Longline Fishing for Swordfish:

Lessons learned from Hawaii

Closure & Reopening

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Pelagic Longline Fishing

Hook depth is function of:
No. of hooks between floats
Distance between floats
Lead weights
Boat speed
Branchline interval
Sagging Ratio (SR = boat speed/line)
Water currents, etc

Typical Longline Gear

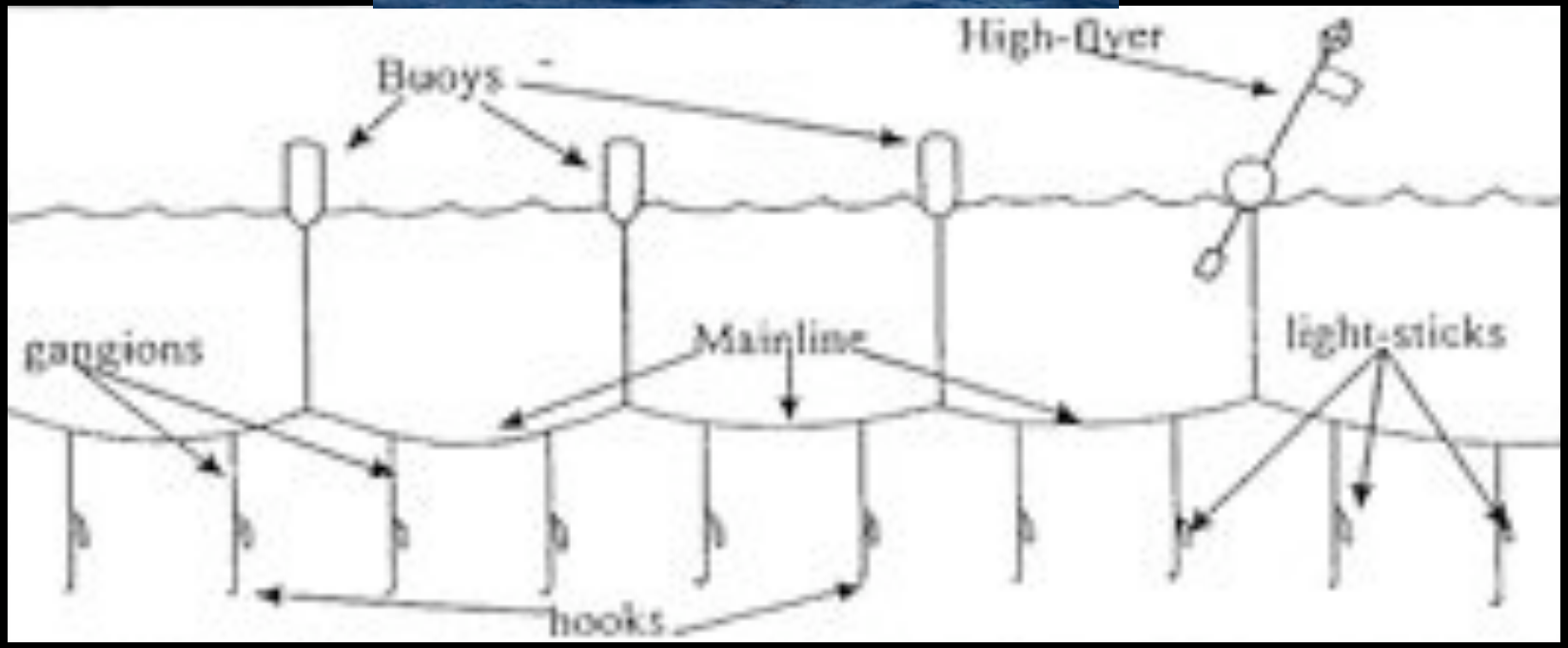


Figure 1. Values indicate the 95% depth and temperature preferences (combined day and night) for various pelagic species as indicated by electronic tagging studies funded by the Pelagic Fisheries Research Program of the University of Hawai'i, NOAA Fisheries, and Pacific Islands Fisheries Science Center.

Selectivity

Selective fishing refers to a fishing method's ability to target and capture organisms by size and species during the fishing operation allowing non-targets to be released Unharmed.

No gear is known to be 100% selective for a given species or size range of individuals.

Incidental Captures

Update on Bycatch Reduction Methods in Longline Fisheries

- **Sea Turtles**
  eg., Circle hooks, Fish bait, Line cutters

- **Seabirds**
  eg., Tori lines, Blue dyed bait, Thawed bait, Weighted lines, Side setting

- **Sharks**
  eg., Chemical deterrents

- **Marine Mammals**
  eg., Fleet communication, fishermen education

Sea Turtle Bycatch

--hard shell (loggerheads)
--leatherbacks

Sea Turtle Bycatch Research in the North Atlantic

By NOAA with the US Shallow-Set Fishery

BLUE WATER FISHERMEN'S ASSOCIATION

Treatments

Hook and Bait

Catch Species **Results**

Loggerhead Turtles 71% Reduction
Leatherback Turtles 66% Reduction
Swordfish 63% Increase
Bigeye Tuna 40% Reduction

versus

Control

Hook and Bait

Loggerhead Turtles 74% Reduction
Leatherback Turtles 75% Reduction
Swordfish 30% Reduction
Bigeye Tuna 24% Increase

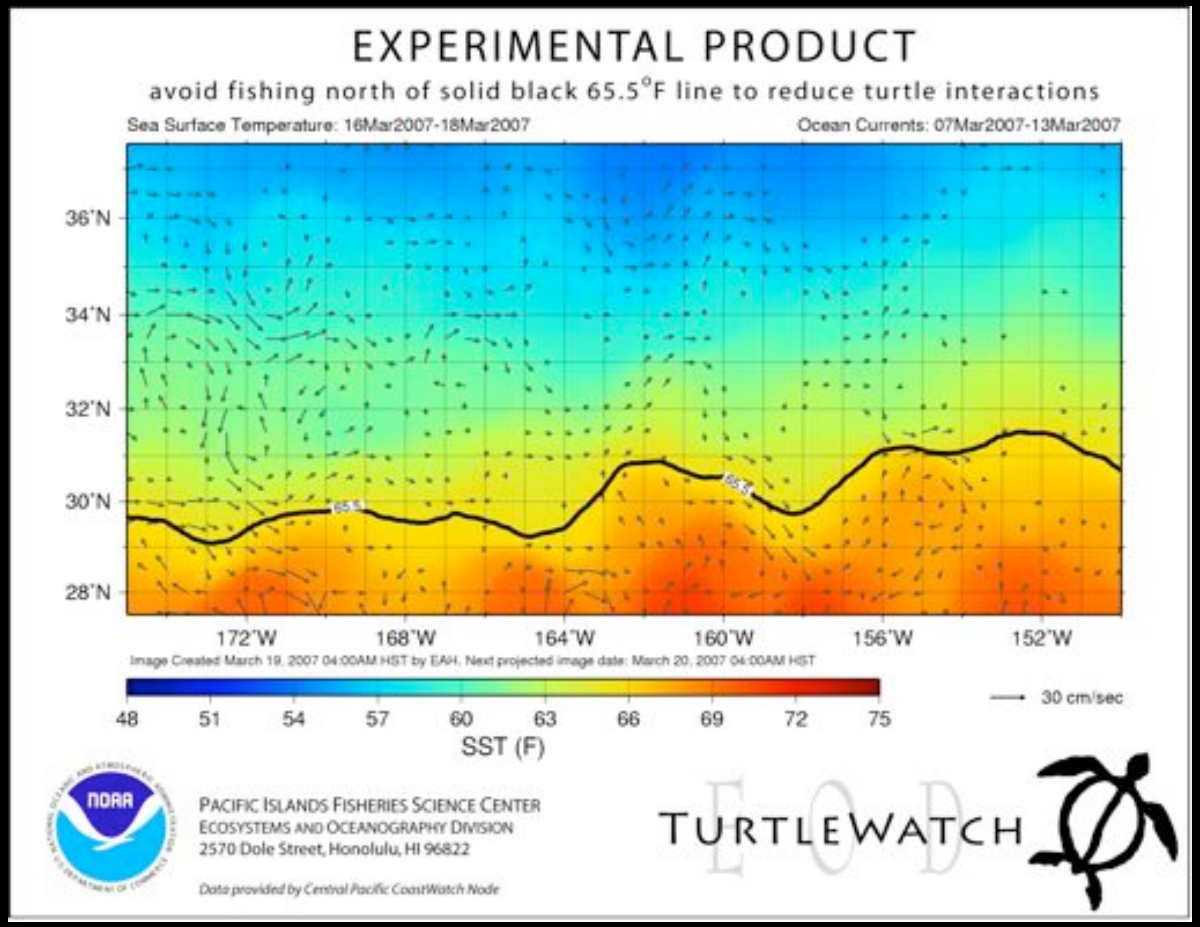
Loggerhead Turtles 88% Reduction
Leatherback Turtles 63% Reduction
Swordfish 20% Increase
Bigeye Tuna 80% Reduction

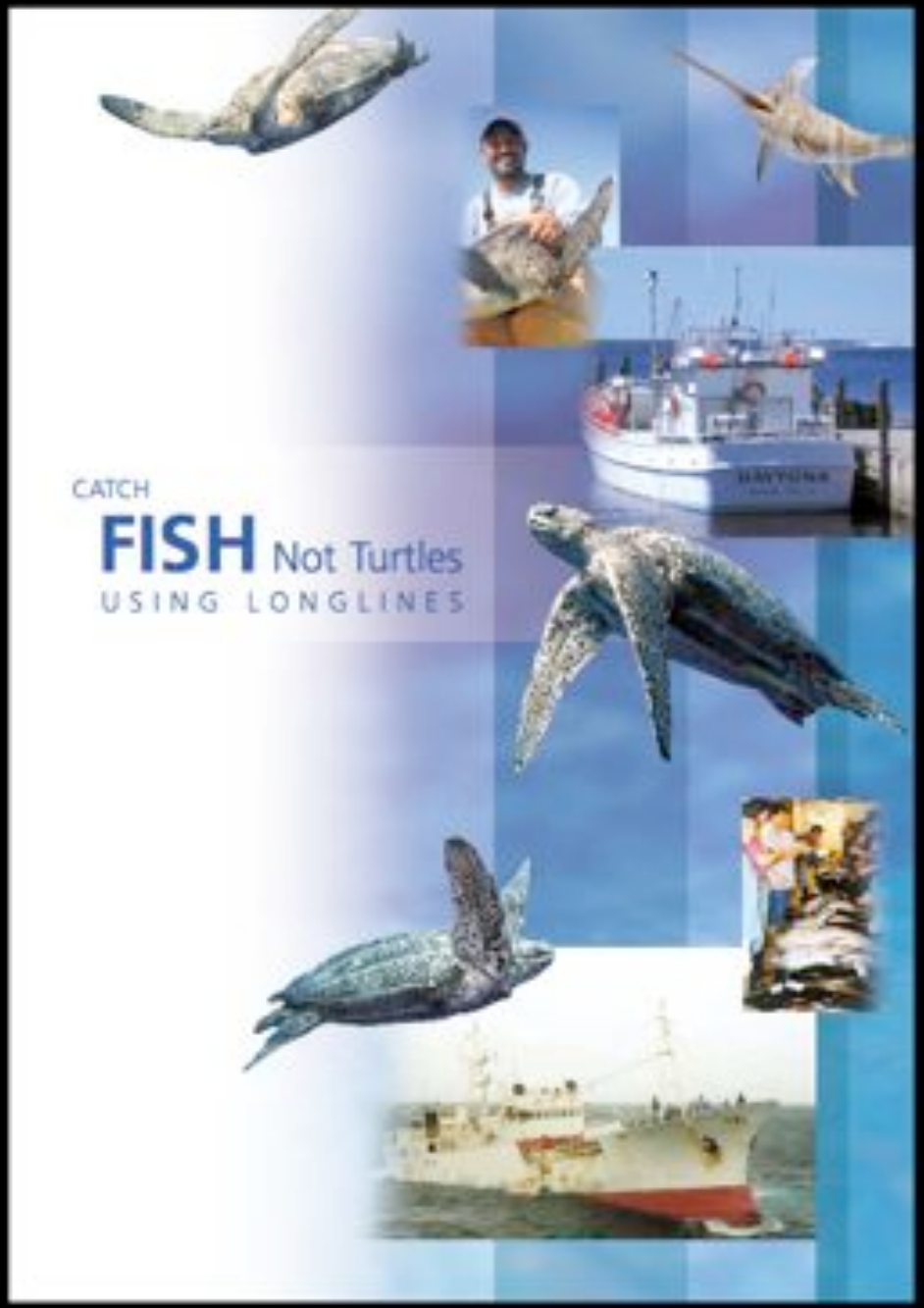
Circle hooks reduce deep hookings compared with “J” shaped hooks, increasing probability of survivorship

Chaloupka et al., 2004

Online resources to identify areas with oceanographic Conditions suggestive of ideal loggerhead sea turtle habitat. Used to guide fishers away from areas in order to reduce sea turtle-longline interactions:

http://www.pifsc.noaa.gov/eod/turtlewatch.php



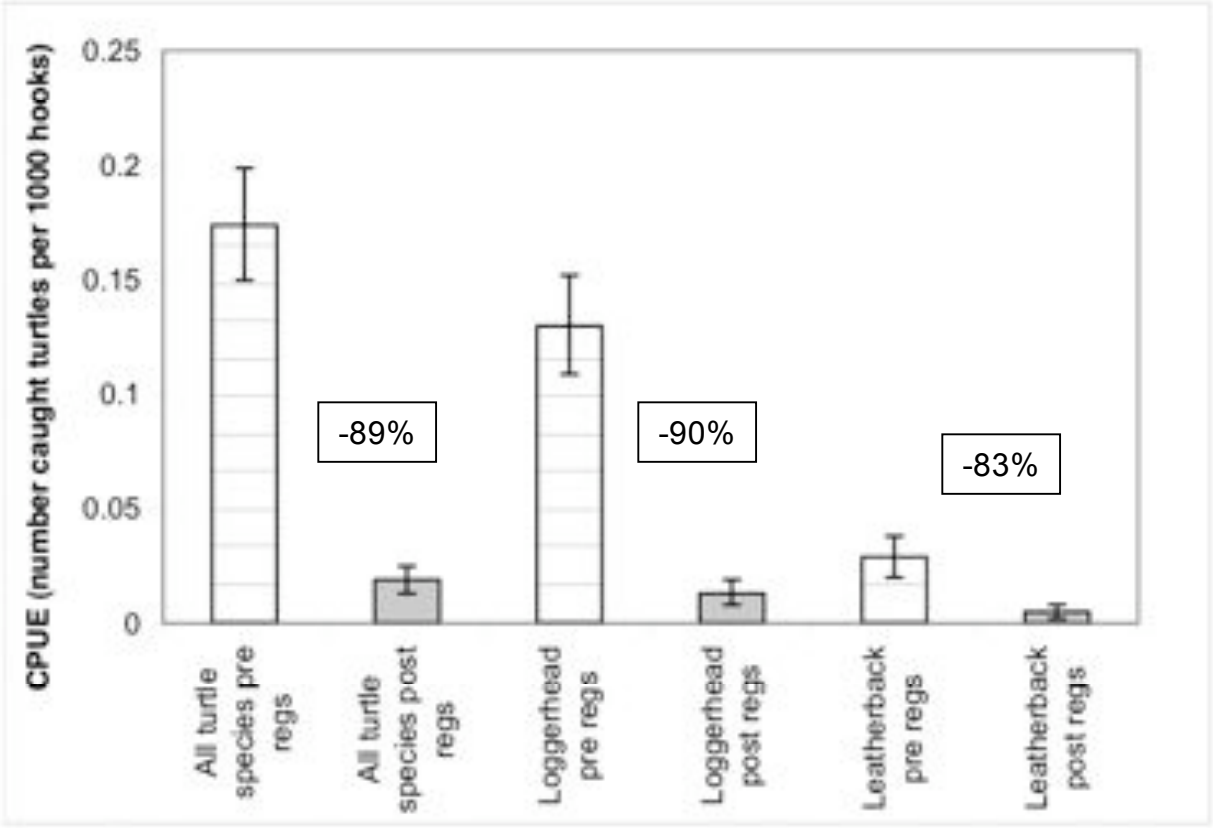

CATCH
FISH Not Turtles
USING LONGLINES


For More Information and to Share Your Ideas

Equipment for Animals boated

For Animals not-boated

Sea Turtle Interactions (CPUE)
Pre- and Post- Hawaii Regulations



Gilman et al. 2006

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Fast-sinking lines reduce seabird mortality in longline fisheries

GRAHAM ROBERTSON

Bullers and white-capped albatrosses fight over fish lost from a longline.

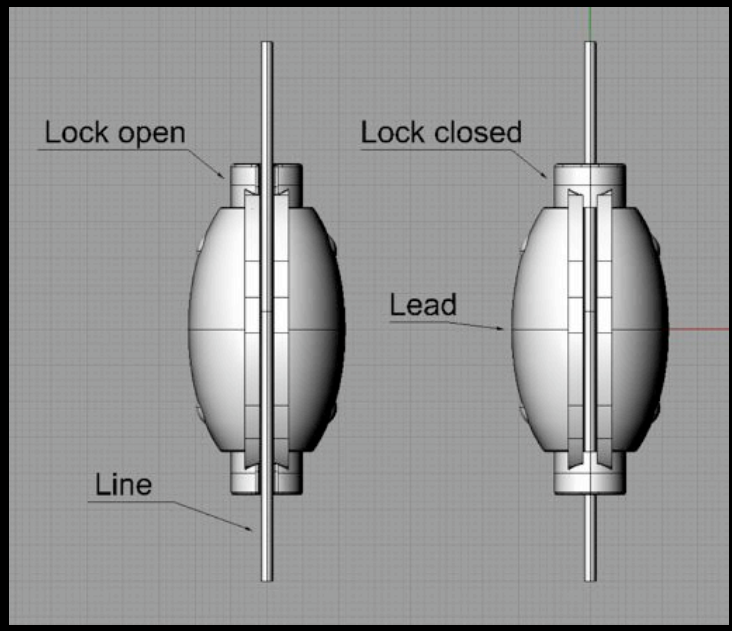
Longline fisheries are implicated in the decreases of many albatross and petrel species worldwide. Seabirds die when they attack baited hooks when lines are being set, become hooked or entangled, pulled underwater and drown. In many longline fisheries seabird fatality is part of 'normal' commercial fishing operations, though the number of birds accidentally killed can vary greatly with location, time of year and type of fishing gear used. We have been addressing this problem by collaborating with fishing industries to develop fishing gear and practices that reduce seabird mortality.

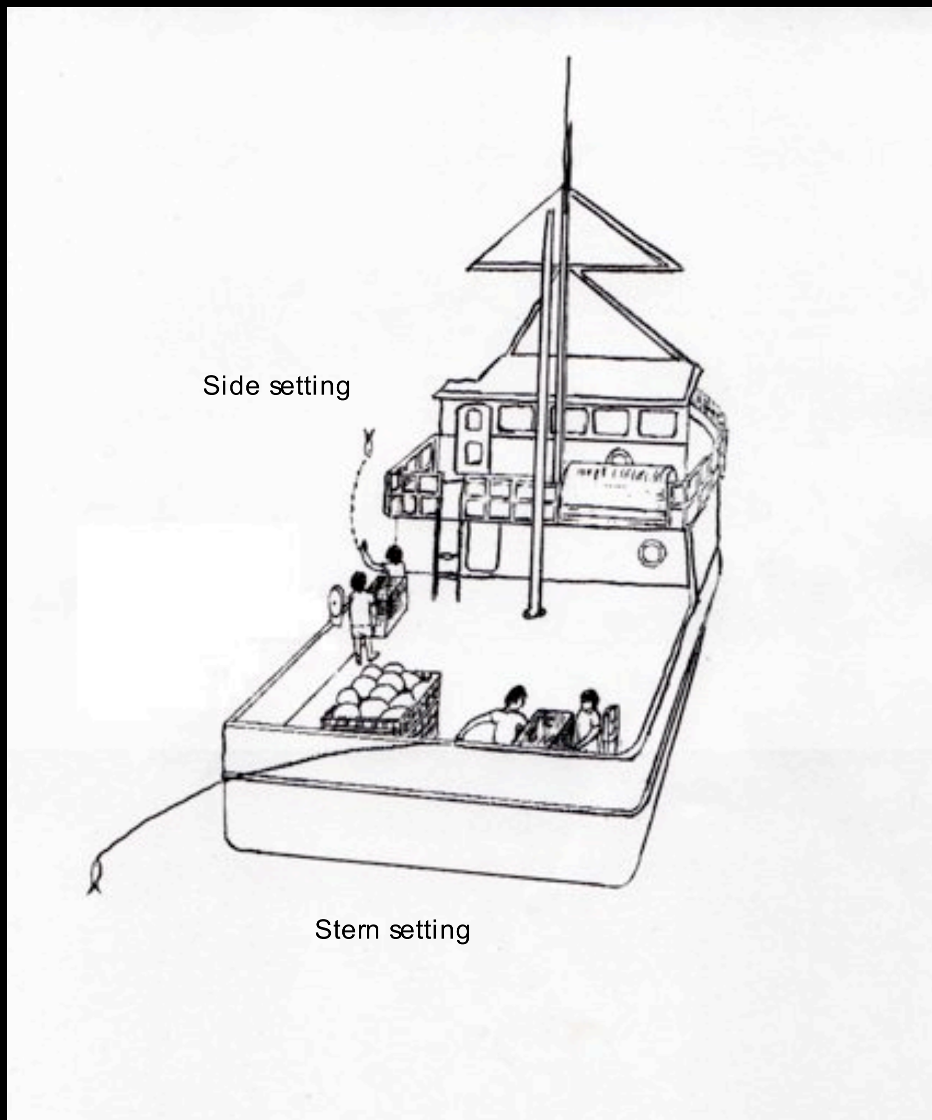
The risks to seabirds are increased by longlines that sink too slowly. Typically, when longlines enter the water they 'float' just beneath the surface, being held aloft by propeller turbulence and wave action. Depending on the vessel and gear type, they might remain in this lofted position for 20 seconds or so and be 50 metres or more astern before they start sinking, making baits easy targets for seabirds. Ideally longlines should start sinking the instant they enter the water and sink as fast as possible.

Longlines with integrated weight (beads of lead woven into the fabric of the line) have the capacity to meet these requirements. To test the effectiveness of longlines with integrated weight the Australian Antarctic Division teamed together with New Zealand Ling Longline (a NZ fishing consortium), Fiskevegn A.S. of Norway (a major longline manufacturer) and the New Zealand Department of Conservation and Ministry for Fisheries. We chose the amount of weight to be inserted into the longline from a previous trial of the sink rates, operational effectiveness and fish catch success of samples of line containing 25 g/m, 50 g/m, 75 g/m and 100 g/m integrated weight. The 50 g/m line performed best – it sank instantly, sank 2.5 times faster than normal line, did not affect fishing efficiency and was easy to use. The next step was to test the performance of the line while under attack from seabirds.

We tested the new line in November 2002 in the ling fishery near Solander Island, south of New Zealand. This was an ideal area for the test because it is frequented by large numbers of shearwaters, albatrosses and white-chinned petrels, species that regularly get killed on longlines. It was important to have white-chinned petrels in the trial because their attacks on longlines are very hard to prevent: they're strong, manoeuvrable fliers and excellent divers and – unlike albatrosses and shearwaters – are caught equally in the day and night. These traits place them at the top of the list of longline-vulnerable seabirds.

We conducted the trial on the F/V *Janas*, a 46.5 m Norwegian-built autoline vessel (hooks are baited automatically) commercially operated as part of New Zealand Ling Longline. The *Janas* fishes with thirty 1,800 m-long magazines of longline which carry a total of 36,000 hooks. We replaced 15 magazines of normal (unweighted) line with 15 magazines of integrated weight line and fished with both longline types side by side. We deployed a bird scaring streamer line over






Fast Facts

Side Setting for Hawai‘i Longliners

To minimize the capture of seabirds and realize big operational benefits, try setting longline gear from the side of your vessel. Here's the how, why, and who of side setting in Hawai‘i.

Mortality in longline fisheries threatens the survival of some seabird species. The birds most often caught are especially sensitive — some live over 60 years and lay only one egg each year or two. While the number of birds you catch may seem small with so many birds following astern, the combined bird catch by all fleets is significant. You can increase survival chances for a bird brought aboard alive and prevent injury to yourself by handling the bird properly. For threatened species, each bird saved is important.

SAFELY RELEASING Seabirds & Avoiding BIRD CAPTURE

Bring bird aboard

1. Maneuver vessel so bird is brought alongside without line tension. May require you to slow or stop hauling, and slow or stop vessel.
2. Work in a team of two. Use long sleeved shirt, gloves, glasses, & towel for safety.
3. Lift bird aboard preferably with a net, otherwise by seizing bill and wing tips, and body—avoid pulling bird up with the line.

Restrain bird

4. Wrap bird in towel and cover eyes to keep feathers clean and bird calm.
5. Keep face away from bill. Hold back of head, avoid holding the soft neck. If hooked in beak, hold head and bill. Do not cover nostrils. Bird may vomit—release bill or bird may suffocate.
6. Hold the bird's body at hip level. Carefully fold wings against the body. Hold bird firmly but do not squeeze—bird needs to move the sides of chest to breathe.
7. One person holds bird. 2nd person removes fishing gear. Cut the line close to the hook.
8. If bird is lightly hooked in the beak, wing, or foot, or hook is sticking out of bird's body, cut hook and pull hook out.

Rest and dry

12. If bird is dry, holds head erect, stands with wings in normal folded position, and is energetic, go to step 17.
13. If bird is waterlogged and exhausted, place in a quiet, dry, shaded place in a large crate with air holes for an hour or two. Put a towel in the bottom of the crate. If a crate is not available, leave bird alone on quiet, protected part of deck.
14. Check the bird every half-hour. Don't attempt to feed.

Swallowed hook or injured bird

9. If hook went down throat and the hook is not visible, cut line as short as possible. Do not pull on the line or try to cut the hook out.
10. If possible, bring birds that swallowed hook and birds with wounds or broken bones ashore for treatment.
11. If cannot bring ashore, then follow remaining steps to release the bird.

Release

15. If the bird is dry, holds head erect, responds to sound, and stands with wings in normal folded position; it is ready to release.
16. Slow vessel.
17. Slowly lower bird by hand to water, releasing hold on head last. Release away from line hauling.
18. Wait until bird is clear of the vessel before motoring away.

Avoid Bird Capture During Setting

Catch fewer birds, save bait, catch more fish, make more money!

- Add more weight close to hooks to increase sink rate
- Set at night
- Thaw bait
- Use a bird-scaring line
- Use underwater setting equipment

Avoid Bird Capture During Hauling

- Discard offal and spent bait on opposite side of vessel from line hauling
- Synchronize vessel speed and hauling rate so baited hooks don't trail on the sea surface astern—use a coiling machine to retrieve baited hooks fast

For example, invented by Japanese fishermen, a line with streamers scares birds from baits when setting. Streamers can also be deployed at line hauling area to scare birds from baits during hauling – make your own or buy one from a fishing equipment supplier.

To learn more and share your ideas:

National Audubon Society oceans.audubon.org • Hawaii Longline Association www.nhi.com/hla/ • BirdLife South Africa www.savethealbatross.org.za

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- **Marine mammals**
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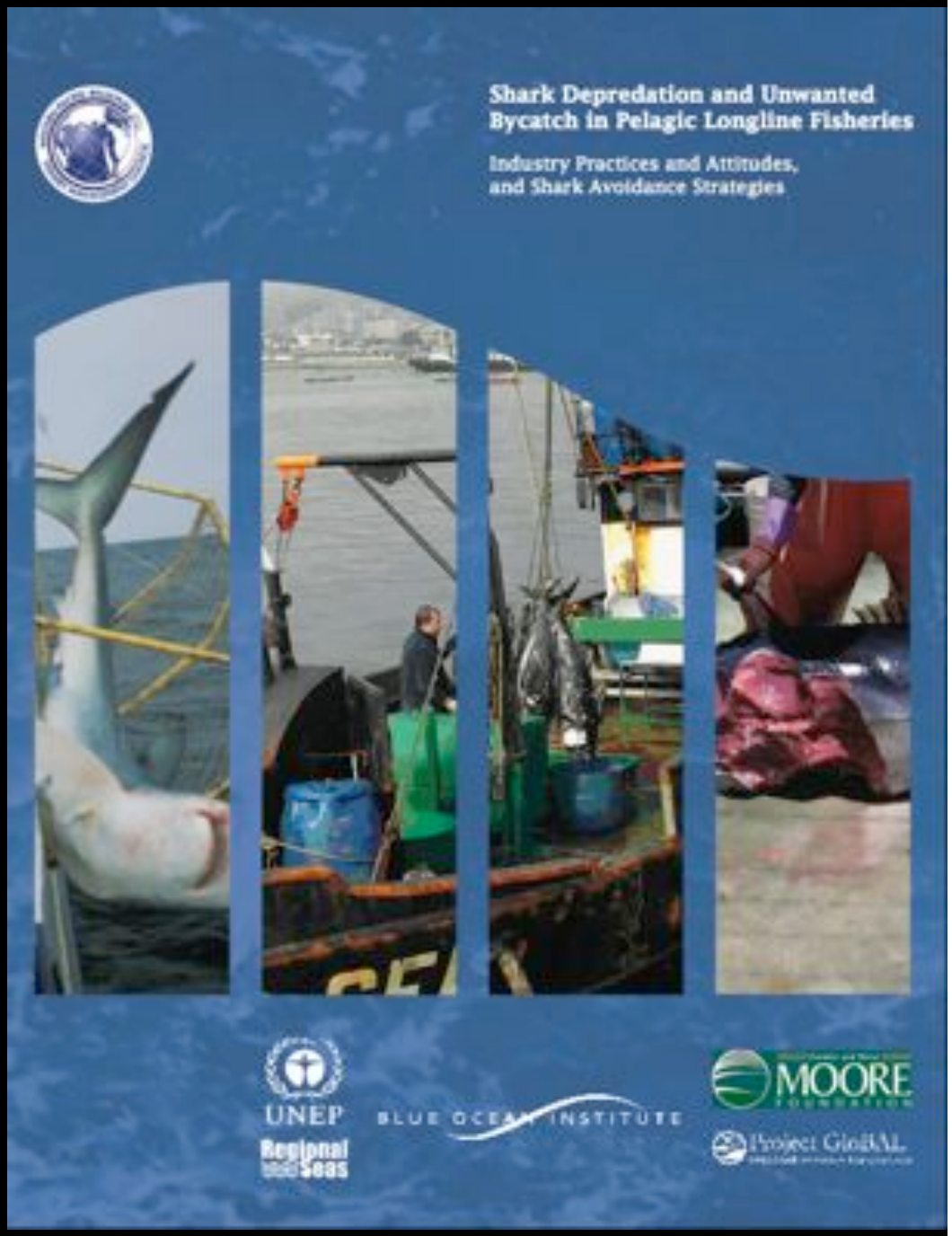
sharks are significant portion of catch in many longline fisheries



Shark bycatch reduction/mitigation

Deterrent studies:

--chemicals
--rare earth magnetics

De-hookers

Shark CPUE: Circle hooks + Bait

- Inconclusive--conflicting info on effect of circle hooks on shark CPUE.
- Use of mackerel bait alone reduces shark CPUE.
- Assessment of HI LL observer data found that shark CPUE was significantly lower (by 36%) after regulations (18/0 Circle hook, mackerel bait) than before (9/0 J hook, squid bait)

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(Dalla Rosa and Secchi 2007)

A review of cetacean interactions with longline gear

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ABSTRACT

Fishery-cetacean interactions, including those with longline gear, give rise to economic, ecological and social concerns. This paper reviews problems resulting from cetacean longline interactions, considers potential strategies to reduce interactions and identifies research priorities and approaches. Depredation by cetaceans (removal and damage of hooked fish and bait from fishing gear) and damage and loss of fishing gear create economic problems; however, the magnitude of this problem is poorly understood. There is also insufficient information to determine whether there are population-level effects resulting from injury and mortality of cetaceans (from incidental entanglement and hooking and from deliberate actions to discourage depredation). Fishery-cetacean interactions may also: change cetacean foraging behaviour and distribution; increase fishing effort to make up for fish taken from gear by cetaceans; and create errors in fish stock assessments that do not account for cetacean depredation. Negative public perceptions of longline fishing can result from news of incidental and deliberate injury and mortality of cetaceans associated with longlining. Information on how to reduce cetacean interactions with longline gear is also limited, as is the understanding of the mechanisms responsible for them. Strategies already employed in some fleets include refraining from setting or cutting sets short when problematic species of cetaceans are observed and fleet coordination of daily fishing times and positions. Many fishermen perceive depredation as an i
possible cetacean avoidance strategies that warrant consideration, includi
and spatially unpredictable and sporadic hotspots of aggregations of ce
sound of the vessel, gear, and setting and hauling activities; (3) quieter
encasement of caught fish to reduce cetacean access to or interest in the
reduce the attractiveness of gear, bait and catch to cetaceans; (6) use of p
a fleet's fishing grounds to distract cetaceans from actual fishing vessels; (
signals; and (8) use of tethered scoutbuoys to track cetaceans and enable
rates should be examined for design and operational differences from ves
effective avoidance methods. There is a need for experimentation in ind
specific efficacy and commercial viability of cetacean avoidance strategi
differently to an avoidance method and cetaceans may habituate to an av
cetaceans.

KEYWORDS: DEPREDATION; FISHERIES; INCIDENTAL CATCH[S]

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Marine Policy 30 (2006) 360–366

MARINE POLICY

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Fleet communication to abate fisheries bycatch

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Received 4 April 2005; accepted 2 June 2005

Abstract

Fleet communication systems report near real-time observations of bycatch hotspots to enable a fishery to operate as a coordinated "One Fleet" to substantially reduce fleet-wide capture of protected bycatch species. This benefits the bycatch species per se, reduces waste, and can provide economic benefits to industry by reducing risk of exceeding bycatch thresholds and causing future declines in target species catch levels. We describe case studies of fleet communication programs of the US North Atlantic longline swordfish fishery, US North Pacific and Alaska trawl fisheries, and US Alaska demersal longline fisheries, and identify alternative fleet communication program designs to reduce fisheries bycatch. Evidence supports the inference that these three fleet communication programs substantially reduced fisheries bycatch and provided economic benefits that greatly outweighed operational costs. Fleet communication may be appropriate in fisheries where there are strong economic incentives to reduce bycatch, interactions with bycatch species are rare events, adequate onboard observer coverage exists, and for large fleets, vessels are represented by a fishery association.

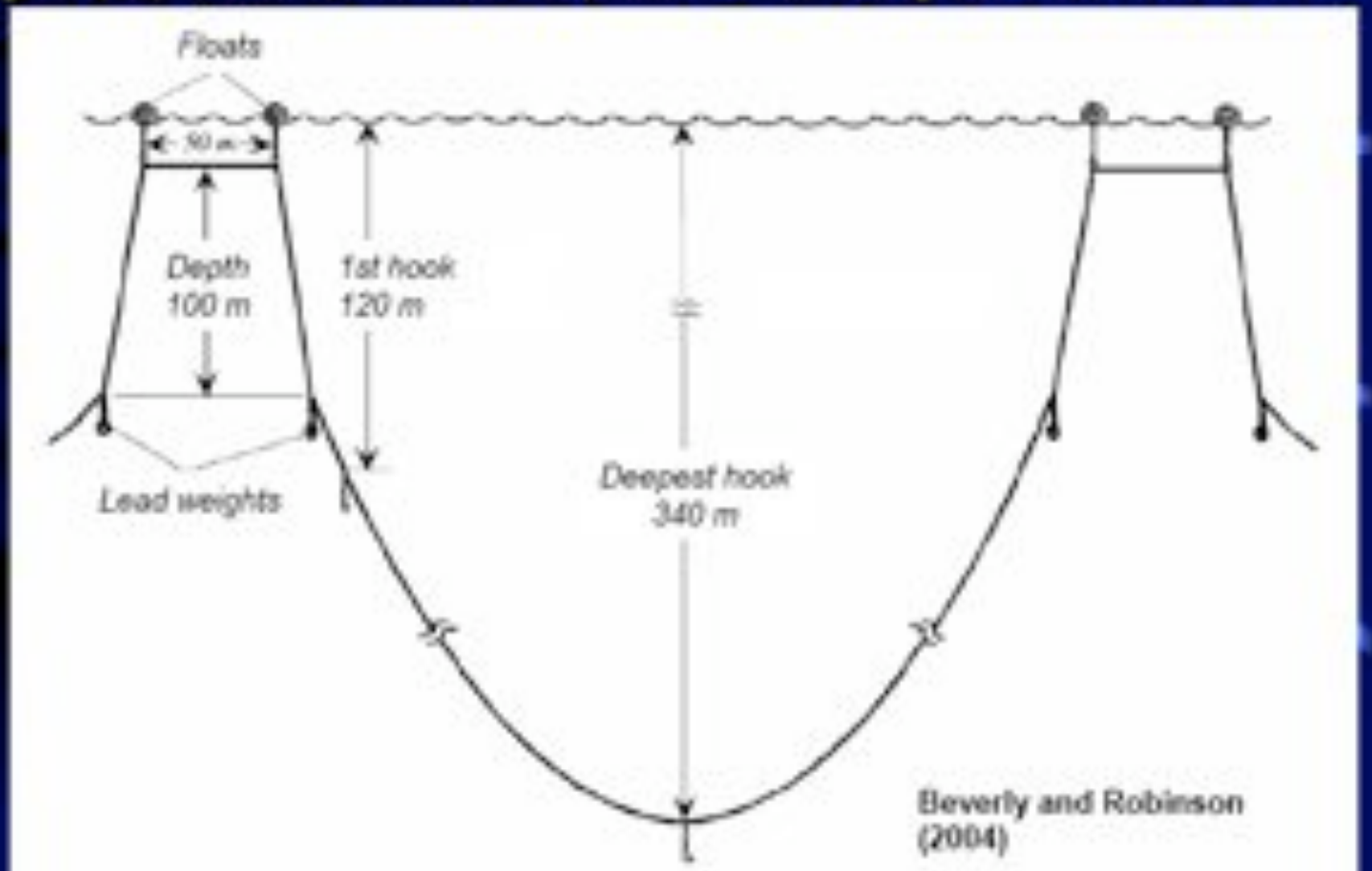
Keywords: Bycatch reduction; Fleet communication; Marine fisheries

Final remarks on Longline Fishing:

- Has potential to be a relatively high selective fishery with respect to target and non-target catch
- Bycatch mitigation efforts have proven very effective
- 1 baited hook= 1 catch, limited soak time
- Fishery is relatively easy to regulate, even dockside
- Very low chance of “ghost nets/lines” as longline gear not easily lost.

END

Deeper Setting: Satellite telemetry and observer data support that setting gear deeper than 40-100 m holds promise for reducing sea turtle interactions



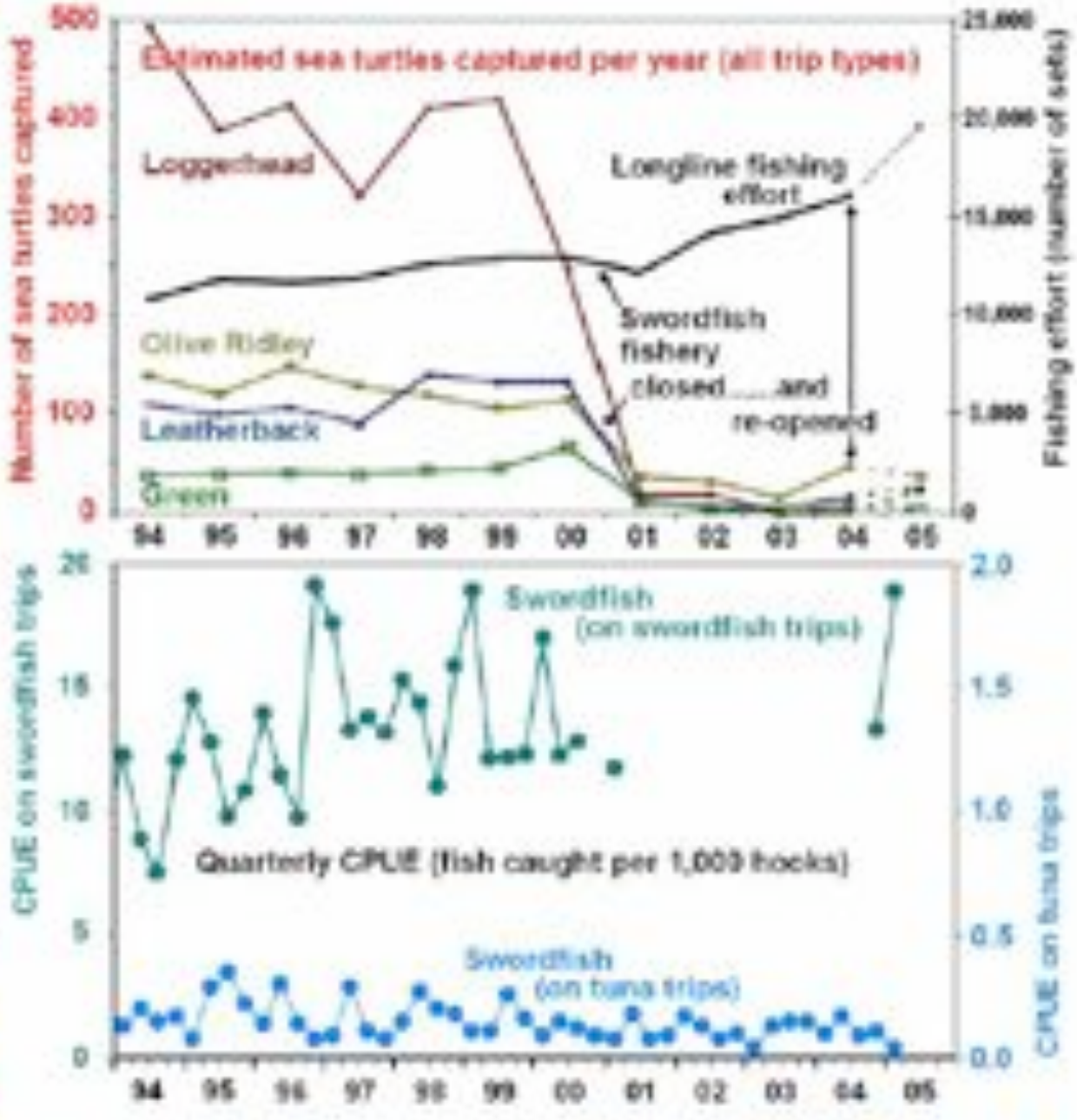
In the 1990's Hawaii longline sea turtle bycatch numbered around 700 per year.

In 2000 the shallow-set fishery targeting swordfish closed. Turtle bycatch was greatly reduced because turtles had mostly been caught on swordfish trips.

In 2004 a "model fishery" for sword-fish was reopened using 18/0 circle hooks and fish bait.

So far the turtle bycatch has stayed low, and the catch rate of swordfish has been very good

WIN WIN SOLUTION



- Azores, Bolten and Bjorndal 2003, unpublished found higher rates of blue shark cpue with circle hooks vs J hooks
- N. Atlantic longline study--18/0 Circle Hook vs. J 9/0 hook, small, but statistically higher blue shark cpue (~8.5 %) (Watson et al 2005)
- N. Pacific Japanese longline found no difference between circle and Japanese tuna hook (Yokota et al 2006)
- However, circle hook increases can be offset with use of mackeral vs. squid bait

- However, in N. Atlantic and Azores, use of mackeral vs. squid bait decreased shark cpue (Watson et al. 2005, Bolten and Bjorndal 20?)