁸	T	Unknown	3C	Completed 10/2016	Initiated 10/2019
Steelhead, Central California Coast DPS	08/1997 01/2006 ⁸	T	Unknown	3C	Completed 10/2016	Initiated 10/2019

Species/Subspecies ESU/DPS	Date Listed/ Reclassified	ESA Status	Trend	Recovery Priority Number ⁶	Status of Recovery Plan	Date 5-Year Review Completed or Initiated ⁷
STEELHEAD						
Steelhead, South-Central California Coast DPS	08/1997 01/2006 ⁸	T	Unknown	3C	Completed 12/2013	Initiated 10/2019
Steelhead, Southern California Coast DPS	08/1997 05/2002 ¹⁰ 01/2006 ⁸	E	Unknown	1C	Completed 01/2012	Initiated 10/2019
Steelhead, California Central Valley DPS	03/1998 01/2006 ⁸	T	Unknown	3C	Completed 07/2014	Initiated 10/2019
ATLANTIC SALMON						
Gulf of Maine DPS	11/2000 06/2009 ¹¹	E	Decreasing	1C	Completed 02/2019	11/2020
NON-SALMONID FISH						
Bocaccio—Puget Sound/Georgia Basin DPS	04/2010 01/2017 ¹²	E	Decreasing	7C	Completed 10/2017	Initiated 3/2020
Eulachon, Southern DPS	03/2010	T	Stable	9C	Completed 09/2017	Initiated 3/2020
Giant Manta Ray	01/2018	T	Unknown	6C	Under Development	N/A
Green Sturgeon, Southern DPS	04/2006	T	Unknown	6C	Completed 08/2018	Initiated 3/2020
Gulf Sturgeon	09/1991	T	Mixed	7C	Completed 09/1995	Initiated 04/2019
Nassau Grouper	06/2016	T	Decreasing	3C	Under Development	N/A
Oceanic Whitetip Shark	01/2018	T	Mixed	6C	Under Development	N/A
Shortnose Sturgeon	03/1967	E	Mixed	1C	Completed 12/1998	Not Started
Smalltooth Sawfish - U.S. DPS	04/2003	E	Increasing	1C	Completed 01/2009	09/2018
Yelloweye rockfish—Puget Sound/Georgia Basin DPS	04/2010 01/2017 ¹²	T	Decreasing	9C	Completed 10/2017	Initiated 3/2020

Species/Subspecies ESU/DPS	Date Listed/ Reclassified	ESA Status	Trend	Recovery Priority Number ⁶	Status of Recovery Plan	Date 5-Year Review Completed or Initiated ⁷
ATLANTIC STURGEON						
Gulf of Maine DPS	02/2012	T	Unknown	3C	Under Development	Initiated 03/2018
New York Bight DPS	02/2012	E	Unknown	1C	Under Development	Initiated 03/2018
Chesapeake Bay DPS	02/2012	E	Unknown	1C	Under Development	Initiated 03/2018
Carolina DPS	02/2012	E	Increasing	1C	Under Development	Initiated 03/2018
South Atlantic DPS	02/2012	E	Mixed	1C	Under Development	Initiated 03/2018
PLANTS						
Johnson's Seagrass	09/1998	T	Stable	4C	Completed 09/2002	11/2007
INVERTEBRATES						
Black Abalone	01/2009	E	Mixed	2C	Completed 11/2020	07/2018
White Abalone	05/2001	E	Unknown	1C	Completed 10/2008	07/2018
Lobed Star Coral	09/2014	T	Mixed	3C	Under Development	Initiated 1/2021
Mountainous Star Coral	09/2014	T	Mixed	3C	Under Development	Initiated 1/2021
Boulder Star Coral	09/2014	T	Mixed	3C	Under Development	Initiated 1/2021
Pillar Coral	09/2014	T	Decreasing	3C	Under Development	Initiated 1/2021
Rough Cactus Coral	09/2014	T	Mixed	3C	Under Development	Initiated 1/2021
15 Indo-Pacific Corals ¹³	09/2014	T	Unknown	5C	Under Development	Initiated 1/2021
Elkhorn Coral	05/2006	T	Mixed	3C	Completed 03/2015	Initiated 1/2021
Staghorn Coral	05/2006	T	Mixed	3C	Completed 03/2015	Initiated 1/2021

Species/Subspecies ESU/DPS	Date Listed/ Reclassified	ESA Status	Trend	Recovery Priority Number	Status of Recovery Plan	Date 5-Year Review Completed or Initiated
SEALS AND SEA LIONS						
Bearded Seal—Beringia DPS	12/2012	T	Unknown	9C	Under Development	Initiated 1/2021
Ringed Seal—Arctic Subspecies	12/2012	T	Unknown	9C	Under Development	Initiated 11/2020
Hawaiian Monk Seal	11/1976	E	Mixed	1C	Completed 03/1983; Revision Completed 08/2007; Amended with Main Hawaiian Island Management Plan 01/2016; Revision Under Development 01/2021	08/2007
Steller Sea Lion— Western DPS	04/1990 11/1990 05/1997	E	Mixed	5C	Completed 12/1992; Revision Completed 03/2008	2/2020
WHALES						
Beluga Whale—Cook Inlet DPS	10/2008	E	Decreasing	2C	Completed 01/2017	Initiated 02/2021
Blue Whale	06/1970	E	Unknown	6C	Completed 07/1998; Revision Completed 11/2020	11/2020
False Killer Whale— Main Hawaiian Islands Insular DPS	11/2012	E	Unknown	1C	Draft Completed 10/2020	Initiated 10/2020
Fin Whale	06/1970	E	Unknown	8C	Completed 07/2010	02/2019
Killer Whale—Southern Resident DPS	11/2005	E	Decreasing	1C	Completed 01/2008	12/2016
Bryde's Whale, Gulf of Mexico	04/2019	E	Unknown	1C	Under Development	N/A
North Atlantic Right Whale	03/2008	E	Decreasing	1C	Completed 05/2005	10/2017
North Pacific Right Whale	03/2008	E	Unknown	4C	Completed 06/2013	12/2017
Sei Whale	06/1970	E	Unknown	6C	Completed 12/2011	Initiated 01/2018
Sperm Whale	06/1970	E	Unknown	7C	Completed 12/2010	Initiated 05/2021

Species/Subspecies ESU/DPS	Date Listed/ Reclassified	ESA Status	Trend	Recovery Priority Number	Status of Recovery Plan	Date 5-Year Review Completed or Initiated
HUMPBACK WHALE						
Central America DPS	06/1970 09/2016	E	Unknown	2C	1970 Listing Completed 11/1991; 2016 Listing Not Started	N/A
Mexico DPS	06/1970 09/2016	T	Unknown	4C	1970 Listing Completed 11/1991; 2016 Listing Not Started	N/A
Western North Pacific DPS	06/1970 09/2016	E	Unknown	7C	1970 Listing Completed 11/1991; 2016 Listing Not Started	N/A



Main Hawaiian Islands insular false killer whale (*Pseudorca crassidens*). Credit: PIFSC, NMFS permit 14097

- 6 Recovery Priority Guidelines (April 30, 2019; 84 FR 18243). <https://www.federalregister.gov/documents/2019/04/30/2019-08656/endangered-and-threatened-species-listing-and-recovery-priority-guidelines>
- 7 For species listed within 5 years, a N/A (Not Applicable) is applied to the status of the 5-Year Review.
- 8 In *Alesea Valley Alliance v. Evans*, 161 F. Supp. 2d 1154 (D. Or. 2001) (*Alesea*), the U.S. District Court, District of Oregon ruled that NMFS could not exclude hatchery fish within the ESU when listing. Although the *Alesea* ruling affected only one ESU, subsequent to the ruling, NMFS initiated new status reviews for 27 ESUs and, in 2005, re-listed 15 ESUs of salmon with revised definitions of the populations to be included in the ESU, delisted one ESU (Oregon Coast coho), and listed one ESU (Lower Columbia River coho); and in 2006, re-listed 10 ESUs of steelhead (and identified them as DPSs).
- 9 This ESU was first emergency-listed as threatened on 8/4/1989, then fully listed as threatened on 11/5/1990, then reclassified as endangered on 1/4/1994.
- 10 This ESU was first listed on 8/18/1997; the southern range extension to the U.S.-Mexico border was added to the listing for this ESU via a final rule on 5/1/2002.
- 11 The Gulf of Maine Atlantic Salmon DPS was originally listed on November 17, 2000 (65 FR 69469) and was revised to include the Androscoggin, Kennebec, and Penobscot River basins in 2009 (74 FR 29344, June 19, 2009).
- 12 The species listing was amended based on a geographic description and to include fish within specified boundaries (January 23, 2017; 82 FR 7711).
- 13 This includes 7 species of threatened Indo-Pacific reef corals known to occur in U.S. waters, as well as 8 threatened species known to occur in foreign waters. The Recovering Threatened and Endangered Species FY 2017-2018 Report to Congress included only the 7 domestic species of Indo-Pacific corals; however, we have included all 15 species here because NMFS intends to develop a recovery plan for listed Indo-Pacific corals that includes all 15 species.

SPECIES *in the* SPOTLIGHT

In 2015, NMFS launched the *Species in the Spotlight* initiative, a strategic approach to endangered species recovery that focuses on species for which immediate, targeted actions can be taken to stabilize the population and prevent extinction. For some of these species, their numbers are so low that they need to be bred in captivity; others are facing human threats that must be addressed to prevent their extinction. In most cases, we understand the limiting factors and threats to these species, and we know that the necessary management actions are likely to be effective. In some cases, we are prioritizing research to better understand the threats so we can fine-tune our actions for the maximum effect. We know we cannot do this alone. A major part of the *Species in the Spotlight* initiative is to expand partnerships and motivate individuals to work with us to get these species on the road to recovery.

In 2016, NMFS developed 5-year Priority Action Plans for the *Species in the Spotlight* in order to focus recovery efforts on high-priority actions that we and our partners can take in the near term to address the most urgent threats to the species. Since the start of the initiative,



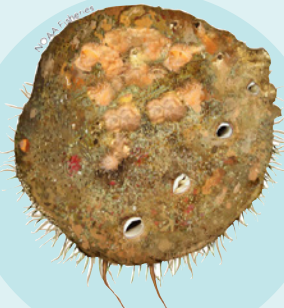
ATLANTIC SALMON GULF OF MAINE DPS



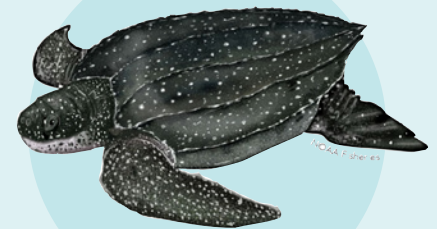
CENTRAL CALIFORNIA COAST COHO SALMON ESU



NORTH ATLANTIC RIGHT WHALE



WHITE ABALONE



PACIFIC LEATHERBACK SEA TURTLE

we have added around 90 new partners, channeled over \$75 million in NOAA grants and discretionary funding, and achieved some important milestones toward stopping the decline of these species. However, we still have a long way to go before these populations are stabilized. To build on these successes and sustain our efforts to recover these species, we recently renewed the *Species in the Spotlight* initiative and developed new 2021-2025 Priority Action Plans, including the first Priority Action Plan for the North Atlantic right whale, which was added to the initiative in 2019.

The stories in this section highlight the progress made in FY 2019-2020 toward implementing high-priority recovery actions for our *Species in the Spotlight*. In these stories, we also feature our 2021 Partners in the Spotlight, whose exceptional efforts have made a profound difference for the species and have been a critical part of the initiative’s success. Their dedication motivates and inspires further conservation efforts and collaboration, and they deserve special recognition for their work. We appreciate all of our current partners and collaborators, as the steps we need to take to stabilize these species would not be possible without them.



COOK INLET BELUGA WHALE DPS



HAWAIIAN MONK SEAL



SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON ESU



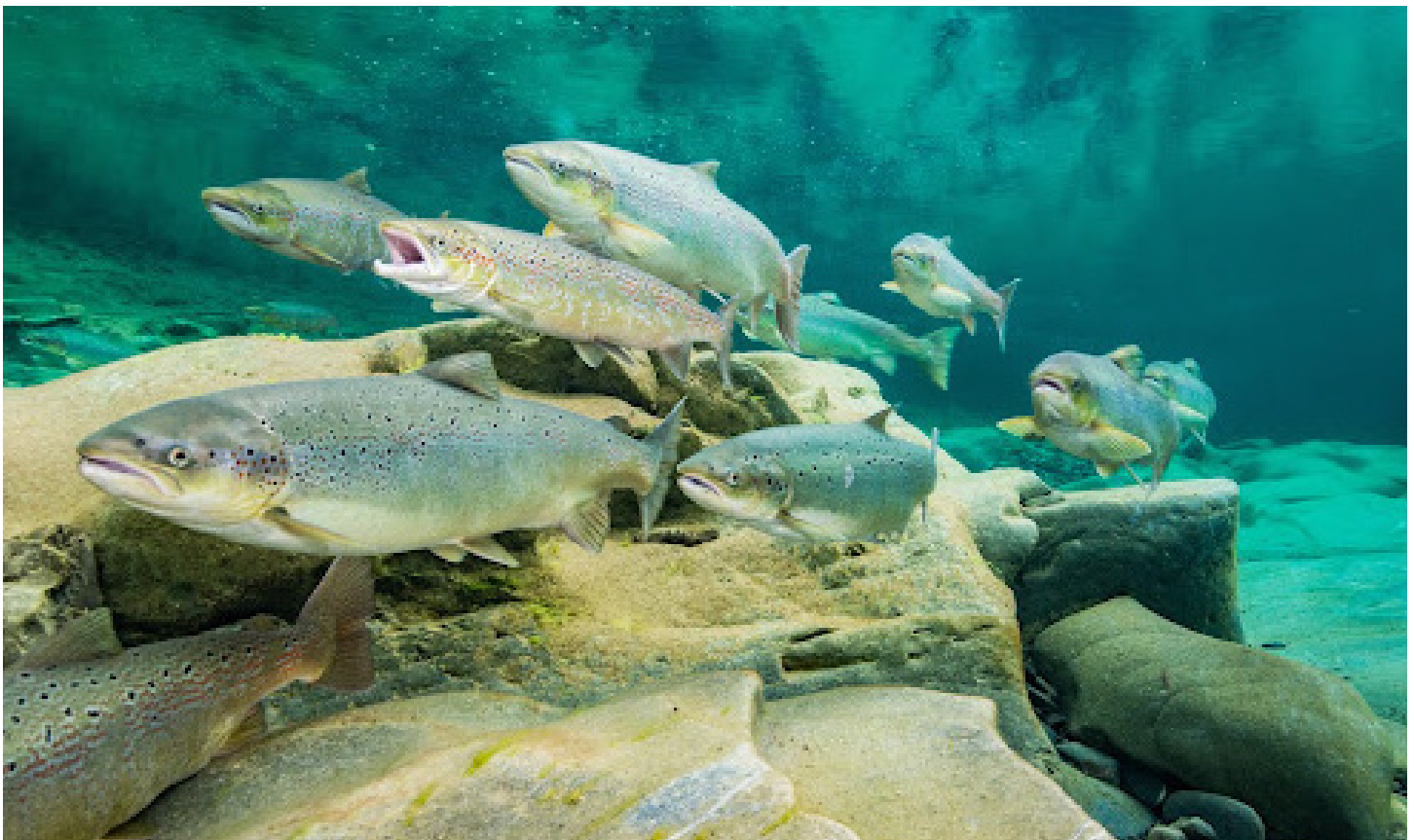
SOUTHERN RESIDENT KILLER WHALE DPS

SPECIES *in the* SPOTLIGHT

ATLANTIC SALMON GULF OF MAINE DPS

The Gulf of Maine DPS of Atlantic salmon (*Salmo salar*) was selected as one of the *Species in the Spotlight* because of its critically low abundance and the continuing decline in the population. Atlantic salmon are anadromous fish that spend the first half of their life in freshwater rivers and streams and the second half maturing in the ocean. The Gulf of Maine DPS includes all Atlantic salmon that return from the Labrador Sea off of Greenland to the rivers and streams of central and eastern Maine. There are three recovery units in the DPS—Downeast Coastal, Penobscot Bay, and Merrymeeting Bay. In the United States, Atlantic salmon populations historically extended as far south as Long Island Sound. Before 1900, southern populations were extirpated due to habitat loss, hydropower development, freshwater habitat impairment, and overharvest.

Today, the only remaining Atlantic salmon populations in U.S. waters exist in a few rivers and streams in central and eastern Maine. These remaining populations are adapted to specific conditions in their natal rivers (often referred to as “river-specific stocks”). Since the endangered listing in 2000, one of these river-specific populations has been extirpated, and another is now on the brink of being lost. This has led to growing concern about the status of the DPS as a whole. River-specific populations still persist in central and eastern Maine, and restoring the rivers that support them is a top priority. In addition, there are rivers in the Gulf of Maine DPS that lack river-specific stocks yet still contain abundant high-quality spawning and rearing habitat that is essential to supporting a recovered population. In particular, habitat in the Kennebec River in the Merrymeeting Bay recovery unit will



Atlantic salmon (*Salmo salar*). Credit: Nick Hawkins

need to be made accessible to returning Atlantic salmon in order to achieve our recovery goals.

Recovery Progress

In FY 2019-2020, we made progress on the key actions identified in the 2016-2020 Priority Action Plan¹⁴ for the Gulf of Maine DPS of Atlantic salmon: (1) reconnect the Gulf of Maine with headwater streams; (2) increase the number of fish successfully entering the marine environment; (3) reduce international fishery mortality off West Greenland; and (4) increase our understanding and ability to improve survival in the marine environment.

Reconnect the Gulf of Maine with Headwater Streams

In 2019 and 2020, at least 73 aquatic connectivity projects were completed within the freshwater range of endangered salmon in Maine, improving access to more than 200 miles of stream and river habitat. By helping to restore connectivity and ecological stream processes, these projects enhance adult access to spawning grounds and help to increase the number of fish that are successfully entering the marine environment. Of particular note, the Atlantic Salmon Federation (ASF), the Midcoast Conservancy, and The Nature Conservancy (TNC) in Maine partnered to remove one dam and to partially remove another on the Sheepscot River, which reconnected 60 miles of juvenile rearing habitat. The Sheepscot is of particular restoration value as it hosts a river-specific stock of Atlantic salmon in the Merrymeeting Bay recovery unit and is the southernmost remaining stock in the United States.

We continue to improve upstream and downstream fish passage and reduce the impact of hydroelectric dams on Atlantic salmon by working through the U.S. Federal Power Act and the ESA. In 2019 and 2020, we worked with hydroelectric dam owners and the Federal Energy Regulatory Commission to improve



The removal of the Coopers Mill Dam on the Sheepscot River in Maine. Credit: Tim Swan

fish passage and habitat conditions at 17 dams within the Gulf of Maine DPS. Although no new fishways were constructed at hydroelectric dams in 2019 or 2020, considerable work is ongoing to support new fishways at projects on the Androscoggin, Kennebec, Penobscot, and Union Rivers.

Removing dams, installing fishways, and improving passage conditions at road crossings remain critical to the recovery of Atlantic salmon because they allow adult salmon moving upstream to reach headwaters and juvenile and post-spawn salmon moving downstream to reach the marine environment. Given the complex life cycle and many threats facing salmon, benefits from recovery actions are not always immediately evident. However, increases in other commercially valuable species, like river herring and American eel, and recreationally important species such as American shad, indicate that fish populations are responding to habitat improvements on salmon rivers. For example, following the removal of Great Works and Veazie dams on the Penobscot River (and improved passage at other upstream dams) in 2012, river herring returns increased from 2,000 in 2011 to over 2 million in 2020. These benefits impact the entire ecosystem, as river herring serve as a source of food for cod, haddock, and other commercially valuable species in the Gulf of Maine. Further improvements to

¹⁴ Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2016-2020-atlantic-salmon>

Atlantic salmon habitat will continue to improve the health of these rivers, providing additional ecosystem and economic benefits.

Increase the Number of Fish Successfully Entering the Marine Environment

Historical practices such as log drives, poor forestry and agriculture practices, pollution, and construction of road networks have damaged rivers and tributaries, greatly altering the complex habitat that once successfully supported Atlantic salmon production. Supporting recovery of the DPS includes increasing smolt production in freshwater habitats and ensuring these juvenile salmon successfully enter the marine environment.

Increased smolt production in freshwater remains a key strategy to mitigate the risk to the DPS given low marine survival. There are numerous threats that affect the number of smolts entering the marine environment, and we are investing in efforts to better

understand and mitigate these threats. Examples of these investments over the last two years include:

- *Increasing Habitat Complexity* — As part of an adaptive management project, Project SHARE is installing large wood and boulder structures in degraded river habitat to evaluate if increased habitat complexity will improve smolt production.
- *Understanding Predator Prey Dynamics* — NMFS is funding a multi-year assessment of the effects of predation on the survival of juvenile Atlantic salmon through the University of Maine. This project includes assessing the effect of predation by smallmouth bass on salmon smolts in the impoundments of hydroelectric dams in the field, and developing a spatial model that will quantify the degree to which predation and competition by bass may constrain smolt production.
- *Preparing for Climate Change* — The Gulf of Maine DPS was ranked highly vulnerable to climate change in a 2016 climate vulnerability analysis. Using climate scenario planning, we are identifying science and management actions that



Installation of large wood by Project SHARE into degraded habitat in the Narraguagus River in eastern Maine. Credit: Project SHARE

will support Atlantic salmon resilience across a range of plausible, alternative, but uncertain future scenarios. These efforts include identifying climate-resilient habitats within the range of the Gulf of Maine DPS and developing strategies to ensure access to, and protection of, these habitats.

Reduce International Fishery Mortality off West Greenland

The mixed-stock fishery operating off West Greenland captures ESA-listed Atlantic salmon that originate from U.S. rivers. At the 2018 annual meeting of the North Atlantic Salmon Conservation Organization (NASCO), the United States worked cooperatively with the other Parties to the West Greenland Commission (Canada, Denmark (in respect to the Faroe Islands and Greenland), and the European Union) to successfully negotiate a new regulatory measure that included an annual quota for the mixed-stock fishery at West Greenland for 2018, 2019, and 2020. The new regulatory measure capped the total catch of salmon for all components of the fishery at 30 metric tons, a substantial reduction from the 45 metric tons that Greenland unilaterally set for the fishery in previous years. The 2018 regulatory measure also included a number of elements designed to significantly improve the management and control of the fishery. For example, licenses were required for all people fishing for Atlantic salmon, including recreational and commercial fishermen. Accurate and detailed reports of fishing activities and landings, including zero landings, were also required prior to receiving a license to fish the following year. These requirements aimed to improve the accuracy of the reported landings and supported more informed fisheries management while also reducing the number of U.S.-origin Atlantic salmon captured in this fishery. The United States is currently working with the Parties to the West Greenland Commission (including the United Kingdom as a new Party in 2020) to negotiate a new regulatory measure for the 2021 fishing season. Through these negotiations, the United States will work to further reduce the harvest of Atlantic salmon at Greenland to minimize the capture of U.S.-origin salmon in the fishery, and continue to work towards improved reporting and management of the fishery.

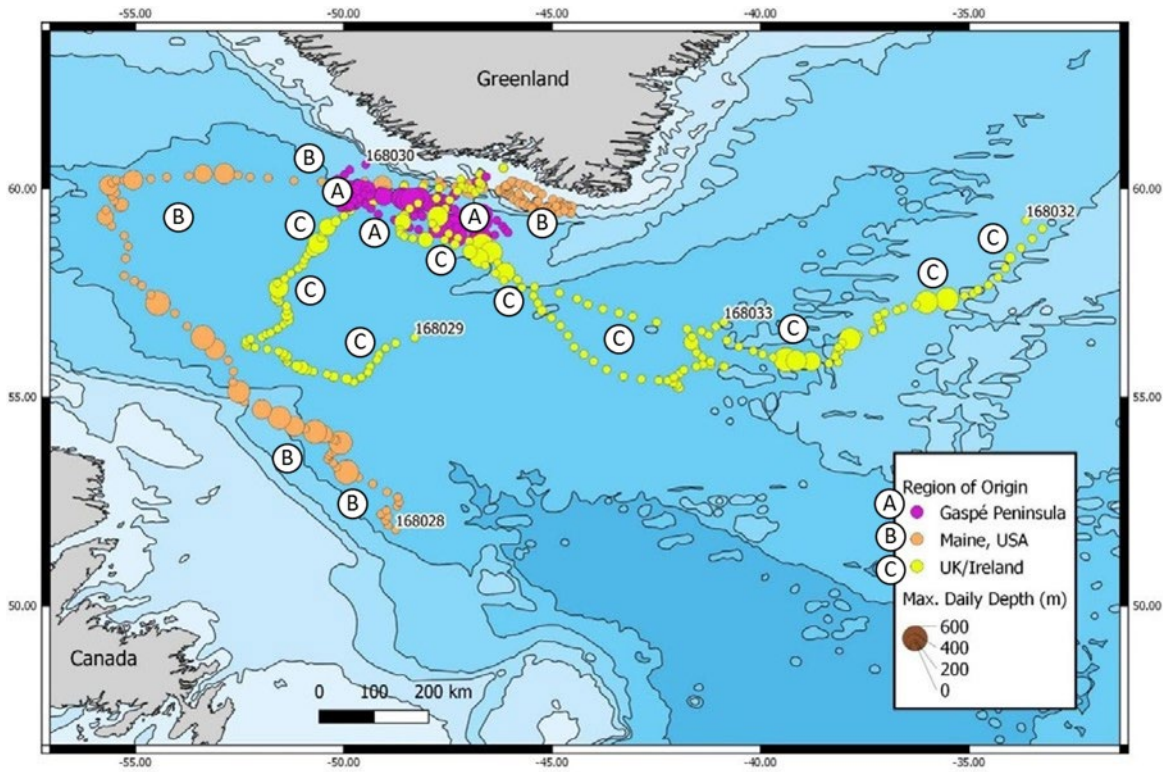
Increase Our Understanding and Ability to Improve Survival in the Marine Environment

In order to successfully reproduce and contribute to future generations, adult Atlantic salmon must return from the Atlantic Ocean to rivers in Maine to spawn. Marine survival rates remain very low and are a major impediment to the recovery of Gulf of Maine populations. The marine habitat of U.S.-origin salmon extends from the Maine coast through Canada to Greenland. NMFS works with domestic and international partners to document catch in fisheries and better understand what factors are affecting marine productivity. NOAA has helped to identify important climate drivers and an ocean regime change, informed models of post-smolt migration to Canada, and documented food web changes that may be playing a role in decreased ocean productivity of salmon. This research supports the identification of causes of poor marine survival and may help identify strategies to support salmon resiliency to dynamic ocean conditions.

During the last two years, NMFS partnered with ASF (Canada), Fisheries and Oceans Canada (DFO), and the Association of Fishers and Hunters (Greenland) to increase knowledge of habitat use by satellite tagging and releasing Atlantic salmon captured at Greenland. This study is improving our understanding of Atlantic salmon migrations by providing detailed migration maps, and by identifying habitat preferences and predators of Atlantic salmon as they migrate from Greenland to natal rivers to spawn. NMFS is also collaborating with the U.S. Woods Hole Oceanographic Institution, ASF, and private tag manufacturing companies to develop novel methods to improve monitoring of marine migration of a wide variety of marine animals.

Other Recovery Progress

NMFS worked with partners throughout the 2019 International Year of the Salmon to raise awareness of the imperiled status of Atlantic salmon. Efforts on both sides of the U.S.-Canadian border were supported, ranging from NGO-led events along idyllic salmon streams in Downeast Maine, to sponsored habitat restoration projects in the same watersheds.



Telemetry tracks and maximum daily depth of adult Atlantic salmon migrating from the coast of Greenland towards natal rivers to spawn. Salmon were tagged and released at Greenland in 2018 and originated from the United States, the United Kingdom, and Canada. This is a joint project between NMFS, Fisheries and Oceans Canada and the Atlantic Salmon Federation.

Highlights included supporting the redevelopment of the Atlantic salmon exhibit at the New England Aquarium, the development of a mobile Atlantic salmon game with Agents of Discovery, events throughout the year that drew thousands of attendees, video projects, social media campaigns, and enhanced local school engagements. Additionally, as part of the Atlantic Salmon Conservation Schools Network, students from New Brunswick and Maine worked with hatchery managers, field biologists, and civil engineers to improve salmon habitat in the Miramichi and Machias rivers.

A new 5-year review for Atlantic salmon was completed in November 2020. The 5-year review concluded that the demographic risks to Atlantic salmon remain high. The number of natural-origin adult returns remains low (less than 100 per recovery unit), and all but one of the river-specific populations are supported by conservation hatcheries that act to buffer extinction risk. The remaining population, which occurs in the Ducktrap River, is at very high risk of extirpation. While hatcheries are essential in preventing the extinction of Atlantic salmon, they can also pose a significant risk to the genetic health of the population. Continued

rigorous monitoring is necessary to ensure that genetic threats are adequately addressed. The 5-year review recommended that there be no change to the endangered classification of the Gulf of Maine DPS of Atlantic salmon as the population remains extremely small and continues to face numerous threats.

Looking Ahead

The 2021-2025 Priority Action Plan¹⁵ builds on the progress we have made thus far and identifies the following actions needed in the next five years to continue working toward the recovery of Gulf of Maine DPS Atlantic salmon: (1) reconnect the Gulf of Maine with headwater streams; (2) improve habitat productivity to increase the number of fish successfully entering the marine environment; and (3) increase our understanding and ability to improve survival in the marine environment. These actions are consistent with the 2016-2020 Priority Action Plan, but emphasis has been added to improving the productive capacity of freshwater rearing habitat (under #2), which has been severely degraded through historical land-use practices.

15 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-atlantic-salmon>

PARTNER *in the* SPOTLIGHT: Maranda Nemeth

Maranda Nemeth has been named a Partner in the Spotlight for her work with the Midcoast Conservancy to remove the Coopers Mills Dam and to partially remove the Head Tide Dam on the Sheepscot River. These two important restoration projects were conducted through a partnership of the Atlantic Salmon Federation, the Midcoast Conservancy, and The Nature Conservancy in Maine. Combined, the two projects restored access to over 60 miles of Atlantic salmon spawning and rearing habitat in the Sheepscot River in the Merrymeeting Bay recovery unit. The restoration of the Sheepscot River is a top priority as it hosts one of the remaining eight river-specific stocks in the Gulf of Maine DPS. The Sheepscot population is of particular importance to recovery as it contains the only river-specific stock in the Merrymeeting Bay recovery unit and is the southernmost stock in the Gulf of Maine DPS.

Maranda is originally from Pennsylvania, where she graduated from Allegheny College and worked for several years as an environmental scientist for an engineering firm and as a restoration stewardship coordinator for a local watershed association prior to moving to Maine in 2018. In 2019, Maranda was hired by ASF to be the manager of the Maine Headwaters Project, which is a multi-year initiative focused on removing barriers to fish passage for endangered Atlantic salmon and other diadromous fish. In her capacity as the manager of this program, Maranda will soon be managing and overseeing the construction of another important project—the removal of the Walton’s Mills Dam on Temple Stream in the Sandy River in the Kennebec River watershed, which is being partially funded by NMFS and will restore access to more than 52 stream miles and more than 2,200 units of high-quality salmon habitat. Restoration of access within and to the Sandy River and its coldwater tributaries has been identified as a high-priority recovery action.



Credit: Jessica Ruhlin

SPECIES *in the* SPOTLIGHTCENTRAL CALIFORNIA COAST
COHO SALMON ESU

Central California Coast (CCC) coho salmon ESU (*Oncorhynchus kisutch*) was first listed under the ESA as threatened in 1996, and subsequently reclassified as endangered in 2005. At the southern extent of the coho salmon species' range, this ESU is at very high risk of extinction. Populations within the ESU reached extremely low levels during the height of California's recent extended drought (2011–2016), though some have rebounded in the past several years. Nevertheless, all populations remain depressed, and well below recovery targets, particularly those in the southern portion of the ESU, which are highly vulnerable to extinction and dependent on ongoing conservation hatchery programs (Spence et al., In prep.).

A critical emerging challenge to CCC coho salmon survival and recovery is the increased frequency of severe weather patterns resulting from climate change. California now routinely experiences above-average temperatures and well below-average precipitation. Unprecedented wildfires throughout the species' range have become a significant habitat concern. Fires of this magnitude cause substantial damage to riparian habitat and instream wood shelter and can lead to increases in landslides and sediment input to streams. The impact of droughts, fires, and flooding on CCC coho salmon habitat will remain for many generations to come. Restoration and additional monitoring of habitat and the species' response to these events are necessary to repair the damage and re-evaluate how climate-driven processes influence CCC coho salmon's survival and recovery.

In addition to the severe weather and wildfires, and despite substantial restoration efforts, habitat challenges for CCC coho salmon include lack of instream habitat complexity and access to floodplains, and impaired instream flow. As the human population

grows, urbanization and rural residential growth will continue to threaten coho salmon and their habitat, unless the current pace of habitat restoration increases to keep up with human disturbance and the changing climate.

Recovery Progress

We have made substantial progress on the key actions identified in the 2016-2020 Priority Action Plan¹⁶ for the CCC coho salmon, including efforts to: (1) continue and expand conservation hatchery programs to prevent extinction; (2) continue and expand restoration and funding partnerships through implementation of priority recovery actions in targeted locations; (3) restore key habitats for conservation hatchery outplanting and improve freshwater survival of coho salmon; and (4) ensure adaptive management of conservation hatchery programs and restoration is informed by monitoring and research.

Continue and Expand Conservation Hatchery Programs to Prevent Extinction

The objectives of Conservation Hatchery Programs are to: (1) temporarily rear captive wild fish to enhance their survival; and (2) via genetic management of broodstock, improve the genetic diversity, abundance, and fitness of fish populations. Both of the Coho Captive Broodstock programs in place receive technical and financial assistance from NMFS and California Department of Fish and Wildlife (CDFW), with NOAA's Southwest Fisheries Science Center (SWFSC) providing genetic analysis and guidance to implement various life-stage release strategies. Each program is adaptively managed by a multi-stakeholder monitoring network. Since Coho Captive Broodstock Programs were instituted in 2001/2002, increases in

16 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2016-2020-central-california-coast-coho-salmon>

Floy tagged central California coast coho salmon, Navarro River, California. Credit: Shaun Thompson, California Department of Fish and Wildlife



the number of ocean returning adults, and naturally-spawned offspring, have been observed in some target populations and coho salmon are re-colonizing once-extirpated watersheds.

Northern Coho Salmon Captive Broodstock Program

The Northern Coho Salmon Captive Broodstock Program (Northern Coho Program) includes conservation hatchery operations for the Marin, Sonoma, and Mendocino Counties. The Northern Coho Program's conservation hatchery is the Don Clausen Fish Facility, in Geyserville, which is principally operated by the U.S. Army Corps of Engineers (USACE). The primary effort in the northern program is the Russian River Coho Salmon Captive Broodstock Program, which has been in operation since 2001, and has effectively increased coho salmon abundance in the Russian River. During the 2019-2020 winter, an estimated 547 program-adult coho salmon returned to the Russian River to spawn, which is the third-highest number since the program was initiated¹⁷. While substantial advances have been made in abundance since an estimated run of 10 fish in 2001, in some years

the majority of returning adults are two-year-old-fish, which is one year younger than peak adult fecundity.

NMFS issued an ESA section 10(a)(1)(A) enhancement permit in 2020 for the Russian River Coho Salmon Broodstock Program, which formally authorizes regional expansion to support the reintroduction of coho salmon throughout the northern portion of the CCC coho salmon ESU. Since 2008, surplus broodstock have been utilized in reintroduction efforts outside of the Russian River, with small populations of coho salmon returning to both Walker and Salmon creeks in Marin and Sonoma counties. In 2018, NMFS and CDFW collaborated with landowners to captively rear Mendocino County coho, and in December 2020, the first cohort of captive-reared adult coho salmon were released to the Garcia and Navarro rivers. Subsequent monitoring by CDFW documented program fish spawning with both other captive-reared and native-origin adults in both watersheds. Financial support from The Nature Conservancy (TNC) and The Conservation Fund made this new partnership possible.

¹⁷ California Sea Grant. 2020. Russian River Coho Salmon and Steelhead Monitoring Report: Winter 2019/20. Windsor, CA. and <https://caseagrants.ucsd.edu/project/coho-salmon-monitoring/landowner-information>



Release of wild adult coho salmon that was reared at the Don Clausen Fish Hatchery into a Mendocino Coastal Stream. Credit: Sarah Gallagher, California Department of Fish and Game

Southern Coho Salmon Captive Broodstock Program

The Southern Coho Salmon Captive Broodstock Program (Southern Coho Program), a joint effort between NOAA's SWFSC and the Monterey Bay Salmon and Trout Project (MBSTP), is essential for the conservation and recovery of CCC coho salmon populations south of San Francisco (Santa Cruz Mountains Diversity Stratum). It has rebuilt two brood years in the Scott Creek watershed, and outplanted yearlings to Scott Creek and three additional watersheds that were functionally extirpated (Pescadero, Waddell, and Aptos Creeks). An initial sunset date of 2009 for the program was revised when field surveys indicated that returns of natural-origin adult coho salmon to Scott Creek, once the regional stronghold that supported all three year classes, had declined to critical levels. Subsequent monitoring has demonstrated that no native-origin adult coho salmon returned to Scott Creek during four spawning winters in the last decade (i.e., 2009–2010, 2011–2012, 2013–2014, and 2016–2017). Continued operation of the program was deemed necessary to prevent extirpation of coho salmon south of San Francisco Bay. NMFS anticipates issuing an ESA section 10(a)(1)(A) enhancement permit in 2021 that would formally authorize ongoing operation of the Southern Coho Program.

The Southern Coho Program suffers from facility and budget constraints, and frequent interruptions from natural disasters, disease outbreaks, and equipment malfunction. The 2020 CZU¹⁸ Lightning Complex Fire caused considerable damage to Kingfisher Flat

Hatchery, the primary facility for the Southern Coho Program. This was the second forest fire to impact this facility in eleven years. Many coho salmon perished in the fire. Efforts to repair the facility are ongoing; NMFS, CDFW, and MBSTP are working to restore full functionality of Kingfisher Flat Hatchery by Fall 2021. Despite the damage and loss sustained during the fire, in December 2020, approximately 10,000 of the estimated 24,000 surviving juvenile coho salmon were successfully released into Pescadero Creek with assistance from the San Mateo County Resource Conservation District (RCD).

Because of facility capacity and water-supply constraints, the program is not meeting current conservation needs. Adults have to be reared in three different locations and juvenile production is limited. Temporary support for adult rearing is being provided by the Northern Coho Program through an agreement with the USACE. Consequently, CDFW and NMFS have determined that a new and larger hatchery is necessary for the recovery of coho salmon in the southernmost part of the species' geographic range. The capital costs required to construct a new conservation hatchery are estimated to be in the range of \$20-25 million, with an estimated annual operating budget of approximately \$2 million. The final cost and operating budget will depend on such factors as specific site requirements, level of partners' cost share, available water quantity and quality, and other operational requirements. NMFS and CDFW are currently investigating potential funding sources.

Continue and Expand Restoration and Funding Partnerships through Implementation of Priority Recovery Actions in Targeted Locations

Partnerships are essential for restoring coho salmon habitat throughout northern California. The state of California's Fisheries Restoration Grant Program, funded in part by the Pacific Coastal Salmon Recovery Fund administered by NMFS, supports restoration projects that align with actions identified in the state and federal ESA recovery plans. Below are updates to the three restoration projects named in the 2016-2020 action plan.

¹⁸ CZU refers to the Cal Fire designation for its San Mateo–Santa Cruz Unit, the administrative division for San Mateo, Santa Cruz, and San Francisco counties.

Lower Ten Mile River Restoration Projects

TNC has implemented two phases of a meaningful restoration project in the lower South Fork Ten Mile River. The project includes multiple engineered log jams, alcoves, and a sizable wetland pond that will provide winter refuge and rearing habitat for coho salmon. TNC also finished designing another phase of restoration on the mainstem Ten Mile River and implemented it in summer 2021 with private funding. NOAA's Restoration Center is currently working with TNC to complete more designs for future implementation.

Garcia River Estuary Enhancement Plan and Implementation

TNC completed the Garcia River Estuary Enhancement Plan in early 2018. NOAA's Restoration Center helped support the first phase of the large-scale restoration on the Bureau of Land Management property within the Point Arena - Stornetta Unit of the California Coastal National Monument, including providing funds to finish designs and complete permitting. TNC is currently seeking implementation funding for

Lauren Hammack (Prunuske Chatham Inc., project designer, and geomorphologist) works with the construction crew to configure logs during the construction of an accelerated wood recruitment structure on the Ten Mile River. Credit: Prunuske Chatham Inc. and The Nature Conservancy, July 1, 2020



this \$3.5-4 million high-priority recovery action to restore the estuarine and floodplain habitats of the Garcia River estuary, which will improve juvenile coho growth and survival.

Scott Creek Lagoon Restoration and Highway 1 Bridge Replacement

The restoration of Scott Creek Lagoon is one of the highest priorities for recovering CCC coho salmon in its southern range. During 2019 and 2020, the Santa Cruz County RCD worked with the technical advisory committee to finalize the Basis of Design Report. The California Department of Transportation (Caltrans) will use these and other products to inform hydraulics and bridge alignment alternatives that allow for lagoon restoration. Santa Cruz RCD has convened a Funding Strategy Team to develop funding scenarios. Caltrans has formed a Project Design Team to advance the development of bridge alternatives.

Restore Key Habitats for Conservation Hatchery Outplanting and Improve Freshwater Survival of Coho Salmon

Conservation hatchery broodstock outplanting requires strategically focused habitat restoration so that recolonization and supplementation efforts can be successful. Because many outplanting sites are located on private land (e.g., agriculture, timber operations, etc.), outreach to these landowners and assistance with project design and permitting has improved our ability to restore key habitats in strategic locations.

Butano Creek Channel Hydrologic Reconnection Project

Located in the lower Pescadero Creek watershed, the Butano Creek Channel Hydrologic Reconnection Project was completed in 2019 by the San Mateo RCD, with \$1.5 million of the \$6 million total project cost provided by NOAA's Restoration Center. This project reconnected 8.6 miles of Butano Creek to the Pescadero Creek estuary by dredging approximately 1.5 miles of channel, redistributing over 70,000 cubic yards of sediment, and filling in problematic human-made channels leaching anoxic sediments/water. This project is expected to mitigate conditions in Pescadero Lagoon that lead to annual occurrences of numerous



Butano Creek Channel Hydrologic Reconnection Project. Credit: San Mateo Resource Conservation District

steelhead dying in the lagoon because of poor water quality. Consequently, no dead steelhead were observed in fall/winter 2020-21 and, for the first time in over a decade, 10,000 juvenile coho salmon from the Southern Coho Salmon Captive Broodstock Program were released into Pescadero Creek. The success of this project has justified multiple other projects upstream, including the removal of two more barriers to open another 3.5 miles of high-quality habitat, and other floodplain and instream complexity projects to benefit conservation hatchery releases.

Restoring Floodplains in Green Valley Creek

Gold Ridge RCD has made significant progress in planning and designing three major winter refugia floodplain projects in lower Green Valley Creek, a major CCC coho salmon tributary in the Russian River watershed where conservation hatchery-raised juveniles are routinely released. Floodplain designs are completed for the Ironhorse Vineyard property, for which Gold Ridge RCD is seeking implementation funds.

Ensure Adaptive Management for Conservation Hatchery

Monitoring and research efforts by federal, state, and local agencies, NGOs, and private partners have provided critical information to adaptively manage

conservation hatchery practices, guide broodstock release strategies, and develop restoration plans. Population abundance and distribution monitoring also provides necessary information on status and abundance trends, which guides conservation strategies to recover coho salmon. In 2018-2019, most population monitoring along the southern Mendocino County coast temporarily ceased because of CDFW funding shortfalls. While CDFW resumed funding the southern Mendocino County coast monitoring program in 2019-2020, funding shortfalls now exist in the Marin County monitoring program. Overall, there continues to be a funding shortfall for priority monitoring efforts. NMFS and CDFW continue to collaborate on strategies to achieve a stable, long-term funding mechanism for monitoring CCC coho salmon populations.

Looking Ahead

The 2021-2025 Priority Action Plan¹⁹ builds upon the progress we have made thus far, and identifies the following actions needed in the next five years to continue working toward the recovery of CCC coho salmon: (1) summit to sea—restoration at a watershed scale; (2) improving instream flow; (3) continuing and expanding captive broodstock programs; (4) partnering and outreach; and (5) monitoring and research—dynamic and changing landscape.

¹⁹ Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-central-california-coast-coho-salmon>

PARTNER *in the* SPOTLIGHT: San Mateo Resource Conservation District

In 1939, visionary farmers in San Mateo County, California formed the first conservation district in California and one of the first in the nation: the San Mateo RCD. Today, the RCD provides comprehensive, integrated services addressing wildlife, water, climate, and agriculture. In the last decade, they have focused their restoration efforts on conserving salmonids and their habitat, especially endangered Central California Coast (CCC) coho salmon.

The RCD's remarkable ability to foster new, and strengthen existing partnerships with public and private landowners in San Mateo County has accelerated progress on key actions identified in the 2016-2020 Priority Action Plan and CCC Coho Salmon Recovery Plan. Significantly, in 2019, the RCD completed the Butano Creek Reconnection Project, which restored access to 8.6 miles of spawning and rearing habitat, addressed water quality issues in Pescadero Creek lagoon, and minimized flooding in the town of Pescadero. Building on the success of this project, the RCD is already working to remove two barriers in Pescadero Creek upstream of this project, which would restore salmonid access to 3.5 miles of high-quality habitat. Because of the Butano Creek Reconnection Project, for the first time in ten years, habitat conditions were suitable to support 10,000 juvenile coho salmon released from the Southern Coho Salmon Captive Broodstock Program. The RCD played a central role in coordinating and collaborating among NOAA's SWFSC, MBSTP, and CDFW to ensure the release was both a success and conducted in accordance with COVID-19 measures. Further, their funding of critical monitoring equipment will help monitor the success of these, and hopefully future release efforts, as well as ongoing salmonid monitoring in the Pescadero Creek lagoon.



Credit: San Mateo Resource Conservation District



Credit: San Mateo Resource Conservation District

Other notable recent efforts include their leadership of the Integrated Watershed Restoration Program in San Mateo County and the Pescadero Roundtable—exemplary collaborative partnerships that are effectively promoting restoration solutions in the Pescadero Creek watershed. Finally, through their Drought Relief Program, the RCD has helped farmers conserve, strategically manage, and store water, thereby ensuring critically important stream flow is maintained throughout this current drought and into the future.

SPECIES *in the* SPOTLIGHT

COOK INLET BELUGA WHALE DPS

The endangered Cook Inlet beluga whale (*Delphinapterus leucas*) has been in decline since 1979. Where once there were an estimated 1,300 of these white whales adjacent to Alaska's most populous region, only an estimated 279 remain. Because of the rapid decline and dire status of the Cook Inlet beluga whale population, NMFS and our partners have made preventing extinction and promoting recovery of this iconic species a top priority. While the majority of the decline can be attributed to unregulated subsistence hunting, it has been almost 20 years since hunting has ceased and the population has failed to increase in numbers. We are still trying to determine what is preventing this beluga whale population from recovering. Key threats identified in the 2016 Recovery Plan are: noise, catastrophic events, cumulative effects of multiple stressors, disease agents, habitat loss or degradation, reduction in prey, unauthorized take, pollution, predation, and subsistence hunting.

Recovery Progress

Although the COVID-19 pandemic hampered fieldwork and other activities in 2020, NMFS and our partners have made substantial progress on the key actions identified in the 2016-2020 Priority Action Plan²⁰ for the Cook Inlet beluga whale: (1) reduce the threat of anthropogenic noise in Cook Inlet beluga whale habitat; (2) protect habitats that support foraging or reproduction of Cook Inlet beluga whales; (3) gain a better understanding of population characteristics of Cook Inlet beluga whales to ensure effective management actions result in recovery; (4) ensure healthy and plentiful prey are available; and (5) improve understanding of why Cook Inlet beluga whales are not recovering by enhancing the stranding response program.

Reduce the Threat of Anthropogenic Noise in Cook Inlet Beluga Whale Habitat

Cook Inlet beluga whales are a very difficult species to study. The extraordinarily silty water they live

in makes it impossible to see them except for the portions of their bodies that break the surface of the water. Thirty-foot tides (the highest in the United States) and miles-wide mudflats make boating extremely dangerous. For a third of the year, belugas dwell among large chunks of ice that are washed back and forth by swift tides. While the harsh conditions may help protect



Cook Inlet beluga whales, including a young calf, traveling through the inlet. Credit: Paul Wade, NMFS permit 20465

²⁰ Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2016-2020-cook-inlet-beluga-whale>



Marine Mammal Laboratory staff deploy acoustic recording equipment in Cook Inlet to detect belugas and measure anthropogenic noise levels. Credit: Verena Gill, NMFS

In addition, NMFS has begun development of a Population Consequences of Disturbance model to assess the degree to which anthropogenic disturbance, and in particular noise, may impact survival and reproduction of Cook Inlet belugas.

Protect Habitats that Support Foraging or Reproduction of Cook Inlet Beluga Whales

Directly across Cook Inlet from Anchorage lies the Susitna River Delta. The Susitna River Delta appears to function as the very core of essential habitat for these whales in the summer months with its plentiful salmon and eulachon runs. At times, a very large proportion of the population has been sighted congregating there during summer months. The Susitna River Delta has also been identified by surveys as an important calving area. This information about foraging and reproduction has led NMFS to give special consideration to protecting the habitat in this area during ESA section 7 consultations.

Although we now have a good understanding of areas important to Cook Inlet belugas in the summer, we have historically known little about their winter habits. In an attempt to better document beluga distribution and habitat during non-summer months, NMFS has partnered with BOEM to implement winter aerial surveys from 2018–2021. The effort is providing valuable information on important wintering areas such as the upper Cook Inlet, Kenai River, Tuxedni Bay, and around Kalgin Island.

Gain a Better Understanding of Population Characteristics of Cook Inlet Beluga Whales to Ensure Effective Management Actions Result in Recovery

Aerial surveys conducted by the NMFS in the summer since 1993 provide our best range-wide population monitoring information for Cook Inlet belugas. These surveys help estimate the abundance of Cook Inlet belugas throughout their range.

Cook Inlet belugas from predatory killer whales, this dynamic environment severely hinders our ability to understand what may be limiting their recovery. The turbid waters also limit the whales' ability to see their food and each other. They see their world through echolocation, which makes noise pollution in Cook Inlet a potentially serious problem. Cook Inlet is a naturally noisy environment at times, given the hiss of glacial silt in the water, the rushing tides moving rubble on the bottom, and the cracks and rumbles of shifting ice during much of the year. Although belugas in Cook Inlet live in an area where visibility is severely limited and the habitat is naturally noisy, they have managed to adapt to these conditions. What they may not be adapted to is human-caused noise from activities such as pile driving, seismic exploration, oil and gas rigs, ship traffic, and military operations.

A partnership of scientists from NMFS and the Alaska Department of Fish & Game (ADF&G) has been deploying passive acoustic monitors around key locations in Cook Inlet to identify beluga seasonal feeding grounds and to better understand noise in these waters and its potential effects on belugas. Since 2019, 14 locations in Cook Inlet have been acoustically monitored year-round, with a goal of characterizing how noise may affect foraging. With support from the Bureau of Ocean Energy Management (BOEM), NMFS is also deploying Cetacean and Porpoise Detectors, which detect the echolocation clicks of toothed whales, dolphins, and porpoises. These detectors classify groups of potential echolocation signals based on the intensity, duration, frequency content, and variation in inter-click intervals. These efforts provide temporal data on beluga activity such as presence, feeding behavior, and habitat usage.



NMFS Staff conducting aerial surveys for Cook Inlet belugas during the Covid-19 pandemic. Credit: Verena Gill, NMFS

Since 2005, NMFS has also supported the Cook Inlet Beluga Whale Photo ID project, which tracks individual beluga whales in Cook Inlet via photographs taken from shore and small boats. Sighting histories are compiled for each known individual in a Cook Inlet beluga photo-ID catalog, providing information on distribution, habitat use, social structure, and reproduction. Since 2017, NMFS has also been employing small, unmanned aircraft to collect aerial imagery of belugas to estimate calf production and add to the existing photo-ID catalog. We are working to partner with entities specializing in artificial intelligence photo recognition with the goal of automating the photo-matching process, allowing for faster processing and analysis of photographic data.

Since 2016, NMFS has collected data on individual whales by obtaining biopsy samples from Cook Inlet belugas to provide data on genotypes to identify individuals, maternal/paternal relationships, the age of whales using epigenetic methods, health indicators from gene expression and skin microbiomes, pregnant females and sexually mature males, hormone stress levels, contaminant loads, and other important parameters.

One of our partners, ADF&G, is close to completing an individual-based population model that we anticipate

will strengthen our estimate of Cook Inlet beluga whale reproduction and survival rates. Sources of data that will feed into the model include the Cook Inlet Beluga Whale Photo ID project, information from necropsies from beach-cast carcasses, satellite and aerial surveys, and genetics information from the Bristol Bay population of beluga whales for comparative purposes. This individual-based model will achieve two main goals: provide a preliminary assessment of whether vital rates can be estimated from the data being used and evaluate the effectiveness of new sources of information to strengthen vital rate estimates.

One purpose of the *Species in the Spotlight* initiative is to gain public support for recovering endangered species that are at high risk of extinction. Increasing public interest in and awareness of Cook Inlet beluga whales bolsters participation in citizen science efforts such as voluntary reporting of beluga sightings and strandings by the public, submission of opportunistic photos for inclusion in the Photo ID project, and participation in visual monitoring efforts, all of which add to our understanding of Cook Inlet beluga habitat use and population trends. In addition, outreach provides education on best practices for operating air- and watercraft and engaging in other recreational activities in beluga habitat. In the case of Cook Inlet beluga whales, NMFS relies heavily on its many partners to advance this effort. Our biggest partnership event is “Belugas Count!” which attracts thousands of people each year. This annual, all-day citizen science celebration aims to bring together members of the public to focus on the endangered Cook Inlet beluga whale, fostering local pride, awareness, and stewardship. It is a collaboration among a variety of federal and state agencies, local and national organizations, industry, as well as individuals.

In 2019, a second citizen science effort was launched: the Alaska Beluga Monitoring Partnership (AKBMP). AKBMP is a collaboration between NMFS and several stakeholder groups offering opportunities for volunteer citizen scientists to contribute to daily beluga monitoring efforts in Cook Inlet from March-May and August-November. AKBMP trains volunteers to support monitoring efforts and coordinates shore-based beluga monitoring activities at five

sites throughout Cook Inlet to collect data on beluga distribution and habitat. The data collected are shared with researchers to inform ongoing marine mammal research and management activities and will be displayed in the Cook Inlet Beluga Whale Sightings Portal. This publicly accessible portal is the result of a partnership between NMFS, Axiom, and the Alaska Ocean Observing System.

Ensure Healthy and Plentiful Prey are Available

The Cook Inlet beluga population remains suppressed either because they are not reproducing fast enough or their survival rates are too low, or both. The availability of sufficient food could affect either or both of these factors. In order to understand if there is sufficient prey for Cook Inlet belugas, we need to understand the whale's nutritional needs for healthy growth and reproduction.

In 2018, NMFS partnered with the Georgia Aquarium and University of California Santa Cruz on a study to determine the energetic requirements and metabolic needs of belugas. Data on oxygen consumption of resting and diving whales housed at Georgia Aquarium were correlated with their overall body condition and daily caloric food intake. This will allow metabolic demands of the whales to be matched to potential prey resource needs and applied to the wild Cook Inlet beluga population. Phase 1 of this study is now complete. Phase 2 of the study commenced in 2021 and will assess metabolic variability due to changes in season, body condition,

and reproductive status. Information from this study will be incorporated into the previously described Population Consequences of Disturbance model to address whether sufficient prey resources are available in the Cook Inlet ecosystem to support the beluga population and to assess the impact of various sources of disturbance on beluga physiology.

In addition, NMFS is working with our partners to identify year-round distribution and abundance of beluga prey in rivers and streams throughout Cook Inlet. For example, in November 2020 we began a pilot project with Kenai Peninsula College to collect environmental DNA to identify fish species present in the Kenai River during winter months when belugas are using the area. This effort will highlight data gaps and greatly expand our understanding of what belugas may be eating in the winter months.

Improve Understanding of Why Cook Inlet Beluga Whales are not Recovering by Enhancing the Stranding Response Program

Scientists sample dead Cook Inlet beluga whales to find clues regarding the population's lack of recovery. In order to obtain the necessary biological information, we need to find these dead whales before the process of decay has become advanced. To this end, NMFS continues to redouble its efforts to inform area pilots and members of the public to quickly report sightings of dead (or live-stranded) animals so members of our stranding network can respond rapidly.



Tamara McGuire, Principal Investigator for the Cook Inlet Beluga Whale Photo ID Project taking photographs of a group of belugas in the inlet. Credit: Tamara McGuire, Cook Inlet Beluga Whale Photo ID Project

NMFS has distributed stranding response kits to specially trained partners, giving them the tools to conduct thorough field examinations of beluga carcasses when strandings occur. We have updated and revised the stranding response plan to include sample collection protocols and are currently updating the Cook Inlet beluga whale stranding response plan. NMFS has also worked to improve service agreements for stranding response, including flight support, veterinarians, and pathologists. We have improved coordination on stranding response with our partners to encourage reporting of dead and live beluga whales. We continue to improve awareness of the stranding hotline via NMFS websites and partner websites, media stories, public service announcements, outreach events, and internet search engines. We have also increased our social media presence and partners have created several Facebook and Instagram pages specifically for Cook Inlet belugas that have a large following that has been active in reporting sightings. We promote timely reporting of strandings at public events including an annual beluga workshop at the Alaska Marine Science Symposium, numerous in-school presentations, outreach booths at large public events (e.g. boat, plane, and sportsman's shows), the annual Belugas Count! festival, and citizen science monitoring sessions. We have produced new educational materials with the stranding hotline number and new signs to post at pullouts along public roadways adjacent to Cook Inlet.

Other Recovery Progress

In addition to citizen science efforts such as AKBMP and Belugas Count!, and other outreach described above, during 2019-2020, NMFS encouraged media coverage and produced public service announcements regarding Cook Inlet belugas. In 2020, we began collaboration with the Public Broadcasting Service, which will produce an episode of Molly of Denali, a popular children's cartoon, dedicated to Belugas Count! and Cook Inlet beluga whales, slated to air in fall 2021.

Another example of successfully garnering support for Cook Inlet beluga recovery is the multi-partner

Cook Inlet Beluga Whale Recovery Implementation Task Force jointly run by NMFS and ADF&G. The primary role of the Task Force is to engage the expertise of researchers, managers, communicators, and various other stakeholders to advise NMFS and ADF&G on specific topics or issues relating to Cook Inlet beluga recovery. During 2019-2020, the Task Force committees accomplished multiple goals, including the development of a matrix for evaluating the effectiveness of existing NMFS mitigation measures for Cook Inlet belugas (Habitat and Threats Committee), which will be used to create a standard set of mitigation recommendations; production of a 2-minute animated public service announcement on the free online platform Vimeo (Outreach Committee); and coordination and tracking of research projects (Research Committee).

Looking Ahead

In collaboration with our partners, we are continuing to improve our knowledge of Cook Inlet beluga whales and their habitat needs. Additional research to identify critical factors limiting the Cook Inlet beluga population is vital to recovery.

The 2021-2025 Priority Action Plan²¹ builds upon the progress we have made thus far and identifies the following actions needed in the next 5 years to continue working toward recovery for the Cook Inlet beluga whale: (1) continue to improve understanding of why Cook Inlet beluga whales are not recovering by enhancing the stranding response program; (2) reduce the threat of anthropogenic noise in Cook Inlet beluga whale habitat; (3) protect habitats that support foraging or reproduction of Cook Inlet beluga whales; (4) gain a better understanding of population characteristics of Cook Inlet beluga whales to ensure effective management actions result in recovery; and (5) ensure healthy and plentiful prey are available. While none of the five key actions have changed from the previous plan, the new 2021-2025 Priority Action Plan highlights the progress made on these actions and highlights future directions based on the past work.

21 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-cook-inlet-beluga-whale>

PARTNER in the SPOTLIGHT: Barbara Švarný Carlson, Friends of the Anchorage Coastal Wildlife Refuge

Barbara Carlson is Unangan (the group identity for the indigenous peoples of the Aleutian Archipelago), originally from Unalaska in the Aleutians, and now resides in Anchorage. She remembers an elder mentor who told her that he saw belugas (x'aada in Unangam tunuu) in Makushin Bay, on Unalaska, before World War II, after which time they ceased to be observed in the area, perhaps due to boat traffic. She is the President & Executive Director of Friends of the Anchorage Coastal Wildlife Refuge (FAR), and is described by colleagues and friends as a person who gets involved and gives of herself generously in order to accomplish goals she considers important.

In her position with FAR and as a private citizen, Barbara has been a passionate and dedicated advocate for Cook Inlet beluga whales for two decades. In 2007, Barbara spearheaded the creation of the Anchorage Coastal Beluga Survey, the first collaborative citizen science effort with NMFS, Defenders of Wildlife, and others to collect data on the distribution and behavior of Cook Inlet belugas. This effort resulted in a peer-reviewed manuscript that has been cited multiple times. Barbara has continued FAR's support and involvement as the efforts to recover this endangered whale have evolved. Barbara was one of the first people to volunteer to serve on the planning committee to create the Belugas Count! event. Under Barbara's guidance, FAR volunteers have staffed multiple Belugas Count! viewing stations annually since the event's inception in 2017. FAR has also been an integral part of the Belugas Count! festival at the Alaska Zoo. It was Barbara who convinced the Mayor of Anchorage to proclaim September 9, 2017 as Belugas Count! day in the Municipality of Anchorage and secure his attendance at the festival. Her methodical attention to detail and accuracy have contributed significantly to the development of survey methods and data sheets for beluga monitoring that are used in these outreach events and other monitoring efforts.

On a broader scale, Barbara is known for her conviction and dedication to supporting and conserving the coastal ecosystems that support Cook Inlet beluga whales, most specifically the Anchorage Coastal Wildlife Refuge. As Executive Director, Barbara contributes to all FAR projects, was an active participant in the creation of the Campbell Creek Estuary Natural Area, and supported the management of invasive plant infestations in Potter Marsh. Not one to shy away from complex and high-profile issues, Barbara navigates the political landscape with knowledge and respect for all parties with whom she engages, an approach that has brought success for the benefit of the refuge as well as Cook Inlet belugas. She is a great leader, prolific writer, and incredible friend. She inspires dedicated FAR volunteers to show up again and again to help fight for conservation and stewardship of Cook Inlet belugas as well as the refuge's other wildlife and habitats.



Barbara Švarný Carlson of Friend of the Anchorage Coastal Wildlife Refuge poses with Belugas Count! mascot Betty Beluga at a past Belugas Count! event. Credit: Alaska Department of Fish and Game (copyright, used with permission)

SPECIES *in the* SPOTLIGHT

HAWAIIAN MONK SEAL

The Hawaiian monk seal (*Neomonachus schauinslandi*) is the world's only surviving tropical seal species. Hawaiian monk seals are endemic to the Hawaiian Archipelago, which stretches 1,500 miles from Hawaii Island to Kure Atoll. There are only about 1,400 Hawaiian monk seals left in the world. While recent population assessments have yielded some encouraging results, the predominant trend has been a steep population decline since the 1950s.

The 2019 annual population assessment showed that Hawaiian monk seals have increased in numbers by

about 2 percent annually since 2013, reversing at least six decades of steep population decline. The population is now estimated to be around 1,430 seals, with roughly 1,100 of those seals in the Northwestern Hawaiian Islands and 300 in the main Hawaiian Islands. This recent growth trend is primarily due to increased juvenile survival in the Northwestern Hawaiian Islands and stability or growth of the six subpopulations. Rapid growth trends observed in the main Hawaiian Islands subpopulation starting in the 1990s appear to have slowed or stopped, and the overall population numbers have remained stable since 2013, although 2019 was



A monk seal sleeps on the shoreline of Nihoa Island in the Northwestern Hawaiian Islands. Credit: Mark Sullivan, NMFS permit 22677



Release of Hawaiian monk seal RH38 after successful rehabilitation at Ke Kai Ola. Credit: Kim Rogers, NMFS permit 18786-03

a record year with 48 pups born in the main Hawaiian Islands. Although this recent trend is encouraging, monk seal numbers are still at one-third of historical population levels, and there is still much work to be done to address threats to their recovery.

Recovery Progress

In FY 2019-2020, we made substantial progress on the key actions identified in the 2016-2020 Priority Action Plan²² for the Hawaiian monk seal: (1) improve survival of juvenile and adult female seals in the Northwestern Hawaiian Islands; (2) manage and mitigate human-seal interactions to ensure natural population growth, minimize conflict, and foster coexistence; (3) detect and prevent catastrophic disease outbreak and disease-related mortality; (4) develop and implement strategic communications plan and social marketing strategy; and (5) encourage community-led monk seal stewardship and citizen science.

Improve Survival of Juvenile and Adult Female Seals in the Northwestern Hawaiian Islands

A slowed rate of decline leading up to the recent population increase described above is due in many ways to NMFS' and our partners' recovery efforts.

In fact, a study from 2014 estimated that 30 percent of monk seals were alive at that time because they directly benefited from a lifesaving intervention performed by NMFS with the aid of our partners, such as disentanglement or dehooking, or are the descendant of a female that benefited from an intervention. This gives us confidence that the cumulative efforts of direct, hands-on interventions for individual seals are making a positive impact on the population. In 2019, a total of 52 interventions to improve individual seals' survival prospects were performed in the Northwestern Hawaiian Islands. These included translocation of 14 pups from high shark predation risk areas to lower risk sites within French Frigate Shoals Atoll (Lalo), releasing 12 seals entangled in marine debris and five seals trapped behind the Tern Island sea wall, and additional miscellaneous interventions including administering antibiotics and reuniting separated mothers and pups. In 2019, four malnourished seals were transported aboard NOAA ships from the Northwestern Hawaiian Islands to The Marine Mammal Center's Ke Kai Ola facility on Hawaii Island, and two rehabilitated yearlings collected during the 2018 field season were released. NMFS had no field presence of its own in the Northwestern Hawaiian Islands in 2020 due to COVID-19, but thanks to many partners, occasional interventions were still able to be conducted.

²² Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2016-2020-hawaiian-monk-seal>

Additionally, with assistance from the U.S. Coast Guard and U.S. Fish and Wildlife Service, NMFS was able to release at Midway Atoll National Wildlife Refuge the four seals that were brought into rehabilitation in 2019.

Manage and Mitigate Human-Seal Interactions to Ensure Natural Population Growth, Minimize Conflict, and Foster Coexistence

Monk seals were essentially extirpated from the main Hawaiian Islands for several hundred years, although in the last few decades they have successfully reestablished a small but thriving population. While this is a hopeful sign of recovery for the species, they were not universally greeted with a warm reception at first. Additionally, close proximity to a growing human population has resulted in human-seal interactions such as harassment of seals hauled out on beaches, fisheries interactions, intentional killings, habituation, and more. A study released in 2020 evaluated causes of death in monk seals in the main Hawaiian Islands between 1992-2019, and found that 57 percent of deaths during this period were human-caused. However, there has been a noticeable positive shift in public attitude in the past 5-10 years, due partially to the fact that seals have now been in the main Islands long enough that younger residents have grown up seeing monk seals their whole lives and view them as an integral part of the marine ecosystem. The shift is also due in part to the work of NMFS, our partners, and community members sharing information, educating the public, engaging with communities, and encouraging peaceful human-seal coexistence.

We have employed a multi-pronged approach to addressing this priority, including conducting outreach targeted at key stakeholder groups (e.g., recreational and subsistence fishers), improving our monitoring and data management, providing grants to state and NGO partners to support outreach initiatives, intervening directly with seals of concern, and rescuing hooked and entangled seals. One of the major barriers to self-reporting when someone thinks they have hooked a seal while fishing is fear that they will be criminally prosecuted, so we launched the “It’s ok to call” campaign several years ago as part of our Fishing Around Seals and Turtles program. Feedback from the fishing community has been positive, and we did see

an increase in self-reporting in 2019, including two cases in which the calls enabled us to launch a quick response to remove the hooks. One of those hooks was lodged in the seal’s esophagus, so calling it in immediately potentially saved the seal’s life.

In order to maximize our effectiveness, we administered several grants during 2019-2020, including providing funds for an ongoing Species Recovery Grant issued under Section 6 of the ESA to the Hawaii Department of Land and Natural Resources (DLNR), which was focused primarily on addressing fishery interactions. We also awarded grants to NGOs to help address a variety of human-seal interactions in multiple ways, including reducing disturbance of hauled-out seals and conducting outreach at locations with heavy fishing pressure where seals are known to take bait or catch off active lines. These grants improve the efficiency of our statewide marine wildlife emergency response program, which includes responding to hooked and entangled seals. With the help of our grantees, we were able to successfully de-hook about 35 seals between 2016-2019. Nevertheless, hookings and entanglements in state-managed nearshore fisheries continue to pose a significant recovery threat. In 2020, we saw an increased number of people fishing recreationally and for subsistence purposes due to COVID-19, resulting in an unusually high frequency of hookings. Thankfully, the majority of these hookings were not life-threatening. We will continue to work with federal, state, and NGO partners to monitor fisheries interactions and explore strategies to reduce injury and mortality, while ensuring that fishing catch and gear remain protected.

Detect and Prevent Catastrophic Disease Outbreak and Disease-Related Mortality

Our program remains focused on morbillivirus and toxoplasmosis—two diseases that are very different but carry serious potential consequences for monk seals. Morbillivirus is widespread, and outbreaks of the disease have caused the deaths of thousands of marine mammals around the world, including an Unusual Mortality Event in pinnipeds on the east coast of the United States between July 2018 and May 2019. This family of viruses includes measles, which human



An endangered Hawaiian monk seal. Credit: James Watt, NMFS, NMFS permit 932-1489

children are immunized against, and distemper, for which vaccines are standard in pet dogs and provide important protection for terrestrial carnivores such as the endangered black footed ferret. The disease has not yet been documented in monk seals in Hawaii, but could potentially be spread by unvaccinated dogs or from other marine mammals such as whales and dolphins. Once introduced into the small population of monk seals, without an intervention like the vaccination program described below, an outbreak could set back recovery for decades, or eliminate hope for the species altogether.

In 2016, after years of investigation and safety trials, NMFS began vaccinating wild monk seals. The program is currently in a maintenance phase focusing primarily on weaned pups and individuals we were unable to vaccinate in previous years. Another tenet of disease outbreak preparedness is surveillance and quarantine readiness. Thanks to citizen scientists and partners who conduct outreach and surveillance of monk seals on beaches, we have a good early warning system in place for sick seals in the main Hawaiian Islands. We developed a document that is reviewed regularly to guide quarantine of seals should an outbreak be detected. Samples are also collected opportunistically from vaccinated seals to study

antibody titers over time and guide future decisions about administering booster vaccines. By the end of 2019, about half of the total population had been vaccinated, and herd immunity was nearly reached at many locations. This is the first ever effort to vaccinate a wild marine mammal species, and we hope this will lay the foundation for future efforts to vaccinate marine wildlife against preventable diseases and safeguard populations against potentially devastating losses.

Since the mid-2000's, it has become apparent that toxoplasmosis poses a major threat to the endangered Hawaiian monk seal. Because of its disproportionate impact on females, a new study published in 2020 concluded that this disease is limiting population growth in the main Hawaiian Islands. Cats are the sole definitive hosts of the protozoal parasite *Toxoplasma gondii*, which spreads when the cat sheds the oocysts (eggs) in their feces. On the island of Oahu alone, estimates of feral cats are in the tens to hundreds of thousands. This means that fecal contamination of the environment is widespread, though it only takes ingestion of one oocyst to cause infection. This disease is often rapidly lethal in Hawaiian monk seals and has also affected other wildlife in Hawaii. It is considered a One Health threat, meaning it impacts the health of

humans, pets, livestock, and wildlife. Feral, abandoned, and other outdoor cats (also called “at-large” cats) have substantial, documented negative impacts on other wildlife as well, and are responsible for numerous mammal, reptile, and bird species extinctions around the world.

The 13 known deaths from toxoplasmosis to-date are likely a significant underestimate, as NMFS is unable to recover every monk seal carcass. Of those we do recover, some have decomposed beyond the point where identification of diseases like toxoplasmosis is possible. In 2020, NMFS and partners, especially The Marine Mammal Center’s Ke Kai Ola, were able to attempt treatment of an adult female monk seal with toxoplasmosis for the first time. Unfortunately, despite 10 weeks of intensive care, she succumbed to the disease, reinforcing the challenge that this disease poses to the species. Thus, our ability to mitigate this threat is complicated not only by a paucity of preventive or curative measures but also by the fact that NMFS has no jurisdiction over cats or the terrestrial ecosystems they inhabit. Furthermore, many policy and management actions enacted or

proposed in an attempt to manage at-large cats are frequently opposed by some vocal constituencies.

Thanks to increased resources made possible by the *Species in the Spotlight* initiative, in 2019 and 2020 we were able to implement enhanced disease monitoring, and convene workshops aimed at prioritizing research questions and management actions that are most likely to make an impact in the near future. We continue to work on developing a strategic threat mitigation plan, incorporating the output from these workshops, which will lay out a roadmap for NMFS and our partners moving forward in the effort to reduce the threat of this deadly disease to Hawaiian monk seals and other native wildlife.

An interagency working group, the Toxoplasmosis and At-large Cat Technical Working Group, was co-founded by NMFS and DLNR in May 2016. This working group, consisting of county, state, and federal agency representatives, continues to grow and develop, reaching out to potential partner agencies, engaging with stakeholders, discussing community outreach messaging, forming collaborative partnerships with



Tube feeding a medicated fish smoothie to R028/Pohaku, an adult female monk seal that underwent treatment for toxoplasmosis in 2020. Credit: NMFS, NMFS permit 22677

cat welfare organizations, and organizing symposia at local and national conservation conferences among other actions. Through this partnership and a growing number of coalitions—including local, national, and multi-stakeholder partnerships with agencies, universities, NGOs, and cat welfare organizations—we have greatly increased our capacity to address this issue.

Develop and Implement Strategic Communications Plan and Social Marketing Strategy

While we lack extensive in-house expertise in communications and social marketing, we have made great strides in developing our internal capacity, and have been able to leverage partnerships and other internal resources to help develop a strategic communications plan and social marketing strategy. We continue to research the major concerns and hurdles to engaging in desired behaviors for all stakeholder groups. Many staff members have received training on the principles and practices of social marketing and targeted communication, which has been incorporated into our education and outreach materials, web and social media presence, and community engagement. Staff also formed an internal Community Based Social Marketing group for knowledge sharing and discussing ideas, and participated in a pilot study with a university research group in 2020. The project was focused on other protected species, but we have been able to apply the outcomes and lessons learned to a similar effort for seals. Graduate and undergraduate students working on social science projects have contributed useful information. A group of volunteer interns has conducted extensive research and developed portions of the strategic communications plan.

Encourage Community-led Monk Seal Stewardship and Citizen Science

Community engagement and monk seal monitoring efforts are cornerstones of our recovery program, and they dovetail in the form of a dedicated network of volunteers. Volunteers across the islands work with various partner agencies and organizations

to report seal sightings and observe seals on local beaches. Volunteers also spend many hours answering questions and educating visitors and community members about Hawaiian monk seal biology and conservation, as well as proper conduct around seals. We continue to support the volunteer network through grants to partner agencies and NGOs like The Marine Mammal Center and Hawaii Marine Animal Response (HMAR), who are essentially our eyes and ears on the beach. We also provide grants to local education and outreach non-profit groups, including a newly formed organization dedicated solely to monk seal conservation, Hawaiian Monk Seal Preservation Ohana. In 2020, community members reached out to us after attending a virtual talk given by NOAA staff and hosted by a grantee organization with the idea to develop an online monk seal identification database. This website will serve as a place where the public can learn about how and why we identify individual animals as well as learn about the individuals themselves. We anticipate this website will be launched later in 2022.

NMFS and partners maintain a seal reporting “hotline” and coordinate a network of partners, staff, and volunteers throughout the main Hawaiian Islands. For many years, individual hotline numbers operated on each island, including two on Hawaii Island, which proved to be confusing for residents and visitors. Since consolidating the individual island hotlines into one statewide reporting number that also accepts calls for sea turtles and cetaceans, the number of monk seal sighting calls has increased by 30 percent. This increase is not only due to consolidating to a single number, but also to the efforts of the volunteer network and other partners spreading awareness about the hotline.

Citizen science is an incredibly useful tool since we cannot track all seals at all times. Seal sightings called into the hotline were incorporated into a recent research effort that used this citizen science data to account for unobserved pupping events (e.g., a sightings gap combined with timing of molting might indicate that a female had a pup and we just didn't observe it), which helps give us a better picture of the health and growth trends of the main Hawaiian Islands population.

Molokai Island has been a geographic focus area for monk seal recovery—it has one of the larger seal populations in the main Hawaiian Islands, but also a significant amount of human-seal conflict. We have been able to engage community members, including community leaders and a class of high school students, by bringing them into the field with us to observe research efforts. Inviting the community to be a part of this work has helped break down boundaries and demystify the work that we do. While COVID-19 has halted these efforts, we hope to be able to continue this type of community engagement in the future. We also contracted an organization that focuses on human-wildlife conflict transformation to conduct an assessment of the conflict and offer training and capacity building to work toward conflict resolution. Lastly, our grantee HMAR, already established as managing the volunteer network on Oahu, was able to expand their work on Molokai. They have hired local staff to head up their operations on Molokai and are beginning to build up their volunteer base. They have successfully responded to multiple stranding incidents, and have worked successfully to increase the number of sightings called into the hotline.

Looking Ahead

Although much more work remains before the species recovers, NMFS and our partners have made significant headway in reducing the extinction risk of Hawaiian monk seals. Our efforts have already resulted in increasing population trends in some parts of the species' range, bolstering the overall growth trend, which, for the first time in decades, is increasing. The 2021-2025 Priority Action Plan²³ builds on the progress we have made thus far and identifies the following actions needed in the next 5 years to continue the trajectory toward recovery for the Hawaiian monk seal: (1) improve survival of juvenile and adult female seals in the Northwestern Hawaiian Islands; (2) mitigate human-seal interactions to ensure natural population growth and minimize conflict; (3) address diseases with population level impacts; and (4) foster community support for monk seal recovery.

23 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-hawaiian-monk-seal>.

PARTNER *in the SPOTLIGHT:* **Diane Pike**

Diane Pike stumbled into the monk seal world in 2008 when she volunteered to help locate a mom and pup pair that were spotted on Molokai during a NOAA aerial survey. Little did she know where that road would lead her! At that time, finding reproductive females giving birth across the main Hawaiian Islands was still a relative novelty. Diane's involvement in monk seal conservation expanded alongside these promising signs of recovery in the species itself. Later that year, she facilitated NOAA's efforts to tag that pup, and in observing the process and learning about the important work happening in her backyard, she was hooked.

The following year, a monk seal pup, now well-known by his flipper tags as KP2, was found abandoned by his mother on the island of Kauai. Diane was part of a small team that stepped up to help monitor this seal after he was rehabilitated and released back into the wild on the island of Molokai. They spent countless hours monitoring his increasingly habituated interactions with people at the Kaunakakai Wharf, and conducting outreach with the community. Through this series of events, Diane grew to understand what seals and people on Molokai needed in order to coexist. That knowledge has made Diane an invaluable asset to NOAA's scientific efforts ever since.

Diane filled the role of marine mammal response coordinator on Molokai for many years, becoming the go-to monk seal person on Molokai for over a decade, an amazing asset to research and recovery efforts there. She has reliably responded to stranded seals, monitored injured and compromised individuals, helped to collect important health and stranding response data, and documented and retrieved carcasses for postmortem examinations. Her impressive contributions to monk seal population assessment data include recording thousands of sightings and engaging the local community in reporting them as well. In 2019, Diane stepped in to assist at Kalaupapa National Historical Park during a period of significant staff transition, working hard to



Credit: R. Maughan

fill in gaps and bring new staff up to speed, all while assisting with monitoring and tagging a large cohort of pups born in the Park that year. Her work in the field and in engaging the community in Kalaupapa and island-wide, have contributed greatly to monk seal conservation. She has assisted with numerous field research projects and has played an instrumental role in pup monitoring and tagging. Diane's boots have logged countless miles hiking the rugged shorelines of Molokai to accomplish all this, and she has enriched the lives of those she encountered professionally and personally along the way.

Recently, Diane decided to step down from her role so that she could focus on family, community, and other things that are important to her. Diane's "retirement" from monk seal recovery work marks the end of an era, and she is leaving things far better than she found them.

SPECIES *in the* SPOTLIGHT

NORTH ATLANTIC RIGHT WHALE

The North Atlantic right whale (*Eubalaena glacialis*) is one of the world’s most endangered large whale species, with fewer than 400 individuals remaining as of January 2019. North Atlantic right whales (also referred to as “right whales” in this section) have been listed as endangered under the ESA since it was enacted in 1973, and are also protected under the Marine Mammal Protection Act (MMPA). Commercial whaling decimated right whales, bringing them to the brink of extinction. Despite protections put in place in the 1970s under both the ESA and the MMPA, recovery has been slow. In 1990, 268 individuals were estimated to be remaining. The population grew to approximately 481 individuals by 2010. Recently, increasing mortality rates and

decreased calving have led to a population decline that has continued at least through 2019.

The species’ coastal distribution puts it at continued risk from human impacts, with vessel strikes and entanglements in fishing gear the leading causes of right whale mortality. These human-caused deaths have been outpacing births. Since 2017, right whales have experienced an ongoing Unusual Mortality Event (UME) throughout its entire range, with 49 individual right whales dead (n=34) or seriously injured (n=15) as of April 2021. Right whales face a number of complex factors limiting their recovery due to their near constant overlap with human activities along the coast, which is further complicated by climate change.



North Atlantic right whale mother and calf. Credit: Florida Fish and Wildlife Commission, NMFS permit 665-1652

Recovery Progress

Since the North Atlantic right whale was identified as a *Species in the Spotlight* in 2019, we have focused our efforts on addressing the most urgent threats to their survival—fishing gear entanglements and vessel strikes. Over the last two years we have made important progress that includes working with our partners to reduce these threats.

Reducing Entanglement in Fishing Gear

Reducing the threat of entanglement to North Atlantic right whales remains a top focus. This includes continued work with the Atlantic Large Whale Take Reduction Team (Team) and partners to develop additional management measures to further reduce mortality and serious injury of right whales due to entanglement in U.S. commercial fishing gear. In 2019, the Team met to develop recommended changes to the Atlantic Large Whale Take Reduction Plan (Plan) that would reduce the impacts of fixed gear fisheries on North Atlantic right whales. To aid in their efforts, a Decision Support Tool (DST) was created that allowed the Team to compare the relative risk reduction of potential management scenarios. To reduce the amount of rope in the water column in areas where right whales occur, the Team focused on reducing the impacts of the northeast lobster and Jonah crab fisheries, since those fisheries fish about 93 percent of the vertical buoy lines in U.S. Atlantic waters. They reached a near consensus on a framework of measures that is expected to achieve a 60 percent reduction in the risk of mortality and serious injury in lobster and Jonah crab trap/pot fisheries in the Gulf of Maine and southern New England. We also held eight scoping meetings in 2019 to involve the public in developing ideas to reduce the risk of mortality and serious injury of large whales in vertical lines (buoy lines) to further inform development of a Draft Environmental

Impact Statement (DEIS). NMFS developed possible modifications to the Plan based on the Team’s near-consensus recommendations, feedback received during scoping, and a compilation of individual proposals received from New England states and representatives of the offshore lobster fishery. An improved version of the DST continued to inform evaluation of management alternatives, after a Center for Independent Experts peer review in November 2019 guided further adaptations of the tool.

In 2020, NMFS issued a DEIS and proposed rule to modify the Plan for public input. Proposed changes to the Plan would:

- Modify gear configurations to reduce the number of vertical lines by requiring more traps between buoy lines.
- Introduce weak insertions or weak rope into buoy lines to reduce severity of entanglements.
- Modify existing seasonal restricted areas to allow conditional ropeless²⁴ fishing experimentation.
- Add one or two new seasonal restricted areas that would be closed to buoy lines but allow experimental ropeless fishing.
- Modify gear marking to introduce state-specific colors for gear marks and increase the number of gear markings and areas requiring marked lines.

In January and February 2021, NOAA Fisheries held two Team meetings and eight additional virtual public meetings to solicit public input on the proposed rule and DEIS. NMFS finalized the rule, published September 17, 2021 to modify the Plan to reduce fishing gear entanglements based on Team recommendations, stakeholder input, and accommodations recommended by state resource agencies. The new rule reduces the number of buoy lines in the water through line reduction and seasonal restricted areas to reduce the chance of a right whale

²⁴ Reference is only to buoy/endline/vertical lines for the United States. This includes a buoy line that is not persistent in the water column (e.g., buoyline-less). “Ropeless” fishing is a term for fishing without persistent vertical buoy/endlines (though groundline is still used between traps on the seafloor). Fishermen can fish “ropeless” sets by grappling, the groundline, or by remotely releasing a buoy or inflating a floatbag attached to rope that is stored on the bottom until retrieved.



Right whale sighted June 8, 2014, during survey. Credit: Christin Khan, NMFS, NMFS permit 17355

encountering the lines, and adds inserts or rope that would break at 1,700 lb or below so that a whale has a better chance of breaking free if it becomes entangled. Together, these measures are expected to reduce risk of death or serious injuries in Northeast lobster trap/pot gear by about 60-69 percent. The rule also requires more gear marking to improve our understanding of where entanglement incidents occur, which could provide information helpful to future modifications of the Take Reduction Plan.

The Team will continue to work toward further reducing risk to North Atlantic right whales in the near future. To prepare, we are expanding the geographic scope of the DST to include: (1) The entire U.S. range of right whales; (2) additional fixed-gear fisheries; and (3) other large whale species.

Continued outreach to commercial fishermen to share the most accurate and current Plan regulatory information is important. Our fishery, fishing gear, and enforcement liaisons regularly engage with appropriate groups. For example, over the last two years our staff conducted trainings with enforcement agencies from the Mid-Atlantic states through Maine

and with industry from Florida to Maine at fishing co-ops and private docks. Additionally, we provided tours of the gear warehouse in Narragansett, RI, to Team members and the Offshore Lobstermen's Association. There, visitors were able to inspect gear that has been recovered from entangled whales. NMFS' physical outreach (i.e. attendance at in-person meetings) was limited in 2020 due to the COVID-19 pandemic, but virtual and in-person events (when possible) continued to be a priority.

To better understand how to reduce risk associated with vertical lines, NMFS continues to work closely with fishermen and other partners. For example, we have worked closely with state fishery management organizations, gear specialists, and fishermen on various gear research efforts including the development and testing of various weak rope and ropeless fishing gear for trap/pot fisheries. We have continued to accelerate research and develop a ropeless fishing pilot program that includes acquiring ropeless fishing systems (leveraging investments from external partners) and collaborating with fishermen to conduct both inshore and offshore testing under real-world conditions. We are collaborating with

organizations such as the Woods Hole Oceanographic Institution and SeaWorld of Florida to provide Northeast commercial fishermen with ropeless fishing units and gear detection apps to further the effectiveness of ropeless fishing under commercial conditions. Collaborating fishermen are providing valuable data on gear effectiveness and durability as feedback to gear manufacturers, who continue to modify prototype gear to meet fishermen's needs. We also worked with the National Aeronautics and Space Administration's (NASA) Center for Collaborative Excellence and Yet2 to crowdsource market research to identify vendors with the expertise to develop an inexpensive geolocation system for traps and pots to be used by fishermen, managers, and enforcement agencies.

Reducing Vessel Strikes

Reducing vessel strikes of North Atlantic right whales remains a top focus for NMFS. In January 2021, we released a review of the mandatory vessel speed rule (50 CFR section 224.105) that evaluated: biological efficacy, mariner compliance, impacts to navigational safety, and economic cost to mariners. The report also assessed the effectiveness of the Dynamic Area Management (DMA) program and general trends in vessel traffic patterns within Seasonal Management Areas (SMA) over time. NMFS welcomed comments for consideration regarding the need for future actions or modifications to our vessel strike reduction efforts. Based on the analyses and data presented, the specific recommendations in the report include:

- Modifying SMAs
- Enhancing enforcement and outreach
- Addressing vessel strike risk from small vessels (< 65 ft in length)
- Modifying or terminating the DMA program
- Research to understand strike risk to younger whales and females and investigate sub-lethal impacts from vessel collisions

Minimizing the risk of vessel strikes (from both small and large vessels) is critical to improving right whale survival. In 2020, we announced a new "Right Whale Slow Zones" campaign in the northeast United States asking all vessel operators to slow down or avoid areas for 15-day periods when right whale detections meet

a certain visual or acoustic detection threshold. The Northeast Implementation Team's recommendation to use passive acoustic detections in vessel strike management provided the foundation for using acoustic triggers to designate Slow Zones. Slow Zones also apply to all size vessels (not only vessels > 65 feet).

NMFS has taken additional steps to evaluate current programs and better understand how to reduce the threat of vessel collisions with North Atlantic right whales. We are developing a coastwide encounter rate risk model to identify areas where whales are at increased risk of vessel strikes based on up-to-date whale and vessel data. We recently started work on a study targeted at understanding the human dimension of vessel cooperation and compliance with voluntary and mandatory vessel speed restrictions to inform targeted and effective outreach to these mariner communities. We are also collaborating with the Florida Fish and Wildlife Conservation Commission on an effort to evaluate mariner use of recommended routing measures in both the Northeast and Southeast.

Continued outreach to the maritime industry to share vessel regulatory information is important. This includes information on the speed rule, Mandatory Ship Reporting requirements, and minimum approach distance regulations (500 yards (1,500 ft)) for vessels in the vicinity of right whales, in an effort to reduce harassment and risk of injury. Our vessel and enforcement liaisons also engage stakeholder groups. For example, over the last two years, vessel strike reduction information (targeting vessels >65') was shared at professional mariner meetings or events in the northeast and southeast United States. These efforts focused on working with state port authorities and maritime associations to reach port pilots, law enforcement officers, ship captains, shipping companies, and others associated with the shipping industry. Additionally, outreach materials were distributed at U.S. Coast Guard (USCG) trainings and general outreach events. For each new Slow Zone and DMA, information was distributed through outlets such as the Mandatory Ship Reporting System, broadcast via USCG and NOAA weather radio, NAVTEX, and emailed to maritime distribution lists, and relevant "interested parties" distribution lists.



Researchers gathering documentation of a right whale through photo-identification and biopsy sampling.
Credit: Keith Hernandez, NMFS, NMFS permit 775-1875

In the northeast, we continued work with whale watching and recreational boating audiences through partnership and collaborative efforts such as the Whale SENSE program, which trains approximately half of the East Coast commercial whale watching fleet on safe marine mammal viewing practices, and includes a module on right whale approach regulations, speed reduction requirements, and sightings reporting. Partnerships with organizations such as the USCG Auxiliary continued, which included distribution of “See a Spout Watch Out” brochures throughout New England and the Mid-Atlantic during vessel safety inspections and Safe Boating training courses. A “Safe Boating Around Whales” public service announcement (PSA) was made available in 2019 after NMFS awarded a contract through the Preserve America program to On The Water, one of the biggest online resources for boaters in the northeast. Their publications

target offshore recreational boaters and fishermen throughout New England and the Mid-Atlantic, and their PSA included right whale approach regulations. NMFS’ physical outreach (i.e. attendance at events and brochure distribution) was more limited in 2020 due to the pandemic, but virtual outreach via social media, websites, and virtual trainings continued to be a priority.

Other Recovery Progress

Over the last two years we have also continued to make significant scientific advances to better monitor North Atlantic right whales and understand the threats causing their decline. NMFS and the Working Group on Marine Mammal Unusual Mortality Events are working closely with an international team of U.S. and Canadian experts to investigate the current

ongoing UME. We also convened a 2019 Health Assessment Workshop to help evaluate current health information data, including associated data gaps, and identified appropriate available and necessary tools and techniques for collecting standardized health data that can be used to understand health effects of environmental and human impacts, and inform fecundity and survivorship models to ultimately guide right whale recovery²⁵. Related to survivorship models, NMFS continued to support the efforts of the Right Whale Implementation Team's Right Whale Population Evaluation Tool (PET) Subgroup to develop a population viability analysis to determine North Atlantic right whale extinction risk and help guide recovery efforts.

NMFS also continues to prioritize and fund a combination of passive acoustic, aerial, and vessel surveys for right whales. Such efforts are critical to understanding right whale habitat use patterns and informing management decisions. For example, we expanded acoustic data collection in the Gulf of Maine (e.g., through a Maine Department of Marine Resources partnership to deploy acoustic recorders off the coast of Maine) and south of Martha's Vineyard and Nantucket. We also continued to support right whale monitoring in the Gulf of St. Lawrence in coordination with Canada. A North Atlantic Right Whale Monitoring and Surveillance Work Group was convened in 2019 to provide recommendations to inform right whale conservation efforts and leverage resources to answer outstanding questions related to population and health status, distribution, and habitat use²⁶. The report will help NMFS develop a long-term, cross-regional plan for monitoring right whale population trends and habitat use in collaboration with partners.

We continued to direct efforts over the last two years to improve our knowledge of how current, new, and emerging marine activities may impact right whales. In 2020, NMFS published the results of a scenario planning exercise for North Atlantic right whales,

which helped prioritize right whale management and science needs in the short term in light of changing ocean conditions and impacts from anthropogenic activities²⁷. We identified right whale management and research actions that reinforced recovery efforts already underway (e.g., reduce impacts from fishing interactions and vessel strikes). The process also emphasized the importance of putting additional effort towards better understanding "novel" actions and/or new, emerging threats (e.g., climate, wind energy, aquaculture, and anthropogenic noise) to optimize North Atlantic right whale recovery in the future. NMFS also partnered with Fisheries and Oceans Canada (DFO) and University of Maine in 2020 to convene a Zooplankton Workshop to coordinate U.S.-Canada cross-boundary zooplankton models and data sharing to inform management of right whales. A workshop report is in progress and collaboration efforts amongst participants through working groups continued in 2020 after the workshop.

Partnerships are critical for recovering right whales and these have continued and/or been expanded over the last two years. The United States and Canada actively collaborate on the recovery of North Atlantic right whales in both Canadian and U.S. waters through ongoing bilateral discussions. In 2019 and 2020, this included regular meetings at the staff and leadership level, both nationally and regionally, to share information and coordinate on science and management considerations related to North Atlantic right whales. NMFS has also convened the Atlantic Large Whale Take Reduction Team and PET Subgroup as discussed above. We continued to convene the Northeast and Southeast U.S. Implementation Teams in 2019 and 2020 to help us further recovery of right whales and involve stakeholders in implementation of the recovery plan. NMFS is also strengthening partnerships with other research groups to expand population and distribution monitoring capabilities and is working with other U.S. agencies including the USACE, USCG, and BOEM. For example, beginning in the

25 <https://www.fisheries.noaa.gov/resource/document/report-health-assessment-workshop-north-atlantic-right-whales-eubalaena-glacialis>

26 <https://www.fisheries.noaa.gov/resource/document/north-atlantic-right-whale-monitoring-and-surveillance-report-and-recommendations>

27 <https://www.fisheries.noaa.gov/resource/document/north-atlantic-right-whale-eubalaena-glacialis-scenario-planning-summary-report>

2020/2021 right whale calving season and continuing annually, the USACE will fund two right whale aerial survey efforts: one off South Carolina and one off North Carolina. Additional partnerships to further recovery of North Atlantic right whales are described in our *Species in the Spotlight* Priority Action Plan.

Looking Ahead

In 2021, we released the first *Species in the Spotlight* Priority Action Plan²⁸ for the North Atlantic right whale. The action plan identifies the following urgent actions we can take in the next five years to halt the decline of this species:

- Protect North Atlantic right whales from entanglement in fishing gear.
- Protect North Atlantic right whales from vessel strikes.
- Investigate North Atlantic right whale population abundance, status, distribution, and health.
- Collaborate with Canada on North Atlantic right whale recovery.
- Improve our knowledge of additional factors limiting right whale recovery.

The Northeast and Southeast U.S. Implementation Teams were jointly convened in 2019 with the primary objective of providing input on coast-wide priorities to inform the development of the Priority Action Plan for North Atlantic right whales. The key actions build off the recovery plan for the North Atlantic right whale. While we have made considerable progress and achieved important milestones toward recovery as noted above, we have a long way to go. However, there are important efforts underway on multiple fronts through NMFS and our partners to recover North Atlantic right whales.

28 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-north-atlantic-right-whale>

PARTNER in the SPOTLIGHT: Katie Moore, U.S. Coast Guard

Katie Moore has long been an important contributor to North Atlantic right whale recovery efforts. Katie serves as a Living Marine Resources Subject Matter Expert with the United States Coast Guard (USCG)-Atlantic Area, and has worked in this capacity to help further right whale recovery from Maine through Florida for close to 20 years. The USCG is an important partner working with NMFS to help protect North Atlantic right whales. Katie's role includes program direction, oversight, administration, resource planning, and technical leadership related to living marine resources. This year, we are recognizing the USCG's and Katie's efforts to protect North Atlantic right whales, though their efforts extend to helping protect other species as well. The USCG not only supports our stranding and disentanglement responders, but they also communicate information to mariners about right whales in partnership with NMFS. Katie's coordination within USCG and with NMFS is critical to successful outcomes and communications. For example, when a North Atlantic right whale that had been seen entangled in unidentified fishing gear since late 2020, was found floating off the coast of South Carolina on February 27, 2021, a multi-agency effort was initiated to investigate the carcass and retrieve the entangling gear. With Katie's involvement, the USCG Sector Charleston assisted in re-locating the carcass the following day within a very limited timeframe due to poor weather conditions. Katie and the USCG's involvement in this event helped NMFS gather important information on entanglement gear and wounds that will aid in determining the most effective measures needed for recovery. This is but one example of numerous special circumstances that Katie and the USCG have provided assistance with right whale rescues.



Credit: Katie Moore

Through Katie, USCG also advises NMFS on the enforceability of proposed regulations aimed at reducing entanglement in fishing gear and vessel strikes. Katie attends Atlantic Large Whale Take Reduction Team meetings, where her expertise is greatly appreciated. Throughout her tenure, Katie has been a constant advisor and collaborator on numerous NMFS teams, including serving as a founding member of the Southeast U.S. Implementation Team and on the newly reconvened Northeast U.S. Implementation Team (including two years as Team Lead). Partnerships are essential to North Atlantic right whale recovery. Katie has played a critical role in establishing, developing, and overseeing long-term partnerships between NMFS and the USCG to further the recovery of North Atlantic right whales.

SPECIES *in the* SPOTLIGHT

PACIFIC LEATHERBACK SEA TURTLE

Leatherback sea turtles (*Dermochelys coriacea*) are highly migratory and are found across the globe in temperate and tropical latitudes.

Leatherbacks in the Pacific Ocean (i.e., Pacific leatherbacks) are split into western and eastern Pacific populations based on their distribution, biological, and genetic characteristics. Eastern Pacific leatherbacks nest along the Pacific coast of the Americas, primarily in Mexico and Costa Rica, and forage throughout coastal and pelagic habitats of the southeastern Pacific. Western Pacific leatherbacks nest seasonally during the winter and summer months, primarily in Indonesia, Papua New Guinea, and the Solomon Islands. This seasonal nesting behavior influences their migratory behavior and marine habitat use. The summer-nesting portion of the population migrates throughout the waters of Southeast Asia with additional components of the summer-nesting population migrating across the North Pacific past Hawaii to feeding areas off the Pacific coast of North America. The winter-nesting segment of the western subpopulation migrates into

the southern hemisphere through the Coral Sea, into waters of the western South Pacific Ocean.

Pacific leatherbacks are considered one of the most at-risk species because of the drastic decreasing trend in their abundance since the 1980s. Western Pacific leatherbacks have declined more than 80 percent and Eastern Pacific leatherbacks by more than 97 percent. They face significant threats from bycatch in fisheries (entanglement and/or hooking), direct harvest of both eggs and turtles, coastal development, and the effects of climate change (habitat loss due to sea level rise, alteration of hatchling sex ratios, and decreased nest success). Additional threats include vessel strikes, ingestion of plastics, and entanglement in marine debris, including lost or discarded fishing gear.

Recovery Progress

We made substantial progress over the last two years on the key actions identified in the 2016-2020 Priority Action Plan²⁹ for the Pacific leatherback turtle, including efforts to:

- (1) reduce interactions in fisheries;
- (2) improve nesting beach protection and increase reproductive output;
- (3) cooperate with international partners to implement conservation measures and established agreements;
- (4) understand migratory habitats and pelagic threats to better implement mitigation

A leatherback turtle entangled in pelagic longline gear. Credit: NOAA Observer Program



29 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2016-2020-pacific-leatherback-turtle>

measures; and (5) raise awareness and education of actions the public can take to support leatherback turtle conservation.

Reduce Interactions in Fisheries

Bycatch in coastal and pelagic fisheries remains one of the most significant threats to Pacific leatherbacks throughout their range. Collaborative efforts are underway to assess fisheries impacts and reduce bycatch in coastal waters, particularly near nesting beaches. The United States works closely with other countries, NGOs, and Regional Fisheries Management Organizations (RFMOs) to reduce bycatch. The United States is a party to two RFMOs in the Pacific—the Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC). Both RFMOs have enacted resolutions, such as the expanded use of circle hooks and finfish for bait, to help reduce sea turtle bycatch and minimize bycatch mortality in longline fisheries that target swordfish. We will continue our efforts to reduce this threat to leatherback turtles and work to encourage the adoption of bycatch reduction measures in all other longline fisheries.

Improve Nesting Beach Protection and Increase Reproductive Output through Outreach and Community Support

Nest protection efforts promote successful hatching by minimizing threats through a science-based management approach. Protection efforts include strategies to prevent egg depredation by feral pigs and dogs, and measures to reduce other threats that lower hatching success. In the Eastern Pacific, the U.S. Fish and Wildlife Service (FWS) continues to support our partners' efforts in Mexico and Costa Rica to protect critical leatherback nesting beaches. In the Western Pacific, NMFS and FWS continue to support, through funding and engaging in community-based projects, leatherback conservation in Papua Barat and Buru, Indonesia. These efforts are focused on fostering



Scanning a leatherback turtle for tags in Papua New Guinea. Credit: J. Isley/scubazoo.com

community involvement through culturally focused community-based education/outreach, with a focus on alternative livelihood programs in Indonesia. The multi-year action plan, developed with the involvement of local government agencies, local village elders, and community members in Buru Island, continues to be implemented. This plan included local and village government roles in encouraging protection activities at the regency to village levels. FWS and NMFS also support a number of projects in the Solomon Islands to monitor nesting activity and improve leatherback nesting conservation, including developing conservation action plans with the local communities. This ensures that nest protection and anti-poaching efforts continue, as every hatchling and nesting female is vital for the survival of these populations.

Cooperate With International Partners to Implement Conservation Measures and Established Agreements

Because Pacific leatherbacks originate from and migrate outside of U.S. territorial waters during much of their life cycle, effective recovery and conservation efforts must engage international partners to address the various threats facing leatherbacks on land and sea. Partnerships are the cornerstone of our Pacific leatherback conservation efforts. The United States continues to work on a Memorandum of Understanding on leatherback conservation with the Government of Indonesia. Furthermore, we have been actively engaged with many environmental NGOs around the Pacific. In the Western Pacific, we are working closely

A leatherback turtle feeding on a jellyfish in Monterey Bay, California. Credit: S. Benson



with the World Wildlife Fund for Nature (WWF) to monitor nesting activity and engage with indigenous communities in the Kei Islands of Indonesia to reduce the intentional harvest of leatherbacks. We also work with Tetepare Descendants' Association and The Nature Conservancy to support on the ground efforts to protect leatherbacks and their nests. Finally, throughout the Pacific, we have been promoting leatherback conservation measures in multilateral instruments that provide opportunities to work collaboratively to conserve and recover the species, such as the Inter-American Convention for the Protection and Conservation of Sea Turtles and the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia. We will continue our international efforts to promote cooperation and share best practices in conservation, support programs to protect nesting beaches, and reduce bycatch and harvest of leatherback turtles.

Understand Migratory and Pelagic Threats to Better Implement Mitigation Measures

Information on migration, foraging areas, and threats in marine habitats is an essential component to inform development of conservation measures. We continue to build partnerships aimed at monitoring, assessing, and reducing impacts to leatherback turtles in their foraging habitats. WWF-Indonesia actively works to monitor the hunting of leatherbacks in the Kei islands in partnership with NOAA's Pacific Islands Fisheries Science Center (PIFSC) and the Pacific Islands Regional Office (PIRO). In 2017, the program documented over 100 leatherback turtles harvested. However, following educational outreach and local government engagement, the number

of turtles harvested decreased notably to seven turtles in 2019, emphasizing the significant conservation value of continuing to focus on reducing this threat to the population. PIFSC researchers also trained local Indonesian WWF staff members on best practices and protocols to satellite tag nesting leatherback sea turtles. Tagging nesting females and monitoring nesting activity were able to continue through the 2019 and 2020 summer nesting seasons during COVID-19 restrictions.

Continuing collection and analysis of genetic samples from fishery bycatch and stranded turtles allows us to understand regional connectivity and the threats to the population. Genetic analysis completed in 2019 helped us identify whether individual bycaught turtles belonged to the nesting populations in Papua New Guinea, Solomon Islands, or Papua, Indonesia. The PIFSC continues to develop partnerships in the western Pacific to build in-country technical capacity to conduct future genetic analyses with standardized markers developed by NOAA's Southwest Fisheries Science Center.

We continue to expand telemetry studies in order to determine overlap between fisheries and leatherback marine habitats. Defining seasonal foraging and migratory areas within the South China, Sulu, Celebes, Molucca, Halmahera, Philippine, and Banda Seas as well as off the U.S. west coast will help guide conservation and management strategies (e.g., real time data used by the State of California to inform the opening and closing of the Dungeness crab fishery season).

Raise Awareness and Education of Actions the Public Can Take to Support Leatherback Turtle Conservation

Increasing the public's awareness and capacity to make responsible seafood choices by supporting sustainably-managed fisheries that work to reduce sea turtle bycatch is an effective, market-based approach to support leatherback conservation. Online resources allow consumers to find out where their seafood is from and buy products sourced from fisheries that incorporate bycatch reduction measures.

Leatherbacks can become entangled in marine debris such as derelict fishing gear or plastic debris, which can interfere with their ability to swim, submerge, feed, avoid predators, and/or surface to breathe, resulting in injury or death. Leatherbacks can also ingest debris such as plastic bags, balloons, latex products, and other refuse, which they mistake for their prey. NOAA's Marine Debris Program continued efforts to reduce the amount of debris in the marine environment and facilitated beach and marine cleanup events throughout Hawaii and along the U.S. Pacific coast.

PARTNER *in the SPOTLIGHT*: Tetepare Descendants' Association

Given the precipitous decline in Western Pacific leatherback nesting over the past few decades, information collection, data sharing, and coordinated conservation action are critical to reverse this trend. We take this opportunity to highlight a special partner whose efforts to protect key Western Pacific nesting beaches has helped to prevent Pacific leatherbacks from vanishing.

Tetepare Island is in the Western Province of the Solomon Islands, and is the largest uninhabited tropical island in the Southern Hemisphere. When commercial logging threatened Tetepare at the beginning of the century, the descendants of Tetepare's former inhabitants formed an alliance to protect and conserve the island for the benefit of all descendants and future generations. The Tetepare Descendants' Association (TDA) is made up of local community members and is one of the largest landowners' associations in the Solomon Islands. Over the years, it has transformed into a community-based conservation organization that leads one of the largest integrated land and marine conservation initiatives in the country. Over the last 15 years, TDA has been actively engaged in recovering one of the few key leatherback nesting populations remaining in the Western Pacific. TDA works on Tetepare Beach and Rendova Beach, which are key nesting beaches for leatherback conservation in the western Pacific.

Looking Ahead

In 2021, we released an updated Priority Action Plan³⁰ for Pacific leatherbacks. The 2021-2025 Priority Action Plan builds on the progress we have made thus far and identifies the following priority actions needed in the next 5 years to conserve Pacific leatherback turtles: (1) reduce fisheries bycatch and in-water harvest; (2) improve protection on nesting beaches; (3) in-water research and monitoring to inform conservation actions; (4) foster cooperation with international partners; and (5) encourage public engagement.



Tetepare Descendants' Association rangers in the Solomon Islands measuring a leatherback turtle following egg disposition. Credit: Cameron Masakolo

TDA has been an essential partner for implementing NOAA's *Species in the Spotlight* Action Plan. TDA Rangers work tirelessly, carrying out overnight foot patrols, tagging and measuring nesting females, and protecting nests from predators and poachers. Along with their international collaborators, they hold training workshops that have fostered renewed enthusiasm from local communities adjacent to the nesting beach. They engage the community and encourage their participation in the leatherback monitoring program despite logistical challenges and limited funding.

TDA is truly committed to the conservation of Pacific leatherbacks. They work nearly year-round in difficult conditions because they are invested in recovering this species. The challenges on the ground are many, but TDA continues to persist with unwavering determination.

30 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-pacific-leatherback-turtle>

SPECIES *in the* SPOTLIGHT

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON ESU

The Sacramento River winter-run Chinook salmon ESU (*Oncorhynchus tshawytscha*) is one of the most at-risk endangered species because it is composed of just one small population that is a mere fraction of its historical size.

The earliest abundance data for this population is from the late 1960s, when the spawning population size was estimated at up to 117,000 adults. Most recently, from 2011 to 2020, the combined abundance of natural- and hatchery-origin spawning winter-run Chinook salmon adults ranged from a low of 827 in 2011 to a high of 8,128 in 2019, with an average of 3,572. The 2012-2016 drought had a biologically significant effect on the abundance of natural-origin spawners; only 153 adults returned in 2017, the lowest level of natural-origin spawners on record, and 461 returned in 2018.

The winter-run Chinook salmon population crashed in the 1970s, and the ESU was subsequently listed as endangered under the ESA in 1989. The species

has persisted in large part due to managed cold water releases into the Sacramento River from Shasta Reservoir, and artificial propagation from Livingston Stone National Fish Hatchery's winter-run Chinook salmon conservation program. Shasta Dam, constructed in 1945, blocks winter-run Chinook salmon from returning each year to their historical spawning grounds in the southern Cascade Mountains in the headwaters of the Sacramento, McCloud, and Pit rivers. Since the dam was constructed, winter-run Chinook salmon have been dependent on sufficient cold water originating from those headwaters to be released from Shasta Reservoir from spring to fall, the time of year when they are present below the reservoir. It has long been recognized that a prolonged drought could have devastating impacts, possibly leading to the species' extinction.

Recovery Progress

In FY 2019-2020, we made substantial progress on the key actions identified in the 2016-2020 Priority Action Plan³¹ for the Sacramento River winter-run Chinook salmon ESU: (1) improve management of Shasta Reservoir cold-water storage; (2) restore Battle Creek and reintroduce winter-run Chinook salmon; (3) reintroduce winter-run Chinook salmon into McCloud River; (4) improve Yolo Bypass fish habitat and passage; and (5) manage winter and early spring



Winter run Chinook salmon juveniles in Battle Creek.
Credit: California Department of Fish and Wildlife

31 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2016-2020-sacramento-river-winter-run-chinook>

Winter-run Chinook salmon being released into Battle Creek. Credit: U.S. Fish and Wildlife Service



Sacramento-San Joaquin River Delta conditions to improve juvenile survival.

Improve Management of Shasta Reservoir Cold-water Storage

The purpose of this action is to ensure cold water is available in the Sacramento River to support winter-run Chinook salmon egg and fry life stages. Since the 2016-2020 action plan was released, the U.S. Bureau of Reclamation (Reclamation) has modified its approach to efficiently release Shasta Reservoir's limited supply of cold water by using the within-season distribution of winter-run Chinook salmon redds to identify how far downstream to provide protective water temperatures. To improve its forecasting precision, Reclamation has continued to evaluate and refine its physical models, including an effort started in 2017 to develop a revised framework for seasonal Shasta and Trinity Division planning and operations modeling. In addition, NOAA's Southwest Fisheries Science Center (SWFSC) and the Sacramento River Settlement Contractors are partnering with Reclamation to improve models for cold water pool management. Actions to protect winter-run Chinook salmon eggs and fry in 2017 and 2018 helped support above average spawning runs of over 8,000 adults in 2019, and over 6,000 adults in 2020.

Restore Battle Creek and Reintroduce Winter-Run Chinook Salmon

The Battle Creek Salmon and Steelhead Restoration Project (BCRP), led by Reclamation, will restore and provide access to approximately 42 miles of prime salmon and steelhead habitat on Battle Creek, plus an additional 6 miles in its tributaries. The Restoration Project is a collaborative effort between Reclamation, Pacific Gas and Electric Company, and various resource agencies, including NMFS, the U.S. Fish and Wildlife Service (FWS), the Federal Energy Regulatory

Commission, the California State Water Resources Control Board, the California Department of Fish and Wildlife, and the California Bay Delta Authority, with valuable participation from the public, including the Greater Battle Creek Watershed Working Group and the Battle Creek Watershed Conservancy. Battle Creek is being restored by the modification of hydroelectric project facilities and operations, including instream flow releases. The BCRP is restoring suitable winter-run Chinook salmon habitat and setting the stage for reintroduction.

Since 2018, the FWS has released 567,412 winter-run Chinook salmon juveniles into Battle Creek as part of a pilot project to help establish a new population and inform a longer term reintroduction effort. In 2020, over 1,000 adults from these releases returned, and were the first winter-run Chinook salmon to successfully spawn in Battle Creek in over 100 years. A large part of the reintroduction success is due to progress made on BCRP, including improved fish passage at hydropower facilities through modifications and dam removal. Restoring habitat and reestablishing a population in Battle Creek will increase the species' abundance, spatial structure, and diversity, and ultimately contribute to its chances of long-term survival and recovery.

Reintroduce Winter-Run Chinook Salmon into Historical Habitats Above Shasta Dam

The 2012-2016 drought and ongoing challenges with water temperature management downstream of Shasta Dam have accentuated the urgent need to reintroduce winter-run Chinook salmon populations into historical habitats like the McCloud River, which is not dependent on Shasta Reservoir storage, and is buffered from drought due to the influence of cold-water springs. The survival and recovery of winter-run Chinook salmon cannot be achieved



Fremont Weir fish ladder in 1965 (top) and 2018 (bottom). The new fish ladder provides much improved passage for adult winter-run Chinook salmon to return to the Sacramento River from the Yolo Bypass. Credit: U.S. Bureau of Reclamation

without establishing additional populations. As such, NMFS, Reclamation, and the California Department of Water Resources (CDWR) have been leading an effort to implement a pilot program guided by science to return winter-run Chinook salmon to selected portions of their historical habitat above Shasta Dam.

In 2018, Reclamation awarded CDWR \$2.7 million as the first installment of a 5-year contract totaling approximately \$9 million for the design, construction, installation, and operation of two juvenile fish collection devices in the lower McCloud River and the McCloud arm of Shasta Reservoir. Under this contract, CDWR has made progress designing and constructing components of the juvenile collection system, including guidance nets, debris booms, and a thermal curtain. Reintroducing winter-run Chinook salmon into historical habitats above Shasta Dam, such as the McCloud River, will increase the

species abundance, spatial structure, and diversity, and ultimately contribute to its chances of long-term survival and recovery.

Improve Yolo Bypass Fish Habitat and Passage

Restoring floodplain habitat in the Yolo Bypass and improving fish access to it will support juvenile winter-run Chinook salmon development, growth, and survival by providing more food for juvenile salmon to eat and better protection from predators, relative to rearing conditions in the main channel of the Sacramento River. Improving fish passage at flood control and agricultural structures such as weirs, gates, and berms in the Yolo Bypass will reduce losses to the population due to delays in adult migration, stranding, and illegal harvesting, which is known to occur in the Yolo Bypass when fish become delayed or stranded.

In 2019, CDWR and Reclamation completed the Fremont Weir adult fish ladder, providing a vital fish passage route for adult winter-run Chinook salmon migrating up the Yolo Bypass to return to the Sacramento River where they can reach their spawning habitat. Overall, fish passage was improved at three weirs and three agricultural road crossings in the last few years.

Manage Winter and Early Spring Delta Conditions to Improve Juvenile Survival

This action is composed of related activities intended to improve our understanding of, manage, and reduce the exposure of juvenile winter-run Chinook salmon to negative flows and high predation rates in the central and south Delta. Progress has been made over the last few years on each of the activities. Here we highlight advancements related to monitoring and modeling.

Real-time monitoring of juvenile winter-run Chinook salmon distribution using catch data from trawls, seines, and rotary screw traps occurs annually allowing for informed water export management. Additionally, acoustically tagged winter-run Chinook salmon juveniles have been tracked annually in winter and spring since 2015 to help managers determine the survival of the juveniles from their release location in Redding through Chipps Island in the western Delta.

The SWFSC has also made progress in advancing the winter-run life cycle model and the related enhanced particle tracking model. Those models are used to evaluate how climate change and different water project operations and management actions (harvest, habitat restoration) influence the long-term viability of winter-run Chinook salmon.

Looking Ahead

The 2021-2025 Priority Action Plan³² builds on the progress we have made thus far, continuing with the five actions from the 2016-2020 Priority Action Plan described above and adding a sixth action focusing on collaborative science and fostering partnership. The first five actions were carried forward because

they are ongoing, long-term actions. The sixth action promotes the development of science and partnerships to adaptively manage Central Valley salmon, habitat, and water to meet winter-run Chinook salmon recovery goals. Three key efforts are: (1) the Collaborative Science and Adaptive Management Program (CSAMP); (2) the SWFSC's winter-run Chinook salmon science program; and (3) the Sacramento River Science Partnership (SRSP). These efforts collectively form key components of adaptive management, from identifying winter-run Chinook salmon recovery priorities and key threats, to modeling impacts of water operations and infrastructure projects, to evaluating impacts of actions taken.

PARTNER *in the SPOTLIGHT*: John Hannon, Bureau of Reclamation

John Hannon with the Bureau of Reclamation is a champion for restoring Chinook salmon and steelhead habitat in the Central Valley of California. Through John's tireless work, he has motivated the restoration community and formed strong partnerships among the local communities, tribes, farmers, environmental groups, and federal and state agencies. The Sacramento River restoration effort that John leads as part of Reclamation's and the U.S. Fish and Wildlife Service's Central Valley Project Improvement Act Fish Program is a great example of a successful public-private partnership that balances habitat conservation with responsible use and stewardship. This partnership among federal and state agencies, the Northern California Water Association, the Sacramento River Forum, River Partners, and Chico State University produces tangible benefits to ESA-listed and economically important salmon and steelhead populations, including winter-run Chinook salmon.

As a partner in restoring Central Valley salmon habitat, NMFS is well aware of how challenging it is to make on-the-ground restoration happen, and we marvel at all that John has accomplished in the Sacramento River. John has moved projects from conception to construction at an unmatched pace with as many as seven habitat improvement projects at a time. Since 2017, 13 projects were completed, resulting in new spawning areas and approximately 26 new acres of much needed rearing habitat.

Additionally, John finds time to lead other important Central Valley salmonid recovery projects. He led Reclamation's planning efforts to reintroduce winter-run Chinook salmon back to historical habitat in the McCloud River, and continues to restore habitat on the American and Stanislaus rivers.



Credit: U.S. Bureau of Reclamation

32 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-sacramento-river-winter-run-chinook>

SPECIES *in the* SPOTLIGHT

SOUTHERN RESIDENT KILLER WHALE DPS

Southern Resident killer whales (*Orcinus orca*) are one of the most endangered whales, with only 74 whales in the population at the end of 2020. The continued population decline over the last decade highlights their challenges with survival and reproduction, and the population's risk of extinction. However, as a small ray of hope, the end of 2020 saw two new calves born including a new calf for J35, also known as Tahlequah. It was heartening to see J35 with a new calf since she was the adult female who carried her dead calf for more than two weeks in 2018 and sparked interest and sympathy around the globe. In 2019 and 2020, we ramped up efforts with new individuals and organizations joining the recovery effort. We responded to the growing urgency, built on the momentum of interest from concerned citizens as they expressed concern about J35 and the entire Southern Resident population,

and expanded our efforts as new partners heard the call to action. The Washington State Orca Task Force (Task Force) completed their work in 2020, releasing two reports of recommendations, many of which were complementary to the Recovery Plan for Southern Residents, and the 2016-2020 *Species in the Spotlight* Priority Action Plan.

Recovery Progress

In FY 2019-2020, we made substantial progress on the five key actions in the 2016-2020 Priority Action Plan³³ for Southern Resident killer whales: (1) protect killer whales from harmful vessel impacts through enforcement, education, and evaluation; (2) target recovery of critical prey; (3) protect important habitat areas from anthropogenic threats; (4) improve our knowledge of Southern Resident killer whale health to

Northwest Fisheries Science Center team attaches a DTag suction cup. Credit: NWFSC, NMFS permit 21348



³³ Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2016-2020-southern-resident-killer-whale>

advance recovery; and (5) raise awareness about the recovery needs of Southern Resident killer whales, and inspire stewardship through outreach and education.

Protect Killer Whales from Harmful Vessel Impacts through Enforcement, Education, and Evaluation

Southern Resident killer whales rely on echolocation and communication to support their critical foraging and social needs; however, physical and acoustic disturbance from vessels can impair these functions. Since NMFS finalized regulations to protect Southern Resident killer whales from vessel impacts in 2011, we have reviewed their effectiveness, and have been working with outreach, enforcement, and industry partners to educate boaters to achieve high rates of compliance to minimize impacts from sound and vessel disturbance. In 2019-2020, we continued to work with Canada, Washington State, and San Juan County as they updated or developed additional protective regulations and voluntary guidelines to help protect Southern Resident killer whales. Our participation included serving on a Washington Academy of Sciences panel and an intergovernmental working group to inform the new licensing program for commercial whale watching in Washington State established in 2020.

Ongoing research projects, like NOAA's Northwest Fisheries Science Center (NWFSC) acoustic recorder tagging (Dtag) project in partnership with Fisheries and Oceans Canada (DFO), continue to provide results to inform protective measures, including new insights into differences in foraging between males and females published in 2019. The results will guide updates to regulations and guidelines. In 2019, we also held a scoping meeting and opened a public comment period to gather input on whether we should update the federal vessel regulations, and what updates to those rules might look like.

We also turned our attention to potential impacts from large ships transiting through our waters. We have



Southern Resident killer whale catching a salmon.
NWFSC, NMFS permit 16163

been building on our partnership with the Canadian ECHO (Enhancing Cetacean Habitat and Observation) Program, an industry-led program, working to understand and manage the impacts of shipping activities. ECHO continued voluntary measures in 2019 and 2020 to slow down and shift vessel operations to reduce sound in important foraging areas. As recommended by the Task Force, we participated with partners on a planning team to develop a framework for a new U.S. program similar to ECHO. We shared a proposal for the new U.S. program called Quiet Sound with interested parties in fall of 2020. We are also collaborating with transboundary and local partners on specific projects, like broader application of the Whale Report Alert System in U.S. waters to enhance awareness of whale movements, and foster implementation of responsible vessel operations.

Target Recovery of Critical Prey

Southern Resident killer whales are fish-eating whales that rely on Pacific salmon as their most important prey. Research indicates that a single species—Chinook salmon—makes up most of their summer diet, and new research has shown that it remains an important component throughout the year. Sufficient salmon prey is essential to recover the Southern Resident population. Knowing where and when the whales are most food-limited, and which salmon stocks they eat and overlap with throughout their range, helps target recovery of salmon stocks that will most benefit the whales. In 2019-2020, we

found ways to use the Prey Priority Report developed by NMFS and Washington Department of Fish and Wildlife, with input from tribal organizations, NGOs, and DFO, provided at a workshop held by the National Fish and Wildlife Foundation (NFWF), and released in 2018. The list of priority Chinook salmon stocks has been incorporated into grant programs including NFWF's Killer Whale Research and Conservation Program (see Partner in the Spotlight story and inset box), and the Pacific Coastal Salmon Recovery Fund to help identify projects that support salmon and killer whale recovery. The priority prey report also informed implementation of initiatives under the Pacific Salmon Treaty to support salmon habitat restoration and hatchery production to benefit the Southern Residents.

To evaluate potential impacts of coastal salmon fisheries, the Pacific Fishery Management Council formed a Workgroup including the NMFS' West Coast Region, the NWFSC, and the Southwest Fisheries Science Center (SWFSC), along with state, tribal, and industry members. The Workgroup completed a risk assessment in 2020 to describe relationships between killer whale population metrics (such as reproduction and body condition) and the abundance of Chinook salmon, which in the coming years will inform management of the ocean salmon fisheries, as well as other actions that change salmon abundance.

Protect Important Habitat Areas from Anthropogenic Threats

Understanding how the whales are using their coastal habitat helps us to evaluate patterns in response to changing environmental conditions and better protect important habitat areas from anthropogenic threats. We pulled research results together from several long-term NWFSC projects using satellite tags, acoustic recorders, sightings, and sampling to inform a revision of critical habitat to protect coastal waters. A proposed rule for modified critical habitat under the ESA was published in 2019, public hearings were held to gather additional public input, and a final rule was published in August 2021. Our research showed that the whales spend most of the winter and a substantial portion of all seasons in outer coastal waters, from Monterey, California, to Southeast Alaska, traveling, foraging, and socializing. A

coastal critical habitat designation provides additional protection from federal actions that can impact important habitat features (prey, passage, and water quality), and raises awareness about the full extent of Southern Resident killer whale habitats.

Improve Our Knowledge of Southern Resident Killer Whale Health to Advance Recovery

Understanding killer whale health is essential to identifying the cause of reduced survival and reproduction in the declining Southern Resident population compared to other increasing or stable populations of killer whales. A review of historical stranding investigations was published in 2020 shedding light on the natural threats the whales face in their environment, and how human activities, such as fishing and boating, may contribute to mortality. In 2019-2020 researchers from Sealife Response, Rehabilitation, and Research; Oregon State University; and the SWFSC have continued to draw on the long-term data set of photogrammetric monitoring (taking measurements from aerial photos) to develop models to relate body condition to population dynamics and examine trends in relation to environmental variables, such as Chinook salmon abundance.

Ongoing research on the health of all the whales has provided baseline information for comparison with compromised individuals and other killer whale populations. Ongoing health sample collection and analysis have given us a clearer picture of pathogens and what microbiomes (i.e., microorganisms in the digestive or respiratory systems) look like for Southern Resident killer whales, and will also give us the capacity to identify any emerging infectious diseases or at risk individuals. In 2019-2020, we developed protocols to guide emergency response for medically treatable whales with compromised health. We drew from our work with veterinarians, researchers, and other experts to mount an emergency response in 2018 to provide remote medical treatment for J50, a juvenile with very poor body condition. While unsuccessful in saving J50, we learned about her condition, reviewed tools and techniques for response, and identified gaps in our capabilities. Building on our recent experience, past cases, and input from experts around the world,



Researchers observe the health condition of individual Southern Residents and collect fecal and breath samples to learn about pathogens and diseases. Credit: NWFSC, NMFS permit 21348

we are continuing to develop response plans for strandings, entanglements, and other circumstances so we can continue to learn about the whales and build our response capacity.

Raise Awareness About the Recovery Needs of Southern Resident Killer Whales and Inspire Stewardship through Outreach and Education

Public awareness of the status of the whales and the threats they face is essential to the conservation of the species. The *Species in the Spotlight* initiative has inspired a new campaign to spread messages about the whales through social media, videos, and web pages. From 2015 to 2020, we participated in 66 Southern Resident killer whale *Species in the Spotlight* events, with approximately 12,600 participants, and reached many more people through websites, social media, distribution of materials, and supporting our partners through educational grants to reach new and expanding audiences. We have updated the Priority Action Plan for 2021-2025 and will continue support for initiatives such as Orca Month every June. Even more importantly, we are developing partnerships that raise awareness about the whales to support conservation efforts with new audiences. Many partners inspire stewardship of the whales and their habitats by educating concerned citizens about actions they can take to help recover the whales.

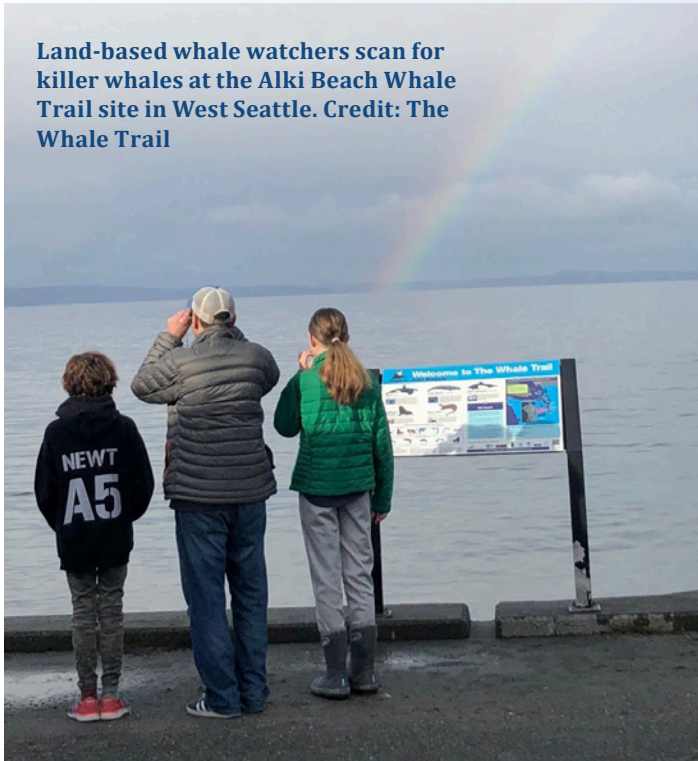
NMFS has long-standing partnerships with education and outreach experts at institutions in the region, such as The Whale Museum and Seattle Aquarium. In 2020, outreach events and visits to exhibits were hindered by the COVID-19 pandemic, but new opportunities and partnerships have helped expand the reach of several education programs. Reaching students and their families is an important way to ensure Southern Residents will have stewards into the future, and 2020 brought new challenges for getting into the classroom as many schools were closed. Our partners at Killer Whale Tales took the usual in-person classroom experience virtual. They ran a thriving online program dedicated to educating kids about Southern Resident killer

whales and what they can do to help the pods, with about 6,000 students signed up by the end of 2020. The Whale Trail, a series of shore-based viewing sites to build awareness about killer whales and other whales and dolphins, provided a safe outdoor experience, including social distancing. As of 2020 the Whale Trail identifies more than 100 shore side whale watching sites, from San Diego to north of Vancouver Island, and includes the Washington State Ferries as another platform for responsibly viewing whales. The creativity shown in 2020 will bring new opportunities into the future.

Other Recovery Progress

Local, state, federal, tribal, and international partners continued to support recovery in 2019 and 2020, implementing actions from NMFS' 2008 Southern Resident killer whale recovery plan, our Species in the Spotlight Priority Action Plan, the Washington Executive Order, the Task Force reports, and Canada's Oceans Protection Plan. These plans are complementary, coordinated, and cover a broad suite of actions addressing the key known threats and increasing our scientific knowledge. The Governor's Task Force drew on existing plans for Southern Residents, NMFS' ESA recovery plans for salmon, and Puget Sound clean-up efforts to guide development of recommendations to support recovery. Additionally, over the last two years we have made progress on

Land-based whale watchers scan for killer whales at the Alki Beach Whale Trail site in West Seattle. Credit: The Whale Trail



developing new partnerships, building external funding resources, and implementing a variety of ongoing research and conservation activities.

Looking Ahead

Over the past two years, we have continued to improve our understanding of and ability to protect this unique population of whales. Despite the progress made by our scientists and regional partners on the key actions identified in the Southern Resident killer whale Priority Action Plan, the population has not grown; in fact the population has declined in abundance since it was first listed under the ESA. We clearly still have important work to do locally, with our federal capabilities, and internationally to bring Southern Resident killer whales back from the brink of extinction. With increased public awareness and momentum through implementation of recommendations by the Governor’s Task Force and in Canada, there are many positive and collaborative initiatives underway to identify resources, make commitments, and follow through on strong actions that will benefit the whales, their prey, and the ecosystem.

For the 2021-2025 Priority Action Plan³⁴, we address the same threats and many of the same challenges from the previous plan. We have also added new elements to actions and removed actions that have been completed.

³⁴ Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-southern-resident-killer-whale>

The 2021-2025 Priority Action Plan builds on the progress we have made thus far and identifies the following actions needed in the next 5 years to continue working toward recovery: (1) protect killer whales from harmful vessel impacts through enforcement, education, and evaluation; (2) target conservation of critical prey; (3) improve our knowledge of Southern Resident killer whale health to advance recovery and support emergency response; and (4) raise awareness about the recovery needs of the whales and inspire stewardship through education and outreach.

2019-2020 NFWF Grants Supporting Southern Resident Killer Whale Conservation

Since the program was launched in 2015, the Killer Whale Research and Conservation Grant Program has awarded 38 grants totaling \$4.4 million to a variety of partners, including research organizations, NGOs, and county and federal agencies. The following are examples of projects funded in 2019-2020 that support actions from the Species in the Spotlight 2016-2020 Action Plan:

Conserving salmon, their habitats, and prey:

- Enhance off-channel pool habitat in the South Fork of the Skagit River to create rearing habitat for juvenile Chinook salmon.
- Restore 150 acres of salmon rearing habitat and improve connectivity in the Port Susan Bay estuary.
- Work with landowners to protect forage fish and juvenile salmon habitat in San Juan County, Washington.
- Collect prey and fecal samples in coastal waters of Washington in the spring to evaluate seasonal diet and habitat use.

Vessels:

- Increase the use and functionality of the Whale Report Alert System and encourage professional mariners to take steps to protect the whales and reduce physical and acoustic disturbance.

Health:

- Develop early indicators to monitor the health of individual whales, and use ongoing photogrammetry

PARTNER *in the SPOTLIGHT*: National Fish and Wildlife Foundation Killer Whale Research and Conservation Grant Program

SeaWorld Entertainment Inc. established the Killer Whale Research and Conservation Program with a contribution pledge in 2015 to support efforts to advance understanding and conservation of killer whales. The National Fish and Wildlife Foundation (NFWF) administers this grant program, with a primary focus on activities that aid in the recovery of the Southern Resident killer whale population. In the first six years, the program has awarded 38 grants totaling \$4.4 million, drawing an additional \$8.4 million in grantee match for a total conservation investment of more than \$12.8 million. These awards have fostered collaborative efforts in the three strategies listed below, combining science with management action and restoration activities.

Conservation strategies for this program include:

- **Increase prey availability:** support projects that increase availability of key salmon runs that are a critical part of the Southern Resident population's diet.
- **Improve habitat quality:** support projects that reduce threats to priority killer whale habitat from pollution and contaminants, vessel traffic, and noise.
- **Strengthen management through research:** support research to improve monitoring of demographics and distribution, health assessments, and effectiveness of management actions.

In addition to awarding grants, NFWF has taken on several special projects to bring people together to support recovery of Southern Resident killer whales. NFWF, working together with NMFS, coordinated the workshop that brought partners and perspectives to the table to contribute to the Priority Prey Report in 2018. In 2019 and 2020, NFWF and Shell Oil Co. supported increased education and awareness of the transboundary Be Whale Wise program, reaching new audiences. The Killer Whale Research and Conservation Grant Program was also able to support



NOAA Administrator Dr. Richard Spinrad presents the Partner in the Spotlight award to Michael Cline, NFWF Chairman of the Board. Credit: Holly Bamford, NFWF

some additional time on the water in 2020 for multiple research projects with the hope of gaining insight into any responses from whales to reductions in vessel traffic, whale watching, and research activities brought about by COVID-19 conditions.

In addition to supporting research and conservation projects, NFWF has been dedicated to making sure the results and outcomes are shared with managers and decision-makers. In 2019, NFWF and SeaWorld Entertainment Inc. held a Grantee Symposium for grantees to share their data, results, and successes with each other to enable better coordination and with managers to ensure uptake of the information into management and recovery programs in the United States and Canada. The Symposium had a packed agenda of presentations, allowed for valuable discussions, and set the stage for further advancing the strategies and goals of the grant program. Additional conference calls organized by NFWF in 2020 also fostered collaboration and dissemination of important information.

NFWF has been a key partner in moving essential projects forward. NFWF serves as a conduit for action as they have successfully engaged funders, including SeaWorld Entertainment Inc., Shell Oil Co., U.S. Fish and Wildlife Service, NMFS, and many grantees over the life of the program, providing critical support for research and conservation of Southern Resident killer whales.

SPECIES *in the* SPOTLIGHT

WHITE ABALONE

The white abalone (*Haliotis sorenseni*), an herbivorous marine snail, was selected as a *Species in the Spotlight* because it was brought to the brink of extinction by a combination of factors, most notably a brief but intense commercial fishery in southern California prior to 1980. Fragmented, low-density populations, a consequence of overfishing, are likely experiencing reproductive failure and have not recovered despite the closure of the fishery in 1997. White abalone's role as a keystone grazer in subtidal kelp forests contributes to sustaining higher species diversity and stability in the ecosystem. NMFS and its partners can prevent the extinction of this endangered kelp forest architect by continuing to restore populations until they reach sustainable levels through a captive propagation, enhancement, research, and monitoring program.

Cultured white abalone. Credit: Melissa Neuman, NMFS

Recovery Progress

In FY 2019-2020, we made substantial progress on the key actions identified in the 2016-2020 Priority Action Plan³⁵ for the white abalone: (1) expand a captive propagation program; (2) implement a successful outplanting program; (3) monitor and enhance white abalone populations in the wild; (4) identify, characterize, and prioritize existing and potential white abalone kelp forest habitat; and (5) develop a comprehensive, multi-institution outreach plan.

Our progress would not be possible without a growing list of partners, all of whom are supported in part by NOAA grants and contracts, especially the ESA Section 6 Species Recovery Grant Program. Our partners include (in alphabetical order): Aquarium of the Pacific (AoP), The Bay Foundation (TBF), Cabrillo Marine Aquarium, California Department of Fish and Wildlife



35 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2016-2020-white-abalone>

(CDFW), Creeklands Conservation, The Cultured Abalone, Moss Landing Marine Laboratory, Paua Marine Research Group (PMRG), The Santa Barbara Natural History Museum Sea Center, SubAqua Imaging, the University of California Davis Bodega Marine Laboratory (BML), and the University of California Santa Barbara.

Expand a Captive Propagation Program

Recent studies at BML and partner captive propagation facilities have focused on examining the impacts of temperature, photoperiod, ocean acidity, diet, and disease on reproductive output and early survival of white abalone. Cool rearing temperatures and antibiotic treatment of captive animals appear to offer protection from disease without compromising growth rates or gut biome health. Broodstock source locations and the nutritional content of the yolk that females pass on to their offspring affect survival of early life stages under acidic conditions. These findings, along with an expansion of captive breeding, rearing, and outreach partnerships, including those with Mexico, led to an increase in captive production by several orders of magnitude—the number of settled juveniles increased from thousands to millions over the past 3 years, and production of one-year-old white abalone increased by several orders of magnitude since 2012. Even with limitations imposed by the COVID-19 pandemic, the number of year-old white abalone exceeded 20,000 individuals in 2020. Identifying the factors that lead to higher reproductive output of our broodstock and higher survival rates of early life stages while the abalone are in captivity is paramount to increasing the production of healthy animals that will eventually be outplanted.

Implement a Successful Outplanting Program

NMFS is leading outplanting efforts with partners, principally CDFW, PMRG, TBF, AoP, and BML. We outplanted approximately 4,200 captive-bred white abalone to the wild in the fall of 2019 and fall of 2020,



The captive breeding program led by the UC Davis Bodega Marine Laboratory has increased production of year-old white abalone by several orders of magnitude since 2012. Credit: Melissa Neuman, NMFS

and developed a strategic plan that outlines our production and outplanting goals through 2024. Other abalone enhancement programs have taught us that once aquaculture production goals are met, repeated outplanting efforts over 5 to 7 years, in multiple areas, are necessary to achieve success. Experimental outplanting efforts will continue and expand with refined methodologies, and result in the addition of multiple outplanting sites. If enhancement efforts are successful over the long-term, white abalone abundance should approach self-sustaining levels in at least one site by 2025.

Monitor and Enhance White Abalone Populations in the Wild

NMFS is leading monitoring efforts with partners, principally CDFW, PMRG, TBF, AoP, and SubAqua Imaging using multiple tools, such as remotely operated vehicles (ROVs), SCUBA, in situ time lapse cameras, abalone recruitment modules, and genetics. Monitoring wild and outplanted abalone is necessary to support research efforts, collect additional broodstock to supplement our captive breeding program, determine whether our restoration efforts are effective, and highlight methodologies that need revision. We learned that at least one wild population continues to decline, predator behavior



Outplanting white abalone. Credit: Bill Hagey, Pisces Design.

does not appear to be significantly altered by an influx of outplanted abalone, and outplant modules (enclosures encased in mesh to keep predators out) offer appropriate shelter and substrate for newly outplanted abalone. Continuing and expanding our monitoring program for white abalone in the wild will benefit species research and restoration by: (1) providing long-term trend data essential for gauging population status and health over time, (2) developing genetic tools that can help us identify abalone in the wild that are a product of our outplanting efforts, and (3) understanding which factors play the most important role in white abalone survival, growth, and reproduction.

Identify, Characterize, and Prioritize White Abalone Habitat

NMFS is leading habitat monitoring efforts with partners, principally CDFW, PMRG, TBF, AoP, and SubAqua Imaging using multiple tools, such as ROVs, SCUBA, in situ time lapse cameras, and environmental data loggers. The identification of resilient kelp forest habitat that is well-buffered from the impacts of climate change is essential to the long-term success of white abalone. We monitored the algal and faunal

community, water temperature, and dissolved oxygen at several sites that were important to white abalone historically and discovered that some are still intact and readily accessible by boat and divers. These sites were chosen for our first and second white abalone outplanting attempts. Continuing and expanding our habitat monitoring program will allow us to identify at least two additional sites for outplanting over the next five years.

Develop a Comprehensive, Multi-Institutional Outreach Plan

Communicating consistent themes and unified messages is critical to the success of the white abalone recovery program. We and our partners developed web stories and short videos that have been distributed via a variety of media platforms. Workshops were convened to: (1) highlight the benefits and garner support for a conservation aquaculture initiative in Cayucos (led by Creeklands Conservation), (2) learn about the progress of abalone captive propagation and enhancement programs on the west coast of North America (led by CDFW), and (3) develop outreach materials for citizen scientists and recreation enthusiasts who want to help

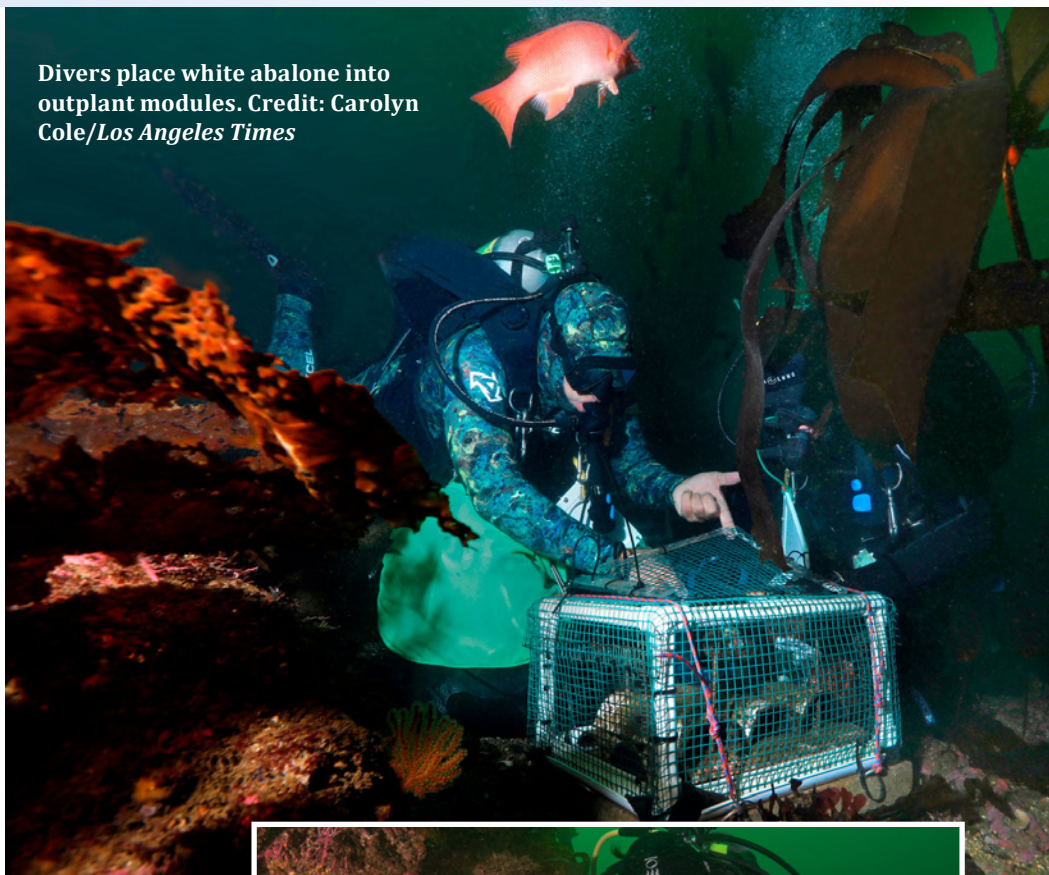
contribute to the discovery and recovery of endangered abalone (led by Channel Islands National Marine Sanctuary). Recently, we recognized that a high-quality shared database is necessary for partners to communicate results in an efficient and consistent way. We created a platform and structure for shared data and developed guidance documents that improve efficiencies in abalone outplant data organization, entry, quality, accessibility, and analysis. This effort will continue over the next several years.

Looking Ahead

Since the launch of the *Species in the Spotlight* initiative in May 2015, we have worked with many partners to: (1) identify the factors that lead to higher rates of white abalone spawning and survival, (2) expand captive breeding and outreach partnerships, including those with Mexico, (3) outplant captive-bred white abalone to the wild, and (4) refine and expand field monitoring in Southern California and Mexico using traditional and novel underwater tools. We have also made progress in developing a shared high-quality database to improve our program's ability to communicate our accomplishments in a consistent and accurate way both within and outside our agency.

The 2021-2025 Priority Action Plan³⁶ builds on the progress we have made thus far and identifies the following actions needed in the next 5 years to continue working toward recovery of white abalone: (1) improve reproductive output and maximize survival of captive-bred animals by conducting research; (2) expand conservation aquaculture for the purpose of population enhancement through outplanting in the wild by prioritizing new grow-out space and capacity; (3) increase outplanting and monitoring in order to enhance white abalone populations in the wild by using existing or improved

Divers place white abalone into outplant modules. Credit: Carolyn Cole/Los Angeles Times



NMFS scientific diver Melissa Neuman observes a white abalone while conducting SCUBA monitoring. Credit: Adam Obaza, Paua Marine Research Group

methodologies and tools; (4) improve data access for recovery partners by developing a shared database that delivers high-quality information in a timely and controlled manner; and (5) improve outreach and communications to build support and foster partnerships by developing a comprehensive, multi-institution outreach strategy that communicates the key recovery messages, and highlights the important roles of partners for recovering white abalone throughout its range.

36 Available at: <https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-white-abalone>

PARTNERS *in the SPOTLIGHT:* **Jim Moore, Laura Rogers-Bennett,** **and Ian Taniguchi**

Three scientists with the California Department of Fish and Wildlife (CDFW) have been instrumental in helping to develop and implement the recovery program for white abalone since the species was listed as endangered in 2001: Dr. Jim Moore, Dr. Laura Rogers-Bennett, and Mr. Ian Taniguchi. Each has devoted their long and illustrious career advancing our understanding of abalone health, ecology, and conservation. Our awardees served on our NOAA white abalone recovery and implementation teams and are co-principal investigators on several NOAA grants that aim to advance our white abalone recovery program. We are pleased to recognize their lifetime contributions to white abalone recovery and conservation by honoring them with our Partners in the Spotlight award.

Dr. Jim Moore began leading the CDFW Shellfish Health Program in 1999. Disease and invasive species prevention has been a top priority for him ever since the inception of the white abalone captive breeding program. With so many partners moving white abalone from one location to another, and the eventual outplanting of white abalone back to natural habitats, maintaining the optimal health of white abalone during every stage of their captive lives was critical. Jim developed several disease treatment and health maintenance protocols, a streamlined health-testing program and schedule, and conducted novel research to help uncover factors that improve the likelihood that our captive abalone will not be compromised health-wise when they leave our facilities and return to the ocean.

Dr. Laura Rogers-Bennett joined CDFW in 1999, at about the same time NOAA was on the verge of listing white abalone as the first endangered marine invertebrate. Laura was part of the skilled scuba diving team that collected our first lonely adult white abalone to begin the now well-established captive breeding program. When the captive breeding program faced a crisis in Ventura, CA due to disease and poor water quality, Laura spearheaded an effort

Credit: Blythe Marshman, CDFW



to move the captive breeding program to the University of California Davis Bodega Marine Laboratory, where state-of-the-art facilities and skilled staff ensured safety, great water quality, and health care. Laura's interdisciplinary approach and high-quality research has advanced the scientific rigor of our program, making it more defensible and more likely to achieve its ultimate goal: white abalone recovery!



Credit: Ken Paglia, CDFW

Mr. Ian Taniguchi began his career with CDFW in 1992. Like Laura, Ian was part of the skilled scuba diving team that collected 21 white abalone broodstock in order to advance our captive breeding initiative. Ian has continued to lend his abalone removal techniques to collect additional broodstock and boost the genetic diversity of our captive breeding program. In addition, his eagle-eyes have helped identify wild and outplanted white abalone during rigorous monitoring efforts. Ian has helped design and deploy abalone outplanting modules that keep abalone safe while they acclimate to their natural environment. Ian, along with Laura, led the CDFW outplant team during the first white abalone outplanting effort in 2019, and he continues to coordinate closely with all of the outplanting partners in preparation for future outplanting efforts.



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