Sea Turtles in U.S. Fisheries

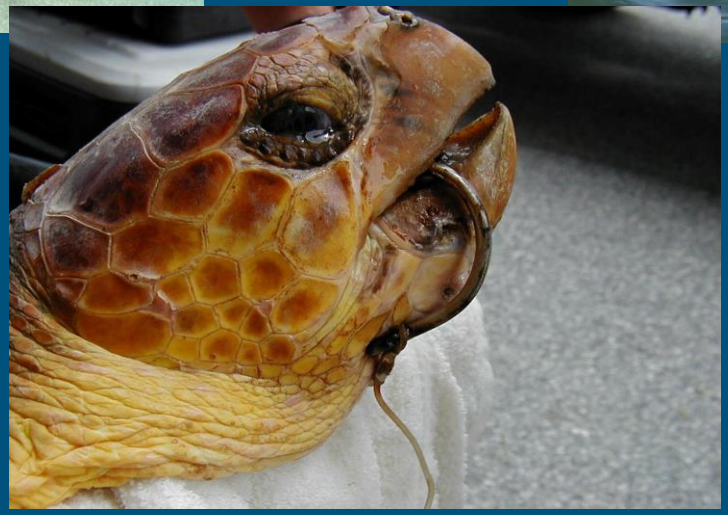


Photo Credit (L to R): Jeffrey Seminoff (NOAA), Damien Bailey (NOAA), Mark Dodd (Georgia DNR).

U.S. Sea Turtle Protections

Common Name	*Endangered Species Act*
Olive ridley turtle	Threatened/Endangered*
Loggerhead turtle	Endangered**
Green turtle	Threatened***
Hawksbill turtle	Endangered
Leatherback turtle	Endangered

*The Mexican breeding population of olive ridleys is Endangered, the rest are Threatened
**North Pacific and South Pacific Loggerhead Distinct Population Segments (DPS)
*** East Pacific Green DPS

Photo Credit: Michael Jensen, NOAA

Species in the Spotlight - Pacific Leatherbacks

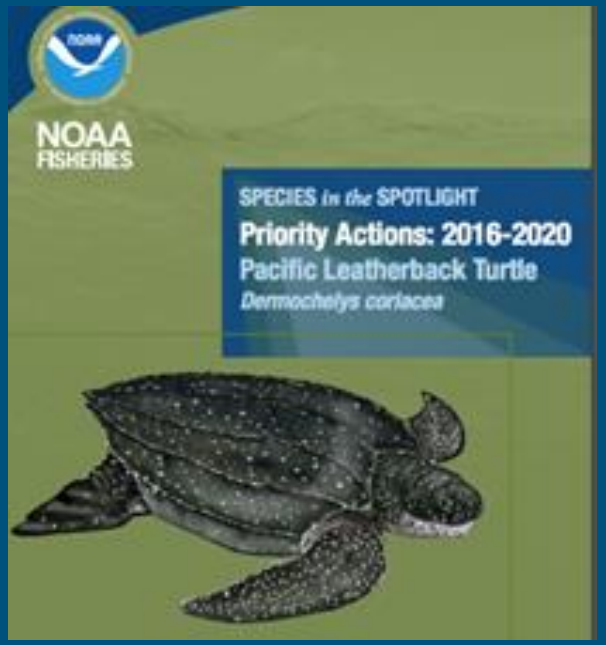
97% decline since 1980s (eastern)

NOAA Fisheries initiative to *increase actions to prevent extinction*

Top 5 Priority Actions include

- Reduce fisheries interactions
- Improve nesting beach protection and reproductive output
- International cooperation
- Monitoring and research
- Public engagement

Photo credit: Scott Benson, SWC



Domestic Laws and Measures for Sea Turtles

Shallow-Set Longline Fishery

Target: swordfish

Large circle hooks required (size 18/0 or larger)
- maximum of 10 degrees offset
- mackerel-type fish bait

A ‘hard cap’ on sea turtle interactions

100% observer coverage

Annual protected species workshops

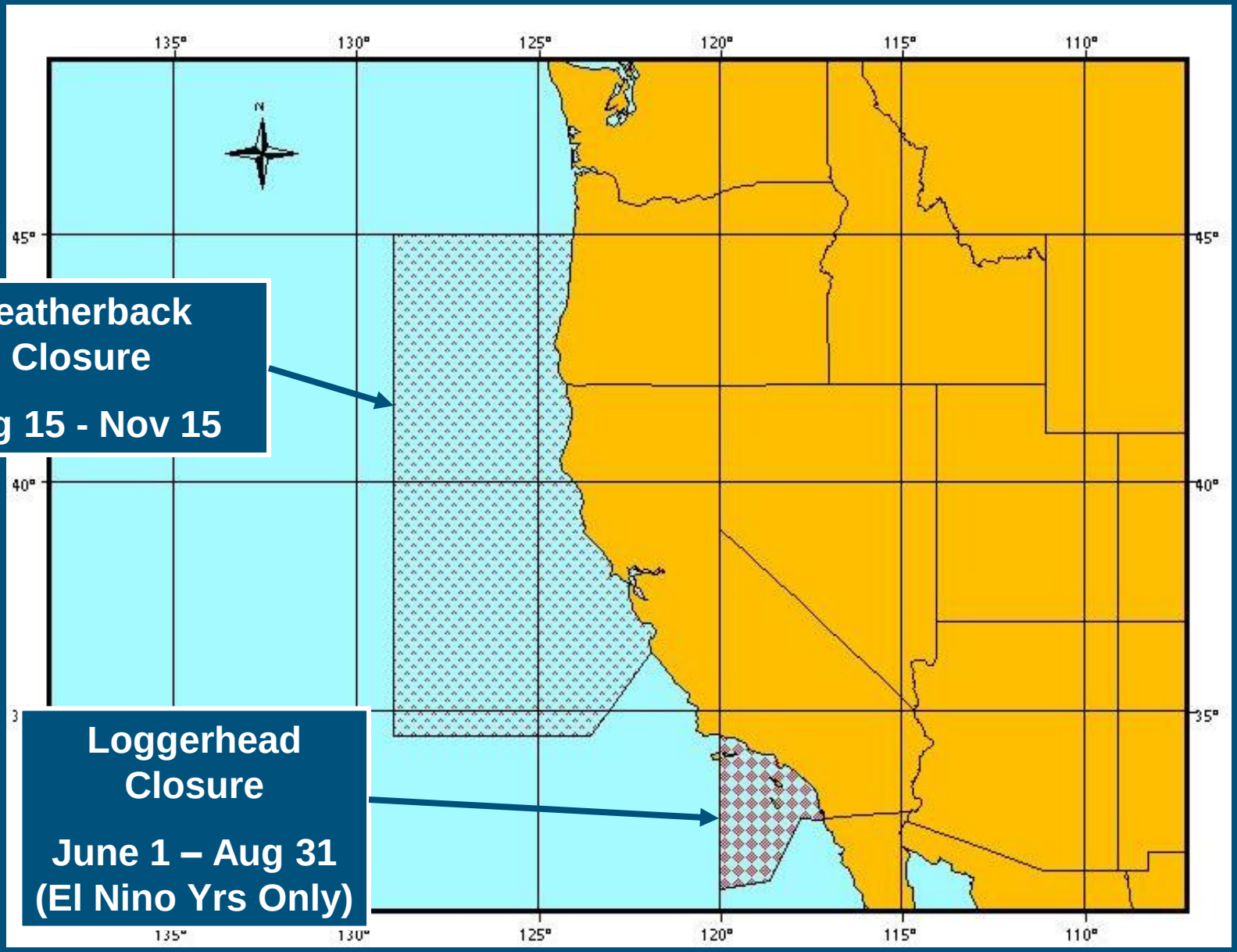
Domestic Laws and Measures for Sea Turtles

California Drift Gillnet Fishery

Target: swordfish and thresher shark

- Time/area closure during forecast or occurring El Niño years to protect North Pacific loggerheads
- Time/area closure (permanent) in central California/southern Oregon to protect Pacific leatherbacks (August 15-November 15)
- Fishery observed since 1990, with ~20% observer coverage
- Annual protected species workshop

Sea Turtle Conservation Areas for CA drift gillnet fishery



Sea Turtle Interactions (2015-2016)

Deep-set Longline (~20%)

Species	Year	Observed	Estimate
Loggerhead	2016	0	0
	2015	1	3
Leatherback	2016	0	0
	2015	0	0
Olive Ridley	2016	1	5
	2015	1	3
Green	2016	0	0
	2015	0	0

Shallow-set Longline (100%)

Species	Year	Observed
Loggerhead	2016	14
	2015	11
Leatherback	2016	2
	2015	2
Olive Ridley	2016	0
	2015	0
Green	2016	0
	2015	0

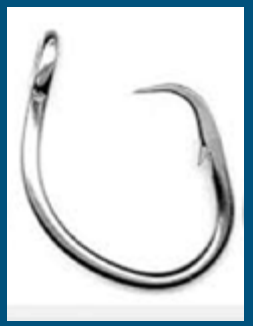
Sea Turtle Interactions

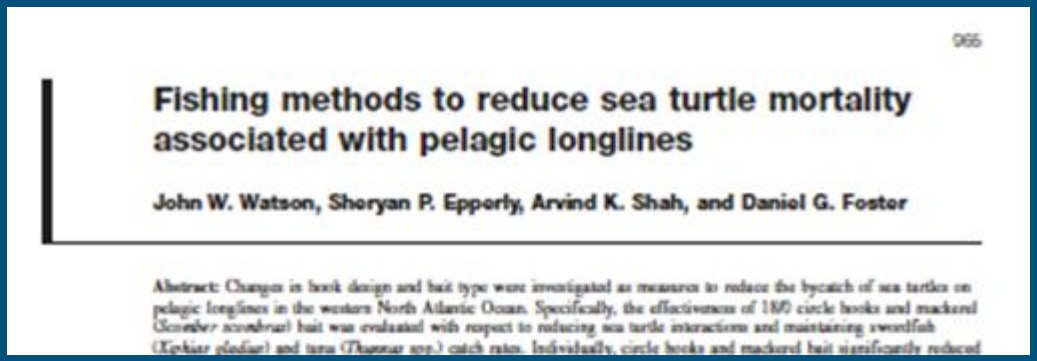
Purse Seine (2014-2015)

Species	Year	Mortality	Released Unharmed	Entangled Alive in Flotsam
Loggerhead	2015	0	1	0
	2014	0	0	0
Leatherback	2015	0	0	0
	2014	0	0	0
Olive Ridley	2015	0	1	0
	2014	0	0	0
Green	2015	0	1	0
	2014	0	0	0
Unidentified	2015	1	0	1
	2014	0	0	0

U.S. Sea Turtle Bycatch Mitigation Research

- Longline fisheries (shallow and deep-set)
  - Location/Sea surface temperature important predictor of risk
  - large circle hooks, minimal offset
  - whole finfish for bait
  - Set deeper hooks





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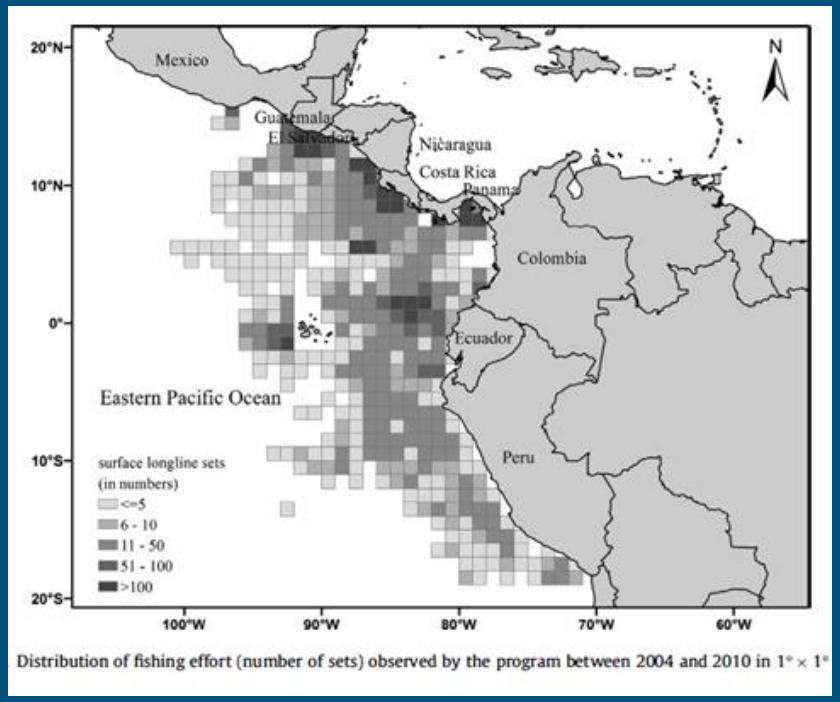
Fishing methods to reduce sea turtle mortality associated with pelagic longlines

John W. Watson, Sheryan P. Epperly, Arvind K. Shah, and Daniel G. Foster

Abstract: Changes in hook design and bait type were investigated as measures to reduce the bycatch of sea turtles on pelagic longlines in the western North Atlantic Ocean. Specifically, the effectiveness of 18/0 circle hooks and mackerel (*Scomber scombrus*) bait was evaluated with respect to reducing sea turtle interactions and maintaining swordfish (*Xiphias gladius*) and tuna (*Thunnus* spp.) catch rates. Individually, circle hooks and mackerel bait significantly reduced

U.S. Collaborative Bycatch Reduction Research with IATTC CPCs

Taiwan, Costa Rica, Ecuador, Mexico, Peru, Cook Islands, Guatemala, and Panama



Distribution of fishing effort (number of sets) observed by the program between 2004 and 2010 in 1° × 1°


Biological Conservation 160 (2013) 214–224

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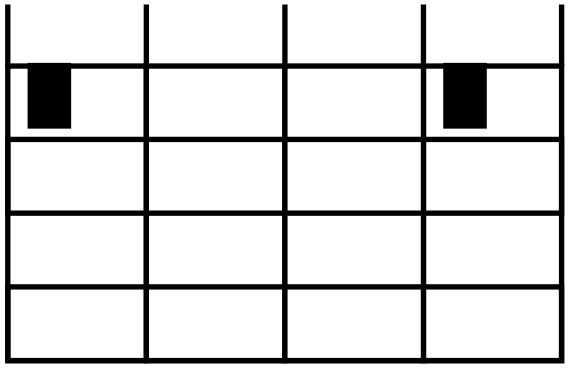
Circle hooks: Developing better fishing practices in the artisanal longline fisheries of the Eastern Pacific Ocean

Sandra Andraka[a,*], Moisés Mug[a], Martin Hall[b], Maite Pons[c], Lucas Pacheco[d], Manuel Parrales[e], Liliana Rendón[e], María L. Parga[f], Takahisa Mituhasi[g], Álvaro Segura[h], David Ortega[i], Erick Villagrán[j], Sara Pérez[j], Celina de Paz[k], Salvador Siu[k], Velkiss Gadea[l], Julián Caicedo[m], Luis A. Zapata[m], Jimmy Martínez[e], Pablo Guerrero[n], Michael Valqui[o], Nick Vogel[b]

Net illumination to reduce Sea Turtle Bycatch

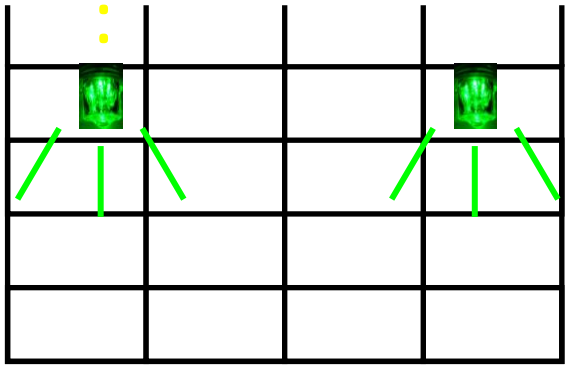
(Wang, Swimmer, Fisler, ProDelphinus, etc)

Experiment: Illuminate nets with lightsticks



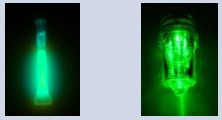
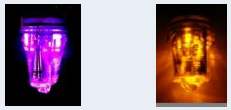
Control Net Inactive LEDs

VS



Activated LEDs

Net Illumination to Reduce Sea Turtle Bycatch

Location Species	Visual Cue/Illumination	Turtle Catch Rates	Target Catch Rate	Citation
Mexico C.m*ydas*	Chemi-lights/LEDs 	40% - 59% decrease	NO change	Wang et al, 2010
Mexico C.m*ydas*	UV/Orange LEDs 	40% - 50% decrease	NO change	Wang et al, 2013
Peru C.m*ydas,* *C. Caretta*	Green LEDs 	65% decrease	NO change	Ortiz et al, 2016

Net illumination to Reduce Multi-Taxa

Bycatch	Visual Cue/Illumination	Change in bycatch	Target Catch Rate
Sea birds 	Green LED	85% reduction	NO EFFECT
Sea lions *(O. flavescens)* 	UV LED	90% reduction	NO EFFECT
Porpoises & Dolphins 	Green LED	60% reduction	NO EFFECT

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MARINE ECOLOGY PROGRESS SERIES
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Published June 3

OPEN ACCESS

Developing visual deterrents to reduce sea turtle bycatch in gill net fisheries

John H. Wang[1,*], Shara Fisler[2], Yonat Swimmer[3]

Illuminating Innovations in Fisheries Technology Reduce Bycatch

By JOHN H. WANG, JOEL BARKAN, SHARA FISLER, and YONAT SWIMMER

Coastal gillnet fisheries are some of the most common fisheries throughout the world, and they play an important
gillnet fisheries are oft
ment; they incidentally
In particular, are often
along the Pacific coast
each year, and off the

Such bycatch can be a severe har
lations. Yet recent experiments
encouraging results in reducing s
target catch species. For the past
in collaboration with Mexican fi
organizations (NGOs), and the M
technological solutions that gill
turtle bycatch. Because we know
in sea turtle ecology and behavio
based bycatch reduction strategi
are commonly used in longline
and battery-powered LED lights
In our experiments with gil
green sea turtle interactions wi
65 percent. The most important
illumination *did not* significant
the total catch value of gillnet fish
tion technology. This finding
reduction technology to have a cha
it must have limited impact on the
Targeted fish species and by
(sharks and rays), sea turtles, and
tivities that can translate to diffe
types of light and, ultimately, to
many pelagic and coastal fish sp

biology letters

Developing ultraviolet illumination of gillnets as a method to reduce sea turtle bycatch

John Wang, Joel Barkan, Shara Fisler, Carlos Godinez-Reyes and Yonat Swimmer

Biol. Lett. 2013 **9**, 20130383, published 24 July 2013

Vol. 545: 251–259, 2016
doi: 10.3354/meps11610

MARINE ECOLOGY PROGRESS SERIES
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Published March 8

Reducing green turtle bycatch in small-scale fisheries using illuminated gillnets: the cost of saving a sea turtle

Natalia Ortiz[1], Jeffrey C. Mangel[1,2,*], John Wang[3], Joanna Alfaro-Shigueto[1,2,4], Sergio Pingo[1], Astrid Jimenez[1], Tania Suarez[1], Yonat Swimmer[3], Felipe Carvalho[3,5], Brendan J. Godley[2]