

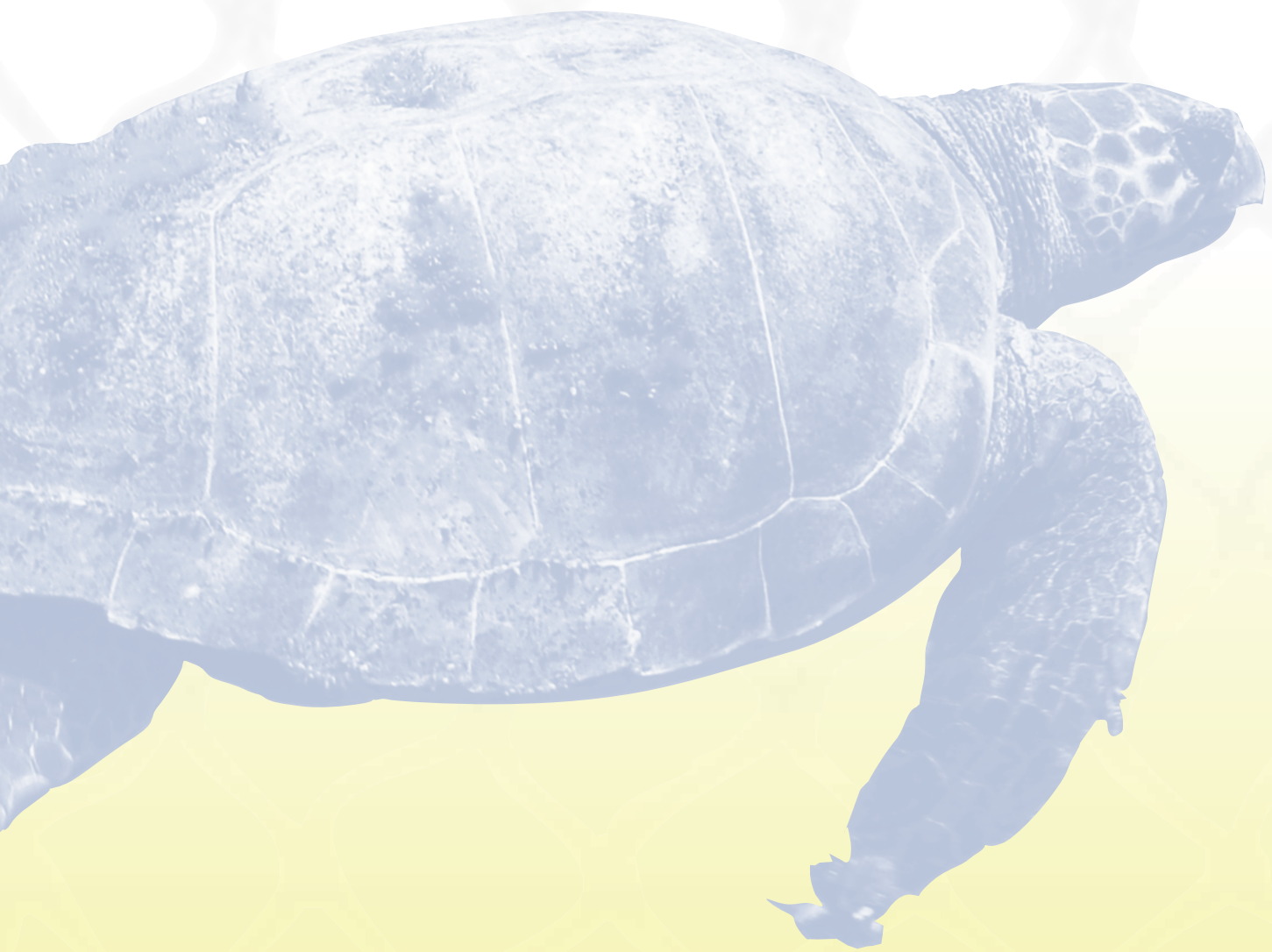
TROUBLE *for* TURTLES

Trawl Fishing in the Atlantic Ocean
and Gulf of Mexico

Trouble for Turtles:

Trawl Fishing in the Atlantic Ocean and Gulf of Mexico

Griffin, E., Miller, K.L., Harris, S. and Allison, D. July 2008.



1350 Connecticut Ave. NW, 5th Floor | Washington, DC 20036 USA
T+1.202.833.3900 | F +1.202.833.2070 | www.oceana.org

EXECUTIVE SUMMARY

Sea turtles have been swimming the world's oceans for more than 110 million years. Although they have survived mass extinctions, **sea turtles are ill-equipped to withstand threats from destructive fishing gear, especially gear used for trawling.**

Bycatch – the unintentional catch of sea turtles in fishing gear – poses a serious threat to sea turtle survival. More than fifteen years ago, the National Marine Fisheries Service (NMFS) began to address this problem by requiring the use of Turtle Excluder Devices (TEDs) in Atlantic Ocean and Gulf of Mexico shrimp trawl nets. Later, summer flounder trawls also were required to use TEDs. **Although TED use has been shown to reduce sea turtle mortality in trawls, the majority of trawl fisheries are still not required to use them.** Furthermore, TEDs are not a complete solution, as they still cause stress, and allow injury, harm and occasionally death to sea turtles. Reducing fishing effort or establishing time and area closures, in addition to the use of TEDs, is the only way to adequately protect sea turtles from the threat of extinction.

Trawl fisheries in the Mid-Atlantic region demonstrate the severity of this problem. On average, **an estimated 770 sea turtles are caught annually in Mid-Atlantic bottom trawl fisheries.** Of these fisheries, only the summer flounder fishery is currently required to use TEDs. In addition, the required TED openings in the summer flounder fishery have been proven to be too small to allow large sea turtles to escape. The Endangered Species Act (ESA) is intended to protect and recover species threatened with extinction. Although all six sea turtle species inhabiting U.S. waters are currently listed as threatened or endangered under the ESA, the government has yet to require TEDs and other bycatch mitigation methods in trawl fisheries that are known to take and even kill sea turtles.

TABLE OF CONTENTS

• Sea Turtle Bycatch in Trawls	1
• Trawl Fishing in the Atlantic Ocean and Gulf of Mexico	2
• Sea Turtle Protection under the Endangered Species Act	3
• The History of Turtle Excluder Devices	4
• The Current Situation	5
• Sea Turtle Bycatch in Trawls in the Mid-Atlantic Region	8
• Conclusions and Recommendations	12
• End Notes	14

Sea Turtle Bycatch in Trawls

For decades, scientists have known that bycatch in trawl fisheries is a major threat to the continued existence of sea turtle populations. Without an avenue for escape, sea turtles are likely to drown when captured in trawl gear due to forced submergence.¹ Turtles that do not initially die from this forced submergence are stressed by it, making them more susceptible to further injuries and death.²

The number, age and species of sea turtles captured in trawl fisheries fluctuate based on the season and geographic location of fishing activity.³ Trawl fishing often occurs in coastal areas that are prime sea turtle habitat.⁴ In these areas trawls capture larger, older and more reproductively “valuable” turtles more frequently than many other fisheries.⁵ As a result, trawl fisheries have a major impact on the population status of loggerhead sea turtles. The Atlantic Loggerhead Recovery Plan Team, convened by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service, determined that bottom trawl fisheries are the single greatest human threat to loggerhead sea turtles, in large part because of their impact on older individuals.⁶

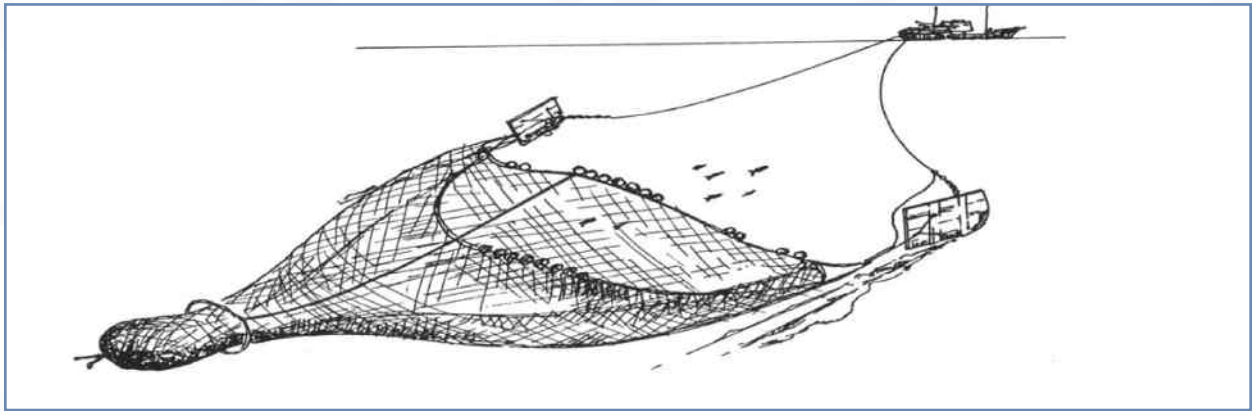
**BOTTOM TRAWL FISHERIES
ARE THE SINGLE GREATEST
HUMAN THREAT TO LOGGERHEAD
SEA TURTLES**

NOAA



Trawl Fishing in the Atlantic Ocean and Gulf of Mexico

Trawling, one of the most destructive and wasteful fishing methods because of its unselective nature, is used to catch a wide variety of species from shrimp to cod.⁷ While there are many kinds of trawls, the basic design consists of a funnel-shaped net where the mouth is kept open and is towed through the water or dragged on the sea floor.⁸ While the otter trawl is the most common type of trawl gear, beam trawls also are used. Otter trawls use doors, heavy large panels in front of the net, to keep the mouth of the net open, while beam trawls use a metal frame to hold the net open.⁹ Another type of trawl is a flynet, which is a high profile trawl used for fish that school higher in the water column than typical groundfish, and is commonly used in depths less than 36 m.¹⁰ Other types of trawls include skimmer, roller frame, pair and clam kicking.¹¹



*Figure 1: Otter Trawl*¹²

Trawl fisheries operate throughout the year in various areas of the Atlantic Ocean and Gulf of Mexico. The time of year and geographic area of the fisheries using trawls depend on the targeted catch and regulations governing each fishery. While the shrimp fishery is one of the most economically significant trawl fisheries, the gear also targets a variety of other species, including flounder, scallop, scup, black sea bass, groundfish, Atlantic croaker, mackerel, weakfish, squid and conch.¹³ Trawls generally target specific species, but because of their unselective nature, they capture any fish, marine mammal, sea turtle or other species in their path that are too large to escape through their mesh nets. These bycatch species get caught in the net, often suffering severe injuries or even death.

Three states in the Atlantic, Virginia, Delaware and New Hampshire, currently prohibit trawling.¹⁴ The other 15 states (Figure 2) along the Atlantic Ocean and Gulf of Mexico coastlines permit trawling in state waters. In addition to the three total closures of state waters, other states ban bottom trawling in particular areas. For example, Maryland prohibits bottom trawling within one mile of the shore and in the Chesapeake Bay or bays behind the Atlantic barrier islands.¹⁵

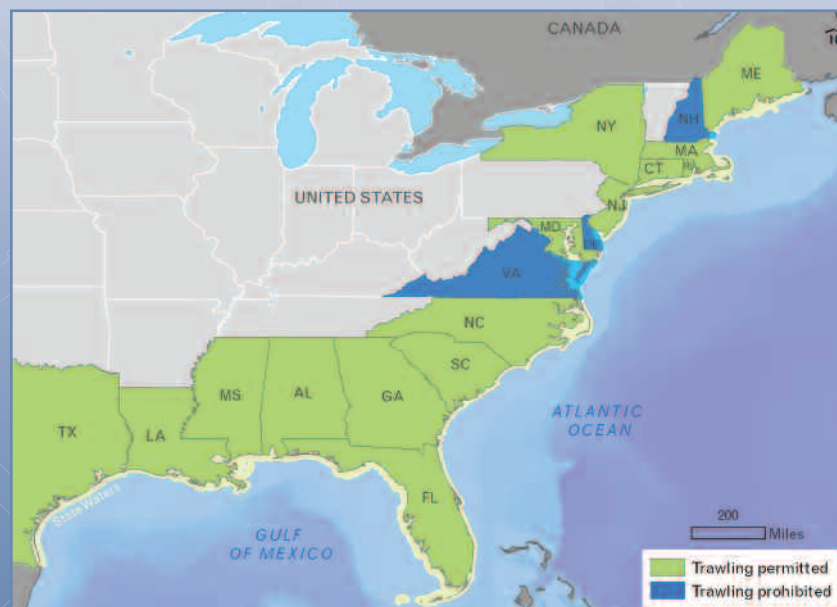


Figure 2: Atlantic and Gulf Coast States with Complete Bans on Trawling

Sea Turtle Protection under the Endangered Species Act

All six sea turtle species in U.S. waters are threatened with or in danger of extinction and are therefore protected by the Endangered Species Act (ESA). As a result, any “take” of sea turtles without government authorization is illegal. The term “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct.¹⁶ Therefore, any interactions between sea turtles and fisheries are “takes” under the ESA and are illegal without government authorization.

For federal fisheries, this authorization is an Incidental Take Statement (ITS). The ITS is given to the fishery as a whole, not to individual fishermen. An ITS is based on a finding that the activities under consideration – in this case fishing – will not cause “jeopardy” to a species, thus allowing the permitted action to continue. Jeopardy, in terms of the ESA, “occurs when an action is reasonably expected, directly or indirectly, to diminish a species’ numbers, reproduction or distribution so that the likelihood of survival and recovery in the wild is appreciably reduced.”¹⁷ In state fisheries, authorization to take sea turtles is granted through an ESA Section 10 Incidental Take Permit.

The sea turtle species most likely to be taken in Atlantic Ocean and Gulf of Mexico trawl fisheries are loggerhead, Kemp’s ridley, leatherback and green.

*Kemp’s ridley, **Lepidochelys kempii***

ESA Status: Endangered



*Loggerhead, **Caretta caretta***

ESA Status: Threatened



*Green, **Chelonia mydas***

**ESA Status: Endangered (Florida & Mexico's Pacific coast breeding colonies)
Threatened (all other populations)**



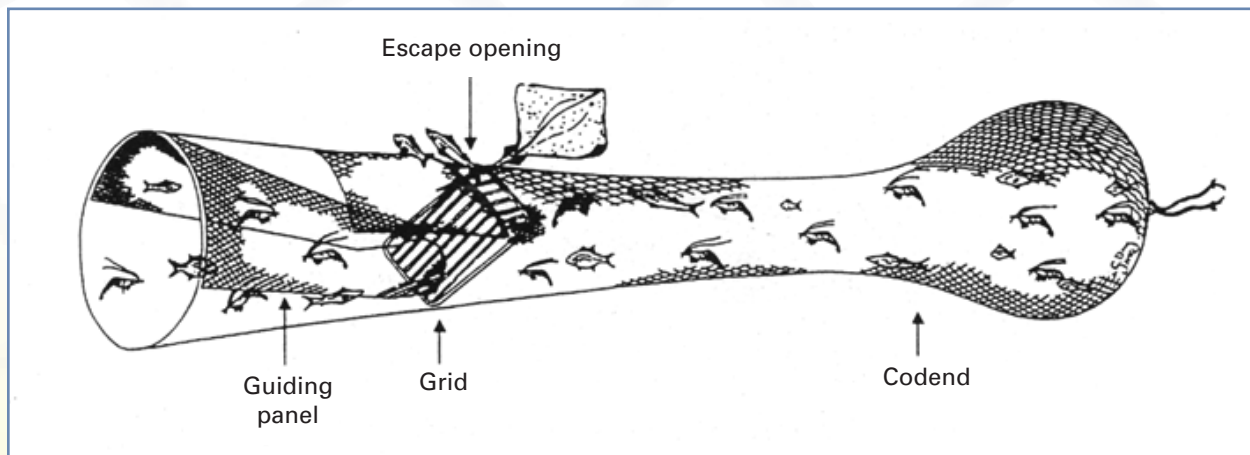
*Leatherback, **Dermochelys coriacea***

ESA Status: Endangered

The History of Turtle Excluder Devices

In the 1980s, an estimated 5,000-50,000 loggerhead and 500-5,000 Kemp's ridley sea turtles died annually in shrimp trawls.¹⁸ To address sea turtle bycatch in this fishery, the National Marine Fisheries Service spent the 70's and 80's designing and testing turtle excluder devices (TEDs) for shrimp trawls. A TED is a grid of bars in the neck of the net with an opening, reminiscent of an escape hatch. The bars are spaced far enough apart to allow shrimp and fish to pass through to the tail of the net while allowing large species, such as sea turtles, to escape from the net through the opening.

**NETS EQUIPPED WITH PROPERLY
FUNCTIONING TEDS COULD LEAD
TO A 97 PERCENT REDUCTION IN
SEA TURTLE NET ENTRAPMENT**



*Figure 3: Example of a Turtle Excluder Device*¹⁹

Studies showed that trawl nets equipped with properly functioning TEDs could lead to a 97 percent reduction in sea turtle net entrapment.²⁰ As a result, in 1992 the federal government required all U.S. shrimp trawlers in the Atlantic Ocean and Gulf of Mexico to use TEDs in all waters, during all seasons.²¹ These regulations were altered in 2003 to require a larger TED opening, which allows larger turtles to escape from the net.²²

The summer flounder fishery also was required to begin using TEDs in 1992. The regulations for this fishery require TEDs in the offshore waters between Cape Charles, Virginia, and the North Carolina/South Carolina border and include a seasonal exemption from the TED requirement north of Oregon Inlet, North Carolina, from January 15 through March 15.

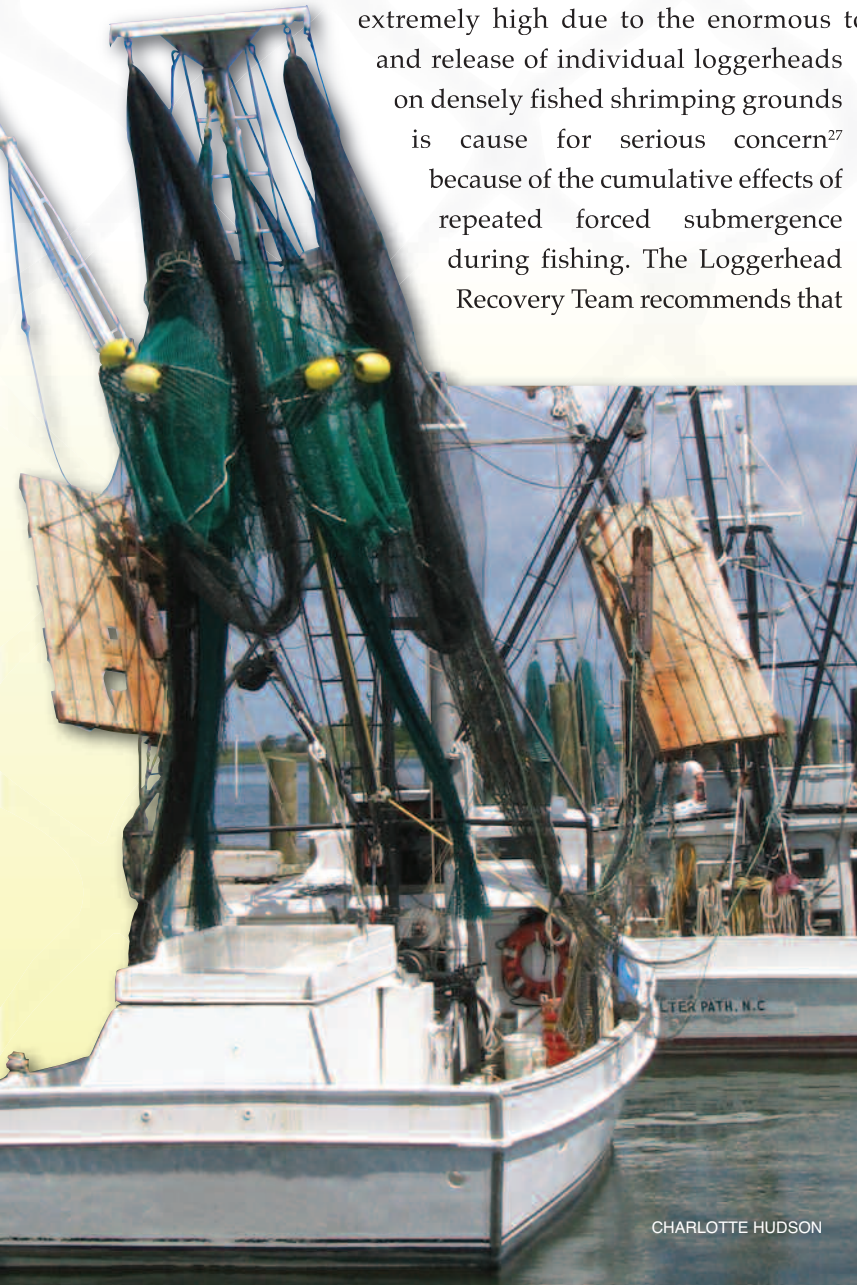
While TEDs reduce the lethal effects of sea turtle bycatch in trawls, the sea turtles' forced submergence and ejection through a TED can still cause stress and injury. These interactions are considered "takes" under the Endangered Species Act and therefore must be reduced to as few as possible.

The Current Situation

Because fishery interactions are one of the primary factors interfering with the recovery of sea turtles in the Atlantic Ocean and Gulf of Mexico, the National Marine Fisheries Service (NMFS) initiated a gear-based approach to address bycatch in 2001, known as the Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic Ocean and Gulf of Mexico Fisheries.²³ As part of the Strategy, NMFS identified trawls as a priority and announced it was considering a requirement for the use of Turtle Excluder Devices (TEDs) in trawls beyond the shrimp and summer flounder fisheries.²⁴

Even though “NMFS has identified trawl gear as a priority for reducing sea turtle bycatch,”²⁵ further implementation of the Strategy has stalled. NMFS only requires the shrimp and summer flounder trawl fisheries to use TEDs. Although for these two fisheries, the evidence is clear that TEDs alone are not sufficient to protect sea turtles.

Estimated bycatch of loggerheads in the southeast U.S. shrimp fishery remains extremely high due to the enormous total effort.²⁶ In addition, the repeated capture and release of individual loggerheads on densely fished shrimping grounds is cause for serious concern²⁷ because of the cumulative effects of repeated forced submergence during fishing. The Loggerhead Recovery Team recommends that



CHARLOTTE HUDSON



NOAA

U.S. Requirements for Shrimp Imports

Motivated by concerns about sea turtles abroad and a competitive disadvantage to U.S. shrimpers, environmental organizations and the shrimp fishing industry lobbied Congress to extend the use of TEDs to foreign shrimp trawlers. In 1989, Congress passed a law that said after a three year grace period, shrimp from countries that did not demonstrate a level of sea turtle protection equal to that of the U.S. were banned from import.²⁸ While the U.S. has clearly taken protection of sea turtles from shrimp fisheries seriously, domestically and abroad, it has failed to prevent sea turtle casualties by other trawl fisheries.

the “overcapacity in the shrimp fishery should be addressed through a limited entry permit system, effort reduction through time/area closures or other approaches that reduce total trawl hours.”²⁹ The shrimp fishery is an ideal candidate for a limited entry system because even with a reduction in effort over recent years, landings have remained relatively constant. With less trawling, and therefore less bycatch, the fishery could still catch approximately the same amount of shrimp.

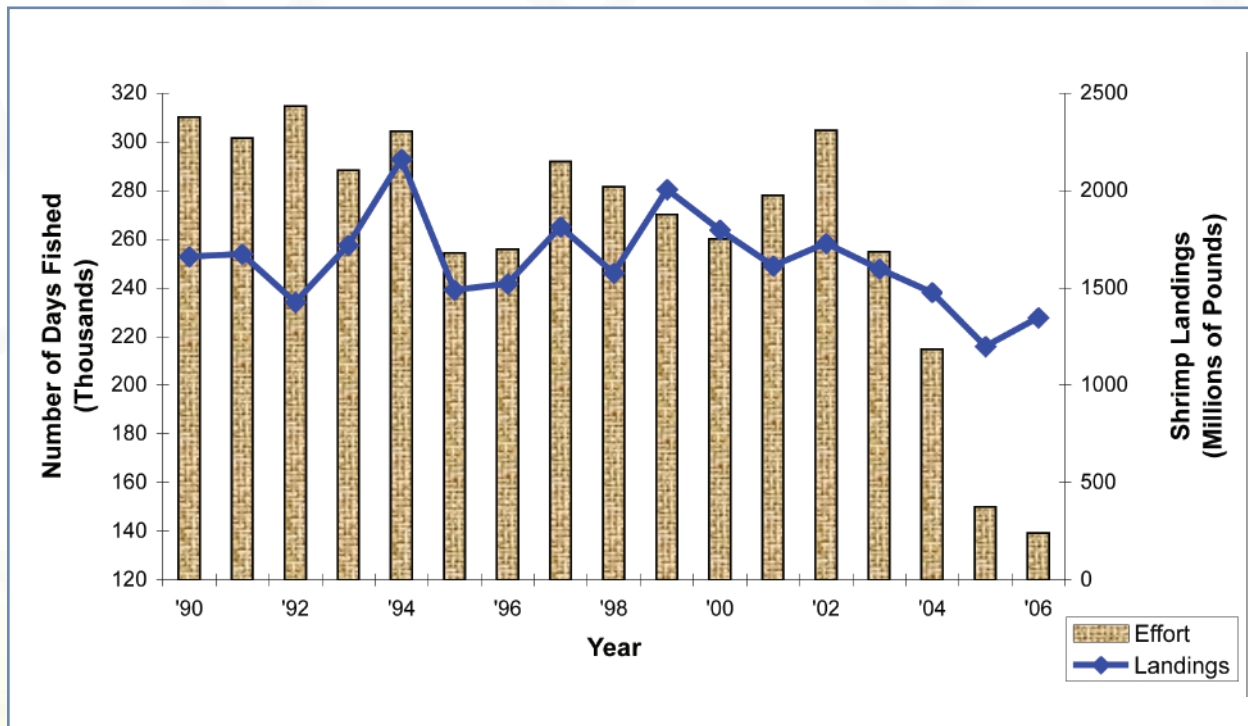


Figure 4: Gulf of Mexico Trawl Shrimp Fishery: 1990-2006 Effort and Landings Data ^{30, 31}

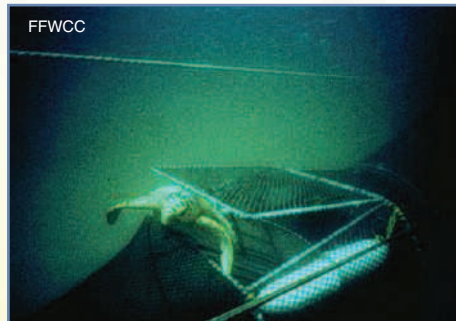
Figure 5: A History of Turtle Excluder Devices in Atlantic Ocean and Gulf of Mexico Trawl Fisheries

1978	1992	1999	2000	2001
NMFS charged with the creation of a device which will prevent turtles from being incidentally taken in shrimp trawls. Over the next few years, the TED is developed, tested and refined.	TED regulations are put in place for all shrimp trawls and for vessels using bottom trawls to fish for summer flounder in specific times and areas off Virginia and North Carolina.	<p>A flaw in the current TEDs system is cited when NMFS publishes a report showing many loggerheads and green sea turtles are too large to fit through regulation sized TED openings.</p> <p>Development of TEDs for the flynet fishery begins.</p>	<p>NMFS issues an Advance Notice of Proposed Rulemaking to expand the size of TED escape openings.</p> <p>Due to documented sea turtle interactions within the whelk trawl fishery, NMFS began evaluating potential TED designs for the fishery.</p>	<p>NMFS announces its “Strategy aimed at addressing the incidental capture of turtles in commercial and recreational fisheries.”</p> <p>The whelk TED passed the NMFS testing protocol in 2001.</p>

Unfortunately, the size of the TED required in the summer flounder fishery was not increased when the regulations went into effect for the shrimp fishery, and therefore remains too small to allow the escape of large sea turtles. Furthermore, the requirement does not apply to all areas where sea turtle interactions could be occurring. Immediate regulatory changes are needed to close these loopholes and require properly sized TEDs in all trawls targeting summer flounder in times and areas where sea turtles are present.

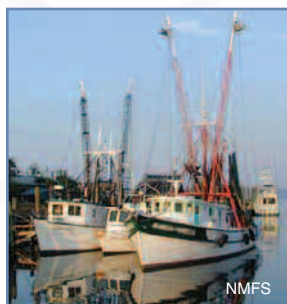
ALTHOUGH TEDS HAVE BEEN DESIGNED TO ADDRESS BYCATCH, TRAWL FISHERIES CONTINUE TO OPERATE IN AREAS KNOWN TO HAVE SEA TURTLES WITH NO REQUIREMENT FOR TEDS

Sea turtle bycatch in trawl fisheries is not only occurring in the shrimp and summer flounder fisheries. TEDs have been designed to address bycatch in many other fisheries, including whelk, calico scallop, sea scallop and flynet, which target Atlantic croaker, weakfish and other finfish,³² and are currently even required by some states. For example, the state of Georgia put TED requirements in place for whelk and jellyfish trawls in 2000 and 2002, respectively. Although the technology is clearly available, trawl fisheries continue to operate in areas known to have sea turtles with no requirement for TEDs. NMFS currently claims to be considering implementing additional TED requirements for the trawl fisheries where sea turtles are present. In February 2007, NMFS announced an Advanced Notice of Proposed Rulemaking, but has yet to issue a new proposed rule.



2003	2005	2006	2007	Present
NMFS publishes final rule increasing regulation sized TED openings for the shrimp fishery to 32 inches by 32 inches in all waters.	NMFS begins testing the feasibility of TED use in the sea scallop trawl fishery and initial results show that TED use in the sea scallop trawl fishery is feasible.	NMFS releases reports showing the extent of loggerhead sea turtle bycatch in Mid-Atlantic bottom otter trawl and scallop trawl gear.	In February, NMFS issues an Advance Notice of Proposed Rulemaking to announce it is considering amendments to current TED regulations including increasing the size of the opening in the summer flounder TED and requiring the use of TEDs in additional trawl fisheries.	NMFS only requires TEDs in two fisheries and sea turtles are still dying in trawls.

Sea Turtle Bycatch in Trawls in the Mid-Atlantic Region



Information on sea turtle bycatch in all trawl fisheries is limited due to inadequate funding for fisheries observers who are unbiased trained scientists that ride along with commercial fishermen to document what is caught at sea. Fisheries observer coverage is especially lacking in state fisheries. However, because of increased observer coverage in specific Mid-Atlantic trawl fisheries, the National Marine Fisheries Service (NMFS) has issued bycatch estimates for these fisheries. The Mid-Atlantic can be used as a case study since the best information available is from that region.

Because scallop trawls fish closer to the ocean bottom, travel at different speeds and have a different net design, their bycatch rate is different from trawls targeting fish.³³ NMFS analyzed scallop trawl bycatch data separately from the remaining trawl fisheries in the Mid-Atlantic region. The scallop trawl fishery captures an estimated 154 sea turtles a year, 20 of which are assumed dead.³⁴

In other Mid-Atlantic trawl fisheries, turtle interactions from 1994 to 2004 were observed in trawls targeting six species groups: summer flounder, croaker, weakfish, long-finned squid, groundfish and short-finned squid.³⁵ It is important to note that the lack of observed turtle interactions on vessels targeting fish species other than these may be due to lower observer coverage levels for that particular sector of the trawl fishery, and not necessarily because of an absence of turtle interactions.³⁶

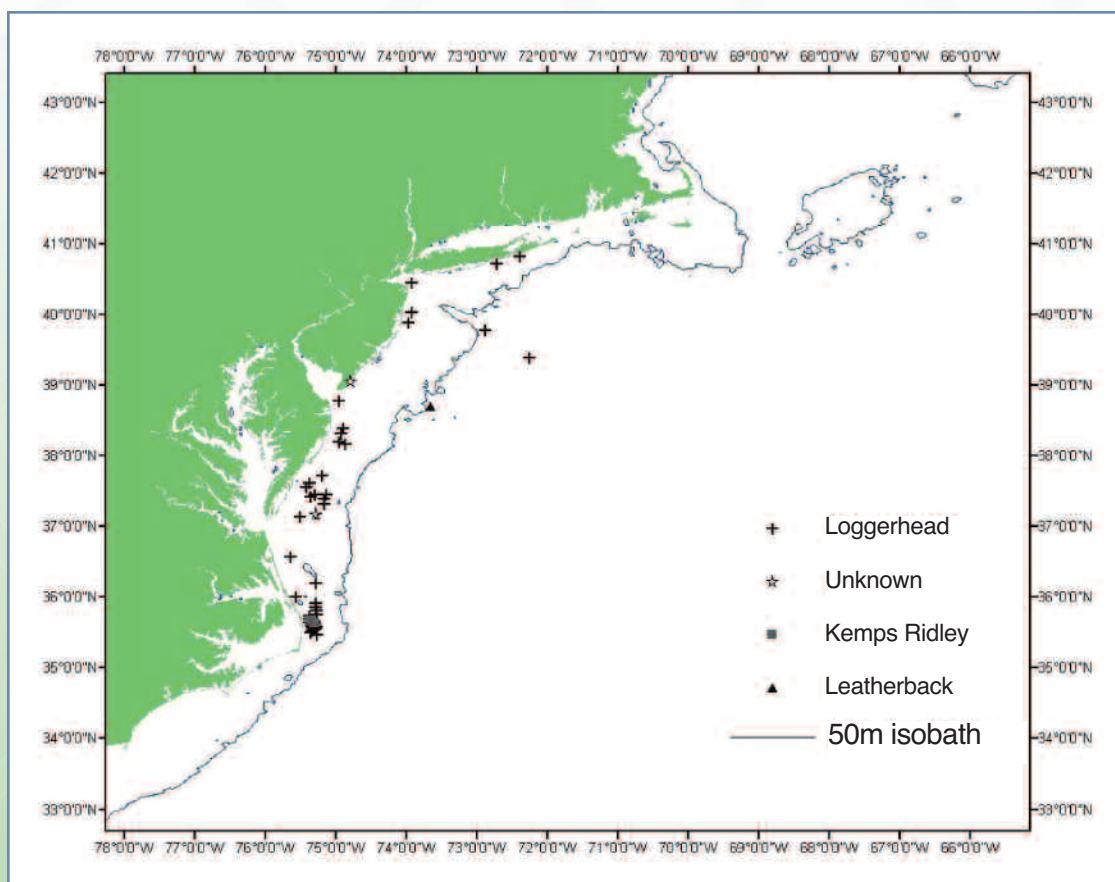
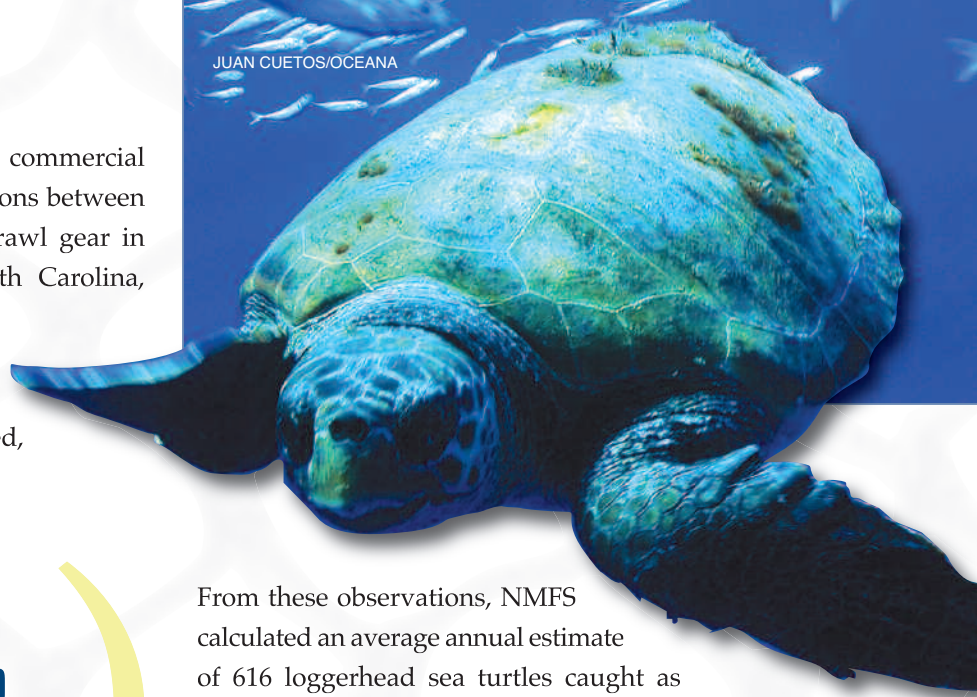


Figure 6: Distribution of Observed Turtle Interactions by Species in Bottom Otter Trawl Gear 1994-2004³⁷

From 1994 to 2004, observers aboard commercial fishing vessels documented 66 interactions between loggerhead turtles and bottom otter trawl gear in the region from Cape Hatteras, North Carolina, to Long Island, New York (Figure 6).³⁸ Of the 66 observed loggerhead interactions, forty-three percent of the loggerheads found were dead, injured, resuscitated or in unknown condition.³⁹



AN AVERAGE OF 770 SEA TURTLES ARE CAPTURED EACH YEAR IN MID-ATLANTIC TRAWL FISHERIES

From these observations, NMFS calculated an average annual estimate of 616 loggerhead sea turtles caught as bycatch in the Mid-Atlantic.⁴⁰ Forty-three percent of those animals, or 265 loggerheads, are assumed to be dead or seriously injured.

	Turtles Captured	Turtles Killed/Seriously Injured
Scallop Trawl	154	20
Other Otter Trawls	616	265
Total	770	285

Figure 7: Average Number of Sea Turtles Captured and Killed in the Mid-Atlantic Trawl Fisheries Annually^{41, 42}

Combining the otter trawl and scallop trawl bycatch estimates for the Mid-Atlantic, an average of 770 sea turtles are captured each year in trawl fisheries. The scallop trawl fishery is responsible for 154 of the captures⁴³ and the other bottom otter trawls are responsible for the remaining 616.⁴⁴

Although sea turtle bycatch in trawl fisheries is a problem across the entire Mid-Atlantic region, bycatch rates in some times and areas are higher than others. The highest bycatch rates in bottom otter trawl gear from 1994 to 2004 occurred in shallow waters (<50 m) of the southern Mid-Atlantic (between 34°N and 38°59'N).⁴⁵ In addition, bycatch rates are especially high off of Cape Hatteras during the winter months and off the mouth of the Delaware Bay during the late summer and fall. Recent studies show that sea turtles forage in these areas during certain times of the year,^{46, 47} resulting in increased bycatch during periods when trawling is conducted in feeding grounds.

SEASONAL MIGRATIONS ALONG THE COAST PUT LOGGERHEADS DIRECTLY IN THE PATH OF TRAWL FISHERIES, RESULTING IN A LARGE NUMBER OF CASUALTIES

past few years. In addition, not a single state trawl fishery, excluding shrimp, has an ITP even though several fisheries have high levels of sea turtle bycatch.

It is important to reemphasize the fact that unless federal and state trawl fisheries that take sea turtles possess an Incidental Take Statement (ITS) or Incidental Take Permit (ITP), respectively, any interaction they may have with a sea turtle is illegal. However, with the exception of the scallop trawl fishery, the ITS levels for the federal Mid-Atlantic trawl fisheries have not been updated, even though new bycatch information has become available over the

Atlantic Croaker Trawl Fishery

Many turtle interactions have been documented off the Outer Banks of North Carolina in winter, when turtles are associated with warm Gulf Stream waters occurring over shallow areas (<70 m) of the continental shelf.⁴⁸ These favorable temperature and depth regimes put the concentrated population at risk for interaction with fishing gear.⁴⁹

During four observed fishing trips in the Atlantic croaker fishery, there were 14 loggerhead turtles caught off the North Carolina coast in January 2007 (Figure 8).⁵⁰ One vessel caught 5 turtles in a single trip. Since this fishery has not been issued an Incidental Take Permit, it is illegal for vessels to catch any amount of sea turtles. Nevertheless, despite this clear violation of the Endangered Species Act, NMFS has taken no action.

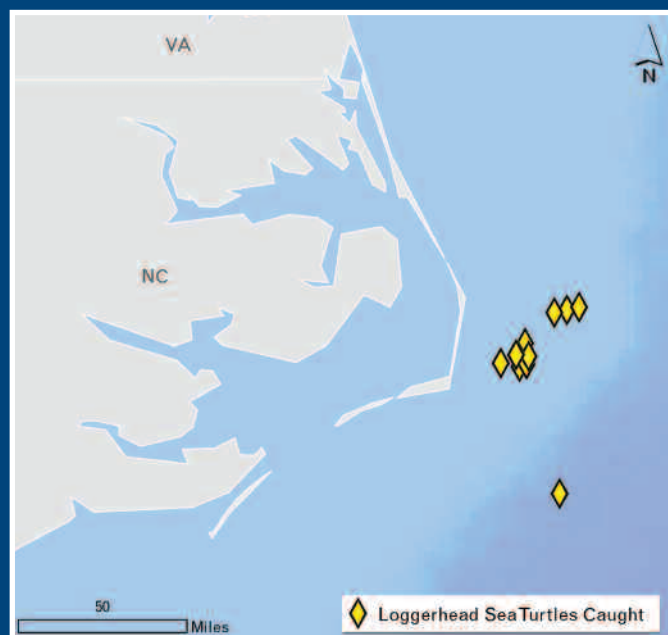



Figure 8: Observed Loggerhead Sea Turtle Catches Off of Cape Hatteras, North Carolina in the Atlantic Croaker Trawl Fishery, January 2007⁵¹



**INCIDENTAL CAPTURE IN
COMMERCIAL AND ARTISANAL
FISHERIES IS THE MOST SIGNIFICANT
MAN-MADE FACTOR AFFECTING
THE CONSERVATION AND RECOVERY
OF LOGGERHEADS**

JUAN CUETOS/OCEANA

Loggerheads at Risk

Loggerheads are widely distributed throughout temperate and sub-tropical waters worldwide. In the U.S., loggerhead nesting occurs primarily along the southeastern coast. As coastal waters warm, loggerheads migrate north, reaching waters off Virginia as early as April and their northern-most foraging grounds in the Gulf of Maine by June. By mid-September most loggerheads begin to move south again, but some remain in the Mid-Atlantic and Northeast area until late fall.⁵² These seasonal migrations along the coast put loggerheads directly in the path of trawl fisheries, resulting in a large number of casualties.

Although loggerheads are listed as threatened under the Endangered Species Act, the number of females nesting continues to decline. According to the most recent Five-Year Review of Loggerheads released by the Federal government, all nesting subpopulations in the western North Atlantic, where trend data is available, are experiencing significant declines.⁵³ The most startling declines are occurring in Florida, where nesting numbers have dropped by 50 percent in the past decade.⁵⁴ Incidental capture in commercial and artisanal fisheries is the most significant man-made factor affecting the conservation and recovery of loggerheads.⁵⁵ Loggerhead populations simply cannot withstand the continued unmitigated impacts of trawl fisheries.

Conclusions and Recommendations

The National Marine Fisheries Service (NMFS) has been aware of the impacts of bottom trawling on threatened and endangered sea turtles for decades. Despite this knowledge and the requirements of the Endangered Species Act, NMFS has knowingly ignored its responsibilities to protect sea turtles from bottom trawling along the Atlantic Ocean and Gulf Coasts of the U.S., violating federal law.

Immediate action is needed to drastically reduce the impact of trawl gear on sea turtles. The ideal action would be to have all trawl gear pulled from the water at times when and places where sea turtles are likely to be present.

At a Minimum, the Following Must Be Done Promptly:

1. **NMFS must require the use of properly sized TEDs in all trawl fisheries operating in seasons or locations where sea turtles are thought to be present. This includes all state and federal waters, all types of trawls and all target species.**
2. **TED regulations must be paired with adequate enforcement and observer coverage.**
3. **In addition to requiring TEDs, which do not reduce the number of interactions with fishing gear, just the severity, NMFS should require time and area closures for at least locations with high sea turtle abundance.**



JUAN CUETOS/OCEANA

END NOTES

- ¹ NOAA. "Endangered and Threatened Wildlife; Sea Turtle Conservation Requirements." Fed. Reg. 72:31. Feb. 15, 2007. p. 7383.
- ² Ibid.
- ³ Murray, Kimberly. 2006. Estimated Average Annual Bycatch of Loggerhead Sea Turtles (*Caretta caretta*) in U.S. Mid-Atlantic Bottom Otter Trawl Gear, 1996-2004. Northeast Fisheries Science Center Reference Document 06-19. p.12.
- ⁴ Murray. 2006. p. 11.
- ⁵ Wallace, B.P., Heppell, S.S., Lewison, R.L., Kelez, S. and Crowder, L.B. 2008 Impacts of fisheries bycatch on loggerhead turtles worldwide inferred by reproductive value analyses. *Journal of Applied Ecology*. Vol 45, p. 1076-1085.
- ⁶ National Marine Fisheries Service and U.S. Fish and Wildlife Service. DRAFT Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (*Caretta caretta*) Second Revision. 2008.
- ⁷ Alverson, D.L., Freeberg, M.H., Pope, J.G., Murawski, S.A. 1994. A global assessment of fisheries bycatch and discards. FAO Fisheries Technical Paper. No. 339. Rome, FAO. 233p.
- ⁸ Fisheries Research Services. 2008. "Description of Commercial Gears." Accessed May 19, 2008. <http://www.marlab.ac.uk/Delivery/standalone.aspx?contentid=413>.
- ⁹ Ibid.
- ¹⁰ North Carolina Division of Marine Fisheries (NCDMF). 2004. Assessment of North Carolina Commercial Finfisheries, 2000-2003. Morehead City (NC): Division of Marine Fisheries, Final Performance Report for Award Number NA 06 FI 0321 1-3.
- ¹¹ NOAA Fisheries: Office of Protected Resources. Sea Turtle Strategy: State Trawl Gear Reports. Accessed May 8, 2008. <http://www.nmfs.noaa.gov/pr/species/turtles/rawl.htm>.
- ¹² Office of Marine Fisheries, Mississippi Department of Marine Resources. Mississippi Trawl Gear Characterization.
- ¹³ National Marine Fisheries Service, Northeast Regional Office. 2008. Endangered Species Act Section 7 Consultation on the Atlantic Sea Scallop Fishery Management Plan [Consultation No. F/NER/2007/00973].
- ¹⁴ NOAA Fisheries: Office of Protected Resources. Sea Turtle Strategy: State Trawl Gear Reports. Accessed May 8, 2008. <http://www.nmfs.noaa.gov/pr/species/turtles/rawl.htm>.
- ¹⁵ MD. REGS. CODE tit. 08.02, § 05.03 (2004).
- ¹⁶ 16 U.S.C. §1532(19).
- ¹⁷ US Fish & Wildlife Service. Endangered Species Section 7 (a)(2) Consultation Process 2008. Accessed June 24. <http://www.fws.gov/midwest/Endangered/section7/section7.html>.
- ¹⁸ NMFS and FWS, 2008.
- ¹⁹ Food and Agriculture Organization of the United Nations. Fisheries and Aquaculture Department. 2008. Equipment Fact Sheet: Turtle Excluder Device. Accessed May 9, 2008. <http://www.fao.org/fishery/equipment/ted>.
- ²⁰ Cox, T.M., Lewison, R.L., Żydelis, R., Crowder, L.B., Safina, C. and A.J. Read. 2007. Comparing Effectiveness of Experimental and Implemented Bycatch Reduction Measures: the Ideal and the Real. *Conservation Biology* (21)5. pp. 1158.
- ²¹ Ibid.
- ²² NOAA. "Endangered and Threatened Wildlife; Sea Turtle Conservation Requirements." Fed. Reg. 72:31. Feb. 15, 2007. p. 7383.
- ²³ NOAA. "Endangered and Threatened Wildlife; Sea Turtle Conservation Requirements." Fed. Reg. 72:31. Feb. 15, 2007. p. 7382.
- ²⁴ Ibid.
- ²⁵ Ibid.
- ²⁶ NMFS and FWS, 2008.
- ²⁷ NMFS and FWS, 2008. p. 153.
- ²⁸ Public Law 101-162, Section 609.
- ²⁹ NMFS and FWS, 2008.
- ³⁰ Nance, J. 2008. Gulf of Mexico Total Shrimp Effort. Personal Communication.

- ³¹ NMFS. 2007. Annual Commercial Landings Statistics. Available online at http://www.st.nmfs.noaa.gov/st1/commercial/landings/annual_landings.html.
- ³² NOAA. "Endangered and Threatened Wildlife; Sea Turtle Conservation Requirements." Fed. Reg. 72:31. Feb. 15, 2007. p. 7383.
- ³³ Murray, K.T. 2004. Bycatch of sea turtles in the Mid-Atlantic sea scallop (*Placopecten magellanicus*) dredge fishery during 2003. 2nd ed. U.S. Dep. Commer, Northeast Fish. Sci. Cent. Ref. Doc. 04-11; p. 13.
- ³⁴ NMFS/NERO. 2008.
- ³⁵ Murray. 2006.
- ³⁶ Ibid.
- ³⁷ Ibid.
- ³⁸ Ibid.
- ³⁹ Ibid.
- ⁴⁰ Ibid.
- ⁴¹ Ibid.
- ⁴² NMFS/NERO. 2008.
- ⁴³ Ibid.
- ⁴⁴ Murray. 2006.
- ⁴⁵ Ibid.
- ⁴⁶ Hawkes, L.A., Broderick, A.C., Coyne, M.S., Godfrey, M.H., Godley, B.J. 2007. Only Some Like it Hot-Quantifying the environmental niche of the loggerhead sea turtle. Diversity and Distributions.
- ⁴⁷ Hopkins-Murphy, S.R., Owens, D.W. & Murphy, T.M. Ecology of immature loggerheads on foraging grounds and adults in interesting habitat in the eastern United States. Loggerhead sea turtles (ed. By A.B. Bolten and B.E. Witherington), pp.79-92. Smithsonian Books, Washington.
- ⁴⁸ Epperly, S.P., Braun, J., Chester, A.J., Cross, F.A., Merriner, J.V., Tester, P.A. 1995. Winter distribution of sea turtles in the vicinity of Cape Hatteras and their interactions with the summer flounder trawl fishery. Bull Mar Sci 56(2):547-568.
- ⁴⁹ Ibid.
- ⁵⁰ Northeast Fisheries Observer Program. Observed Incidental Take for January 2007. <http://www.nefsc.noaa.gov/femad/fishsamp/fsb/>.
- ⁵¹ Ibid.
- ⁵² NMFS/NERO. 2008. p:18-19.
- ⁵³ National Marine Fisheries Service; Office of Protected Resources and U.S. Fish and Wildlife Service; Southeast Region. 2007. Loggerhead Sea Turtle (*Caretta caretta*) 5-Year Review: Summary and Evaluation. p. 10-12.
- ⁵⁴ Florida Fish and Wildlife Conservation Commission's (FWC) Index Nesting Beach Survey, accessed 5/28/08. http://research.myfwc.com/features/view_article.asp?id=27537.
- ⁵⁵ NMFS. 2007. p. 36.



Oceana campaigns to protect and restore the world's oceans. Our teams of marine scientists, economists, lawyers and advocates win specific and concrete policy changes to reduce pollution and to prevent the irreversible collapse of fish populations, marine mammals and other sea life. Global in scope and dedicated to conservation, Oceana has campaigners based in North America (Washington, DC; New York, NY; Juneau, AK; Anchorage, AK; Monterey, CA; Portland, OR; St. Petersburg, FL and Boston, MA), Europe (Madrid, Spain; Brussels, Belgium) and South America (Santiago, Chile). More than 300,000 members and e-activists in over 150 countries have already joined Oceana. For more information, please visit www.Oceana.org.



www.oceana.org