

Sea Turtle Interactions in the U.S. Pacific Longline and Drift Gillnet Fisheries

A Report Submitted to the Inter-American Tropical Tuna Commission as Required
by the Resolution to Mitigate the Impact of Tuna Fishing Vessels on Sea Turtles
(Resolution C-07-03)
and the
Consolidated Resolution on Bycatch (Resolution C-04-05)

**Prepared by NOAA's National Marine Fisheries Service (NMFS)
West Coast Region
Long Beach, CA**

June 2020

Sea Turtle Interactions in the U.S. Pacific Longline and Drift Gillnet Fisheries

Preface

Under the June 2007 *Resolution to Mitigate the Impact of Tuna Fishing Vessels on Sea Turtles* (Resolution C-07-03), and voluntarily under Resolution C-04-05 (*Consolidated Resolution on Bycatch*), Parties agreed to submit available information on interactions of vessels flying their flag with sea turtles in fisheries under the competence of the Inter-American Tropical Tuna Commission (IATTC). Additionally, Parties agreed to report on both progress in the development of technology to reduce sea turtle bycatch and the actions taken to provide their vessels with the necessary equipment for appropriate release of incidentally caught sea turtles. Therefore, the United States has prepared this annual report on the interactions of U.S. fishing vessels with sea turtles in and adjacent to the eastern Pacific Ocean (EPO). The report also discusses the conservation measures taken by the United States to reduce sea turtle bycatch.

The United States has limited the scope of fishery interaction data discussed in this report to longline and drift gillnet fisheries in the Pacific Ocean. Some of these fisheries, such as Hawaii longline fisheries, range across the Pacific Ocean and include fishing effort that occurs outside the IATTC Convention Area. Where possible, this report makes an effort to distinguish and highlight activities that specifically occur within the IATTC Convention Area, or EPO, although it is not always possible to do so. The United States is also monitoring takes of sea turtles by large purse seine vessels in the EPO, including entanglement in fish aggregating devices. However, we obtain these data from the IATTC staff; therefore, we do not include this fishery in this report, as there is no benefit in providing these data back to the IATTC.

Lastly, this report is an update to the report submitted in 2019 pursuant to Resolutions C-04-05 and C-07-03. Unchanged background information is not repeated here.

Swordfish/Tuna Longline Fisheries

Please refer to pages 3-6 of the report submitted in 2014 for a thorough background on the operation and management of West Coast and Hawaii U.S. longline fisheries targeting tunas and swordfish. Updates are described here:

U.S. West Coast-Based Deep-set Longline (DSLL) Fishery

There were no sea turtle interactions in the DSLL fishery operating out of California in 2018 (NMFS West Coast Region observer program, unpublished data, 2019). In 2019 the fishery interacted with 1 loggerhead sea turtle.

Hawaii-based Pelagic Longline Fishery

Shallow-Set

In 2018, the fishery interacted with 4 leatherback, 28 loggerhead, and no olive ridley or green sea turtles within the IATTC Convention Area. In 2019, the fishery interacted with 4 loggerhead sea turtles within the IATTC Convention Area.

Deep-Set

The deep-set fishery has roughly 20% observer coverage. In 2018, observed turtle takes in the IATTC Convention Area for this fishery consisted of 1 olive ridley, 2 green, and no leatherback or loggerhead sea turtles. Extrapolated point estimates indicate that 5 olive ridley takes occurred with a standard error of 4.8 and 11 green takes with a standard error of 7. In 2019, observed turtle takes in the IATTC Convention Area for this fishery consisted of 2 olive ridley sea turtles, and no green, leatherback, or loggerhead sea turtles. Extrapolated point estimates indicate that 6 olive ridley takes occurred with a standard error of 4.1.

Swordfish/Thresher Shark Drift Gillnet Fishery

Please refer to pages 8-9 of the report submitted in 2014 for a thorough background on the operation and management of the U.S. drift gillnet fishery targeting swordfish and thresher shark. Updates are included here.

Table 1: Sea Turtle Interactions observed in the U.S. West Coast Drift Gillnet Fishery 2009-2019. Sources: the West Coast Region Observer Program and SAFE reports 2006-2019, available at: <https://www.pcouncil.org/safe-documents-2/>

Year	Active Vessels	Swordfish (mt)	Thresher shark (mt)	Observed Sets	Estimated Total Sets	% Observer Coverage	Observed Turtle Takes	Take per 100 obs. sets
2009	35	258	38	101	761	13.3	1 [†]	0.93
2010	26	62	41	59	492	12.0	0	0
2011	22	119	55	85	435	19.5	0	0
2012	17	118	37	83	445	18.7	1 [†]	1.20
2013	18	102	48	176	470	37.4	0	0
2014	15	127	26	113	379	29.8	0	0
2015	17	101	32	74	361	20.5	0	0
2016	20	183	32	134	737	18.2	0	0
2017	17	179	42	114	598	19.0	0	0
2018	22	148	26	130	513	25.3	0	0
2019	14	52	25	73	323	22.6	0	0

[†] Leatherback, released alive
All data are preliminary

Conservation Measures

Please refer to previous U.S. sea turtle reports for a thorough background on the history of sea turtle conservation and mitigation measures the United States has implemented in both the longline and drift gillnet fisheries. Those pages also include past trainings, outreach events, conferences, workshops, collaborations with other nations and organizations, as well as research publications. Recent developments include:

Species in the Spotlight – Pacific Leatherback

Of all the species NMFS protects under the Endangered Species Act (ESA), eight are considered

to be among the most at-risk of extinction in the near future. As a result, the “Species in the Spotlight: Survive to Thrive” initiative was created - a concerted agency-wide effort to spotlight and save these highly at-risk species. One of these “Species in the Spotlight” is the Pacific leatherback sea turtle (*Dermochelys coriacea*) which are globally listed under the ESA as endangered.

Throughout the Species in the Spotlight campaign, NMFS will engage public and private sector partners in collaborative actions to spur recovery for these species. On February 10, 2016, NMFS released 5-Year Action Plans for the eight “Species in the Spotlight.” These plans outline efforts vital for stabilizing their populations and preventing their extinction, and serve as road maps for their recovery. The action plan focuses on five critical areas to improve conservation efforts for Pacific leatherbacks: 1) reduce interactions in fisheries; 2) improve nesting beach protection and increase reproductive output through outreach and community support; 3) cooperate with international partners to implement conservation measures and established agreements; 4) understand migratory and pelagic threats to better implement mitigation measures; and 5) raise awareness and education of actions the public can take to support leatherback turtle conservation. Action #1 and #3 are most relevant to our work within the context of the IATTC and other regional fishery management organizations.

Under this special designation, leatherback sea turtles will be prioritized for directed funding and competitive grant award programs. One such program is the ESA Section 6 grant program which provides funds to the states and recognized tribes to support research and conservation programs that aide in the recovery of endangered species. The states of Washington, Oregon, and California have included leatherback sea turtles in their Section 6 Agreements and are eligible to submit proposals for this species.

In early 2018, NMFS and the U.S. Fish and Wildlife Service initiated a status review for the globally listed endangered leatherback sea turtles, to determine if distinct population segments (DPS) (i.e., discrete and significant subpopulations) exist and if so, given their status, to consider whether the listing (currently “endangered”) should be changed for each DPS. The status review was peer-reviewed and is expected to be completed in the summer or fall of 2020.

In 2018, NMFS developed a framework to assess the vulnerability of sea turtles to climate change in order to broadly evaluate the impacts across their entire life cycle and including a range of variables (e.g., beach incubation temperature, sea surface temperature, ocean acidification, and sea level rise). This assessment will help to characterize the sensitivity and adaptive capacity of sea turtles throughout the world, including those populations migrating and foraging in the eastern tropical Pacific Ocean. Sea turtle populations worldwide were evaluated (via scoring system) by experts based on the population’s exposure and vulnerability to climate change to all life stages, and these results will be published in a peer-reviewed manuscript in the next 1-2 years.

Participation in Seminars, Meetings, Conferences, Symposiums, etc.

- 39th International Sea Turtle Symposium. Charleston, South Carolina, February 2019.
- 9th IATTC Bycatch Working Group meeting. NMFS co-authored an IATTC paper on East Pacific leatherback turtle, which was presented at this meeting. La Jolla, California,

May 2019.

- NMFS worked on supporting an updated sea turtle resolution at IATTC, with result of adoption of C-19-04 during the 94th Annual IATTC meeting in Spain, July 2019.
- NMFS held a multi-day Sea Turtle Bycatch Reduction workshop to prioritize management and research for reducing fisheries bycatch of all sea turtles. Silver Spring, Maryland, September 2019.
- NMFS participated in the 11th Scientific Committee Meeting of The Inter-American Convention for the Protection and Conservation of Sea Turtles, St. Petersburg, Florida, September 2019.
- NMFS has included training on sea turtle safe handling, release, and identification as part of each Agreement on the International Dolphin Conservation Program (AIDCP) Seminar for Fishing Captains. Attendance at this seminar is one of the requirements to receive an eastern tropical Pacific operator's permit and be placed upon the AIDCP list of qualified captains. Several workshops are offered each year, both in-person or via webinar.
- Throughout 2019, NMFS has provided training on sea turtle safe handling, release and resuscitation to participants in the California drift gillnet fishery, exempted fishing permit participants targeting swordfish in the U.S. west coast EEZ (i.e., deep-set buoy gear and deep-set linked buoy gear, deep-set shortline, and deep-set and shallow-set longline), and the Hawaii-based longline fishery.
- NMFS provides environmental compliance training to its scientists participating in research cruises, specifically, safe handling and resuscitation guidelines, sea turtle identification, and reporting requirements.
- NMFS collaborated with colleagues in Peru, Colombia, and Spain to attach satellite tags on sea turtles to track movements and identify habitat use and preferred habitat for predictive purposes.
- NMFS collaborated with colleagues in Brazil, Italy, and Spain on a study regarding sea turtle decompression sickness from turtles caught in trawl gear.
- NMFS worked on the sea turtle resolution at the Western and Central Pacific Fisheries Commission (WCPFC) Scientific Committee (SC), and co-convened the WCPFC SC's Ecosystem and Bycatch Theme section.

Gear Experiments

Technical advice has been provided for ongoing and new studies (2019) on sea turtle bycatch mitigation experiments, underway in Indonesia and the Philippines, with focus on trials with net illumination.

Published Research from U.S. Government Scientists and Managers

Avens, L., L. R. Goshe, G. R. Zug, G. H. Balazs, S. R. Benson, H. Harris. 2020. Regional comparison of leatherback sea turtle maturation attributes and reproductive longevity. *Marine Biology*. 167.1: 4. <https://doi.org/10.1007/s00227-019-3617-y>

Banerjee, S.M., Allen, C.D., Schmitt, T., Cheng, B.S., Seminoff, J.A., Eguchi, T., Komoroske, L.M. (2019) Baseline health parameters of east Pacific green turtles at southern California foraging grounds. *Chelonian Conservation and Biology* 18 (2):163-174.

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Fonseca, L.G, P. Saltidrián Tomillo, W.N. Villachica, W.M. Quirós, M. Pesquero, M. Heidemeyer, F. Joyce, P.T. Plotkin, J.A. Seminoff, and R.A. Valverde. 2018. High nest density of east Pacific green turtles (*Chelonia mydas*) in Costa Rica. *Chelonian Conservation and Biology* 17:169–176.

Hetherington, E. D., C. M. Kurle, S. R. Benson, T. T. Jones, and J. A. Seminoff. 2019. Re-examining trophic dead ends: stable isotope values link gelatinous zooplankton to leatherback turtles in the California Current. *Marine Ecology Progress Series* 632: 205–219.

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Parga, M.L., Crespo-Picazo, J.L., Monteiro, D. Y. Swimmer 2020. On-board study of gas embolism in marine turtles caught in bottom trawl fisheries in the Atlantic Ocean. *Sci Rep* 10, 5561. <https://doi.org/10.1038/s41598-020-62355-7>

Ramirez, M.D., J.A. Miller, E. Parks, L. Avens, L.R. Goshe, J.A. Seminoff, M. Snover, and S.S. Heppell. 2019. Reconstructing movement of marine megafauna using trace elements: a case study in sea turtles. *Marine Ecology Progress Series* 608:247–262.

Welch, H., E.L. Hazen, D. Briscoe, S. Bograd, M. Jacox, T. Eguchi, S. Benson, C.C. Fahy, T. Garfield, D. Robinson, J.A. Seminoff, and H. Bailey. 2019. Environmental indicators to reduce loggerhead turtle by-catch offshore southern California. *Ecological Indicators* 98:657-664.

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Preface

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The United States has limited the scope of fishery interaction data discussed in this report to longline and drift gillnet fisheries in the Pacific Ocean. Some of these fisheries, such as Hawaii longline fisheries, range across the Pacific Ocean and include fishing effort that occurs outside the IATTC Convention Area. Where possible, this report makes an effort to distinguish and highlight activities that specifically occur within the IATTC Convention Area, or EPO, although it is not always possible to do so. The United States is also monitoring takes of sea turtles by large purse seine vessels in the EPO, including entanglement in fish aggregating devices. However, we obtain these data from the IATTC staff; therefore, we do not include this fishery in this report, as there is no benefit in providing these data back to the IATTC.

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Hawaii-based Pelagic Longline Fishery

Shallow-Set

In 2017, the fishery interacted with 3 leatherbacks, 5 loggerheads, 1 Olive Ridley, and no Green Sea Turtles within the IATTC Convention Area. In 2018, the fishery interacted with 4 leatherback, 28 loggerhead, and no Olive Ridley or Green sea turtles within the IATTC Convention Area.

Deep-Set

The deep-set fishery has roughly 20% observer coverage. In 2017, observed turtle takes in the IATTC Convention Area for this fishery consisted of 6 olive ridleys, no green, leatherback, or loggerhead sea turtles. As this fishery only has roughly 20% coverage, extrapolated point estimates indicate that 28 olive ridleys were taken with a standard error of 10.0. In 2018, observed turtle takes in the IATTC Convention Area for this fishery consisted of 1 olive ridley, 2 green, and no leatherback or loggerhead sea turtles. Extrapolated point estimates indicate that 5 olive ridley takes occurred with a standard error of 4.8 and 11 green takes with a standard error of 7.

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Year	Active Vessels	Swordfish (mt)	Thresher shark (mt)	Observed Sets	Estimated Total Sets	% Observer Coverage	Observed Turtle Takes	Take per 100 obs. sets
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Throughout the Species in the Spotlight campaign, NMFS will engage public and private sector partners in collaborative actions to spur recovery for these species. On February 10, 2016, NMFS released 5-Year Action Plans for the eight “Species in the Spotlight.” These plans outline efforts vital for stabilizing their populations and preventing their extinction, and serve as road maps for their recovery. In October, 2018, NMFS hosted California Leatherback Day in La Jolla, California, with over 200 participants.

Under this special designation, leatherback sea turtles will be prioritized for directed funding and competitive grant award programs. One such program is the ESA Section 6 grant program which provides funds to the states and recognized tribes to support research and conservation programs that aide in the recovery of endangered species. The states of Washington, Oregon, and California have included leatherback sea turtles in their Section 6 Agreements and are eligible to submit proposals for this species.

In early 2018, NMFS and the U.S. Fish and Wildlife Service initiated a status review for the globally listed endangered leatherback sea turtles, to determine if distinct population segments (DPS) (i.e., discrete and significant subpopulations) exist and if so, given their status, to consider whether the listing (currently “endangered”) should be changed for each DPS.

In 2018, NMFS developed a framework to assess the vulnerability of sea turtles to climate change in order to broadly evaluate the impacts across their entire life cycle and including a range of variables (e.g., beach incubation temperature, sea surface temperature, ocean acidification, and sea level rise). This assessment will help to characterize the sensitivity and adaptive capacity of sea turtles throughout the world, including those populations migrating and foraging in the eastern tropical Pacific Ocean.

Participation in Seminars, Meetings, Conferences, Symposiums, etc.

- North Pacific Trilateral Loggerhead Recovery Plan Meeting. La Jolla, CA, January 2018
- U.S. - Mexico bilateral meeting. Discussions included a review of the status and conservation of Pacific leatherback turtles as well as current and potential collaboration efforts to recover this endangered species. Silver Spring, Maryland, February 2018
- 38th International Sea Turtle Symposium. Kobe, Japan, February 2018
- NMFS and USFWS held a multi-day workshop to prioritize management and research for Pacific leatherback sea turtles, including an outline of cost estimates, lead agencies/offices, and potential partners. La Jolla, California, March 2018

- 8th IATTC Bycatch Working Group meeting. La Jolla, California, May 2018
- California Leatherback Turtle Day at Monterey Bay National Marine Sanctuary. Santa Cruz, California, October 2018.
- NMFS has included training on sea turtle safe handling, release, and identification as part of each AIDCP Seminar for Fishing Captains. Attendance at this seminar is one of the requirements to receive an ETP operator's permit and be placed upon the AIDCP list of qualified captains. Several workshops are offered each year, both in-person or via webinar.
- Throughout 2018, NMFS has included training on sea turtle safe handling, release and resuscitation to participants in the California drift gillnet fishery, an exempted permitted fisheries targeting swordfish in the U.S. west coast EEZ (experimental deep-set buoy gear fishery and deep-set linked buoy gear), and the Hawaii-based longline fishery.
- NMFS collaborated with colleagues in Brazil and Spain on a study regarding sea turtle decompression sickness from turtles caught in trawl gear.
- NMFS collaborated with colleagues in Peru, Colombia and Spain to attach satellite tags on sea turtles to track movements and identify habitat use and preferred habitat for predictive purposes.
- NMFS worked with the The Inter-American Convention (IAC) for the Protection and Conservation of Sea Turtles.
- NMFS worked on the sea turtle resolution at the WCPFC SC, and co-chaired the WCPFC SC Ecosystem and Bycatch Theme.

Gear Experiments

Technical advice has been provided for ongoing and new studies (2018) on sea turtle bycatch mitigation experiments, underway in Indonesia, Brazil, Spain, Peru, and Chile.

Published Research from U.S. Government Scientists and Managers

Eguchi, T., S. McClatchie, C. Wilson, S.R. Benson, R.A. LeRoux and J.A. Seminoff. 2018. Loggerhead Turtles (*Caretta caretta*) in the California Current: Abundance, Distribution and Anomalous Warming of the North Pacific. *Frontiers in Marine Science*. Volume 5; Article 452; December 2018.

Harrison, A., D.P. Costa, A.J. Winship, S.R. Benson, S.J. Bograd, M. Antolos, A.B. Carlisle, H. Dewar, P.H. Dutton, S.J. Jorgensen, S. Kohin, B.R. Mate, P.W. Robinson, K.M. Schaefer, K.M. Gjerde and B.A. Block. 2018. *Nature Ecology & Evolution*. Vol. 2: 1571-1578. October 2018.

Hazen, E.L., K.S. Scales, S.M. Maxwell, D.K. Briscoe, H. Welch, S.J. Bograd, H. Bailey, S.R. Benson, T. Eguchi, H. Dewar, S. Kohin, D.P. Costa, L.B. Crowder, R.L. Lewison. 2018. A dynamic ocean management tool to reduce bycatch and support sustainable fisheries. *Science Advances* 2018; 4:eaar3001.

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Sampson, L., A. Giraldo, L.F. Payan, D.F. Amorocho, M.A. Ramos, and J.A. Seminoff. 2018. Trophic ecology of green turtle *Chelonia mydas* juveniles in the Colombian Pacific. *Journal of the Marine Biological Association of the United Kingdom* 98(7):1817–1829. DOI: [10.1017/S0025315417001400](https://doi.org/10.1017/S0025315417001400)

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
Sustainable Fisheries Division
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802

150413SWR2013SF00161:TD

Dr. Guillermo Compeán
Director, Inter-American Tropical Tuna Commission
8901 La Jolla Shores Drive
La Jolla, California 92037-1508

Re: Submission of sea turtle report

Dear Dr. Compeán:

NOAA's National Marine Fisheries Service (NMFS) has prepared the attached report summarizing the available information regarding interactions with sea turtles by U.S. longline and drift gillnet fishing vessels in the Eastern Pacific Ocean in 2016 as well as updated information for 2015. This report is submitted under both Resolution C-07-03 (Resolution to Mitigate the Impact of Tuna Fishing on Sea Turtles) and Paragraph 4 of Resolution C-04-05 (Consolidated Resolution on Bycatch).

The attached report addresses (1) observed and estimated capture and mortality rates for the U.S. Pacific longline fisheries; (2) observed bycatch and management in the drift gillnet fishery off the U.S. West Coast; (3) information on efforts to reduce sea turtle bycatch and mortality in the longline and drift gillnet fisheries, including outreach activities, technical workshops, and gear research; and (4) an update on U.S. efforts to promote sea turtle conservation around the world.

Please contact Taylor Debevec at 562-980-4066 or Taylor.Debevec@noaa.gov if there are any questions regarding the United States data reporting in accordance with Resolutions C-07-03 and C-04-05.

Sincerely,

Heidi Taylor
Highly Migratory Species Branch Chief

cc w/ enclosure:

Barry Thom, U.S. Commissioner to the IATTC
David Hogan, U.S. Department of State
William Fox, U.S. Commissioner to the IATTC
Donald Hansen, U.S. Commissioner to the IATTC
Edward Weissman, U.S. Commissioner to the IATTC
Ryan J. Wulff, NMFS, West Coast Region
Penny Ruvelas, NMFS, West Coast Region
Christofer Boggs, NMFS, Pacific Islands Fisheries Science Center

Enclosure



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Preface

Under the June 2007 *Resolution to Mitigate the Impact of Tuna Fishing Vessels on Sea Turtles* (Resolution C-07-03), and voluntarily under Resolution C-04-05 (*Consolidated Resolution on Bycatch*), Parties agreed to submit available information on interactions of vessels flying their flag with sea turtles in fisheries under the competence of the Inter-American Tropical Tuna Commission (IATTC). Additionally, Parties agreed to report on both progress in the development of technology to reduce sea turtle bycatch and the actions taken to provide their vessels with the necessary equipment for appropriate release of incidentally caught sea turtles. Therefore, the United States has prepared this annual report on the interactions of U.S. fishing vessels with sea turtles in and adjacent to the eastern Pacific Ocean (EPO). The report also discusses the conservation measures taken by the United States to reduce sea turtle bycatch.

The United States has limited the scope of fishery interaction data discussed in this report to longline and drift gillnet fisheries in the Pacific Ocean. Some of these fisheries, such as Hawaii longline fisheries, range across the Pacific Ocean and include fishing effort that occurs outside the IATTC Convention Area. Where possible, this report makes an effort to distinguish and highlight activities that specifically occur within the IATTC Convention Area, or EPO, although it is not always possible to do so. The United States is also monitoring takes of sea turtles by large purse seine vessels in the EPO, including entanglement in fish aggregating devices. However, we obtain these data from the IATTC staff; therefore, we do not include this fishery in this report, as there is no benefit in providing these data back to the IATTC.

Lastly, this report is an update to the report submitted in 2016 pursuant to Resolutions C-04-05 and C-07-03. Unchanged background information from previous reports is not repeated here.

Swordfish/Tuna Longline Fisheries

U.S. West Coast-Based Deep-set Longline (DSLL) Fishery

There were no sea turtle interactions in the DSLL fishery operating out of California in 2016.

A new biological opinion for this fishery was completed in August of 2016. This report reviews the fishery's impact on species listed as endangered under the U.S. Endangered Species Act. The biological opinion concluded that the fishery will likely adversely affect Pacific leatherback, loggerhead, olive ridley, and green sea turtles but that it is not likely to jeopardize these species. The biological opinion also set incidental take levels for these species. If the fishery reaches any of these levels over ten years the fishery will close while its impacts are re-evaluated.

Table 1. Incidental take numbers for a ten-year time period, both entanglements and mortalities, for sea turtle species that interact with the west coast longline fishery.

Species	Entanglements -- Mortalities
green	Up to 1 -- 1
leatherback	4 -- 2
Olive ridley	6 -- 6
Loggerhead	1 -- 1

Hawaii-based Pelagic Longline Fishery

Tables 2 and 3 provide bycatch estimates for sea turtles for all longline trips landing in the specified years, 2015 or 2016. A fishing operation was considered within the IATTC Convention Area if at least one of the recorded locations (begin set, end set, begin haul, or end haul) was within the region.

A. Shallow-Set

Table 2. Number of observed incidental interactions of sea turtles for the Hawaii shallow-set longline fishery in 2015 and 2016, where the Hawaii shallow-set longline fishery had 100% observer coverage. Counts are provided for all species with an observed interaction in 2015 or 2016 and species of concern because of their endangered species status and history of past interactions. Counts are given for waters within the IATTC Convention Area.

Species of Sea Turtle	Year	Observed Takes
Loggerhead	2016	14
	2015	11
Leatherback	2016	2
	2015	2
Olive Ridley	2016	0
	2015	0
Green	2016	0
	2015	0

B. Deep-Set

Table 3. Estimates of the number of incidental interactions of sea turtles for the Hawaii deep-set longline fishery in 2015 and 2016. Estimates are provided for all species with an observed interaction in 2015 and 2016 and species of concern because of their endangered species status and history of past interactions. Estimates are given for waters within the IATTC Convention Area.

Species of Sea Turtle	Year	Observed Takes	Estimates	Standard Error
Loggerhead	2016	0	0	2.48
	2015	1	3	2.62
Leatherback	2016	0	0	2.82
	2015	0	0	3.69
Olive Ridley	2016	1	5	4.19
	2015	1	3	2.62
Green	2016	0	0	2.06
	2015	0	0	2.34
Unidentified Hard Shell	2016	0	0	2.06
	2015	0	0	1.67

Swordfish/Thresher Shark Drift Gillnet Fishery

New Regulations for Monitoring, Control, and Surveillance

NMFS published a final rule¹ to establish a vessel monitoring system by January 1, 2016, as required under IATTC Resolution C-14-02, to enforce time/area closures.

Table 4: Sea Turtle Interactions observed in the U.S. West Coast Drift Gillnet Fishery 2009-2016. Sources: the West Coast Region Observer Program and SAFE reports 2006-2016, available at: <http://www.pcouncil.org/highly-migratory-species/stock-assessment-and-fishery-evaluation-safe-documents/>

Year	Active Vessels	Swordfish (mt)	Thresher shark (mt)	Observed Sets	Estimated Total Sets	% Observer Coverage	Observed Turtle Takes	Take per 100 obs. sets
2009	35	252	38	101	761	13.3	1 [†]	0.93
2010	26	62	41	59	492	12.0	0	0
2011	22	119	55	85	435	19.5	0	0
2012	17	118	37	83	445	18.7	1 [†]	1.20
2013	18	95	48	176	470	37.4	0	0
2014	15	127	26	113	379	29.8	0	0
2015	17	95	31	74	361	20.5	0	0
2016	20	171	28	134	737	18.2	0	0

[†] Leatherback, released alive

-- Not available

All data are preliminary

Conservation Measures

Please refer to previous U.S. sea turtle reports for a thorough background on the history of sea turtle conservation and mitigation measures the United States has implemented in both the longline and drift gillnet fisheries. Those pages also include past trainings, outreach events, conferences, workshops, collaborations with other nations and organizations, as well as research publications. Recent developments include:

Species in the Spotlight – Pacific Leatherback

Of all the species NMFS protects under the Endangered Species Act (ESA), eight are considered to be among the most at-risk of extinction in the near future. As a result, the “Species in the Spotlight: Survive to Thrive” initiative was created - a concerted agency-wide effort to spotlight and save these highly at-risk species. One of these “Species in the Spotlight” is the Pacific leatherback sea turtle (*Dermochelys coriacea*) which are globally listed under the ESA as endangered.

¹ 80 FR 60533, October 7, 2015 - <https://www.gpo.gov/fdsys/pkg/FR-2015-10-07/pdf/2015-25474.pdf>

Throughout the Species in the Spotlight campaign, NMFS will engage public and private sector partners in collaborative actions to spur recovery for these species. On February 10, 2016, NMFS released 5-Year Action Plans for the eight "Species in the Spotlight." These plans outline efforts vital for stabilizing their populations and preventing their extinction, and serve as road maps for their recovery. In October, 2016, NMFS hosted California Leatherback Day in La Jolla, California, with over 200 participants.

Under this special designation, leatherback sea turtles will be prioritized for directed funding and competitive grant award programs. One such program is the ESA Section 6 grant program which provides funds to the states and recognized tribes to support research and conservation programs that aide in the recovery of endangered species. The states of Washington, Oregon, and California have included leatherback sea turtles in their Section 6 Agreements and are eligible to submit proposals for this species.

Participation in Seminars, Meetings, Conferences, Symposiums, etc.

- 35th International Sea Turtle Symposium, Turkey (April, 2015).
-Fisheries observer workshop with emphasis on sea turtle handling and release
- International Commission for the Conservation of Atlantic Tunas (ICCAT) Subcommittee on Ecosystems and Bycatch, Madrid, Spain (June 2015).
- Inter-American Convention on Sea Turtles in Vina del Mar, Chile, (October 2015).
- North Pacific Loggerhead Plan Meeting, La Jolla, CA, (January, 2016).
- 36th International Sea Turtle Symposium, Lima, Peru, (February, 2016).
- Areas Beyond National Jurisdiction (ABNJ, or Common Oceans) Tuna Project held a Joint RFMO Technical Working Group-Bycatch on sea turtle bycatch mitigation, Honolulu, Hawaii USA (February 2016 and November 2016).
- Yonat Swimmer served on the ICCAT Ecosystems and Bycatch Working Group to discuss sea turtle bycatch in ICCAT fisheries and attempts for mitigation. (September 2016).
- NMFS has included training on sea turtle safe handling, release, and identification as part of each AIDCP Seminar for Fishing Captains. Attendance at this seminar is one of the requirements to receive an ETP operator's permit and be placed upon the AIDCP list of qualified captains. Several workshops are offered each year, both in-person or via webinar.
- NMFS has included training on sea turtle safe handling, release and resuscitation to participants in the California drift gillnet fishery, an experimental deep-set buoy gear fishery, and the Hawaii-based longline fishery.

Gear Experiments

- Technical advice has been provided for ongoing and new studies (2016-2017) on sea turtle bycatch mitigation experiments, underway in Indonesia, Brazil, Spain, Peru, Chile, and Mexico. The following gear trials are ongoing:
 - Gillnet modification studies aimed to reduce turtle bycatch in Indonesia, Mexico, and Peru and Chile. (2015-2016)
 - Continuation of studies with the University of Central Florida regarding loggerhead and hawksbill turtle movements in relation to oceanic currents in the Atlantic.
- Research conducted in Peru, Chile, Indonesia and Mexico during 2015-2016 to test the influence of gillnet illumination on incidental capture rates of loggerhead sea turtles.
- Study in Baja California Sur, Mexico in 2015-2016 to test an acoustic deterrent device in a gillnet fishery to reduce sea turtle bycatch.

Sea Turtle Tracking Studies

- Sea turtle tracking studies have also provided information on turtles' high use areas in the Atlantic and Pacific Oceans, and have elucidated turtles' use of oceanic fronts and other environmental features such as chlorophyll *a* and sea surface temperatures.

Published Research from U.S. Government Scientists and Managers

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Benaka LR, Sharpe L, Abrams K, Campbell M, Cope J, Darby F, Dick EJ, Hyde J, Linton B, Lunsford C, Rioux D and Y. Swimmer. (2016) Action Plan for Fish Release Mortality Science. US Department of Commerce, NOAA, 34 p. NMFS-F/SPO-161.

Gilman E, Chaloupka M, Swimmer Y, Piovano S (2016) A cross-taxa assessment of pelagic longline bycatch mitigation measures: conflicts and mutual benefits to elasmobranchs. *Fish and Fisheries*. 10.1111/faf.12143.

Ortiz N, Mangel JC, Wang J, Alfaro-Shigueto J, Pingo S, Jimenez A, Suarez T, Swimmer Y, Carvalho F & BJ Godley (2016) Reducing green sea turtle bycatch in small-scale fisheries

using illuminated gillnets: The Cost of Saving a Sea Turtle. *Marine Ecology Progress Series* 545: 251-259.

Huang H, Swimmer Y, Bigelow K, Gutierrez A, Foster D (2016) Influence of hook type on catch of commercial and bycatch species in an Atlantic tuna fishery. *Marine Policy* 65: 68–75.

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Monteiro D, Estima SE, Gandra T, Silva AP, Bugoni L, Swimmer Y, Seminoff J, Secchi, E. (In press) Long-term spatial and temporal patterns of sea turtle strandings in southern Brazil. *Marine Biology*.

Piovano S, Swimmer Y (2016) Effects of a hook ring on catch and bycatch in a Mediterranean swordfish longline fishery: small addition with potentially large consequences. *J. Aquatic Conservation: Mar and Freshw Ecosystems*. DOI: 10.1002/aqc2689.

Michael P. Jensen, Nicolas Pilcher, Nancy N. FitzSimmons. Genetic markers provide insight on origins of immature green turtles *Chelonia mydas* with biased sex ratios at foraging grounds in Sabah, Malaysia. *Endangered Species Research*. 31:191-201.

Okuyama J, Seminoff JA, Dutton PH and Benson SR. 2016. Fine-scale monitoring of routine deep dives by gravid leatherback turtles during the internesting interval indicate a capital breeding strategy. *Frontiers in Marine Science* 3:166. doi: 10.3389/fmars.2016.00166