TEDs for All Trawls: A Net Positive for Fishermen and Sea Turtles

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Executive Summary

Bycatch, the catch of non-target fish and ocean wildlife, is one of the greatest threats to healthy fish populations and marine ecosystems around the world. Global estimates show that fishermen are discarding as much as 40 percent of what they catch, totaling nearly 63 billion pounds every year of wasted fish and ocean wildlife. Experts say one type of fishing in particular, shrimp trawling, has one of the highest bycatch rates among current fishing practices in the world. This can be seen in the United States, where, in 2013, the Gulf of Mexico shrimp trawl fishery discarded an estimated 242 million pounds of seafood and ocean wildlife - about 62 percent of its total catch. In fact, if the fish were of marketable size, the value of the discarded catch in the Gulf of Mexico shrimp trawl fishery would equate to more than $350 million in wasted fish. Additionally, according to government estimates, Southeast shrimp trawl nets come into contact with endangered and threatened sea turtles half-a-million times a year, potentially resulting in 50,000 deaths.

But what if there was an easy step our government could take to help ensure that our domestic, wild-caught shrimp was more sustainably caught? A simple solution comes in the form of Turtle Excluder Devices (TEDs), which are metal grates positioned inside the openings of shrimp nets that allow turtles to escape, preventing them from drowning. Shrimp slip through the grate's bars into the sack at the end of the net, while turtles, sharks, rays, crabs and larger, non-target fish can go free. When used properly, TEDs are 97 percent effective at allowing captured turtles to escape.

If the U.S. takes appropriate actions to reduce bycatch in the Southeast shrimp trawl fishery by requiring TEDs in all nets, Americans could feel better about eating domestic shrimp, and other countries could feel pressure to do the same in order to compete with the high standards of American shrimp. This win-win conservation action will not only yield immediate economic and ecological value at home, but could also have long-term environmental benefits on a global scale.

Currently, many fishermen in the Southeast use TEDs, but about 2,400 boats are allowed to operate in the region without them. Many retailers and other seafood buyers, including Whole Foods, have made a commitment to buy sustainably caught seafood. However, due to the lack of a TED requirement in a portion of the shrimp fishery, some U.S. domestic shrimp is considered a poor choice by seafood buying guides. If the fishery were to require TEDs for all trawls, more markets would be open to U.S. shrimp, and buyers would no longer consider it a product to avoid.

In addition, in the past two years, the government has tested a new, improved TED design that reduced fish bycatch by an additional 25 percent and could help save even more sea turtles—particularly younger turtles that are smaller and might otherwise slip through the larger spacing on traditional TEDs. Reducing fish discards in this way could allow populations to rebuild and support healthier commercial and recreational fisheries.

Decreasing fish bycatch in the shrimp fishery would benefit other fishermen by reducing pressure on already struggling commercial and recreational fisheries. Of the 242 million pounds of fish discarded by Gulf of Mexico shrimp trawls, almost 90 million pounds are species known to be valuable to other fishermen, such as red snapper, Atlantic croaker and red drum. Indeed, if those 90 million pounds of fish had been of marketable size and landed in their respective commercial fisheries, their value would have exceeded $350 million (see Appendix 1). The fish that do not end up in shrimp trawls are free to be caught by other anglers and commercial fishermen if they survive to marketable size.

Reducing sea turtle bycatch will also benefit those who depend on tourism for their livelihoods. Sea turtles play a variety of important ecological roles, including helping maintain the health of seagrass beds, coral reefs and beaches. Healthier and more abundant oceans draw divers, beach-goers and recreational anglers. Secondly, sea turtles themselves bring in a significant amount of tourism dollars to the Southeast. Sea turtle tourism attracts more than 500,000 visitors to the region annually, providing direct income to local residents through tours and dives, but also through other travel expenditures like lodging, food, transportation and fuel. In a two-month time period, turtle walks contributed about $250,000 to the local economy in just two counties in Florida.

TEDs are simple devices that can do a great amount of good—protect marine life, open new markets for shrimpers, boost nature-based tourism, and leave more fish in the sea for other fisheries—but only if they are used, and used properly.

In order to protect endangered and threatened sea turtles, reduce fish bycatch and protect coastal nature-based tourism economies, President Obama should direct the National Oceanic and Atmospheric Administration (NOAA) to:

- Require all exempt shrimp trawls to use smaller-spaced TEDs;
- Require all trawls that currently use TEDs to transition to smaller-spaced TEDs; and
- Increase observer coverage in the Southeast shrimp trawl fishery to monitor the amount of sea turtles caught, as well as the amount of fish that is wasted.

Introduction

Forrest Gump was on to something: shrimp is the most popular seafood in the United States. The average American consumes more than 4 pounds of shrimp every year.[1] The U.S. shrimp trawl fishery generates more than $680 million annually, making it the second most valuable domestic fishery,[2] with the majority of domestic shrimp caught in Florida, Alabama, Mississippi, Louisiana and Texas. In 2014, these states produced nearly 207 million pounds of shrimp, generating nearly $588 million in revenue for

[1] NMFS, “Fisheries of the United States, 2014,” Current Fishery Statistics (U.S. Department of Commerce, 2015), https://www.st.nmfs.noaa.gov/commercial-fisheries/fus/fus14/index.
[2] NMFS, “Fisheries of the United States, 2014” NMFS, “Fisheries of the United States, 2014.”

local fishermen.[3] This represents 70 percent of all wild-caught American shrimp and accounts for 86 percent of the total value.[4]

Overall, however, 90 percent of the shrimp consumed in the U.S., both wild-caught and farm-raised, is imported.[5] Concerns over these imports are growing. Recent news stories have exposed illegal antibiotic and pesticide use in farm-raised shrimp, as well as human rights abuses in the shrimp fishery in Southeast Asia.[6]

The domestic shrimp fishery has its own issues. Gulf of Mexico shrimp trawlers are responsible for more bycatch than any other U.S. fishery, as 62 percent of what comes up in these shrimpers' nets is discarded, amounting to 242 million pounds of wasted sea life.[7] Threatened and endangered sea turtles are especially impacted. Overall, the Southeast shrimp trawl fishery, encompassing both the Gulf and South Atlantic, is responsible for more sea turtle deaths than any other fishery, as the government estimates that more than 50,000 sea turtles could be killed every year.[8]

While current bycatch rates for the U.S. shrimp trawl fishery are high, the fishery has made improvements in recent decades. The bycatch rate for shrimp trawl nets 30 years ago was more than 90 percent,[9] but this began to decrease as more shrimpers started employing Bycatch Reduction Devices and TEDs.[10]

Despite these bycatch improvements,[11] however, more needs to be done. TED requirements are inconsistent from state to state and between different gear types. Currently, all U.S. shrimp trawls are required to use TEDs except approximately 2,400 boats that operate in U.S. waters with skimmer, pusher-head or butterfly trawl nets.[12] These nets – often used in shallow waters – are held open by metal frames and are either pulled or pushed through the water. The lack of a TED requirement for these

[3] NMFS, "Fisheries of the United States, 2014." Calculations were derived by using the ex-vessel price, which is the price at first sale, reflecting what the boat's catch was first valued at.
[4] NMFS, "Fisheries of the United States, 2014."
[5] NMFS, "Imports and Exports of Fishery Products Annual Summary, 2014 Revised," Curret Fishery Statistics, (July 15, 2015), https://www.st.nmfs.noaa.gov/Assets/commercial/trade/Trade2014.pdf.
[6] Kate Hodal and Chris Kelly Felicity Lawrence, "Revealed: Asian Slave Labour Producing Prawns for Supermarkets in US, UK," *The Guardian*, June 10, 2014, sec. Global development, http://www.theguardian.com/global-development/2014/jun/10/supermarket-prawns-thailand-produced-slave-labour; Margie Mason et al., "AP: Global Supermarkets Selling Shrimp Peeled by Slaves," *The Big Story*, accessed April 19, 2016, http://bigstory.ap.org/article/8f64fb25931242a985bc30e3f5a9a0b2/ap-global-supermarkets-selling-shrimp-peeled-slaves; Consumer Reports, "How Safe Is Your Shrimp?," accessed April 19, 2016, http://www.consumerreports.org/cro/magazine/2015/06/shrimp-safety/index.htm.
[7] NMFS, "U.S. National Bycatch Report: First Edition Update 2," 2016, http://www.st.nmfs.noaa.gov/observer-home/first-edition-update-2.
[8] NOAA, NMFS, and SERO, "Shrimp Biological Opinion, 2014," 2014.
[9] D. L. Alverson et al., "A Global Assessment of Fisheries Bycatch and Discards," \iFAO Fisheries Technical Paper (FAO), 1994, http://agris.fao.org/agris-search/search.do?recordID=XF9551729; Ivor Clucas, "A Study of the Options for Utilization of Bycatch and Discards from Marine Capture Fisheries," \iFAO Fisheries Circular 928
[10] Lekelia D Jenkins, "Reducing Sea Turtle Bycatch in Trawl Nets: A History of NMFS Turtle Excluder Device (TED) Research," *Marine Fisheries Review* 74, no. 2 (2012): 26–44.
[11] *Federal Register, Sea Turtle Conservation; Shrimp Trawling Requirements |Proposed Rule; Request for Comments; Notice of Public Hearing, 2012, https://www.gpo.gov/fdsys/pkg/FR-2012-05-10/pdf/2012-11201.pdf*, 2012.
[12] *Federal Register, Sea Turtle Conservation; Shrimp Trawling Requirements |Proposed Rule; Request for Comments; Notice of Public Hearing, 2012, https://www.gpo.gov/fdsys/pkg/FR-2012-05-10/pdf/2012-11201.pdf*.

vessels concerns seafood sustainability groups like Monterey Bay Aquarium's Seafood Watch,[13] the publishers of a popular consumer guide that assigns the most commonly consumed seafood into the categories "Avoid" (red), "Good Alternative" (yellow) or "Best Choice" (green).[14] These designations are based on criteria like the health of the fishery, the type of gear used, chemical and pesticide use in aquaculture operations and bycatch rates. None of the wild-caught shrimp from the Southeast are labeled "Best Choice" by Seafood Watch. In fact, shrimp from the skimmer trawl fishery, with the exception of Florida, are marked as "Avoid" due to the lack of a government-enforced TED requirement.[15] This red-list designation prevents these fishermen from selling shrimp to about 13,000 retailers across the country that have refused to source any red-listed seafood product.

In place of a TED requirement, the Southeast skimmer trawl fishery is required to enact tow-time restrictions.[16] Tow-time restrictions require shrimpers to bring the nets out of the water at certain time intervals to be checked for entangled turtles, preventing their drowning. In practice, however, tow-time restrictions have been shown to be ineffective. A 2006 study found that to be as effective as TEDs, tow times would have to be limited to just 10 minutes,[17] and that any longer "resulted in rapid escalations in mortality."[18] Not only are the current time requirements of 55 to 75 minutes too long to adequately prevent turtle deaths, but they are also difficult to enforce.[19] In fact, observer coverage of skimmer trawl fisheries in the Northern Gulf of Mexico between May and June 2012 found that only 35 percent of tows were within the required 55-minute tow-time limit.[20]

Additionally, the Southeast shrimp trawl fishery is only required to have observers onboard their boats for 2 percent of its fishing trips each year.[21] In 2012, NOAA reported that there were 22,985 days of skimmer trawl fishing,[22] but just 119 of those days had observer coverage — roughly 0.5 percent, or one-quarter, of the coverage required.[23] Furthermore, NOAA's own scientists have reported that legally required tow-time restrictions were often ignored by fishermen even when they knew they were being observed.[24] As

[13] Jennifer Dianto Kemmerly, "Monterey Bay Aquarium's Seafood Watch® Programme," in *SEAFOOD Ecolabelling*, ed. Trevor Ward and Bruce Phillips (Wiley-Blackwell, 2008), 340–66, http://onlinelibrary.wiley.com/doi/10.1002/9781444301380.ch17/summary; Monterey Bay Aquarium, "Seafood Watch," 2016, http://www.seafoodwatch.org/.
[14] Monterey Bay Aquarium, "Seafood Watch."
[15] Monterey Bay Aquarium, "Seafood Watch."
[16] NMFS, *National Marine Fisheries Service/NOAA, Commerce, 50 CFR Ch. II § 223.206*, 2013.
[17] Christopher R. Sasso and Sheryan P. Epperly, "Seasonal Sea Turtle Mortality Risk from Forced Submergence in Bottom Trawls," *Fisheries Research* 81, no. 1 (October 2006): 86–88, doi:10.1016/j.fishres.2006.05.016.
[18] Sasso and Epperly, "Seasonal Sea Turtle Mortality Risk from Forced Submergence in Bottom Trawls."
[19] NMFS, "Keeping Turtles out of Skimmer Trawl Nets in the South Atlantic and Gulf of Mexico: Turtle Excluder Device (TED) Testing," June 18, 2014, http://www.nmfs.noaa.gov/pr/species/turtles/skimmertrawlnets.htm.
[20] Federal Register, Sea Turtle Conservation; Shrimp Trawling Requirements | Proposed Rule; Withdrawal, 2013, https://federalregister.gov/a/2013-02786.
[21] NMFS, "National Observer Program FY 2012 Annual Report" https://www.st.nmfs.noaa.gov/Assets/Observer-Program/pdf/FY_2012_NOP_Annual_Report_FINAL.pdf
[22] NOAA, NMFS, and SERO, "Shrimp Biological Opinion, 2014."
[23] Elizabeth Scott-Denton, Jo Williams, and Jeffrey R. Pulver, "Observer Coverage of the 2014 Gulf of Mexico Skimmer Trawl Fishery," *NOAA Technical Memorandum NMFS-SEFSC* 666 (2014), http://sero.nmfs.noaa.gov/protected_resources/sea_turtle_protection_and_shrimp_fisheries/documents/2014_skimmer_trawl_observer_report.pdf.
[24] Elizabeth Scott-Denton et al., "Skimmer Trawl Fishery Catch Evaluations in Coastal Louisiana, 2004 and 2005," *Marine Fisheries Review* 68, no. 1–4 (2006): 30–35; NOAA, NMFS, and SERO, "Shrimp Biological Opinion, 2014."

evidenced by lengthy tow times, minimal observer coverage and even flagrant flouting of the rules, tow-time restrictions have proven to be largely ineffective at preventing sea turtle deaths.

A Simple Solution

In the early 1980s, NOAA, shrimpers and environmental groups combined efforts to design a new type of gear meant to reduce incidental captures of sea turtles. This collaboration resulted in the development of the first TED, and since then, NOAA has continued to test and improve the original design.

Testing conducted by NOAA in Louisiana and North Carolina waters in the last two years showed that reducing the space between the bars of a TED, from the standard 4 inches to 3 inches, can save a considerable number of smaller sea turtles and reduce fish bycatch by an additional 25 percent.[25] Additionally, a 2014 report found that TEDs with even more narrowly spaced flat bars (2 inches) effectively reduced bycatch, while maintaining similar shrimp catch rates.[26] These experiments also demonstrated an overall reduction in the total weight of sharks, rays, skates and horseshoe crabs captured.[27] These long-term benefits come at a relatively low upfront cost of roughly $400 per TED.

The Southeast shrimp trawl fishery discards more fish and kills more sea turtles than any other U.S. fishery, but it does not have to continue down this path. By simply requiring all shrimp trawls to employ smaller-spaced TEDs, the U.S. government could save thousands of turtles and millions of pounds of fish annually. President Obama should direct NOAA to require all trawls to use smaller-spaced TEDs, including trawls that currently use the original TEDs, as well as increase enforcement and observer coverage in this fishery. These requirements would help sea turtle populations recover, open new markets to Southeast shrimp fishermen, reduce fish bycatch and help maintain a strong tourism industry. Such a simple solution that has so many benefits should be taken seriously.

TEDs Would Benefit Shrimpers

It is no coincidence that shrimpers were among the groups responsible for the development of TEDs,[28] as the devices directly benefit them in several ways. TEDs not only reduce fish bycatch, but may also reduce fuel costs as well as grant shrimpers access to retail markets that only buy shrimp from fisheries that are not red-listed.

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[25] "Keeping Turtles out of Skimmer Trawl Nets in the South Atlantic and Gulf of Mexico: Turtle Excluder Device (TED) Testing :: NOAA Fisheries," June 18, 2014.
[26] Michel Anthony Nalovic, "An Evaluation of a Reduced Bar Spacing Turtle Excluder Device in the U.S. Gulf of Mexico Offshore Shrimp Trawl Fishery" (Masters, e College of William and Mary, 2014), http://web.vims.edu/library/Theses/Nalovic14.pdf.
[27] Nalovic, "An Evaluation of a Reduced Bar Spacing Turtle Excluder Device in the U.S. Gulf of Mexico Offshore Shrimp Trawl Fishery."
[28] Lekelia D Jenkins, "Profile and Influence of the Successful Fisher-Inventor of Marine Conservation Technology," *Conservation and Society* 8, no. 1 (2010): 44, doi:10.4103/0972-4923.62677.

Some fishermen in the skimmer trawl fishery already voluntarily use TEDs. However, Florida is the only state that requires its skimmer trawl fleet to employ TEDs. Shrimp from fisheries without TED requirements (specifically skimmer) are red-listed by Monterey Bay Aquarium's Seafood Watch—a designation that urges consumers to "avoid" these products due to high levels of bycatch.[29] This red-listing carries weight beyond the choices of individual consumers in the grocery store. Products red-listed by Seafood Watch will not be purchased by more than 13,000 retail outlets across the country,[30] including the supermarket Whole Foods.

Because the state of Florida requires TEDs in all of its shrimp trawls, including skimmers, Florida shrimpers enjoy access to these large and growing markets. A federal requirement for TEDs in all trawls would likely prompt Seafood Watch to remove the "avoid" designation and list all Southeast shrimp as a "good alternative" (yellow), opening up markets and ultimately benefitting shrimpers, wholesalers, retailers and all the players throughout the U.S. seafood supply chain.

A recent example of Seafood Watch changing the status of a product came as a result of shrimpers themselves pushing for enforcement of a TED requirement. Until last year, shrimp landed by Louisiana otter trawls were red-listed by Seafood Watch,[31] due to a 1987 state law that prevented the enforcement of TED use in these nets.[32] With no enforcement, Seafood Watch was not able to verify that Louisiana otter trawls were actually using TEDs, so the shrimp remained red-listed until July 2015.[33] That summer, the state law preventing enforcement of the federal TED requirement was repealed at the behest of the Louisiana Shrimp Task Force – a group of shrimp industry stakeholders that voted unanimously to support federal enforcement. As a result, shrimp from the Louisiana otter trawl fishery are now considered a "good alternative" by Seafood Watch, and those shrimpers today have access to thousands of new buyers across the country.

TEDs have other direct benefits to shrimpers. A 2006 study demonstrated that the reduction of bycatch as a result of TED use reduces the time that crews had to spend sorting out the targeted shrimp from other non-target species.[34] In addition, studies have shown that TEDs, like other Bycatch Reduction Devices, may reduce fuel consumption.[35] The act of pulling the net behind the boat accounts for 70 percent of the

[29] Monterey Bay Aquarium, "Seafood Watch."
[30] Monterey Bay Aquarium, "Seafood Watch."
[31] Monterey Bay Aquarium, "Seafood Watch."
[32] *Louisiana §57.2*, 1987.
[33] Oceana, "Louisiana Agrees to Save Thousands of Sea Turtles and Protect State's Shrimp Industry," *Oceana USA*, July 1, 2015, http://usa.oceana.org/press-releases/louisiana-agrees-save-thousands-sea-turtles-and-protect-states-shrimp-industry; Monterey Bay Aquarium, "Seafood Watch [Website]"; *Louisiana §416.2*, 2015.
[34] Matt K. Broadhurst, Petri Suuronen, and Alex Hulme, "Estimating Collateral Mortality from Towed Fishing Gear," *Fish and Fisheries* 7, no. 3 (September 1, 2006): 180–218, doi:10.1111/j.1467-2979.2006.00213.x.
[35] Christopher W. Glass et al., "Bycatch Reduction in Massachusetts Inshore Squid (Loligo Pealeii) Trawl Fisheries," *Marine Technology Society Journal* 33, no. 2 (January 1, 1999): 35–42, doi:10.4031/MTSJ.33.2.6; J. W. Valdemarsen, T. Joergensen, and A. Engas, "Options to Mitigate Bottom Habitat Impact of Dragged Gears," *FAO Fisheries Technical Paper (FAO)*, 2007, http://agris.fao.org/agris-search/search.do?recordID=XF2008434141; B. Van Marlen, "Energy Saving in Fisheries (ESIF) FISH/2006/17 LOT3: Final Report" (IMARES, 2008); D Queirolo et al., "Improved Interspecific Selectivity of Nylon Shrimp (Heterocarpus Reedi) Trawling in Chile," *LATIN AMERICAN JOURNAL OF AQUATIC RESEARCH* 37, no. 2 (2009): 221–30.

fuel used by shrimping vessels,[36] however, Bycatch Reduction Devices have been found to cut the amount of drag on the net, thus reducing the drag on the boat and gear.[37] Decreasing this drag could also reduce the amount of money that boat captains have to spend on fuel.[38]

A fishery-wide TED requirement in the Southeast would allow shrimp buyers to purchase U.S. shrimp with more confidence. With an official requirement, all shrimpers in the Southeast would have access to buyers that previously had avoided some shrimp from the region. This benefit would be in addition to protecting sea turtles, shortened sort times and potentially reduced fuel costs for shrimpers.

One (Fisher)man's Trash is Another (Fisher)man's Treasure

Employing the new, smaller-spaced TEDs on all shrimp trawls can also benefit other fishermen in the Southeast by potentially reducing bycatch by 60 million pounds annually,[39] easing pressure on populations of fish that are targeted by anglers and commercial fishermen.

According to the National Marine Fisheries Service, the Gulf of Mexico shrimp trawl fishery's bycatch in 2013 accounted for 62 percent of the total fishery catch, meaning the weight of bycatch exceeded the weight of the shrimp landed by almost 100 million pounds.[40] Of the 242 million pounds of discards in 2013, almost two-thirds were unspecified fish, crustaceans and other invertebrates.[41] The remaining one-third – almost 90 million pounds – included valuable species such as red snapper, Atlantic croaker and red drum.[42] If that 90 million pounds comprised fish that had been of marketable size and landed in their respective commercial fisheries, its value would have exceeded $350 million (see Appendix 1).

Red snapper are among the most highly valued species discarded by the Gulf of Mexico shrimp trawl fishery. In 2013, the fishery discarded about 16.5 million red snappers,[43] the majority of which were under 1 year old and measured less than 5 inches long.[44] Red snapper is considered overfished, yet discards amounted to almost 1.5 million pounds – equal to nearly 30 percent of the commercial red snapper

[36] Gary L. Graham and Dewayne Hollin, *Fuel Efficiency Analysis of Trawl Nets in the Gulf of Mexico Shrimp Fisheries* (Sea Grant College Program, Texas A & M University, 1993).
[37] Graham and Hollin, *Fuel Efficiency Analysis of Trawl Nets in the Gulf of Mexico Shrimp Fisheries*.
[38] Glass et al., "Bycatch Reduction in Massachusetts Inshore Squid (Loligo Pealeii) Trawl Fisheries"; Valdemarsen, Joergensen, and Engas, "Options to Mitigate Bottom Habitat Impact of Dragged Gears"; Van Marlen, "Energy Saving in Fisheries (ESIF) FISH/2006/17 LOT3: Final Report"; Queirolo et al., "Improved Interspecific Selectivity of Nylon Shrimp (Heterocarpus Reedi) Trawling in Chile."
[39] NMFS, "U.S. National Bycatch Report: First Edition Update 2." Oceana based its calculation on the result being ¼ of the total reported bycatch.
[40] NMFS, "U.S. National Bycatch Report: First Edition Update 2."
[41] NMFS, "U.S. National Bycatch Report: First Edition Update 2."
[42] NMFS, "U.S. National Bycatch Report: First Edition Update 2."
[43] Gulf Council SSC, "Review of 2014 SEDAR 31 Red Snapper Update Assessment" (Tampa, Florida: Gulf of Mexico Fishery Management Council: Standing and Special Reef Fish SSC, 2015), http://sedarweb.org/docs/postsedar/Gulf%20Council%20SSC%20Review%20of%202014%20SEDAR%2031%20Update_0.pdf.
[44] William J. Gazey et al., "Age Composition, Growth, and Density-Dependent Mortality in Juvenile Red Snapper Estimated from Observer Data from the Gulf of Mexico Penaeid Shrimp Fishery," *North American Journal of Fisheries Management* 28, no. 6 (December 1, 2008): 1828–42, doi:10.1577/M07-216.1.

fishery catch.[45] If all of these fish had been of legal marketable size (16 inches), the market value would have been more than $5.7 million. Though most juveniles do not survive to be caught by the directed fishery, NOAA and other scientists acknowledge the negative impact the shrimp trawl fishery can have on the red snapper population and suggest that a reduction in trawl bycatch may increase snapper abundance.[46]

Over 52 million pounds of Atlantic croaker were also discarded by Gulf shrimp trawls in 2013. This is 367 times more croaker than was landed in the commercial fishery and 82.5 times the amount landed by recreational anglers.[47] If that discarded catch had been of marketable size – not predominantly juveniles – and sold at market rate, the value of that bycatch would have been over $311 million. Indeed, the impact of this incidental catch on the Atlantic croaker population is significant. In reviewing the status of Atlantic croaker, fishery experts cited inadequate discard data as complicating the assessment,[48] but added that reducing the bycatch was the most viable path toward returning the stock to its historic highs.[49]

Minimizing the bycatch of commercially valuable fish in the Southeast shrimp trawl fishery would potentially benefit both commercial fishermen and recreational anglers. Four of the top 10 species by weight for all U.S. recreational fish catch—red drum, red snapper, spotted sea trout and Spanish mackerel—are frequently discarded in large amounts in the Gulf of Mexico shrimp trawl fishery.[50] Though the federal government sets quotas for most of those species every year in their own fisheries, their bycatch in the shrimp fishery continues to be largely unregulated and uncapped. Even after red snapper fishermen have met their quotas and ended their season, hundreds of thousands of pounds of snapper continue to be caught in shrimpers' nets and discarded. Requiring TEDs with reduced bar spacing could prevent the bycatch of millions of pounds of valuable fish.[51] Less bycatch could mean healthier fish populations and, ultimately, more productive recreational and commercial fisheries.

[45] SEDAR, "Stock Assessment Report of SEDAR 7: Gulf of Mexico Red Snapper," SEDAR, Southeast Data, Assessment, and Review (One Southpark Circle #306 Charleston, SC 29414: SEDAR, 2005), http://sedarweb.org/sedar-7-sar1-red-snapper-stock-assessment-report; NMFS, "U.S. National Bycatch Report: First Edition Update 2"; NMFS, "Annual Landings," page, *Commercial-Sub Level*, (2016), https://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/annual-landings/index.
[46] Gulf Council SSC, "Review of 2014 SEDAR 31 Red Snapper Update Assessment"; SEDAR, "Stock Assessment of Red Snapper in the Gulf of Mexico 1872 – 2013 - with Provisional 2014 Landings," SEDAR Update Assessment, Southeast Data, Assessment, and Review (4055 Faber Place Drive, Suite 201 North Charleston, SC 29405: SEDAR, September 7, 2015), http://sedarweb.org/sedar-7-sar1-red-snapper-stock-assessment-report.
[47] NMFS, "Annual Landings"; NMFS, "U.S. National Bycatch Report: First Edition Update 2."
[48] SEDAR, "SEDAR 20: Atlantic Croaker 2010 Benchmark Stock Assessment," SEDAR, Southeast Data, Assessment, and Review (One Southpark Circle #306 Charleston, SC 29414: SEDAR, August 2010), http://sedarweb.org/docs/sar/atlanticCroaker2010BenchmarkStockAssessment.pdf.
[49] "Sea Around Us | Fisheries, Ecosystems and Biodiversity [Website]," accessed April 4, 2016, http://www.seaaroundus.org/data/#/taxon/600408?chart=catch-chart&dimension=eez&measure=tonnage&limit=10; Sandra L Diamond, Lindsay G Cowell, and Larry B Crowder, "Population Effects of Shrimp Trawl Bycatch on Atlantic Croaker," *Canadian Journal of Fisheries and Aquatic Sciences* 57, no. 10 (October 1, 2000): 2010–21, doi:10.1139/f00-154.
[50] NMFS, "Fisheries of the United States, 2013," Current Fishery Statistics (U.S. Department of Commerce, September 2014).
[51] NMFS, "Keeping Turtles out of Skimmer Trawl Nets in the South Atlantic and Gulf of Mexico: Turtle Excluder Device (TED) Testing."

Economic Benefit of Sea Turtles

Not only have sea turtles helped maintain healthy seagrass beds and coral reefs for more than 65 million years, but they also attract tourists to coastal towns in the South Atlantic and Gulf of Mexico, providing these communities with measurable economic benefits. Nature-based tourism provides direct income to local residents through tours and dives and through other travel spending like lodging, food, transportation and fuel. For example, more than 11.5 million tourists visited Gulf states in 2011 for wildlife viewing, spending $6.5 billion and generating $2 billion in federal, state and local taxes.[52]

Sea turtle tourism attracts over 500,000 visitors to coastal communities in the Southeast annually (see Appendix 2). Tourists can observe sea turtles by scuba diving, participating in sea turtle nesting walks, and visiting injured sea turtles at rehabilitation centers. In Florida alone, there are 23 centers that host turtle walks that attract a total of 10,000 visitors annually.[53] During the 2013 nesting season, approximately 3,600 tourists participated in turtle walks in Brevard and Indian River Counties in Florida.[54] These sea turtle walks contributed about $250,000 to the local economy of those counties in just two months.[55]

Many people also enjoy the experience of seeing turtles that were once sick or injured being rehabilitated and released back to the wild. The Turtle Hospital in Marathon, Florida hosted 75,000 visitors to view turtles in 2015,[56] the Karen Beasley Sea Turtle Rescue and Rehabilitation Center had 82,400 visitors in their facility last year,[57] and 120,000 visitors attended sea turtle release events hosted by Sea Turtle Inc. on South Padre Island, TX.[58] Release events like these often attract up to 1,000 people at a time (See Appendix 2).[59]

Scuba diving is another popular way for tourists to appreciate sea turtles. Divers contribute to local economies by renting and buying equipment or filling tanks at dive shops and resorts. Many travelers choose their vacation destinations based on proximity to dive sites. In a study conducted in 2008 by Oceana, in collaboration with Duke University, scuba divers indicated a great desire to dive with sea turtles, and 76 percent of all divers who responded said they would be willing to pay, on average, an additional $29.63 for each dive in which they had the chance to see a sea turtle.[60]

A 2012 study collected data from 8,476 randomly selected households in the U.S. and found that respondents were willing to pay an average of $44 per household per year for 10 years to support the

[52] Shawn Stokes and Marcy Lowe, “Wildlife Tourism” (1812 Chapel Hill Rd Durham, NC 27707: Datu Research, LLC, July 9, 2013), www.daturesearch.com/wp-content/uploads/WildlifeTourismReport_FINAL.pdf.
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[55] Cope, “A Socio-Economic Assessment of Marine Turtle Eco-Tourism.”
[56] The Turtle Hospital, personal communication, March 2016.
[57] Terry Meyer, personal communication, March 17, 2016.
[58] William Botts, personal communication, February 18, 2016.
[59] William Botts, personal communication, February 18, 2016.
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recovery of the loggerhead sea turtle and $68 for the recovery of leatherback sea turtles.[61] Residents of and visitors to North Carolina's Bald Head Island were willing to pay, on average, $58 per year to support the management and protection of nesting sea turtles on the island.[62]

Sea turtles play an important role in Southeast coastal tourism sectors. Expansion and enforcement of TED use, along with the adoption of TED models that feature narrower-bar spacing, will allow more turtles to escape shrimper's nets alive. As more sea turtles survive, populations can be restored and thrive so tourists can continue to observe sea turtles for generations to come.

Conclusion

Turtle Excluder Devices benefit shrimp fishermen by reducing sort times and allowing them to access additional markets. But TEDs are also good for other fishermen in the Gulf of Mexico. Fewer fish caught as bycatch in shrimp nets means more fish in the ocean that could be caught by recreational and commercial fishers. Universal deployment of smaller-spaced TEDs could save thousands of sea turtles annually, contributing to a robust coastal tourism sector. Many shrimpers are already voluntarily using TEDs on their skimmer trawls, and they should be rewarded for their commitment to preserving healthy oceans by gaining access to buyers that require verification of TED enforcement.

In order to protect endangered and threatened sea turtles, reduce fish bycatch and protect coastal nature-based tourism economies, President Obama should direct NOAA to:

- Require all exempt shrimp trawls to use smaller-spaced TEDs;
- Require all trawls that currently use TEDs to transition to smaller-spaced TEDs; and
- Increase observer coverage in the Southeast shrimp trawl fishery to monitor the amount of sea turtles caught, as well as the amount of fish that is discarded.

This is a common-sense solution: TEDS for all trawls, featuring the most up-to-date, narrow bar-spacing design would benefit shrimpers, turtles, Southeast residents and businesses, and visitors to the region. Such a requirement is a win-win solution that needs to be adopted by the Obama administration and the Department of Commerce, which oversees NOAA.

It is not often that we encounter a conservation action that yields such immediate and substantial benefits—both for the environment as well as regional economies. It is time for the U.S. government to take a stand and implement this change and implement TEDs in all trawls.

[61] Kristy Wallmo and Daniel K. Lew, "Public Willingness to Pay for Recovering and Downlisting Threatened and Endangered Marine Species: Valuing Species Recovery," *Conservation Biology* 26, no. 5 (October 2012): 830–39, doi:10.1111/j.1523-1739.2012.01899.x.
[62] Gladys M. Delgadillo, "A Case Study on the Value of Having Sea Turtles Nest on Bald Head Island, NC in 2012" (Stanford University, n.d.).

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Appendix 1: GULF STATES LANDINGS BY SPECIES 2013

FISH	Bycatch (lbs)	Value of market catch of equivalent weight ($)	Bycatch as a multiple of commercial landings
Atlantic croaker	52,347,481	311,676,457	367
Seatrout and weakfish	18,540,386	33,256,639	165
Longspine porgy	11,554,019	n/a	n/a
Red snapper	1,473,227	5,725,250	<1
Atlantic sharpnose shark	1,371,951	686,616	8
Spanish mackerel	970,140	971,972	1
Red drum	696,883	1,421,973	19
Black drum	517,041	465,681	<1
Southern flounder	503,054	963,269	6
Blacktip shark	372,996	301,105	8
Bonnethead	304,832	171,239	10
Smooth dogfish	249,081	109,479	<1
Grouped sharks	241,841	161,572	<1
Lane snapper	234,493	574,241	9
King mackerel	228,296	436,159	<1
Finetooth shark	44,252	35,879	<1
Blacknose shark	42,363	251,519	16
Vermilion snapper	31,572	89,072	<1
Spinner shark	3,450	2,094	<1
Other snappers	3,348	9,233	<1
Cobia	2,663	9,061	<1
Finfish (species not reported)	108,398,332		
Non-penaeid shrimp crustacean	24,163,982		
Non-crustacean invertebrates	19,889,397		
Total	**242,185,080**	**357,318,512**	

*Calculated with $/lb of South Atlantic landings in 2013.

Discarded Catch in the Gulf of Mexico Shrimp Trawl Fishery in 2013.

With a total of 240 million pounds of bycatch in 2013, the Gulf of Mexico Shrimp Trawl fishery had more bycatch than any other fishery reported in the U.S. National Bycatch Report for that year.

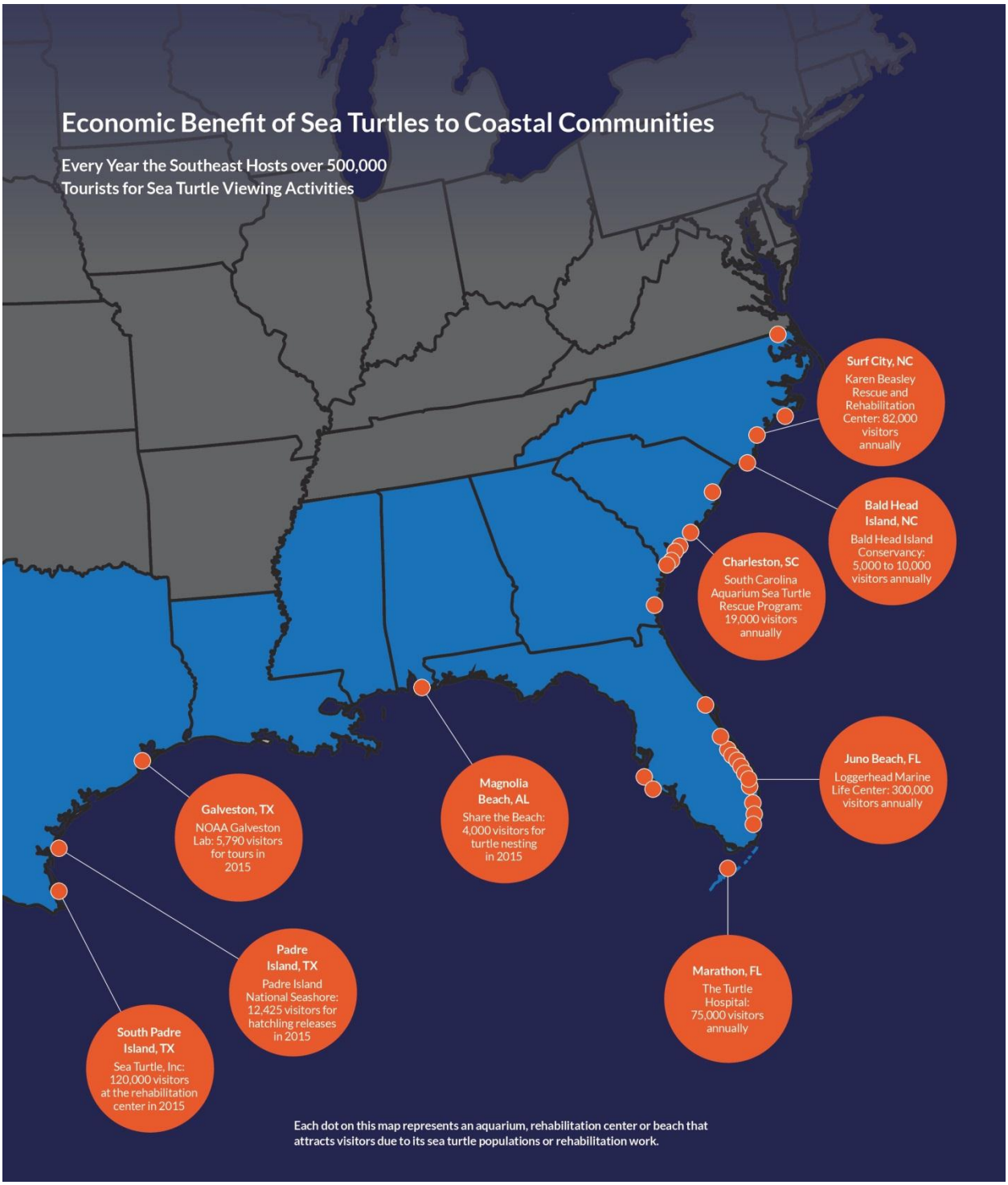
- Six species have bycatch totals that are between 19 and 386 times the amount of their respective landings in the commercial fishery.
- Almost two-thirds of the bycatch is unidentified, therefore species composition and value cannot be determined. This includes unspecified finfish, non-shrimp crustaceans, and other invertebrates.
- A number of by-caught species, including red snapper, blacknose sharks, blacktip sharks and others are already considered to be "overfished" by NOAA. In these cases especially, bycatch is damaging already-struggling populations that can ill-afford any additional losses.

Notes on data sources and calculation of "market equivalent" value

Bycatch data is from U.S. National Bycatch Report First Edition Update 2, Table 4.5.3a Fish Bycatch by Fishery 2013 (https://www.st.nmfs.noaa.gov/Assets/Observer-Program/bycatch-report-update-2/Table%204.5.3a.pdf). "Other snappers" include blackfin, cubera, dog, gray, mutton, queen, silk, and yellowtail snappers, as well as "snappers" as listed in landings data. Seatrout and weakfish include sand and spotted seatrout. Weights and values of landings of directed fisheries are from NOAA Commercial Fisheries Statistics (http://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/monthly-landings/index). Longspine porgy do not have a U.S. market.

Value of the market catch of equivalent weight was calculated by multiplying the pounds of bycatch per species by the value per pound of landings of that species in 2013 (calculated by dividing the value ($) of that fishery in 2013 by the pounds landed). For example, in 2013, 5,295,087 pounds of red snapper were landed in the Gulf States commercial fishery. These landings had a value of $20,574,987. Therefore, red snapper had a value of $3.88/lb. in 2013. Red snapper caught and discarded by the Gulf of Mexico Shrimp Trawl fishery in 2013 totaled 1,473,227 pounds. Multiplying this by the price per pound results in a value of $5,724,482.

Appendix 2: Economic Benefit of Sea Turtles to Coastal Communities



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