Promoting the Survival of Leatherback Turtles in the Greater Atlantic Ocean by Eliminating Capture and Mortality Associated with Coastal Gillnets in Trinidad

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Scott A. Eckert, Ph.D.

Wider Caribbean Sea Turtle Conservation Network

Duke University Marine Laboratory

135 Duke Marine Lab Road

Beaufort, NC. 28557

WIDECAST

Wider Caribbean Sea Turtle Conservation Network

Conservation Challenge

The most significant threat to the *Critically Endangered* (cf. IUCN) leatherback sea turtle throughout the Atlantic Ocean, and arguably throughout the world, is the accidental capture of the species by gillnets. While leatherbacks are best known as an oceanic species, adults reside in coastal waters for up to six months every other year as they engage in mating and egg-laying. During this time they are subject to capture and drowning in gillnet fisheries operating in coastal waters.

Swordfish gillnet fisheries were a primary cause of the decimation of the largest leatherback population in the world which, until a decade ago, nested along the Pacific coasts of Mexico and Costa Rica. This fishery (occurring off Chile and Peru) drove the population of more than 75,000 turtles to less than 1,000 in 15 years [1] and is primarily responsible for the *Critically Endangered* status of the species today. In the Atlantic Ocean, gillnet-induced mortality is equally dramatic. Artisanal gillnet fisheries operate near many of the world's largest remaining nesting colonies in Africa, South America, and the Caribbean. Exceptionally severe is the entanglement of leatherbacks in Trinidad[2, 3], the world's second largest nesting colony.

More than 6,000 leatherbacks nest in Trinidad each year (in 2007, 10,500 leatherbacks were recorded nesting in Trinidad – S. Eckert unpub. data)[4]. Approximately 3,000 gillnet entanglements occur each year in Trinidadian waters; as many as 1,000 turtles drown or are killed in an effort to salvage the net[2, 3]. Hardship to the fishing industry in Trinidad is also severe. Entanglements cause extensive damage to fishing gear, forcing many fishers to stop fishing during the leatherback nesting season.

Strategy to Resolve the Crisis

To address the crisis a National Consultation was hosted in 2005 by the Wider Caribbean Sea Turtle Network (WIDECAST) and the Trinidad Ministry of Agriculture, Land and Marine Resources. It was attended by all national stakeholders, as well as international fishery bycatch reduction experts, and produced an implementation plan to resolve the bycatch problem[5]. One of the findings of this Consultation was the need to evaluate new or alternate fishing methods that could significantly reduce bycatch without causing economic loss to fishers. The Consultation also strongly stressed that all stakeholders be involved in these field trials to assure understanding and acceptance of the mitigation measures. Stakeholders agreed on a common approach that used fishers to test new methods, sea turtle non-government groups and government biologists to provide data collection, and both domestic and international scientific teams to provide experimental design and data analysis. To structure the program, a multi-year timeline was developed that facilitated capacity building among stakeholders in the early stages and then a series of bycatch reduction experiments, with regular stakeholder inputs to guide the process (Figure 1).

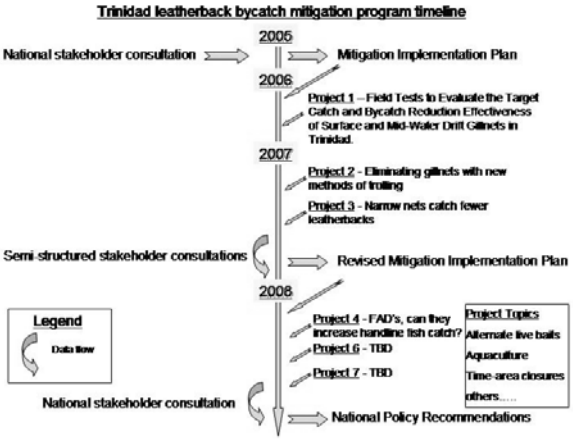


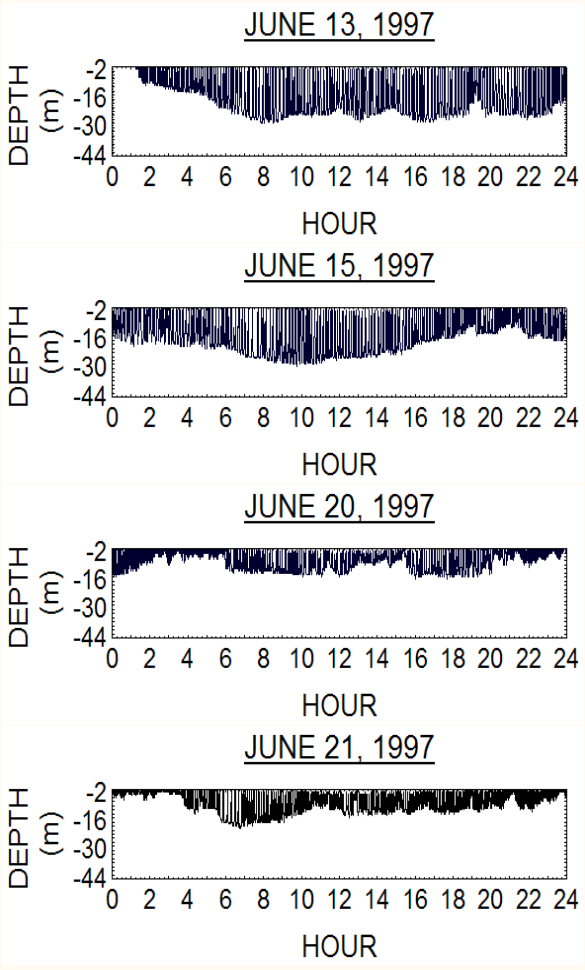
Figure 1 - Schematic representation of the Trinidad Leatherback Sea Turtle Bycatch Reduction Program timeline.

Solution Building

2006 Field Trials

Field trials were initiated in 2006 to investigate whether standard nets set with the top line 5 meters below the surface would result in fish catch equivalent to that of the more traditional set (i.e. nets set to 10 meters below the surface). The

concept behind this approach was that our previous research indicates that leatherbacks travel along the bottom when moving away from their nesting beaches, but closer to the surface when returning to the beach to nest (Figure 2, S. Eckert, WIDECAST, unpubl. data). We hoped that by setting the nets mid-water, we might reduce leatherback entanglement while not compromising fish catch.



To ensure stakeholder involvement, all fishers who participated in the experiment were paid for their effort and vessel use, all gear (experimental and control) was provided, and fishers were allowed to retain and sell their catch. Local sea turtle conservation groups were contracted to serve as on-board fishery technicians and gather data. This structure allowed fishers to participate without financial risk, and actually resulted in increased income for their participation. And, because sea turtle conservation groups in Trinidad have extensive experience in field data collection, we were assured that data gathering would be done properly. Finally by having two of the most important stakeholder groups working together, we created a venue for each group to share their respective expertise.

Fish catch results from this experiment showed that catch of high-value species (kingfish, serra mackerel) was reduced and lower-value demersal species (shark, catfish) increased, causing an economic loss to the fishers (Figure 3 , [6]). Because experiments were conducted late in the nesting season, when turtle catch rates are typically low, the experiment provided no usable data on bycatch rates. However, a positive and very significant finding was that the target spe-

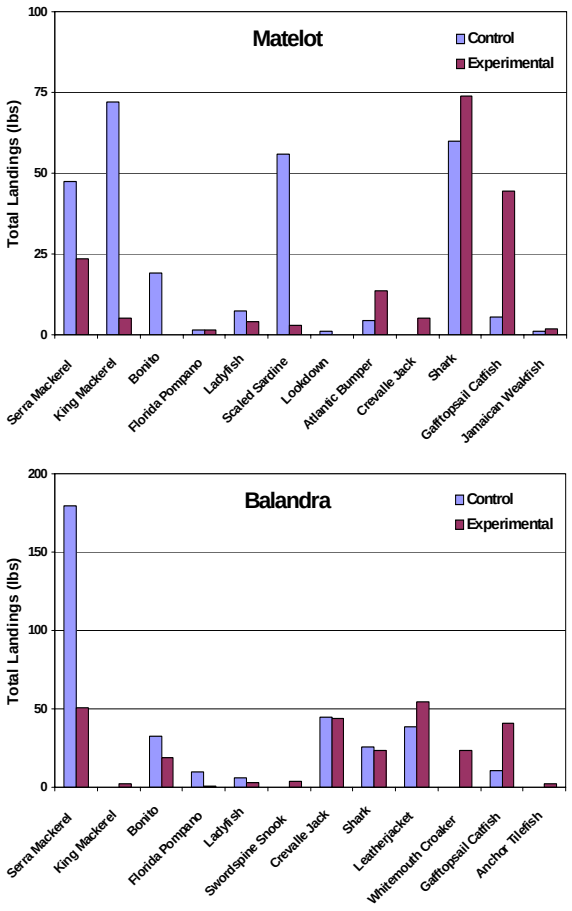


Figure 3-Total catch (lbs) by species and net type for fish collected during 30 trips from Matelot and 26 trips from Balandra in northeastern Trinidad, during the 2006 fishing season. Species are listed left to right, pelagic to demersal. (Figure from Gearhart and Eckert, 2005)

cies are best caught in the upper 5 m of the water column, suggesting two new methods of fishing which may radically improve fishing efficiency while reducing or eliminating sea turtle mortality. Moreover, by providing the opportunity for fishers and local conservationists to work together directly, the experiments created structure and experience within stakeholder groups for regular communication, and the capacity to build shared experience in developing solutions.

2007 Field Trials

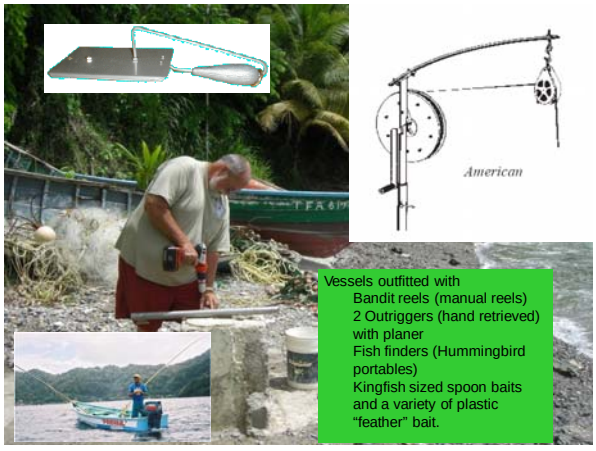
In 2007 we conducted two field projects followed by a semi-structured consultation with stakeholders.

Eliminating gillnets with new methods of trolling

The highest value species harvested by Trinidad's artisanal fisheries is the kingfish (*S. cavalla*), traditionally caught using live bait in a hook-and-line fishery or with gillnets. From March to September, kingfish are targeted almost exclusively with gillnets due to lack of bait in local waters. A cost-effective alternative to catching kingfish with gillnets may be to use trolled artificial baits or lures. In this project Trinidad fishers tested modern troll systems using outriggers with planers, bandit reels and fish finders to evaluate how well this system could catch kingfish and other mackerel species.

Four fishers were hired from 3 ports, one from Matelot, 2 from Toco and one from Balandra Bay. Each vessel was outfitted with 2 outriggers with planers, one bandit reel and a portable fish finder. Fishers were also provided various baits, including kingfish sized spoon baits and feather baits. GPS units and standard data collection forms were provided. We also experimented with the use of commercial computerized and 12 volt powered reels (http://www.lindgren-pitman.com/c-7-electric-reels.aspx). Fishers, data collection staff and observers were trained in the use of all gear and data collection.

Onboard observers maintained a fishing log on standardized data forms that included, date, Port name, Fisher name, time departed from port, time returned to port, start time of trolling, end time of trolling, location of troll initiation, and troll completion, time and location of catch. Upon return to port catch was counted and



weighed and identified to species. Fuel consumption was also monitored.

Each vessel made 30 – 31 trips between 1–31 July 2007. As expected, no turtles were caught during the trolling experiments. The average total catch weight per trip was 55.76 lbs. Ten species were caught, 52% (by weight) of the catch was kingfish, followed by Cavali (28%) and Carite (11%) (Figure 4). Fishers used an average 9.6 gallons of fuel per day. Using the average market value of fish per lb (corrected for species) and subtracting operational costs of fuel and oil we calculate that fishers will net an average of $406 TT per day.

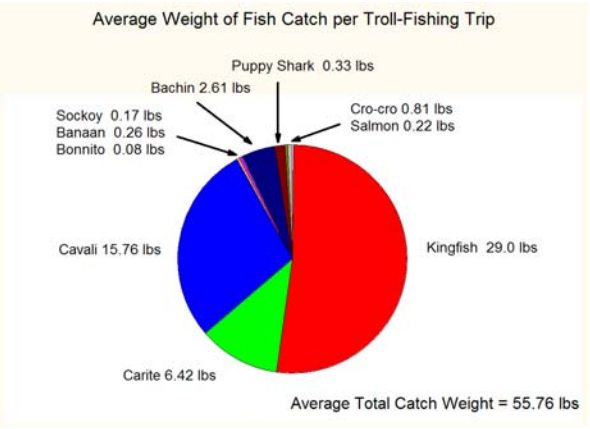


Figure 4-Average total weight of fish caught per troll fishing trip by species. Kingfish accounted for more than half of the total weight of all species caught.

Use of low –profile gillnets to reduce leatherback capture rates

Traditional surface drift gillnets used along the northern and eastern coasts of Trinidad fish from the surface to 10- 15 m deep using nets with between 100 – 150 vertical meshes, and are often set in waters less than 20 m deep. These nets are very effective at capturing a large number of species, but king mackerel (*S. cavalla*) and sierra mackerel (*S. sierra*) bring the highest price per lb. price (TT$8-$35) and are thus the most sought-after species. Based on research we conducted in 2006, it appears that these target species spend most of their time in the upper 5m of the water column, which is why surface drift gillnets are the preferred fishing gear. Reducing the fishing depth or 'profile' of the net to a level that targets the most productive portion of the water column, the upper 10-15 ft, should maximize target catch while reducing unwanted bycatch of lower value finfish species. Furthermore, such a net configuration is 'stiffer' because it does not tend to billow and thus turtles are more likely to bounce off the net rather than being entangled. Several studies in North Carolina's flounder gillnet fishery found that low profile nets significantly reduce the incidence of sea turtle entanglements when compared to traditional gillnets that contained twice as much webbing. This experiment is designed to determine if a 50 mesh net, fished at the surface using traditional nocturnal driftnetting methods will catch fish at a level comparable to 100 mesh or deeper nets, while catching less turtles.

We contracted 2 fishing vessels, one from Toco, one from Matelot to make 30 fishing trips each from 11 May – 29 June 2007 on traditional fishing grounds along the northern and eastern coasts of Trinidad. This time period encompasses the peak of the leatherback nesting season and also coincides with highest incidental capture of turtles. We used a matched pair experimental design with traditionally-set standard surface drift gillnets (100 mesh) as controls, and experimental nets that are identical except that they are 50 meshes deep. Nets were set in a single string in an alternating configuration (control, experimental, control, experimental) with each vessel setting eight nets (four matched pairs) per trip.

Observers, hired from the sea turtle conservation projects, attended each trip to collect data and work with the fishers to monitor nets and release entangled turtles immediately. Date, port of departure, time of net set and net retrieval, set location (latitude / longitude) and retrieval location (latitude / longitude) were recorded. Data on turtle interactions was also gathered including species, condition at release, whether it was tagged (and tag numbers), and in which net the capture occurred was also recorded.

The observers also separated the catch from each net for dockside assessment. Dockside assessment of catch was made by the contracted observer or by individuals hired to make these assessments on shore. Data on catch included, species, counts and weights for each net.

A broad diversity of species of fish were caught using in gillnets. The largest proportion of spe-

cies caught were Carite, followed by Kingfish. For the same amount of net fished (e.g. 150 lbs) the experimental nets caught a higher total weight of fish and averaged 91 lbs per set (Figure 5). In a cost analysis we estimate that fishers would net $541 TT per set when fuel costs are included. However, this does not account for the expense of net repair from turtle bycatch.

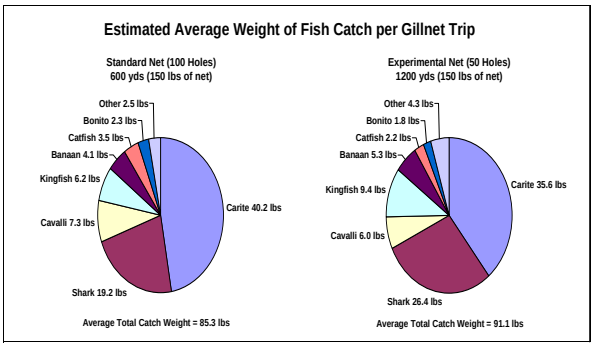


Figure 5-Average total weight of fish caught per set using traditional 100 mesh and experimental 50 mesh surface drift gillnets in the waters of Trinidad.

A total of 119 leatherback turtles were captured and released during 60 nights of the study. The experimental net captured 29 turtles, 68% fewer than the control net. Furthermore the fishers reported that a number of turtles "bounced out" of the experimental net without becoming entangled. Also significant were fisher observations that entangled turtles were more easily freed from the shallower nets with far less damage to the net. The latter observation is confirmed by an analysis of repair costs. Traditional nets sustained five times more damage (as documented by a 5-fold increase in cost of net repair) than the lower profile surface-set nets. Cost of net repair in the experimental nets reduced profit by $41 TT per net set to $499 TT per set, and in the control nets by $197 TT to $334 TT.

Despite a 68% average reduction in turtle bycatch, there was a large difference between the two ports tested. Leatherback bycatch was reduced by 74% in the eastern port and only 11% in the northern port. On further investigation, the use of net marking lights was identified as a potential cause for the disparity observed between ports. The eastern port did not use lights while the northern port used a light to mark the end of the string of nets and on the boat. It is possible that these lights, are attracting turtles to the nets. We suspect that we will be able to increase the bycatch reduction in lit nets by switching lighting to long wavelength LED's for which leatherback have reduced sensitivity.

StakeholderReaction/Response

In October 2007, we held a series of meeting with fishers to present the results the summer experiments. At the conclusion of the presentation and follow-on discussion, we presented fishers with a questionnaire to evaluate how well these new methods might be adopted and implemented. All (100%) reported that the catch of leatherbacks poses a serious problem for their fishing; 90% reported that they would switch to fishing with shallow set nets (10% said they "might" switch); 90% said they would be willing to switch to trolling; and 70% said they would switch to new methods even if they had to bear "some" of the costs of the switch (20% more said they might switch depending on the cost).

Conclusions

Analysis of the most recent experiments suggests that we are well on our way to resolving the by-catch problem in surface-set drift gillnets in Trinidad, West Indies. By refining gillnet fishing methods, introducing more modern fishing techniques, fairly and transparently incorporating stakeholders into the process of developing mitigation methods, and responding to fisher feedback, we believe that we can significantly reduce the bycatch of Critically Endangered (cf. IUCN RedList) leatherbacks in the nearshore waters of this Caribbean island. We intend to continue this work next year, sponsoring another series of fisher-inspired bycatch reduction experiments, as well as refining the mitigation methods already under development based on results to date.

Program Sponsors

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