

# The Science and Policy Behind Proposed Sea Turtle Conservation Measures

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## Abstract

*In recent months, two major actions have been initiated that may change the landscape of sea turtle conservation and potentially ignite controversy. The first action involves an October 2001 proposal by the National Marine Fisheries Service's to substantially amend Turtle Excluder Device regulations. The extended public comment period for this proposal concluded on February 15, 2002. In the other action, two environmental groups jointly filed a petition on January 10, 2002, to list certain subpopulations of loggerhead sea turtles (*Caretta caretta*) as endangered. Both the petition and the proposal result from public concern and scientific evidence that current conservation measures are not sufficient to allow recovery of some sea turtle populations, mostly likely loggerhead and perhaps leatherback and green turtles as well.*

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## Background

All sea turtles that traverse U.S. waters are listed under the Endangered Species Act of 1973 (ESA). The Kemp's ridley (*Lepidochelys kempi*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) turtles are listed as endangered. The loggerhead (*Caretta caretta*), olive ridley (*Lepidochelys oliveacea*), and green (*Chelonia mydas*) turtles are listed as threatened, with the exception of two breeding populations of green turtles and one breeding population of olive ridley turtles, which are listed as endangered.

The National Research Council (1990) reported that in U.S. waters shrimp trawling is the primary source of anthropogenic mortality for sea turtles. The Council estimated that during the 1980s shrimp trawling drowned 44,000 loggerhead and Kemp's ridley turtles each year. In order to reduce this mortality, National Marine Fisheries Service (NMFS) mandated the voluntary use of Turtle Excluder Devices (TEDs) in 1987; these regulations became compulsory in 1990.

This regulation and subsequent

amendments require most shrimp and summer flounder trawlers, operating in the Southeastern U.S., to have a NMFS-approved TED installed in each net. A TED consists of an angled barrier, known as a grid, which has vertical slots wide enough to allow shrimp to pass into the net bag but narrow enough to deflect turtles out of an escape opening in the net (Figure 1). NMFS has certified a number of TED designs, which must exclude 97% of the sea turtles that enter the net. In addition, the escape opening, when stretched to form a triangle, must meet or exceed certain parameters. Along the Atlantic Coast the required width is 35 inches and the height is 12 inches; in the Gulf of Mexico the required width is 32 inches and the height is 10 inches (Federal Register 1992).

The use of TEDs, in combination with other conservation measures, appear to be partially successful in helping to recover sea turtle populations. The Turtle Expert Working Group (2000) found that the population size of Kemp's ridley turtles is increasing exponentially. However, this same report found that of the four

genetically distinct subpopulations of loggerhead turtles, only one is stable or increasing, the status of two are unknown, and the northern subpopulation has been declining since the 1970s. This downward population trend in the northern subpopulation, which ranges from North Carolina to northeast Florida, factors significantly into the activities of recent months.

## Science: population trends and fisheries bycatch

In 1980, the South Carolina Department of Natural Resources (SCDNR) began monitoring loggerhead nesting activity because the state has an extensive population of these threatened turtles (Figure 2). The quality long-term data generated from studies in South Carolina comprises a significant portion of the available knowledge about loggerhead populations, which is one of the better-studied sea turtle species. Thus this data is widely used in making policy decisions that often have ramifications for other sea turtle species, as is the case with the proposed TED regulations.

SCDNR conducted ground and aerial beach surveys on a five-year

cycle that entailed three consecutive survey years followed by two non-survey years. A female loggerhead typically nests every two or three years, so this survey design monitored approximately 83% of the nesting population. For the survey years of 1980-82, there were on average less than 5,500 nests statewide. This number decreased to about 4,000 for both the 1985-87 and 1990-92 surveys. The 1995-97 surveys revealed a further decline to less than 3,000 nests. Notably, for the first and third intervals, nesting effort diminished in excess of 25%, which represents a reduction of over 5% each year. Despite variance in nesting intensity and hurricane effects, this downward trend was determined to be statistically significant, thus indicating a true change in the overall population size (Hopkins-Murphy et al. 2001).

In an effort to determine the possible causes of loggerhead population decline, SCDNR categorized the beach survey areas as undeveloped, developed, or mixed-use. The rate of decline was consistent across these categories, which suggests that suitable nesting habitat is readily available (Hopkins-Murphy et al. 2001). This finding is in contrast to a pervasive public misconception that loss of nesting habitat is the cause of declining sea turtle populations. To the contrary, 36% of South Carolina's nesting beaches are protected from development. Furthermore, in South Carolina 70% of the nesting effort is included in nest protection projects, with hatching levels that have exceeded the 60% hatching success goal stated in the Loggerhead Turtle Recovery Plan (Hopkins-Murphy et al. 1999). Moreover, Crouse et al. (1987) used a population model to show that the reproductive value of sub-adults and adults is far greater than hatchlings. In other words, in comparison to older life stages, the mortality of hatchlings has substantially



**Figure 1. Turtle excluder device (TED) manufactured by Saunders Marine Machine Shop. The oval metal ring and bars deflect the turtles. The cut in the netting is where the trap door will be placed. The bars force a turtle to the trap door which will open allowing the turtle to go free. Photo by Bob Williams, NOAA.**

less impact on the population growth rate. Given the sum of this informa-

tion, mortality in the South Carolina trawl fisheries warrants examination.

Unlike other states, South Carolina has a good history of TED use, so the data are not overly biased by non-compliance. In 1988, South Carolina became the first state to enact regulations requiring the use of TEDs. By 1991, when TED regulations went into full force, most trawlers were in compliance with the law. Accordingly, in the years that followed, the number of strandings (i.e. dead sea turtles found along the shore) decreased by nearly two-thirds. However, the percent composition of strandings changed as well, less sub-adult turtles and more adult female turtles were found dead. This shift toward adult females, which are larger than subadults and reproductively active, indicates that TEDs may not exclude larger, more reproductively-valuable turtles. Thus this shift could explain the continued population decline (Hopkins-Murphy et al. 2001).

On behalf of NMFS, Epperly and Teas (1999) conducted a study in which they compared the sizes of



**Figure 2. North Inlet - Winyah Bay National Estuarine Research Reserve. Loggerhead sea turtles nest on South Carolina beaches from May to August. Adult and juvenile sea turtles can be observed in South Carolina estuaries during most months of the year where they feed on a variety of shellfish. Source: NOAA Photo Library.**

stranded turtles throughout the southeastern U.S. waters to the minimum opening sizes of TEDs. For the study they used data gathered by volunteers for the Sea Turtle Stranding and Salvage Network (STSSN), an organization that recovers and documents the condition of turtles stranded along the U.S. coast. These records typically include the length and width of the carapace (i.e. the upper shell) but not the body depth. In order to estimate the body depth for the STSSN data set, Epperly and Teas used data from captive and nesting turtles to create a predictive equation that could generate the body depth if provided the carapace length. The results of this comparative study, which used STSSN data from 1986-1997, shows that only 1% of stranded loggerhead turtles had a carapace width that exceeded the minimum TED opening width. However, as many as 47% of stranded loggerhead turtles and 7% of green turtles had body depths that exceeded the minimum TED height. In the last three years of the analysis, nearly 1300 stranded turtles exceeded the minimum TED opening size (Epperly and Teas 1999).

Shrimp trawling, however, is not the only fishery that takes sea turtles as bycatch. A recent study examines the effect of potential sea turtle conservation measures in the Atlantic longline fishery, as well as the shrimp trawl fishery on sea turtle population growth (Epperly et al. 2001a, 2001b). The longline fishery incidentally captures both loggerhead and leatherback turtles; however, due to data availability, this study focuses on loggerheads. The researchers use a computer model to determine the life stage and management action, most likely to stabilize or increase the Atlantic loggerhead population. Based on data from other studies, the model uses three population growth rates, of which a -3% growth rate is probably the most realistic estimate. In addition,

the model assumes that the proposed TED regulations would increase survival of benthic juveniles and adults by 30%. To explore the potential effects of conservation activities within the longline fishery and an increase in longline fishing effort, the modelers increase and decrease the survival rate of pelagic juvenile loggerheads by 10%. The 10% decrease is the most realistic scenario because increasing fishing effort has most likely increased bycatch levels. Using an initial population growth rate of -3%, the model reveals that simply decreasing mortality in the longline fishery will not allow the recovery of loggerhead populations. Rather in order to achieve a positive population growth rate for loggerheads both longline conservation measures (measures which are yet undetermined, although much research is being conducted) and the proposed TED regulations are necessary (Epperly et al. 2001a, 2001b). Because shrimp trawls kill the life-stages of turtles with the highest reproductive value and simply kill a greater number of turtles, conservation measures in the shrimp trawl fishery have a greater impact on population growth than conservation measures in the longline fishery.

### **Policy: proposed TED regulations**

On October 2, 2001, in response to the mounting scientific evidence that current sea turtle conservation measures are inadequate, NMFS announced its intention to make seven alterations to the existing sea turtle conservation regulations. These amendments would only affect the 15,000 trawlers operating in the Atlantic and Gulf waters of the southeastern U.S. and would (1) require all hard TEDs to have a grid with a minimum inside measurement of 32 inches by 32 inches; (2) require the use of either the double-cover flap TED (which has an escape opening

of at least 56 inches by 20 inches) or the leatherback modification (which has an escape opening with a minimum of 71 inch straight-line stretched mesh) (Figure 3); (3) disallow the use of the hooped hard TED; (4) disallow the use of weedless TEDs and Jones TEDs; (5) disallow the use of accelerator funnels; (6) require bait shrimpers to use TEDs in states where a state-issued bait shrimp license holder can also fish for food shrimp from the same vessel; (7) and require the use of tow time limits on small try nets (Federal Register 2001b).

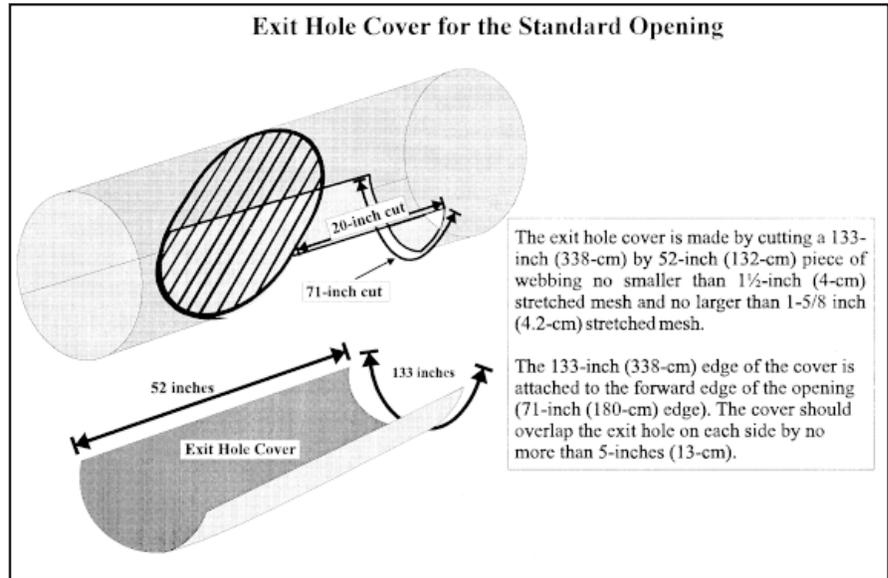
The first three amendments specifically address the scientific evidence that the current size of TED escape openings does not allow the passage of large sea turtles, specifically leatherback turtles and some loggerhead and green turtles. Leatherback turtles can weigh over 1,500 lbs.; all other sea turtles are much smaller. For example, the next largest sea turtle, the loggerhead, weighs up to 250 lbs. (NMFS and USFWS 1991, 1992). In contrast to the hooped hard TED, which would be disallowed under the proposed rule, both the double-cover flap TED and the leatherback modification allow the escape of larger turtles (Federal Register 2001a). By requiring the adoption of these TEDs, NMFS could cease using the Leatherback Contingency Plan (LCP).

The LCP mandates an expensive and inefficient procedure in which NMFS conducts weekly aerial surveys of the leatherback conservation zone during the leatherback annual spring migration from January through June. This unwieldy zone ranges from north of Cape Canaveral, Florida to the southern border of Virginia. If observers sight a congregation of ten or more leatherbacks along a 50-mile transect during replicate surveys, NMFS closes the shrimp trawl fishery in that vicinity for two weeks. A major problem with this

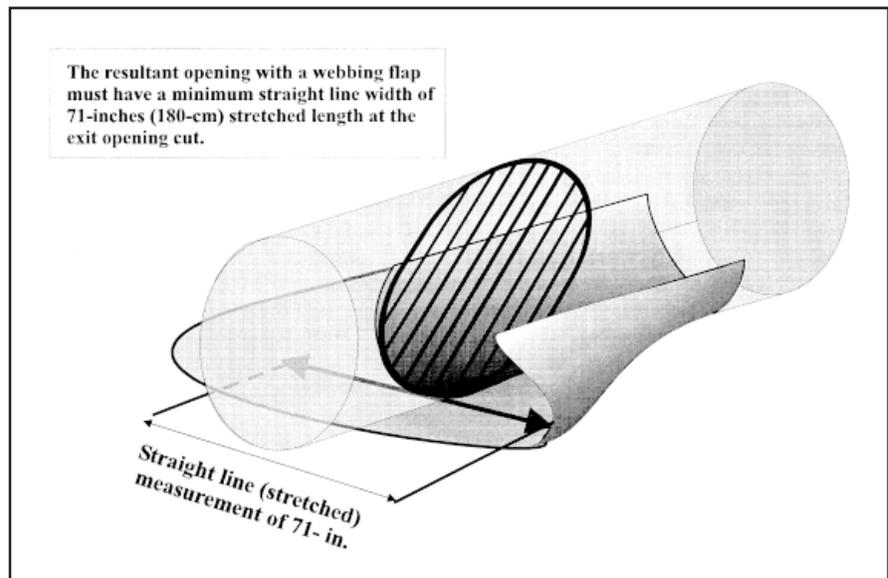
procedure is that replicate surveys are not always possible due to weather, staff availability, and equipment constraints; also, sighting less than ten leatherbacks during a replicate survey does not necessarily indicate that the turtles have left the area. Furthermore, the LCP does not cover the full spatial and temporal distribution of leatherbacks. During non-LCP months in autumn 1999, 15 leatherbacks stranded on the eastern coast of Florida; months into this epidemic NMFS finally issued an emergency closure of the fishery (Federal Register 1999). For the past 15 years, the number of leatherbacks killed in the Western Gulf of Mexico has increased, reaching a high of 21 in 1999. Leatherbacks also strand regularly in the Eastern Gulf; neither the Western nor Eastern Gulf is included in the LCP. The current level of leatherback mortality is alarming, especially given that the nesting effort at the largest leatherback rookery has decreased by over 15% each year since 1987 (Federal Register 2001b). The proposed amendments for TEDs with larger grids and escape openings should prove to be more effective than the present measures for protecting large sea turtles.

The other amendments in the proposed rule seek to improve protection for all sea turtles found along the coast of the southeastern U.S., i.e. Kemp's ridleys, hawksbills, leatherbacks, greens, and loggerheads. The amendments prohibit the use of the weedless TED and Jones TED, both of which have deflector bars that do not attach to the bottom of the grid frame. This modification allows the convenient removal of debris, but the design is structurally weak. A study has shown that if the bars, which are easily bent during trawling, become angled inward the TED will not exclude turtles.

The accelerator funnel, a device that directs and speeds shrimp toward



**Figure 3a. Exit hole covering for the standard TED opening. Diagram from Federal Register XXXXXXXX.**



**Figure 3b. Completed standard TED opening. Diagram from Federal Register XXXXXXXX.**

the net bag, will be disallowed because the funnel would extend out of the larger escape opening, causing the loss of shrimp.

Previously, NMFS has excluded small try nets (i.e. small trawls used to test for the presence of shrimp) from turtle protection regulations. However, observer data document that try nets account for 43% of turtle captures (Federal Register 2001b). Moreover in 2001, shrimpers reported catching more than twenty sea turtles

in their smaller try nets. NMFS recognizes that the proposed trawl time limits for small try nets will be difficult to enforce, but this is the only conservation mechanism currently available for this type of gear.

In the past, NMFS has also exempted bait shrimpers from TED regulations, in the belief that turtles do not drown in this fishery, because trawl times are short so as to catch live undamaged shrimp. But NMFS enforcement and gear specialists have

seen an increase in bait shrimpers that have more than 32 lbs. of dead shrimp on board. This suggests that bait shrimpers are also trawling for food shrimp. NMFS now believes that the bait shrimp exemption is unenforceable, and thus the fishery represents a risk to sea turtle populations and so will be required to use TEDs (Federal Register 2001b).

To date there has been a mixed response to this proposed rule by constituents. Because NMFS extended the comment period, which just ended on February 15, 2002, the Service has not yet responded to the comments it received. However, late last year NMFS did issue a summary of and response to comments it received as a result of an Advanced Notice of Proposed Rule Making. Environmental organizations, federal and state agencies, STSSN volunteers, and concerned citizens support the increase in escape opening size; many of these same groups also recommended modifications to the LCP. The U.S. Fish and Wildlife Service (FWS) suggested the decertification of the hooped hard and weedless TEDs, as well as the abolishment of the bait shrimp exemption. The Georgia Department of Natural Resources recommended that a leatherback modification be adopted universally. In addition, they claimed that 30% of Georgia fishermen already use this modification because it excludes trash fish and the flap covering the escape hole helps retain shrimp. However, Commercial Fishermen of Lafitte, the Florida Fish and Wildlife Conservation Commission, and the Texas Shrimp Association opposed portions of the proposal by respectively, lobbying against the prohibition of the hooped hard TED, questioning the economic burden of the regulations, and questioning the scientific basis of the proposed rule (Federal Register 2001b).

### **Policy: petition for reclassification**

In their concern for sea turtle conservation, two non-governmental groups have taken legal action in order to assure that imperiled loggerhead turtles have the fullest protection that U.S. law provides. On January 10, 2002, the Turtle Island Restoration Network (TIRN) in conjunction with the Center for Biological Diversity (CBD) petitioned NMFS and FWS to list the northern and Florida Panhandle subpopulations of loggerhead turtles as endangered and to designate critical habitat for the species. The petition proposes that not only nesting habitat but also the waters in which sea turtles feed should be declared critical habitat.

In addition to the studies discussed in this article, TIRN and CBD cite the life history of loggerhead turtles as support for their request for reclassification. Although the northern subpopulation represents only 9% of U.S. loggerheads, they are disproportionately important to the health of the entire population (TEWG 2000). This is because nest temperature determines the sex of sea turtles, with warmer temperatures yielding more females; thus the northern population contributes 65% of male U.S. loggerhead turtles. Moreover, female sea turtles possess a strong fidelity for nesting on their natal beaches; migration to new nesting beaches is extremely limited, so colonization or repopulation via dispersal would take thousands of years. This is a particular concern for the Florida Panhandle subpopulation. The available data suggest there are less than 1,000 loggerhead turtles nesting in that subpopulation each year; it is possible that a single catastrophic event could extirpate the entire subpopulation (TEWG 2000). High nesting site fidelity also severely restricts maternal gene flow, so that the mitochondrial DNA profile of separate populations is distinctly different (TEWG 2000).

TIRN and CBD use this and other evidence to support their request to designate these two subpopulations as distinct population segments (DPS), which warrant protection.

Although Congress has not defined the concept of DPS, NMFS and FWS jointly declared that a population segment must be discrete, significant in relation to the remainder of its species, and satisfy ESA conservation requirements. The Services offered two standards for discreteness; the one applicable in this case is that the population must be "markedly separated from other populations of the taxon as a consequence of physical, physiological, ecological, or behavioral factors" (Federal Register 1996). To fulfill this requirement TIRN and CBD cited physical and ecological separation during nesting and genetic and morphological differences between the subpopulations, as well as quoted past NMFS and Turtle Expert Working Group (TEWG) statements. NMFS stated that it "treats these genetically distinct loggerhead turtle nesting aggregations as distinct subpopulations whose survival and recovery [are] critical to the survival and recovery of the species" (NMFS 2001). The TEWG recommended that based on genetic differences the subpopulations should "be considered independent demographically, consistent with the definition of a distinct vertebrate population segment and of a management unit" (NMFS 2001).

In determining the significance of a population segment to the overall population, NMFS has suggested four considerations, although others are possible. The two that apply in this case are (1) evidence that loss of the DPS would result in a significant gap in the range of a taxon and (2) evidence that the DPS differs markedly from other populations in its genetic characteristics. Once again the turtles' unique reproductive behavior

is crucial to meeting these requirements. Namely, slow dispersal rates would guarantee a persistent range gap if a nesting population was lost and northern subpopulation males are an important source of genetic diversity (TIRN and CBD 2002).

Once NMFS determines a population to be discrete and significant, it evaluates the conservation status of the population based on five criteria. Meeting one or more of these would qualify the species for endangered status. The two which apply in this case are (1) the present or potential destruction, modification, or curtailment of its habitat or range and (2) other natural or manmade factors affecting its continued existence. TIRN and CBD address these criteria by summarizing the numerous anthropogenic sources of mortality and habitat degradation, which include fishery bycatch, beach development, artificial lighting, and pollution (TIRN and CBD 2002). Currently this petition for reclassification is being considered for emergency listing of the subpopulations. The emergency rule would be in effect for 240 days, meanwhile the northern and Florida panhandle loggerhead turtle subpopulations would enter the normal listing process.

If brought to fruition, the reclassification of loggerhead subpopulations and the proposed TED regulations would be the most profound change in sea turtle conservation measures in the U.S. since the origi-

nal TED mandate in 1987. At that time the nationally publicized conflict climaxed when shrimpers blockaded ports in protest to the regulations. Hopefully in the intervening time, working relationships have developed among NMFS, state agencies, non-governmental groups, and industry, which will guide these potentially controversial processes to amicable and appropriate endings.

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