Source: Safina Center http://safinacenter.org/

The Safina Center (formerly Blue Ocean Institute) was founded in 2003 by Dr. Carl Safina. It was built on three decades of research, writing and policy work by Dr. Safina. The Institute is based at Stony Brook University on Long Island, NY and is a 501(c)3 nonprofit organization.

Gillnets – The Entanglers

By **Elizabeth Brown**

The Safina Center is often asked to describe various types of fishing gear and explain which ones are the most destructive to the ocean. Another frequent question is why our seafood ratings for a particular species differ depending on the fishing method used. In this series, we will describe how common types of gear work, what they catch, how they affect ocean wildlife and habitats, what technologies or regulations can help lessen the gear's negative effects, and what we see as the path forward to ensure healthy oceans in the future.

We want to help seafood consumers, businesses, and chefs who use our seafood ratings better understand what the terms 'trawl', 'longline', or 'handline' really mean. We also hope this series will help everyone understand the collateral damage that fishing can cause to the ocean and the importance of choosing seafood caught in a responsible way.

Gillnets entangle fish by their gills – hence the name. But in addition to entangling target fish species, **they can entangle and cause great harm to a variety of ocean wildlife**.

Gillnets – The Entanglers

What is a gillnet?

A gillnet is a **large net wall** that hangs vertically in the water. Floats line the top of the net, while weights line the bottom of the net. The net is made of transparent monofilament line, so fish and other animals are unable to see it. Fishermen vary the mesh size or size of the net holes depending on the size of the species they want to capture. Small mesh sizes are used when targeting small species and large mesh sizes are used when targeting large species. The mesh size or net holes are designed to be large enough for the head of the fish to pass through it, but not its body. As a result, when fish swim into the net they are entangeld by their gills.

Gillnets often consist of many individual net walls tied together. Prior to 1991, when the United Nations banned large-scale drift gillnets on the high seas, these nets stretched for up to 40 miles long! Today, the longest gillnets *stretch for one to two miles* (which is still pretty long) and they are typically 10-50 ft high. Fishermen may leave these nets in the water for a few hours to a couple of days.

Gillnets are fished in both the open ocean and coastal waters and can be set at different depths.

—If the gillnet is suspended in the top or mid-depths of the water, it is called a mid-water gillnet or a drift gillnet.

—If the gillnet is set on the bottom of the ocean floor, either by weighting it down or anchoring it the seafloor, it called a bottom gillnet.

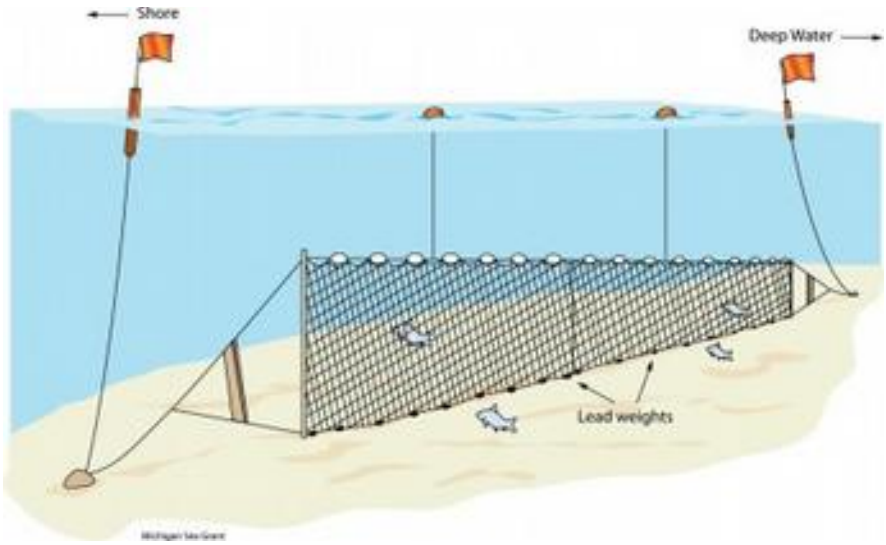

Illustration of a bottom set gillnet anchored to the seafloor. Credit: Michigan Sea Grant.

What does a gillnet catch?

Bottom gillnets are used to catch a variety of fish that live on or near the bottom of the ocean floor, such as **cod, pollock, flounder, monkfish, halibut, and striped bass**.

Mid-water gillnets are used to catch species that live in the top or mid depths of the ocean, like **swordfish, sharks, mackerel, and salmon**.

How do gillnets affect the ocean?

Gillnets are designed to catch a specific size range of fish, but are not species specific. They often entangle many fish that fishermen are not trying to catch. They also frequently entangle large ocean animals, including whales, seals, sea turtles, seabirds, and sharks – many of which are threatened or endangered with extinction. This unintended catch is called '**bycatch**'.

Left: Sunfish are a common bycatch in gillnets. Credit: Alessio Viora/Marine Photobank. Right: A short finned pilot whale entangled and killed by a California drift gillnet. Credit: NOAA.

Many consider gillnets to have the highest bycatch impacts on marine mammals, sea turtles, seabirds, and sharks of any fishing gear[1]. Gillnets are often referred to as walls of death. When large ocean animals interact with gillnets they may become entangled around their head, mouths or limbs. Because the net is made out of very strong material, it is nearly impossible for the animals to escape. The net line is also very thin and sharp and can cut deep into the animal's flesh – this can lead to infections, limited movement, or loss of a limb (not to mention a severe amount of pain). If animals that need air to breathe (e.g. sea turtles, marine mammals, sea birds) are unable to reach the surface for an extended period, they will drown. And even if fishermen are able to set them free before they drown, the damage caused by the gillnet may impair their ability to feed or swim, still slowly leading to their death[2].

Here are a few examples of the harm that gillnet fisheries can cause to ocean wildlife:

—The U.S. Northeast bottom gillnet fishery that targets cod, pollock and other fish **has killed more than 16,000 harbor porpoises since 1990,** and **also frequently kills endangered humpback and North Atlantic right whales**[3].

—The California mid-water or drift gillnet fishery for swordfish and thresher sharks **entangles and kills many species of concern** including **endangered sperm whales**, several **other whales**, **dolphins**, **sea lions**, **non-target sharks**, **depleted bluefin tuna**, and occasionally **endangered sea turtles**[4].

—Small-scale gillnet fisheries off Baja California, Mexico have some of the **highest sea turtle bycatch rates in the world, killing thousands of sea turtles each year**[5].


Coastal gillnet fisheries around the world incidentally catch and entangle sea turtles. Photo Credits: Carl Safina (left) and NOAA (right).

Gillnet fisheries that target species like salmon or striped bass in coastal waters (e.g. bays, estuaries, or rivers), tend to have a lower potential to interact with marine mammals, seabirds, sharks, and turtles. However, some North Pacific salmon fisheries do occasionally entangle seabirds and marine mammals.

Because **bottom gillnets** contact the ocean floor they can **cause moderate damage to bottom habitats**. If they become ensnared on physical or biological structures, such as rocks, corals, sponges, or aquatic plants, they may break or uproot them. There is the greatest potential for damage when fishermen are hauling the net in. However, bottom gillnets cause much less damage

to ocean habitats compared to bottom-dragging gears (e.g. trawls). Mid-water gillnets rarely contact the bottom, and thus have minimal effects on bottom habitats.

What can be done to lessen the negative effects of this fishing gear?

There are **several gear modifications that can help reduce bycatch of species of concern** in gillnet fisheires.

Pingers are small acoustic devices that are put on gillnets to reduce bycatch of porpoises, dolphins, or other marine mammals. Pingers emit a high pitched sound every few seconds, which warns marine mammals that there is something ahead and deters them from getting too close to the net. Most fish do not hear the high pitched sounds that pingers emit and thus are unaffected.

Pingers. Credit: NOAA

The U.S. requires the use of pingers in the Northeast bottom gillnet fishery and California drift gillnet fishery[6]. Scientists have found that when unitized correctly pingers can reduce bycatch of porpoises, dolphins, and some other marine mammals by 70-90%. In the Northeast gillnet fishery, fishermen have not always complied with the pinger regulations. But thanks to negative media attention generated by The Safina Center and other ocean conservation groups about this issue, **compliance is now improving**[3]. The European Union also requires the use of pingers for certain European gillnet fisheries, but many countries have not yet implemented this regulation.

Weak links are another gear modification sometimes used in gillnet fisheries to reduce the bycatch of marine mammals. Weak links are inserted into various places of the gillnet and are designed to break under the force of a swimming whale. This helps prevent the entanglement of large whale species. The **U.S. requires the use of weak links** in several U.S. Atlantic gillnet fisheries.[7]

Scientists are also developing **new technologies to reduce the capture of sea turtles in gillnets**. One promising solution is the **illumination of gillnets with LED lights**. The idea is that placing LED lights on gillnets will allow sea turtles to see the net and hopefully avoid it. Whereas, fish species that fishermen are trying to capture may not be able to see the lights. A former Safina Center seafood analyst, Jesse Senko, and his colleagues have been testing the effectiveness of these lights in **reducing sea turtle bycatch in Baja California, Mexico gillnet fisheries**[8]. Early results have indicated that illuminating the gillnets can reduce bycatch of loggerhead and green sea turtles by 40-60%. And the results also suggest that these lights may reduce bycatch of other

species too, while increasing the target catch. Scientists are testing the effectiveness of this modification in gillnet fisheries in Peru, Chile, Brazil, and Indonesia too. Scientists also continue to study other modifications to reduce sea turtle bycatch, such as buoyless nets.

Setting an illuminated gillnet (note green LED light clipped to the float line) off the Baja California, Mexico coast. Photo by Jesse Senko.

Other ways to reduce bycatch include restricting gillnet fishing in certain areas or during certain times that are likely to have a high potential for bycatch, restricting the depth that fishers can fish at, restricting the length and/or depth of the net, requiring fishers to check their gillnets frequently, and setting hard limits on the amount of non-target species the fishery is allowed to kill.

To reduce the amount of damage bottom gillnets have on ocean habitats, managers can restrict their use in vulnerable habitats like coral reefs or sponge beds.

The Path Forward

Around the world gillnet fisheries are having a devastating effect on large ocean wildlife, like whales/dolphins, sea turtles, seabirds, and sharks. Given that these species are so vital to marine ecosystems and many are threatened or endangered with extinction, we must ensure we are taking measures to reduce these negative effects.

Fishery managers must take immediate action to reduce bycatch of vulnerable ocean wildlife in gillnet fisheries, including requiring and enforcing the use of available gear modifications/technologies. There are far too many fisheries out there that have not taken appropriate measures to reduce bycatch. But even in those fisheries where measures have been taken (e.g. U.S. gillnet fisheries), they are still having a highly negative effect on some species, like whales and sea turtles. [Which means that in gillnet fisheries with no bycatch reduction measures in place, the impact is likely catastrophic.]

As mentioned earlier, the United Nations banned large-scale drift gillnet fishing on the high seas in 1991. Since then, several other countries have restricted the use of gillnets off their coasts. As I was writing this blog, I was thinking – perhaps it's **time to phase out the use of large gillnets in all areas of the ocean**. Shouldn't we **find new ways to fish,** that cause far less harm to ocean animals? There are some promising new and innovative fishing methods out there. For instance, scientists are exploring the possibility of using **deep-set buoy gear to catch swordfish** off the California coast, instead of indiscriminate drift gillnets[9]. Deep-set buoy gear involves dropping a line with a hook deep below the surface. The method allows for the capture of swordfish, while minimizing the capture of unintended species. [We will cover deep-set buoy gear and other selective fishing methods in more detail later on in this series.]

Replacing gillnets with more selective methods will not be easy and will take time. It will require collaboration among scientists, fishermen, and managers. But for the sake of our ocean wildlife, it seems like the right path forward to pursue.

Elizabeth Brown *is a research scientist at The Safina Center.*

Notes:

1. **Addressing the Collateral Impacts of Fishing Methods in U.S. Waters http://mcbi.marine-conservation.org/publications/pub_pdfs/ShiftingGears.pdf.**
2. **Harm caused by gillnets to ocean wildlife http://www.nmfs.noaa.gov/pr/interactions/gear/gillnet.htm and http://www.worldanimalprotection.org/sites/default/files/int_files/sea-change-campaign-tackling-ghost-fishing-gear_0.pdf**
3. **U.S. Northeast bottom gillnet fishery's impacts on ocean wildlife. http://voices.nationalgeographic.com/2012/10/25/as-fisheries-service-dithers-new-england-porpoises-drown/, http://safinacenter.org/2012/11/better-late-than-never-new-england-gillnetters-now-say-theyll-save-porpoises/, and http://www.nmfs.noaa.gov/pr/pdfs/fisheries/lof2012/northeast_sink_gillnet.pdf**
4. **California drift gillnet fishery's impact on ocean wildlife http://www.biologicaldiversity.org/news/press_releases/2014/drift-gillnets-09-10-2014.html and http://www.westcoast.fisheries.noaa.gov/fisheries/wc_observer_programs/sw_observer_program_info/data_summ_report_sw_observer_fish.html**
5. **Baja California gillnet fishery's impact on sea turtles http://www.academia.edu/5426036/Bycatch_and_directed_harvest_drive_high_green_turtle_mortality_at_Baja_California_Sur_Mexico and http://www.nmfs.noaa.gov/ia/iuu/msra_page/2013_biennial_report_to_congress__jan_11__2013__final.pdf**
6. **Pinger requirements in U.S. gillnet fisheries to reduce marine mammal bycatch http://www.greateratlantic.fisheries.noaa.gov/protected/porptrp/ptci.html and http://www.nmfs.noaa.gov/pr/interactions/trt/poctrp.htm**
7. **Weak link requirements in U.S. gillnet fisheries to reduce marine mammal bycatch http://www.greateratlantic.fisheries.noaa.gov/Protected/whaletrp/**
8. **Illuminating gillnets to reduce sea turtle bycatch http://safinacenter.org/2013/07/do-sea-turtles-see-the-led-light/ and http://www.pifsc.noaa.gov/qrb/2013_10/article_15.php**

9. **Finding a better way to catch Pacific swordfish**
http://www.pewtrusts.org/~/media/Assets/2014/05/02/LetsFindABetterWaytoCatchPacificSwordfish.pdf?la=en