Bycatch reduction in US swordfish fisheries

Dr. Rebecca Lewison
San Diego State University
rlewison@mail.sdsu.edu

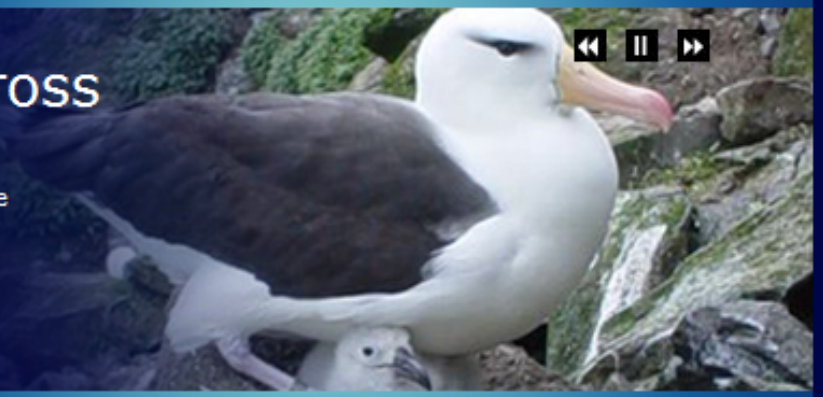
PROJECT GloBAL

GLOBAL BYCATCH ASSESSMENT OF LONG-LIVED SPECIES

ABOUT | SPECIES OF CONCERN | FISHING GEAR | NEWS | MAPS | REGIONS | COLLABORATOR RESOURCES | PUBLICATIONS

In Focus: Black-browed Albatross

Although numerous, the Black-browed Albatross population is currently declining at a rate of ~4% per year, with a projected decline of ~65% over three generations (65 years). This qualifies the species as endangered under IUCN Red List Category.



read the story >

SEARCH: GO

Project GloBAL

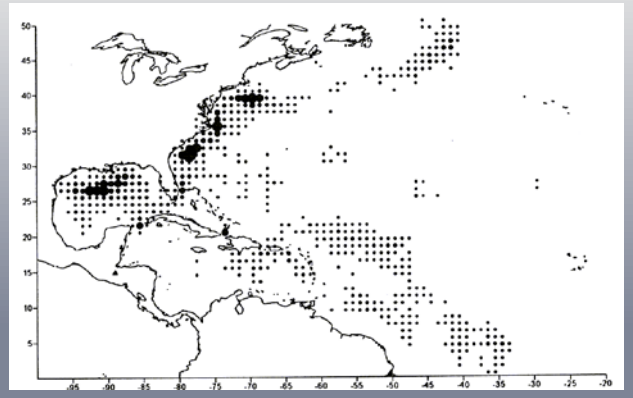
is a research initiative designed to assess the impact of fisheries bycatch on marine mammals, seabirds, and sea turtles worldwide, working toward the larger goal of reducing fisheries bycatch of these vulnerable species and promoting sustainable fisheries. Through synthesis of existing data, collaboration and coordination of ongoing research efforts, our objectives are to develop new approaches to bycatch assessment looking across gear types and taxa and to place bycatch into an oceanographic context.

Publications

The Project GloBAL team has submitted a total of 31 manuscripts for peer-reviewed publication, 25 of which have been accepted or published and six of which are now in review. We plan to submit eight additional manuscripts by Fall 2009. To view the publications list and access the published articles, click here.

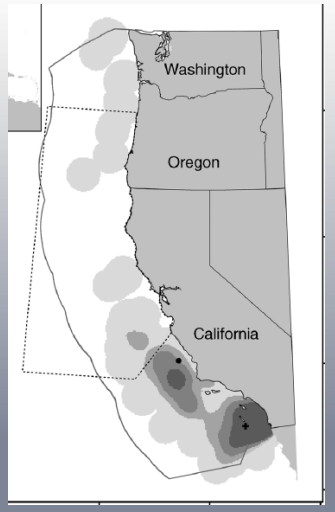
Bibliography

Atlantic



Pelagic Longlines

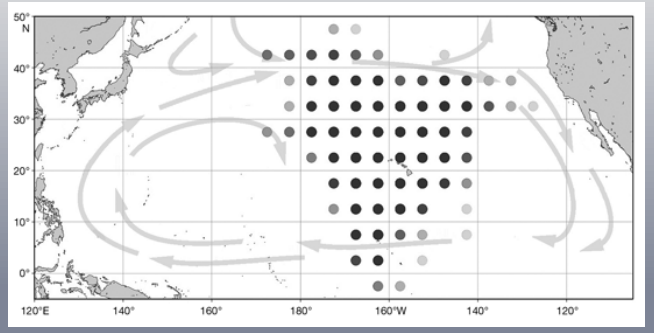
- **Loggerheads**
- **Leatherbacks**
- **Risso's dolphins**
- **Pilot whales**
- **Sharks**
- **Billfish**



Drift Gillnet

- **Leatherbacks**
- **Risso's dolphins**
- **Sperm whales**
- **Cetaceans**
- **Sharks**

Pacific



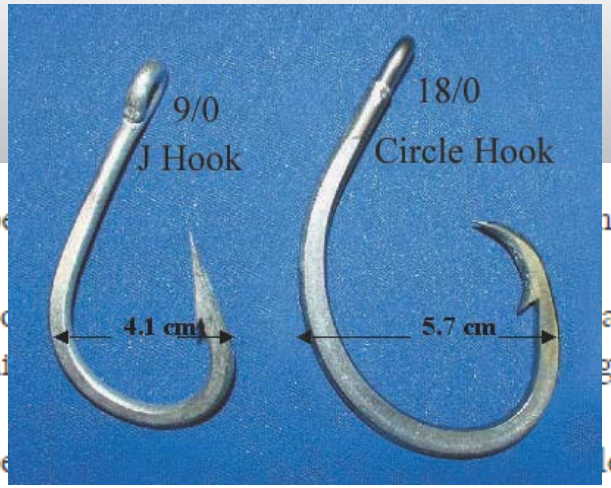
Pelagic Longlines*

- **Loggerheads**
- **Leatherbacks**
- **BF albatross**
- **Laysan's albatross**
- **Sharks**
- **False killer whales**

Common bycatch reduction measures:

Time-area closures (TACs), changes in gear deployment, gear changes, hard caps/quotas*

Atlantic



A number of strict regulations have be … nen

- Required to use large circle hoo … ar i … oks are specifically designed to minimi … g ar … a better chance at survival.
- Trained and certified to use spe … lease turtles if they are incidentally caught.
- Required to stop fishing and move one nautical mile if they encounter a protected species.
- Required to protect pilot whales and Risso's dolphins when fishing in the Mid-Atlantic Bight by limiting the length of their lines to 20 nautical miles and posting marine mammal handling/release guidelines on their vessel. In addition, if fishing in the Cape Hatteras Special Research Area, pelagic longliners must contact NOAA Fisheries at least 48 hours prior to a trip and carry observers if requested.
- Required to use weak hooks in the Gulf of Mexico to reduce incidental catch of bluefin tuna and are prohibited from using live bait to reduce bycatch of billfish.
- Restricted from areas of the Gulf of Mexico and the Atlantic to reduce bycatch of all species, especially undersized swordfish.
- Required to carry vessel monitoring systems (satellite technology) onboard their boats to enforce these closures.
- Required to carry at-sea fisheries observers upon request (about 8 percent of the longline fleet is randomly selected for observation during fishing trips). NOAA Fisheries reviews observer data to monitor protected species interactions.

http://www.fishwatch.gov/seafood_profiles/species/swordfish/species_pages/north_atlantic_swordfish.htm

Atlantic

A number of strict regulations have been implemented to prevent bycatch. Fishermen are:

- Required to use large circle hooks and certain types of bait that limit gear interactions with sea turtles. Circle hooks are specifically designed to minimize the damage caused by hooking, giving animals that are captured and released a better chance at survival.
- Trained and certified to use special techniques to safely de-hook and release turtles if they are incidentally caught.
- Required to stop fishing and move one nautical mile i
- Required to protect pilot whales and Risso's dolphins ength of their lines to 20 nautical miles and posting marine ma lition, if fishing in the Cape Hatteras Special Research Area, pe 8 hours prior to a trip and carry observers if requested.
- Required to use weak hooks in the Gulf of Mexico to r d from using live bait to reduce bycatch of billfish.
- Restricted from areas of the Gulf of Mexico and the A sized swordfish.
- Required to carry vessel monitoring systems (satellite es.
- Required to carry at-sea fisheries observers upon requ ected for observation during fishing trips). NOAA Fisheries rev ions.

http://www.fishwatch.gov/seafood_profiles/species/swordfish/species_pages/north_atlantic_swordfish.htm

Atlantic

A number of strict regulations have been implemented to prevent bycatch. Fishermen are:

- Required to use large circle hooks and certain types of bait that limit gear interactions with sea turtles. Circle hooks are specifically designed to minimize the damage caused by hooking, giving animals that are captured and released a better chance at survival.
- Trained and certified to use special techniques to safely de-hook and release turtles if they are incidentally caught.
- Required to stop fishing and move one nautical mile if they encounter a protected species.
- Required to protect pilot whales and Riss[illegible] the Mid-Atlantic Bight by limiting the length of their lines to 20 nautical miles and postin[illegible] release guidelines on their vessel. In addition, if fishing in the Cape Hatteras Special Research Area, pelagic longliners must contact NOAA Fisheries at least 48 hours prior to a trip and carry observers if requested.
- Required to use weak hooks in the Gulf of Mexico to reduce incidental catch of bluefin tuna and are prohibited from using live bait to reduce bycatch of billfish.
- Restricted from areas of the Gulf of Mexico and the Atlantic to reduce bycatch of all species, especially undersized swordfish.
- Required to carry vessel monitoring systems (satellite technology) onboard their boats to enforce these closures.
- Required to carry at-sea fisheries observers upon request (about 8 percent of the longline fleet is randomly selected for observation during fishing trips). NOAA Fisheries reviews observer data to monitor protected species interactions.

Move on rule

http://www.fishwatch.gov/seafood_profiles/species/swordfish/species_pages/north_atlantic_swordfish.htm

Atlantic

A number of strict regulations have been implemented to prevent bycatch. Fishermen are:

- Required to use large circle hooks and certain types of bait that limit gear interactions with sea turtles. Circle hooks are specifically designed to minimize the damage caused by hooking, giving animals that are captured and released a better chance at survival.
- Trained and certified to use special techniques to safely de-hook and release turtles if they are incidentally caught.
- Required to stop fishing and move one nautical mile if they encounter a protected species.
- Required to protect pilot whales and Risso's dolphins when fishing in the Mid-Atlantic Bight by limiting the length of their lines to 20 nautical miles and posting marine mammal handling/release guidelines on their vessel. In addition, if fishing in the Cape Hatteras Special Research Area, pelagic longliners must contact NOAA Fisheries at least 48 hours prior to a trip and carry observers if requested.
- Required to use weak hooks in the Gulf of Mexico to reduce incidental catch of bluefin tuna and are prohibited from using live bait to reduce bycatch of billfish.
- Restricted from areas of the Gulf of Mexico and the Atlantic to reduce bycatch of all species, especially undersized swordfish.
- Required to carry vessel monitoring systems (satellite technology) onboard their boats to enforce these closures.
- Required to carry at-sea fisheries observers upon request (about 8 percent of the longline fleet is randomly selected for observation during fishing trips). NOAA Fisheries reviews observer data to monitor protected species interactions.

http://www.fishwatch.gov/seafood_profiles/species/swordfish/species_pages/north_atlantic_swordfish.htm

Atlantic

A number of strict regulations have been implemented to prevent bycatch. Fishermen are:

- Required to use large circle hooks and certain types of bait that limit gear interactions with sea turtles. Circle hooks are specifically designed to minimize the damage caused by hooking, giving animals that are captured and released a better chance at survival.
- Trained and certified to use special techniques to safely de-hook and release turtles if they are incidentally caught.
- Required to stop fishing and move one nautical mile if they encounter a protected species.
- Required to protect pilot whales and Riss c Bight by limiting the length of their lines to 20 nautical miles and postin es on their vessel. In addition, if fishing in the Cape Hatteras Special Resea OAA Fisheries at least 48 hours prior to a trip and carry observers if requ
- Required to use weak hooks in the Gulf o n tuna and are prohibited from using live bait to reduce bycatch of billfish.
- Restricted from areas of the Gulf of Mexico and the Atlantic to reduce bycatch of all species, especially undersized swordfish.
- Required to carry vessel monitoring systems (satellite technology) onboard their boats to enforce these closures.
- Required to carry at-sea fisheries observers upon request (about 8 percent of the longline fleet is randomly selected for observation during fishing trips). NOAA Fisheries reviews observer data to monitor protected species interactions.

- **Electronic monitoring**
- **Observers**

(~8% coverage)

http://www.fishwatch.gov/seafood_profiles/species/swordfish/species_pages/north_atlantic_swordfish.htm

Pacific

Longlines

. Since 2004, longliners in Hawaii have operated under several strict regulations to minimize impacts on other species:

- **fishery closure (2001-2004)**
- Every vessel carries a fishery observer and a satellite tracking system to monitor fishing.
- Use of circle hooks and finfish bait, instead of [illegible] a turtles caught and cause less injury to sea turtles that are hooke[illegible]
- Following sea turtle handling and release pro[illegible] chance of survival.
- Annual limits on the number of leatherback a[illegible]er limit is reached, the fishery is closed for the rest of the year.
- Gear restrictions to minimize seabird interactions and injury to seabirds.

- **Electronic monitoring**
- **Observers**

(100% shallow set, 8-20% deep set)

Gillnets

Regulations prohibit fishing with drift gillnets north of Point Conception, California, from August 15 through October 31 to protect leatherback sea turtles. (In the past, most accidental catch of leatherbacks has occurred north of this area in October, so by closing this area seasonally, fishermen avoid interacting with sea turtles.) Regulations also include specific gear requirements for drift gillnets (e.g., pingers that emit sound to deter marine mammals, and net extenders that drop the net below the surface to allow marine mammals to pass without being entangled).

Pacific

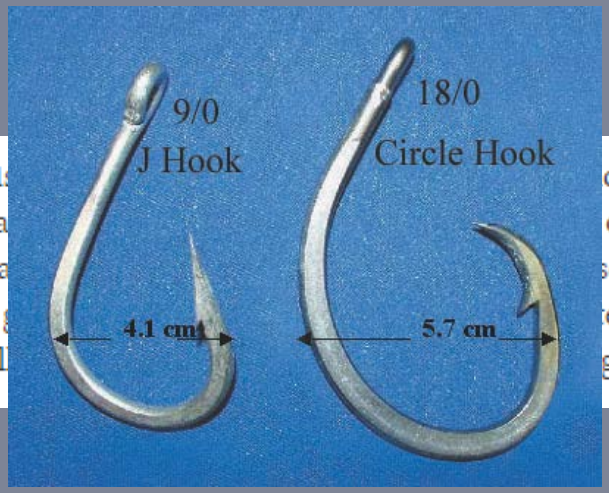
Longlines

. Since 2004, longliners in Hawaii have operated under several strict regulations to minimize impacts on other species:

- Every vessel carries a fishery observer and a satellite tracking system to monitor fishing.
- Use of circle hooks and finfish bait, instead of J-hooks and squid bait, to reduce the number of sea turtles caught and cause less injury to sea turtles that are hooked.
- Following sea turtle handling and release protocols that minimize further injury and increase the chance of survival.
- Annual limits on the number of leatherback and loggerhead sea turtles that can be caught; if either limit is reached, the fishery is closed for the rest of the year.
- Gear restrictions to minimize seabird interactions and injury to seabirds.

Gillnets

Regulations prohibit fi cep h October 31 to
protect leatherback sea of area in October, so
by closing this area sea sea ic gear
requirements for drift er at drop the net
below the surface to al g e



Pacific

Longlines

. Since 2004, longliners in Hawaii have operated under several strict regulations to minimize impacts on other species:

- Every vessel carries a fishery observer and a satellite tracking system to monitor fishing.
- Use of circle hooks and finfish bait, instead of J-hooks and squid bait, to reduce the number of sea turtles caught and cause less injury to sea turtles that are hooked.
- Following sea turtle handling and release protocols that minimize further injury and increase the chance of survival.
- Annual limits on the number of leatherback and loggerhead sea turtles that can be caught; if either limit is reached, the fishery is closed for the rest of the year.
- Gear restrictions to minimize seabird interactions and i

Gillnets

Regulations prohibit fishing with drift gillnets north of Point 31 to protect leatherback sea turtles. (In the past, most accidental c ober, so by closing this area seasonally, fishermen avoid interacting w requirements for drift gillnets (e.g., pingers that emit sound t net below the surface to allow marine mammals to pass without

Pacific

Longlines

. Since 2004, longliners in Hawaii have operated under several strict regulations to minimize impacts on other species:

- Every vessel carries a fishery observer and a satellite tracking system to monitor fishing.
- Use of circle hooks and finfish bait, instead of J-hooks and squid bait, to reduce the number of sea turtles caught and cause less injury to sea turtles that are hooked.
- Following sea turtle handling and release protocols that minimize further injury and increase the chance of survival.
- Annual limits on the number of leatherback and loggerhead sea turtles that can be caught; if either limit is reached, the fishery is closed for the rest of the year.
- Gear restrictions to minimize seabird inte

Hard cap/Take limit

- **Leatherbacks – 26**
- **Loggerheads – 34**

(Limits increased in 2012)

Gillnets

Regulations prohibit fishing with drift gillnets north of Point Conception, California, from August 15 through October 31 to protect leatherback sea turtles. (In the past, most accidental catch of leatherbacks has occurred north of this area in October, so by closing this area seasonally, fishermen avoid interacting with sea turtles.) Regulations also include specific gear requirements for drift gillnets (e.g., pingers that emit sound to deter marine mammals, and net extenders that drop the net below the surface to allow marine mammals to pass without being entangled).

Pacific

Longlines

. Since 2004, longliners in Hawaii have operated under several strict regulations to minimize impacts on other species:

- Every vessel carries a fishery observer and a satellite tracking system to monitor fishing.
- Use of circle hooks and finfish bait, instead of J-hooks and squid bait, to reduce the number of sea turtles caught and cause less injury to sea turtles that are hooked.
- Following sea turtle handling and release protocols that minimize further injury and increase the chance of survival.
- Annual limits on the number of leatherback and loggerhead sea turtles that can be caught; if either limit is reached, the fishery is closed for the rest of the year.
- Gear restrictions to minimize seabird interactions and injury to seabirds.

Gillnets

Regulations prohibit fishing with drift gillnets north of Point Conception, California, from August 15 through October 31 to protect leatherback sea turtles. (In the past, most accidental catch of leatherbacks has occurred north of this area in October, so by closing this area seasonally, fishermen avoid interacting with sea turtles.) Regulations also include specific gear requirements for drift gillnets (e.g., pingers that emit sound to deter marine mammals, and net extenders that drop the net below the surface to allow marine mammals to pass without being entangled).

Longline fishermen may side-set or set from the stern. They must also employ a suite of mitigation measures including:

- Weighted branchlines
- Blue-dyed baits
- Strategic offal discards
- Mandatory night-setting
- Specific baits for swordfish-targeted operation

Hawaii Longline Seabird Regulations

(Code of Federal Regulations Title 50, Part 665, Section 665.815)

1. How do you set your gear →	STERN-SETTING		SIDE-SETTING	
2. Do you shallow-set or deep-set, and where are you →	Shallow-Set Anywhere	Deep-Set North of 23° N	Shallow-Set Anywhere	Deep-Set North of 23° N
3. What you need to do ↓				
Deploy mainline from port or starboard side at least 1 m forward of stern corner			Yes	Yes
If line shooter is used, mount it at least 1 m forward from stern corner			Yes	Yes
Use a specified bird curtain aft of the setting station during the set			Yes	Yes
Deploy gear so that hooks do not resurface			Yes	Yes
Attach 45 g or heavier weights within 1 m of hook of each hook		Yes	Yes	Yes
Use a line shooter to set the mainline		Yes		
Keep two 1-pound containers of blue-dye on boat	Yes	Yes		
Use completely thawed and blue-dyed bait	Yes	Yes		
Keep fish parts and spent bait with all hooks removed for strategic offal discard	Yes	Yes		
Cut all swordfish heads in half, and use heads and livers for strategic offal discard	Yes	Yes		
Night Set - begin set 1 hour after local sunset and finish 1 hour before next sunrise and keep lighting to a minimum	Yes			

Important note: If a seabird is accidentally caught, you must follow safe seabird handling guidelines everywhere you fish.

NOAA FISHERIES SERVICE

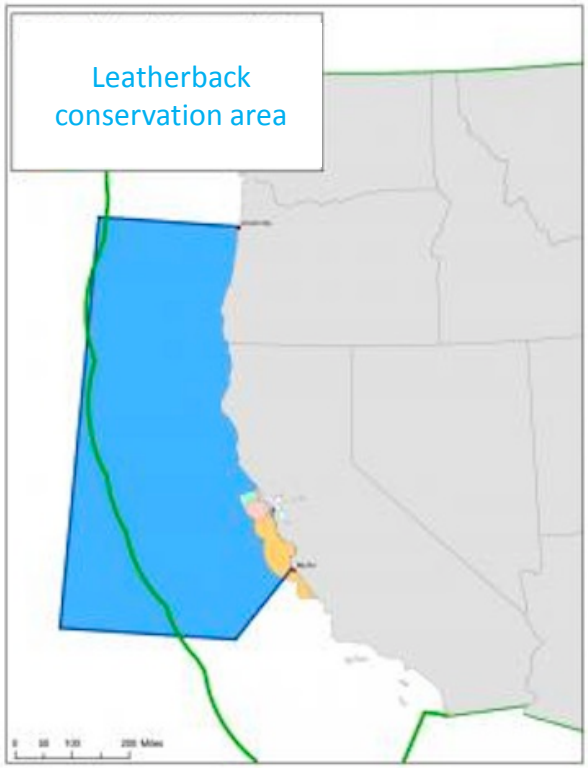
Pacific Islands Regional Office

Sustainable Fisheries

(808) 725-5000

APRIL 2014

Pacific

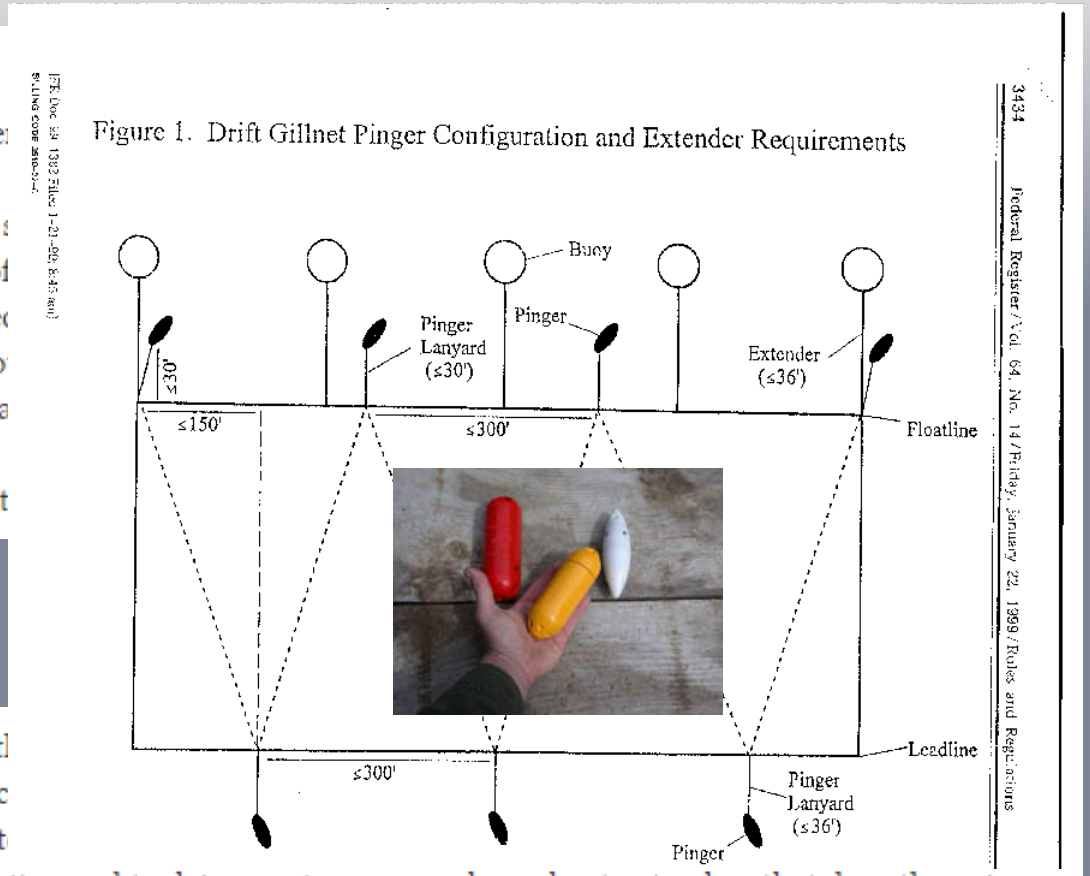


Lor

2004

Gi

Regulations prohibit fishing with drift gillnets nort
protect leatherback sea turtles. (In the past, most ac
by closing this area seasonally, fishermen avoid int



requirements for drift gillnets (e.g., pingers that emit sound to deter marine mammals, and net extenders that drop the net below the surface to allow marine mammals to pass without being entangled).

- **Observers**

(~ 20-30% coverage, 100% in >2000m)

BIOLOGICAL CONSERVATION 139 (2007) 19–28

available at www.sciencedirect.com

ScienceDirect

Mitigating Seabird Bycatch during Hauling by Pelagic Longline Vessels

Eric Gilman[1]*, Milani Chaloupka[2], Brett Wiedoff[3], Jeremy Willson[3]

OPEN ACCESS

Reducing seabird bycatch in the Hawaii longline tuna fishery

Eric Gilman[1,2,*], Donald Kobayashi[3,4], Milani Chaloupka[5]

Fishing methods to reduce sea turtle mortality associated with pelagic longlines

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

Has bycatch reduction in US swordfish f ?

- ✔ Circle hooks
- ✔ Move on rules
- ✔ Bait changes
- ✔ Side setting, scari

Table 1. Results of experiments to determine

Study	Oc
Kraus et al. 1997	Gu
Trippel et al. 1999	Ba
Larsen 1999	
Gearin et al. 2000	Was
Bordino et al. 2002	
Barlow & Cameron 2003	

*Change in bycatch between nets with and u

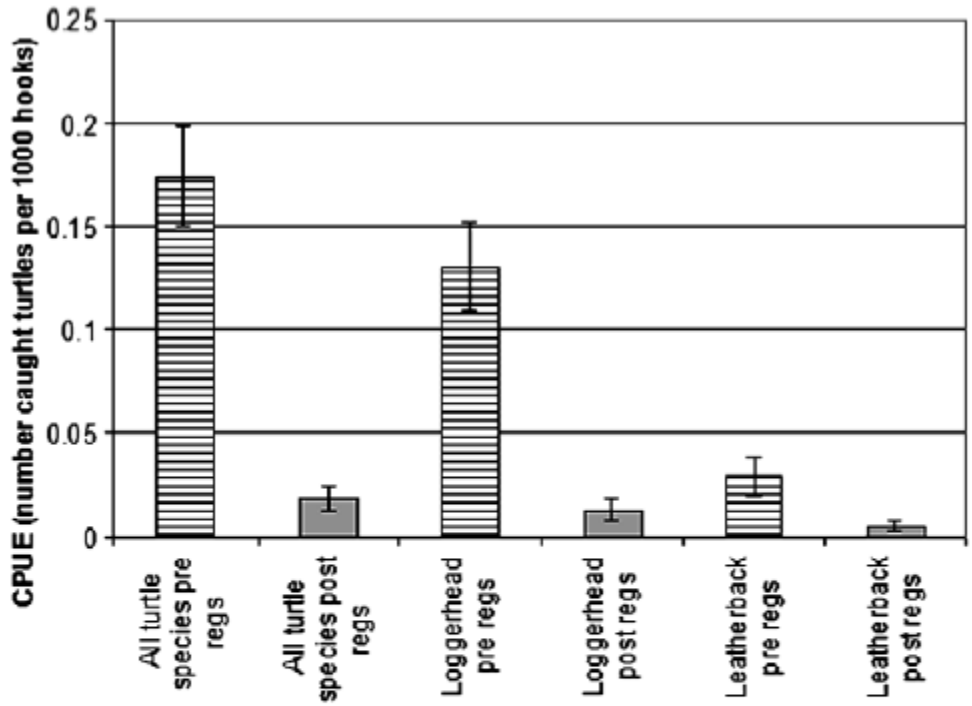


Fig. 2 – Sea turtle capture rates (captures per 1000 hooks) in the Hawaii-based pelagic longline swordfish fishery for combined turtle species, loggerhead turtles, and leatherback turtles, for the periods before and after regulations designed to reduce sea turtle captures came into effect. Error bars are bootstrapped (N = 1000) 95% non-parametric confidence intervals.

(Cox et al. 2007)

What drives efficacy?

Gear/fishing practice technical performance

Compliance : Enforcement

Economic consequences

Stakeholder engagement

Sustainable implementation/continued use

What does this tell us?

- Need for bycatch reduction is ubiquitous, across all large-scale gear types
- EM and observer data is critical to monitoring bycatch and tracking performance
- Bycatch reduction gear and practices for SWO fisheries have been effective across gear types
- Efficacy goes beyond successful experimental trials; Whether or not a bycatch reduction measure “works” is not simple to answer
- Stakeholder engagement and involvement is an important component of developing effective and sustainable bycatch reduction

Next steps in bycatch reduction for SWO (all) fisheries

- Continued compliance/enforcement for existing measures
- Support stakeholder engagement and involvement
- Develop new methods for bycatch reduction that continue to support managed target catches and economic viability

Next steps in bycatch reduction for SWO (all) fisheries

- Continued compliance/enforcement for existing measures
- Support stakeholder engagement and involvement
- Develop new methods for bycatch reduction that continue to support managed target catches and economic viability

Questions? Discussion?

C. Safina