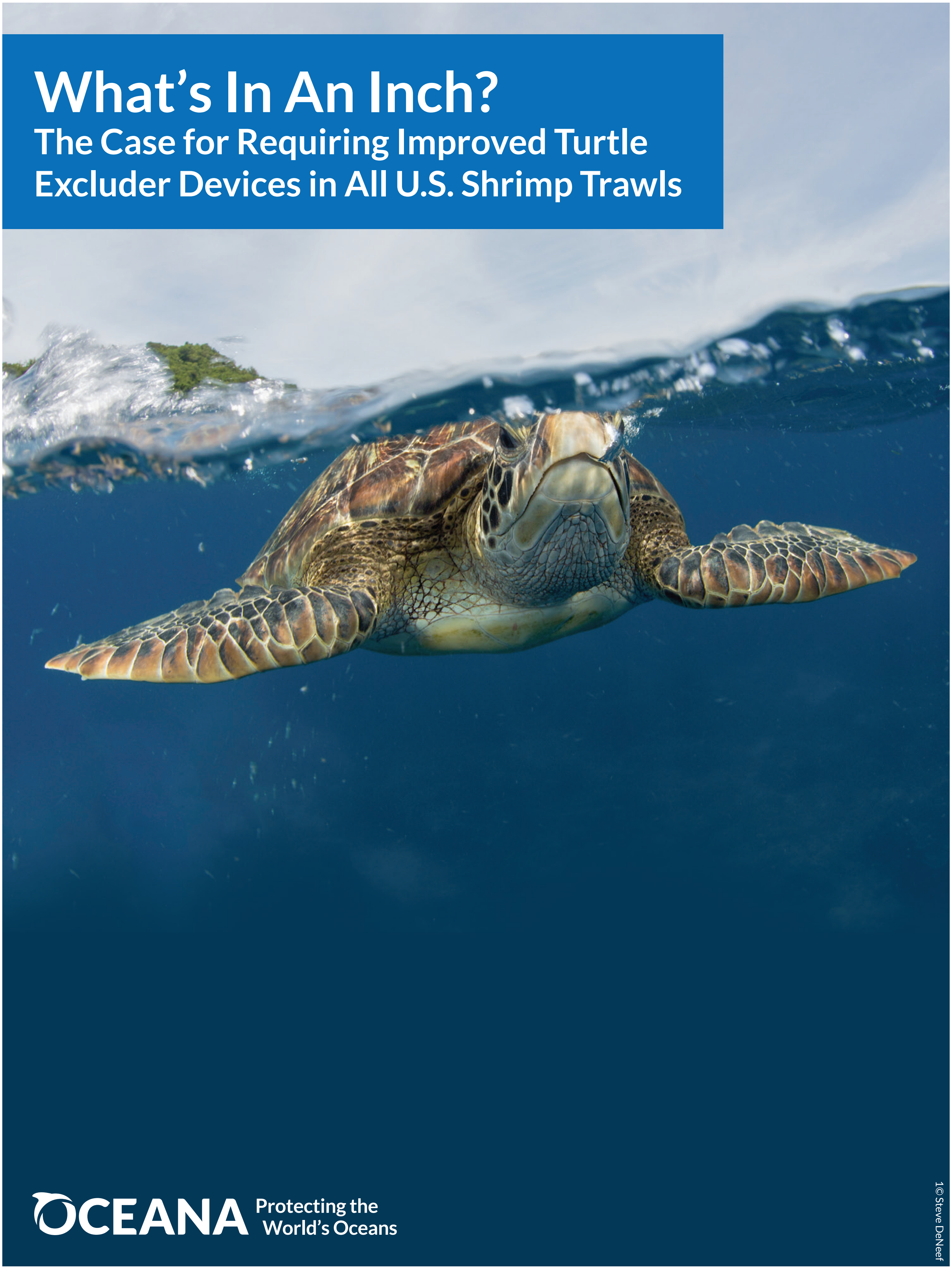
What's In An Inch?

The Case for Requiring Improved Turtle Excluder Devices in All U.S. Shrimp Trawls



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Authors: Mariah Pfleger, Kara Shervanick and Lora Snyder

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Executive Summary

The National Marine Fisheries Service can save the lives of thousands of threatened and endangered sea turtles by requiring a simple modification to shrimp fishing gear. Shrimp fishing vessels in the South Atlantic and the Gulf of Mexico (from North Carolina to Texas) encounter endangered and threatened sea turtles over 500,000 times a year, resulting in tens of thousands of deaths annually.

However, shrimp fishing vessels can insert metal grates called Turtle Excluder Devices (TEDs) into their trawl nets that let sea turtles escape, while still allowing the net to catch shrimp.

Unfortunately, the benefits of TEDs are not being fully realized. In fact, less than half of the shrimp vessels in the U.S. are required to use TEDs.

Furthermore, some types of TEDs work better than others. The National Marine Fisheries Service has found that by modifying the current TED—reducing the space between the bars from the current 4-inch requirement to no more than 3 inches—more small sea turtles can escape drowning.

Currently, the Fisheries Service is developing new measures to protect sea turtles, including through requirements for TEDs on all trawls. But the regulations will not do enough unless the government also requires that all TEDs have no more than 3-inch spacing between their bars.

The Fisheries Service may also consider requiring 3-inch TEDs only on nearshore vessels – vessels that fish near the coastline. Restricting 3-inch TEDs to just the nearshore region will needlessly result in thousands of sea turtle deaths, because shrimp vessels catch smaller sea turtles offshore as well as nearshore.

To demonstrate that 3-inch TEDs should be required on all trawls in order to most effectively reduce sea turtle mortality, Oceana analyzed data from academic and government sources documenting 352 sea turtle captures and found:

- Sea turtles, including those that are too small to be saved by 4-inch TEDs, are found both nearshore and offshore.
- 3-inch TEDs could save 66 percent more sea turtles than 4-inch TEDs.
- 3-inch TEDs could save 222 percent more critically endangered Kemp's ridley sea turtles, the species most at risk.

In short, the Fisheries Service can save thousands of sea turtles by requiring 3-inch TEDs on all shrimp fishing trawl vessels in the South Atlantic and the Gulf of Mexico. Anything less results in the unnecessary death of thousands of endangered and threatened sea turtles.

Oceana/Melissa Forsyth

Introduction

Trawling is one of the greatest threats facing sea turtle populations in the Southeast Atlantic and Gulf of Mexico.[1] This method of fishing uses large nets with weights at the bottom of the mouth of the net and floating devices at the top to keep the mouth of the net as wide as possible. As the vessel pulls the net through the water, the net catches fish, invertebrates, and, in some cases, sea turtles that are funneled to the back of the net, known as the "cod end".[2]

Many sea turtles ultimately drown in the nets, as they have no means of escaping to the surface to breathe. In fact, according to government estimates, the Southeast shrimp trawl fishery interacts with these sea turtles over 500,000 times a year, resulting in tens of thousands of deaths.[3]

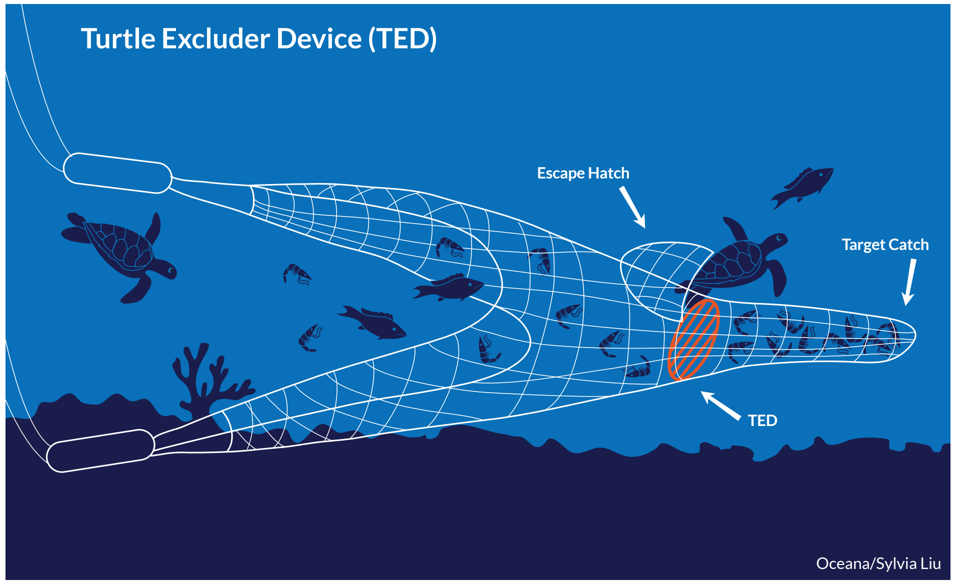

Figure 1. An example of trawl gear and how a Turtle Excluder Device is incorporated into the net to allow turtles to escape.

In the 1980s, to address the issue of sea turtle bycatch in trawl fisheries, some shrimpers and environmental groups aided the Fisheries Service in developing the Turtle Excluder Device.[4] TEDs are metal grates positioned inside shrimp nets near the cod end that have a flap in front to allow sea turtles to escape (Figure 1).

Shrimp are able to slide past the bars of the TED into the cod end, while sea turtles, sharks, rays and larger, non-target fish go free.[5] When installed properly, standard TEDs with bars 4 inches (10.16 cm) apart (4-inch TEDs) may be up to 97 percent effective at reducing the capture of sea turtles large enough to be blocked by the bars.[6]

The Fisheries Service has not yet required the use of TEDs in all U.S. shrimp trawls, so the accidental encounter and capture of small sea turtles remains high.[7]

Multiple types of vessels comprise the Southeast shrimp trawl fishery and each is regulated differently. This includes those that operate in shallow waters closer to shore ("nearshore") and those that operate miles off the coast in deeper waters ("offshore").

Skimmer, pusher heads and wing net trawls, collectively referred to as "skimmer trawls,"[8] operate nearshore, while otter trawl vessels tend to be larger vessels that operate offshore.[9]

Since 1987, the Fisheries Service has required all otter trawl vessels to use 4-inch TEDs,[10] while the nearshore skimmer trawls in the Southeast, totaling at least 2,400 vessels, are exempt from TED requirements.[11] The Fisheries Service requires these vessels to comply with alternative measures such as tow-time restrictions;[12] however, vessels in the skimmer trawl fleet have been caught exceeding the time requirements,[13] which can cause sea turtles to drown.

In 2012, the Fisheries Service proposed to eliminate the TED exemption and require TEDs on all trawls,[14] however, the Fisheries Service claimed the rule was not promulgated because the 4-inch TEDs were not narrow enough to prevent small sea turtles from passing through.

> "Fishery observers found that turtles captured in skimmer trawls are so small that they are not necessarily able to escape through the TED door. Instead, the smaller turtles can pass through the bars of the TED and get caught inside the end of the net, potentially causing them to drown rather than allowing them to escape as intended."[15]

Table 1. The minimum straight carapace length at which a turtle will be excluded		
	4" TED (10.16 cm)	3" TED (7.62 cm)
Green	27.72	20.81
Kemp's ridley	25.72	18.73
Loggerhead	23.86	17.39
Hawksbill	21.08	15.81

Table 1. The straight carapace length (SCL) at which each species of sea turtle in our data set will not pass through a given bar spacing. All SCL measurements are given in centimeters.

The Fisheries Service found that any Kemp's ridley sea turtle less than 25.72 centimeters in straight carapace length (SCL)[16] could pass though the 4-inch TED bars (Table 1).[17] Based on the same methods used by the Fisheries Service, Oceana calculated the sizes at which each species of sea turtle would pass through a 4-inch TED bar spacing, increasing the likelihood of drowning (Table 1) (Appendix 1).

Additionally, the Fisheries Service found after conducting multi-year testing in order to find a more efficient TED, that by reducing bar spacing by 1 inch (from 4 inches to 3 inches) (3-inch TEDs), more small sea turtles could successfully escape the nets.[18] Unfortunately, small sea turtles that are capable of passing through a 4-inch TED live both nearshore and offshore,[19] where they can come into contact with skimmer, pusher head, wing net and otter trawl vessels.

Testing by the Fisheries Service itself demonstrates that to save more sea turtles, TEDs with a maximum bar spacing of 3 inches should be required on all trawls. This study corroborates those findings. By requiring this type of TED on both otter trawl and skimmer trawl vessels, the government would protect small juvenile sea turtles found nearshore and offshore.

Why 3-inch TEDs Should be Required in All Trawls

Juvenile sea turtles start their lives in the sand, hatching out of an egg and digging their way to the surface to make their journey to the open ocean, where they feed and grow until they return to shallow nearshore waters.[20] Scientists have caught and tagged 1-to 2-year-old[21] green and Kemp's ridley sea turtles along the coastline and as far as 62 miles from shore in the Gulf of Mexico.[22]

Unfortunately, the current regulations do not adequately protect juvenile sea turtles, as the required 4-inch TED leaves them at risk of slipping through the bars and drowning while offshore. Nearshore, there is no TED requirement at all.[23]

The endangered Kemp's ridley[24] is one such example. This species is between 2 and 4 years old when it transitions from open ocean to coastal habitats, where they remain until they reach sexual maturity (Table 2).[25,26]

During this transition, Kemp's ridley sea turtles are about 25 centimeters straight carapace length, a size that is only excluded from trawls using a 4-inch TED. At this age, Kemp's ridleys can be found both offshore[27] and nearshore, making them vulnerable to both skimmer and otter trawl vessels.

In addition, Kemp's ridley sea turtles nest almost exclusively on the beaches of the western Gulf of Mexico,[28] arguably making them the species most impacted by shrimp trawls in the South Atlantic and Gulf of Mexico. The decision to not require offshore shrimp trawls to use 3-inch TEDs could be especially devastating to this species.

Oceana analyzed data from academic and government sources documenting 352 sea turtle captures.[29] The data included information concerning catch location, species of sea turtle, and carapace length – which correlate with life stage. Oceana mapped the captures[32] to show the nearshore and offshore habitats used by sea turtles during different life stages (Figure 2).[33] Each point in Figure 2 represents one individual, including green, hawksbill and Kemp's ridley sea turtles, ranging in size from 4.9 to 87.3 centimeters SCL.

The coordinates of the sea turtles are mapped over known shrimp trawling locations from the 2011-2015 Electronic Log Book (ELB) shrimp tow time data (Figure 2).[34]

Table 2. Life Stage, Ecosystem, Age and Size of the Kemp's Ridley Sea Turtle			
Life stage	**Ecosystem**	**Approximate age**	**Size at approximate age (SCL)[30]**
Hatching stage	Land	Unborn	N/A
Hatching swim frenzy/ transitional stage	Nearshore	~4.5 days old	~4 cm
Juvenile stage (primary)	Offshore	0–2 years (but can be up to 4 years old)	~4 cm – ~29 cm
Juvenile stage (secondary)	Nearshore	This transition happens around ~2 years old (but can happen anywhere from 1–4 years old)	≥ ~25 cm

Table 2. Life stage, ecosystem, age and size of the Kemp's ridley sea turtle.[31]

When turtle capture locations are mapped on top of shrimp trawling tow time data, it becomes evident that sea turtles at various life stages can encounter shrimp trawls. These interactions can occur nearshore, where skimmer trawls operate, or offshore, where otter trawl vessels fish.

More Sea Turtles Could be Saved with Reduced Bar Spacing

The requirement of 4-inch TEDs on otter trawl vessels was a step forward for sea turtle conservation in 1987; however, new research on sea turtle life history makes it clear that small sea turtles found both offshore and nearshore can slip through the bars of a 4-inch TED and drown.[36]

Since the time of the original requirements, TEDs have undergone a number of improvements that can help to minimize the capture of small sea turtles,[37] including a new design with smaller bar spacing. In order to successfully escape a net equipped with a 4-inch TED, a sea turtle must have a body depth[38] of greater than 4 inches (10.16 cm). Likewise, a sea turtle with body depth greater than 3 inches (7.62 cm) will have the ability to escape 3-inch TED.

Oceana analyzed the same data that was used in Figure 2 from 352 sea turtles captured and measured by researchers in the Southeast (Figure 3 and 4) in order to determine which individuals could be saved with a 3-inch TED. These turtles were located nearshore in shallow coastal waters as well as offshore, as far as 100 kilometers (62 miles) from shore, representative of hundreds of thousands of sea turtles that interact with trawls in this region. The methods used for body depth calculations can be found in Appendix 1. Our results (Figures 3 and 4) indicate that:

- Only 28 percent (100) of the 352 sea turtles in the data set would have likely survived an encounter with a shrimp trawl if a 4-inch TED were used;
- Forty-seven percent (166) of the 352 sea turtles in the data set would have likely survived an encounter with a shrimp trawl if a 3-inch TED were used, an increase of 66 percent; and
- Of those 66 percent, two-thirds were found within 10 miles of known shrimping activity. This is likely a conservative number, as the shrimp trawl data does not include all vessels operating in the Southeast.[40]

Examining the 41 Kemp's ridley sea turtles in the dataset – found both nearshore and offshore – our results (Figure 4) indicate that:

- Only 22 percent of the Kemp's ridleys in the data set (9 of the 41) would have likely survived an encounter with a shrimp trawl if a 4-inch TED were used; and
- Seventy-one percent of Kemps ridleys in the data set (29 of the 41) would have likely survived an encounter with a shrimp trawl if a 3-inch TED were used, an increase of 222 percent.

Thus, a 1-inch reduction in TED bar spacing could significantly increase the number of Kemp's ridley sea turtles able to survive capture in shrimp nets, which is particularly important for a species that is only at 14.5 percent of historic nesting levels and previously underwent more than 99 percent decline in population.[42]

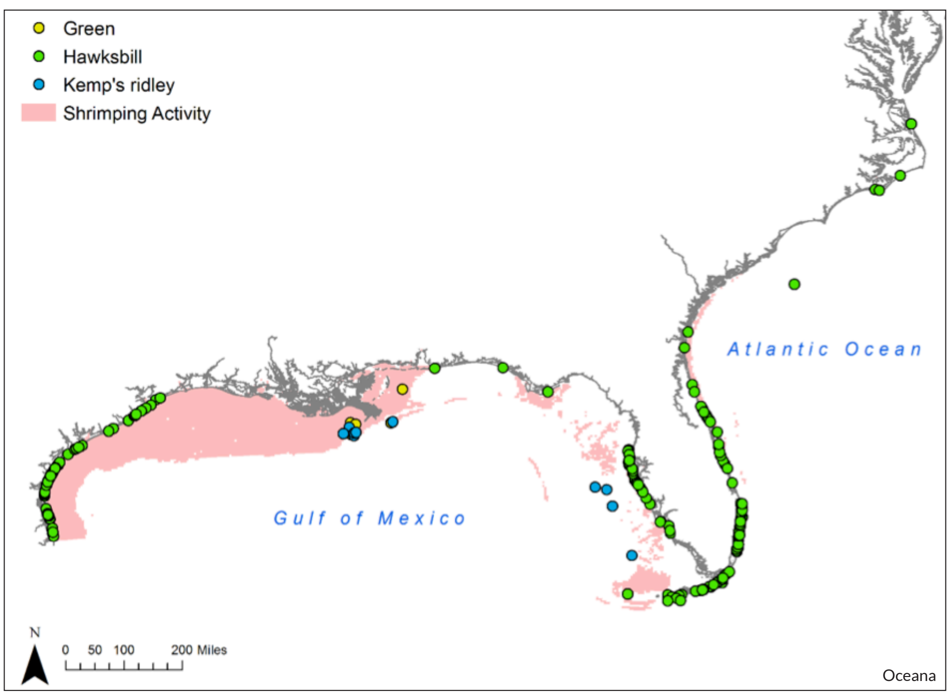

Figure 2. Southeast Region Sea Turtle Captures. Map of all sea turtle captures in the Southeast region included as data points in this report. Yellow circles indicate green sea turtles, green circles represent hawksbill sea turtles, and blue circles represent Kemp's ridley sea turtles. All sea turtles have been mapped, but due to close proximity in capture locations, not all individuals can be seen. Pink shaded areas indicate the presence of shrimp trawl activity from 2011 to 2015.[35]

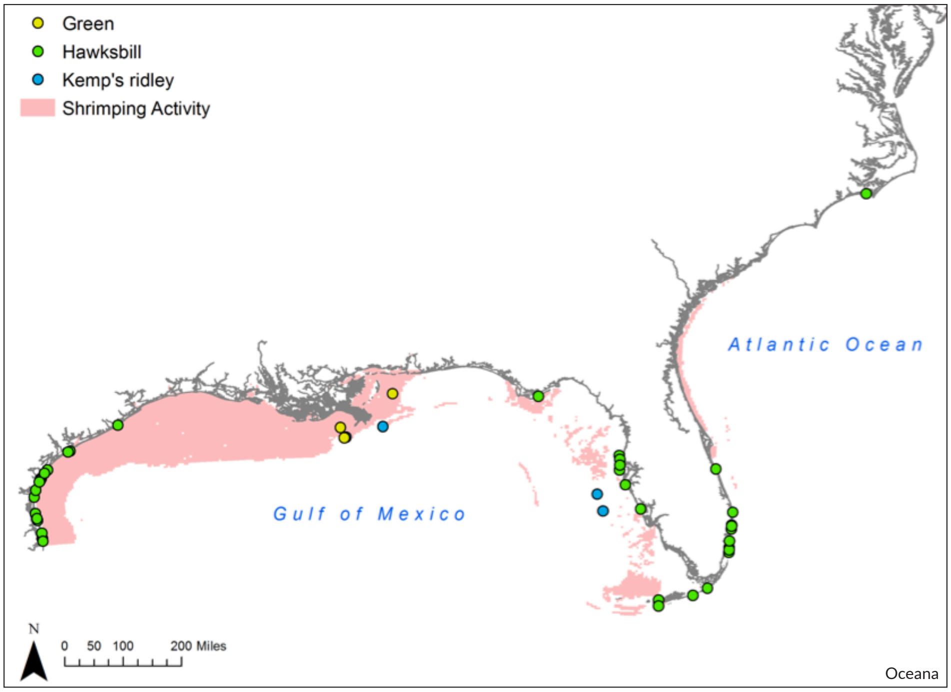

Figure 3. Sea Turtle Mortality Preventable by a 1-inch Reduction in TED Bar Spacing. Of the sea turtle capture locations from Figure 2, this map shows those turtles that are within the size range to have drowned in a TED with 4-inch bar spacing, but would have survived a TED with 3-inch bar spacing. Yellow circles indicate green sea turtles, green circles represent hawksbill sea turtles, and blue circles represent Kemp's ridley sea turtles. All saved sea turtles have been mapped, but due to close proximity in capture locations not all individuals can be seen. Pink shaded areas indicate the presence of shrimp trawl activity from 2011 to 2015.[41]

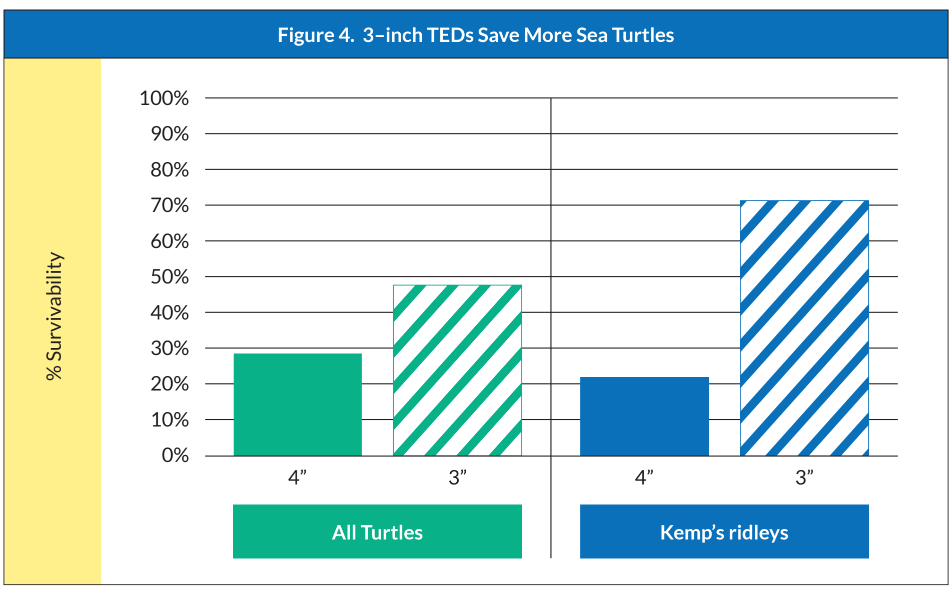

Figure 4. Survivability of sea turtles in 3-inch vs. 4-inch TEDs. Solid bars represent percentage of sea turtles that would survive an encounter with a trawl using a 4-inch TED. Striped bars represent percentage of sea turtles that would survive an encounter with a trawl using a 3-inch TED. Green represents all sea turtle species, while blue represents only Kemp's ridley sea turtles.

Why 3-inch TEDs Need to be Required in All Trawls

The Fisheries Service has suggested a number of regulatory alternatives to address the problem of small sea turtle mortality in the Southeast shrimp trawl fishery. These include:

- Requiring all skimmer trawls, pusher-head trawls and wing nets (butterfly trawls) in both the Atlantic and Gulf areas to use either modified TEDs with narrow bar spacing (i.e., less than the current 4-inch bar spacing maximum) or standard TEDs; or
- Requiring all skimmer trawls, pusher-head trawls and wing nets in both the Atlantic and Gulf areas to use modified TEDs with narrow bar spacing; or
- Requiring all trawlers (i.e., otter trawls, skimmer trawls, pusher-head trawls and wing nets) fishing in specific areas where small sea turtles occur to use modified TEDs with narrow bar spacing.[43]

This report demonstrates that small sea turtles are found both nearshore and offshore, and that 3-inch TEDs could save 66 percent more turtles than 4-inch TEDs. Additionally, implementation of 3-inch TEDs could save 222 percent more critically endangered Kemp's ridley sea turtles, a species that nests exclusively in the Gulf of Mexico. In order to increase protections for sea turtles, the only appropriate alternative for the Fisheries Service would be to require TEDs with a maximum of 3 inch bar spacing on all trawls in the Southeast region.

APPENDIX - Methods

Calculations

Table 1 shows the calculations that were required in order to analyze the data. Most of the data was taken using the standard of straight carapace length (SCL); however, if it was measured in curved carapace length (CCL), the data was converted using the equations in Column A.

When sea turtles are captured, they are measured in either SCL, or curved carapace length (CCL) – the length from the front edge to the rear edge of the shell, along the arch of the shell. In order to transform CCL data to body depth, CCL has to be transformed into SCL via species-specific formulas.[44] Once all data was converted to SCL, the values were then converted to a body depth measurement (BD) for each species using the equations in Column B.

Note that the equations were prepared by different researchers. See Table 2 for source information. Once the body depth has been calculated, it is easy to determine whether or not any given sea turtle would be saved by a 4-inch or 3-inch TED (Appendix 1).

In order to figure out whether or not an individual sea turtle would survive a given TED bar spacing, values for each species had to be calculated using the equations in Column C. Column D is the SCL at which each sea turtle species would survive a given TED bar spacing (4 inches or 3 inches). These values were then applied to the BD information for each species to determine the "survivability" of an individual sea turtle.

Table 1					
	A	B	C	D	
Explanations:	Conversion from CCL to SCL	Given an SCL, what's the corresponding BD	Given a BD, what size would the SCL be?	SCL at which each species will survive a given bar spacing	
	CCL → SCL	**SCL → BD**	**BD → SCL**	**4" (10.16 cm)**	**3" (7.62 cm)**
Green	SC = 0.294+(0.937* CCL)	ln BD=-1.0115+(1.0023*ln SCL) [n=176, r^2=0.977]	ln SCL=(ln BD+1.0115)/1.0023	27.72	20.81
Kemp's Ridley	SCL= 0.013+(0.945* CCL)	ln BD=-0.6283+(0.9075*ln SCL) [n=631, r^2=0.989]	ln SCL=(ln BD+0.6283)/0.9075	25.72	18.73
Loggerhead	SCL= -1.442+(0.948* CCL)	ln BD=-0.5682+(0.9100*ln SCL) [n=250, r^2=0.966]	ln SCL=(ln BD+0.5682)/0.9100	23.86	17.39
Hawksbill	SCL = -0.212+(0.955* CCL)	ln BD=-0.6345+(0.9090*ln SCL) [n=274, r^2=0.9827]	ln SCL=(ln BD+0.6345)/0.9090	21.08	15.81

Table 1. The equations that were used to A) convert a curved carapace length (CCL) to a straight carapace length (SCL), B) calculate a given sea turtles body depth (BD) using their SCL, C) determine what the SCL would be for a selected BD (i.e. the bar spacing of a TED), and D) the SCL values for each species for a given bar spacing. See Table 2 for source information.

Table 2. The corresponding sources for the information in Table 1.			
Sources:	Teas, W. G. (1993). *Species composition and size class distribution of marine turtle strandings on the Gulf of Mexico and southeast United States coasts, 1985-1991*. US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center.	Epperly, S. P., & Teas, W. G. (2002). Turtle excluder devices–are the escape openings large enough? *Fishery Bulletin*, 100(3), 466–474. *[green/kemps/loggerhead]* van Dam, R. P., & Diez, C. E. (1998). Caribbean hawksbill turtle morphometrics. *Bulletin of Marine Science*, 62(1), 145–155. *[hawksbill]*	Calculated by rearranging the equations in column B

For Example
The data that was used in the NOAA report, which tested the effectiveness of TEDS with 4-inch bar spacing for Kemp's ridley sea turtles in the Gulf of Mexico (Memorandum from Bonnie Ponwith on SEFSC Skimmer Trawl Observer Data and Analysis (Sea Turtle Captures and Percentage Released in TEDs) to Roy E. Crabtree (Aug. 16, 2012) (on file with Oceana)), can be found in columns A and B of Table 3. There were 18 straight carapace length (SCL) measurements and three curved carapace length (CCL) measurements given. Because body depth (BD) is calculated using SCL, the CCL's needed to be converted to SCL. Using the CCL value in cell B4, the following example demonstrates how BD was calculated for an individual.

The equation for converting CCL to SCL for a Kemp's ridley sea turtle is defined by the expression below.

$$SCL=0.013+(0.945*CCL)$$

For a CCL value of 22.9 cm,

$$SCL=0.013+(0.945*22.9)$$

Thus, the SCL= 21.65

The relationship between BD and SCL is below.

$$\ln BD= -0.6283+(0.9075*\ln SCL)$$

By rearranging the equation,

$$BD=e^{-0.6283+(0.9075*\ln SCL)}$$

For a SCL value of 21.65 cm,

$$BD=e^{-0.6283+(0.9075*\ln 21.65)}$$

Thus, the BD=8.69

Once the body depths were calculated for all individuals, if the BD was less than 10.16 cm, which is the bar spacing distance in a 4-inch TED, then they were classified as not surviving an interaction with a 4-inch TED (Table 3, column D). If the BD was less than 7.62 cm, the bar spacing distance of a 3-inch TED, then the Kemp's ridley sea turtle was classified as not surviving an interaction with a 3-inch TED (Table 3, column E). The difference in the number of individuals that survived was considered the survivability of sea turtles if a 3-inch TED bar spacing had been used. Table 1 shows that with a 4-inch TED, 7 out of 21, or 33 percent of the Kemp's ridley sea turtles would have survived, whereas with a 3-inch TED, 21 out of 21, or 100 percent of the Kemp's ridley sea turtles would have survived.

Table 3. NOAA's data for testing of 21 Kemp's ridley sea turtles[45]

	A	B	C	D	E
	SCL (cm)	CCL (cm)	Body Depth (CM)	Survive a 4" ted? (BD above 10.16 cm?)	Survive a 3" ted? (BD above 7.62 cm?)
1	19.3		7.83	No	*Yes*
2	21.4		8.60	No	*Yes*
3	21.6		8.67	No	*Yes*
4	21.65*	22.9	8.69	No	*Yes*
5	22.0		8.82	No	*Yes*
6	22.4		8.96	No	*Yes*
7	22.4		8.96	No	*Yes*
8	22.5		9.00	No	*Yes*
9	23.1		9.22	No	*Yes*
10	23.2		9.25	No	*Yes*
11	23.64*	25	9.41	No	*Yes*
12	24.0		9.54	No	*Yes*
13	24.30*	25.7	9.65	No	*Yes*
14	24.8		9.83	No	*Yes*
15	29.3		11.44	*Yes*	*Yes*
16	29.4		11.47	*Yes*	*Yes*
17	29.4		11.47	*Yes*	*Yes*
18	30.0		11.68	*Yes*	*Yes*
19	35.4		13.58	*Yes*	*Yes*
20	36.0		13.79	*Yes*	*Yes*
21	45.6		17.09	*Yes*	*Yes*

* indicates that the data was obtained by converting CCL to SCL.

Table 4. All sea turtle, sources, species, length, and location data included in these analyses.

The following colors represent the sources from which the data was obtained.

Memorandum from Bonnie Ponwith on SEFSC Skimmer Trawl Observer Data and Analysis (Sea Turtle Captures and Percentage Released in TEDs) to Roy E. Crabtree (Aug. 16, 2012) (on file with Oceana).
E-mail from Wendy Teas, NOAA Federal, to Jennifer Lee, NOAA Federal (May 31, 2013, 12:05 EDT) (on file with Oceana).
Putman, N. F., & Mansfield, K. L. (2015). Direct Evidence of Swimming Demonstrates Active Dispersal in the Sea Turtle "Lost Years." *Current Biology*, 25(9), 1221–1227. https://doi.org/10.1016/j.cub.2015.03.014

Data that are bracketed with an * are CCL data					
Unique ID	Source/data file location	Species	SCL (cm)	Release Latitude	Release Longitude
1	Putman, N. F., & Mansfield, K. L. (2015). Direct Evidence of Swimming Demonstrates Active Dispersal in the Sea Turtle "Lost Years." *Current Biology*, 25(9), 1221–1227. https://doi.org/10.1016/j.cub.2015.03.014	Green	14.1	28.56259	-89.68685
2		Green	15.3	28.59799	-89.74522
3		Green	15.5	28.64606	-89.63086
4		Green	15.6	28.59799	-89.74522
5		Green	15.7	28.64606	-89.63086
6		Green	15.8	28.62009	-89.94616
7		Green	15.8	28.62009	-89.94616
8		Green	15.9	28.77267	-89.80135
9		Green	16.0	28.62009	-89.94616
10		Green	16.3	28.66982	-89.77107
11		Green	16.5	28.59799	-89.74522
12		Green	16.6	28.56259	-89.68685
13		Green	16.9	28.63226	-89.67791
14		Green	17.6	28.62009	-89.94616
15		Green	17.8	28.59799	-89.74522
16		Green	18.4	28.56259	-89.68685
17		Green	18.9	28.56259	-89.68685
18		Green	19.1	28.62009	-89.94616
19		Green	19.5	28.66982	-89.77107
20		Green	20.5	28.89037	-88.76559
21		Green	21.1	28.89037	-89.76559
22		Green	25.4	28.63226	-89.67791
23		Green	27.2	29.72882	-88.47305
24		Green	28.8	28.8494	-89.6438
25		Kemps	14.6	28.64606	-89.63086
26		Kemps	16.1	28.56259	-89.68685
27		Kemps	16.9	28.56259	-89.68685
28		Kemps	17.1	28.77267	-89.80135
29		Kemps	17.4	28.62009	-89.94616
30		Kemps	17.4	28.62009	-89.94616
31		Kemps	17.4	28.77267	-89.80135
32		Kemps	17.9	28.62009	-89.94616
33		Kemps	18.1	28.62009	-89.94616
34		Kemps	18.2	28.64606	-89.63086
35		Kemps	18.3	28.56259	-89.68685

Data that are bracketed with an * are CCL data					
Unique ID	Source/data file location	Species	SCL (cm)	Release Latitude	Release Longitude
36		Kemps	18.7	28.62009	-89.94616
37		Kemps	19.3	28.63226	-89.67791
38		Kemps	20.2	28.64606	-89.63086
39		Kemps	22.2	28.91369	-88.71671
40		Kemps	22.3	28.91369	-88.71671
41		Kemps	23.3	26.8099	-83.2503
42		Kemps	23.5	27.22677	-83.39353
43		Kemps	26.2	27.28753	-83.68142
44		Kemps	29.9	25.58167	-82.76667
45	E-mail from Wendy Teas, NOAA Federal, to Jennifer Lee, NOAA Federal (May 31, 2013, 12:05 EDT) (on file with Oceana).	hawksbill	20.8	24.7195	-81.0187
46		hawksbill	20.8	28.2999	-96.4807
47		hawksbill	20.8	26.4653	-80.0569
48		hawksbill	21.0	26.4586	-80.0583
49		hawksbill	21.5	28.1900	-82.8504
50		hawksbill	21.6	27.8597	-80.4471
51		hawksbill	23.0	26.8637	-82.3173
52		hawksbill	23.1	26.1175	-97.1653
53		hawksbill	23.2	27.6091	-97.2054
54		hawksbill	23.4	25.9078	-80.1218
55		hawksbill	23.6	25.7802	-80.1284
56		hawksbill	23.8	28.9405	-95.2940
57		hawksbill	24.0	27.8332	-97.0463
58		hawksbill	24.3	27.4595	-82.6969
59		hawksbill	24.4	29.6644	-84.8555
60		hawksbill	24.5	24.6051	-81.8711
61		hawksbill	24.6	26.7787	-80.0314
62		hawksbill	25.0	27.8370	-82.8379
63		hawksbill	25.0	34.6956	-76.7110
64		hawksbill	25.2	25.9069	-80.1212
65		hawksbill	25.5	26.5803	-97.2833
66		hawksbill	25.7	27.6266	-97.1952
67		hawksbill	25.8	27.1881	-82.5021
68		hawksbill	26.1	29.4599	-94.6147
69		hawksbill	26.4	26.3162	-81.8400
70		hawksbill	26.5	27.0592	-97.379

Table 4
continued

Data that are bracketed with an * are CCL data					
Unique ID	Source/data file location	Species	SCL (cm)	Release Latitude	Release Longitude
71		hawksbill	26.7	27.8304	-97.0501
72		hawksbill	28.8	24.7257	-81.0084
73		hawksbill	30.0	24.8532	-80.7316
74		hawksbill	30.1	25.9491	-80.1189
75		hawksbill	30.9	26.1295	-97.1670
67		hawksbill	31.8	24.6276	-82.8723
77		hawksbill	32.3	27.6424	-97.1869
78		hawksbill	32.4	30.7561	-81.459
79		hawksbill	32.7	25.9604	-80.1185
80		hawksbill	33.0	27.8415	-97.0451
81		hawksbill	34.5	27.6483	-97.1843
82		hawksbill	35.2	27.5900	-97.2133
83		hawksbill	36.2	27.4059	-82.6547
84		hawksbill	37.8	27.7186	-82.7413
85		hawksbill	38.0	26.8768	-80.0399
86		hawksbill	38.6	26.1429	-81.8078
87		hawksbill	41.0	24.8008	-80.8003
88		hawksbill	41.8	27.3778	-82.6354
89		hawksbill	43.5	27.6242	-82.7383
90		hawksbill	44.0	24.6117	-81.5250
91		hawksbill	44.6	26.5791	-97.2829
92		hawksbill	45.7	27.685	-82.7384
93		hawksbill	46.3	24.7168	-81.0235
94		hawksbill	46.6	25.9138	-80.1213
95		hawksbill	48.5	24.7280	-81.0312
96		hawksbill	52.1	28.2141	-82.8508
97		hawksbill	54.4	29.8443	-81.2648
98		hawksbill	55.3	27.8237	-82.8302
99		hawksbill	55.9	28.0224	-82.8261
100		hawksbill	58.8	28.0165	-82.8276
101		hawksbill	59.9	25.8627	-80.1192
102		hawksbill	60.1	26.3318	-80.0729
103		hawksbill	60.8	27.7863	-82.7867
104		hawksbill	61.0	24.5519	-81.7685
105		hawksbill	61.5	28.1846	-82.8671
106		hawksbill	62.8	24.8081	-80.8332
107		hawksbill	63.5	25.0193	-80.4992
108		hawksbill	64.4	26.4363	-82.0422
109		hawksbill	64.8	26.7031	-80.0327
110		hawksbill	64.9	26.3084	-80.0757
111		hawksbill	65.5	27.8636	-80.448
112		hawksbill	65.5	26.3218	-81.8424
113		hawksbill	66.1	27.6183	-97.2005
114		hawksbill	66.3	26.2107	-81.8169
115		hawksbill	66.8	27.961	-82.8312
116		hawksbill	68.1	25.7033	-80.1545
117		hawksbill	68.4	25.6820	-80.1558
118		hawksbill	70.0	27.9081	-82.8482
119		hawksbill	70.0	27.7424	-82.7587
120		hawksbill	70.2	24.5780	-81.5769
121		hawksbill	75.5	25.6896	-80.1566
122		hawksbill	76.6	27.1043	-97.3765
123		hawksbill	87.3	27.8981	-97.0111
124		hawksbill	4.9	27.7413	-97.1237
125		hawksbill	5.0	29.2909	-81.0383
126		hawksbill	5.1	25.9212	-80.1213
127		hawksbill	5.6	27.2608	-82.5459
128		hawksbill	5.7	26.1531	-97.1703
129		hawksbill	5.8	26.1300	-97.1667
130		hawksbill	5.8	28.9389	-80.8303
131		hawksbill	5.8	27.6133	-97.2038
132		hawksbill	5.9	26.5048	-80.0512
133		hawksbill	5.9	27.7131	-97.1422
134		hawksbill	6.0	29.2758	-81.0309
135		hawksbill	6.1	26.1388	-97.1680
136		hawksbill	6.1	27.3320	-97.3320
137		hawksbill	6.2	26.4617	-80.0581
138		hawksbill	6.4	27.5008	-97.2623
139		hawksbill	6.4	26.1350	-97.1667
140		hawksbill	6.4	27.5797	-97.2211
141		hawksbill	6.5	26.7317	-80.0348
142		hawksbill	6.5	27.5917	-97.2133
143		hawksbill	6.5	27.3600	-97.3217
144		hawksbill	6.5	24.5515	-81.7703
145		hawksbill	6.5	26.1023	-97.163
146		hawksbill	6.6	26.3670	-80.0682
147		hawksbill	6.6	26.0280	-80.1143
148		hawksbill	6.6	27.6192	-97.2005
149		hawksbill	6.7	27.1400	-97.3735
150		hawksbill	6.7	27.8223	-97.0586

Table 4
continued

Data that are bracketed with an * are CCL data					
Unique ID	Source/data file location	Species	SCL (cm)	Release Latitude	Release Longitude
151		hawksbill	6.8	27.8067	-97.0730
152		hawksbill	7.0	26.1178	-97.1663
153		hawksbill	7.0	29.2359	-81.0113
154		hawksbill	7.0	25.1242	-80.407
155		hawksbill	7.1	29.0953	-80.9329
156		hawksbill	7.2	27.9462	-80.4957
157		hawksbill	7.3	26.6391	-80.0372
158		hawksbill	7.4	25.8209	-80.1204
159		hawksbill	7.5	28.6568	-80.6327
160		hawksbill	7.5	29.0269	-80.8884
161		hawksbill	7.6	26.0917	-97.1617
162		hawksbill	7.6	29.1317	-80.9568
163		hawksbill	7.6	29.0278	-80.8889
164		hawksbill	7.6	26.4103	-80.0641
165		hawksbill	7.7	29.2078	-80.9974
166		hawksbill	7.8	29.2591	-81.0227
167		hawksbill	7.8	24.74	-80.9818
168		hawksbill	7.9	26.4397	-80.0605
169		hawksbill	8.0	26.544	-80.01
170		hawksbill	8.0	26.4851	-97.2484
171		hawksbill	8.1	29.0953	-80.9329
172		hawksbill	8.1	26.3774	-80.0671
173		hawksbill	8.2	29.0694	-80.9094
174		hawksbill	8.4	47.7726	-97.1012
175		hawksbill	8.6	25.0750	-80.4533
176		hawksbill	8.7	26.5045	-97.2546
177		hawksbill	8.8	29.0436	-80.8977
178		hawksbill	8.9	28.0689	-80.5567
179		hawksbill	9.1	28.2898	-80.6070
180		hawksbill	9.1	26.3828	-80.0665
181		hawksbill	9.2	26.3779	-80.067
182		hawksbill	9.2	27.8109	-97.0685
183		hawksbill	9.3	29.0996	-95.0974
184		hawksbill	9.4	26.363	-80.0684
185		hawksbill	9.4	29.2124	-94.9201
186		hawksbill	9.4	27.827	-97.0536
187		hawksbill	9.5	28.1058	-96.7984
188		hawksbill	9.5	25.6915	-80.1566
189		hawksbill	9.6	24.7180	-81.0180
190		hawksbill	9.8	29.0732	-80.9113
191		hawksbill	10.2	26.6152	-80.0365
192		hawksbill	10.2	24.7197	-81.016
193		hawksbill	10.3	25.8691	-80.1192
194		hawksbill	10.3	26.8852	-80.0541
195		hawksbill	10.3	26.2217	-97.1799
196		hawksbill	10.4	29.0349	-80.8931
197		hawksbill	10.5	24.5225	-81.6578
198		hawksbill	10.5	29.2067	-94.9297
199		hawksbill	10.6	26.6844	-97.3176
200		hawksbill	10.8	24.9083	-80.5217
201		hawksbill	10.8	28.154	-80.5839
202		hawksbill	10.9	26.1898	-80.0953
203		hawksbill	10.9	29.0384	-80.8953
204		hawksbill	10.9	27.4290	-97.2958
205		hawksbill	11.1	26.1663	-80.0981
206		hawksbill	11.1	28.7411	-95.67
207		hawksbill	11.3	25.7672	-80.1202
208		hawksbill	11.4	27.8272	-97.0528
209		hawksbill	11.4	27.5785	-97.2206
210		hawksbill	11.5	26.5049	-80.0514
211		hawksbill	11.5	26.4899	-80.0533
212		hawksbill	11.7	25.9246	-80.1208
213		hawksbill	12.1	25.9296	-80.1204
214		hawksbill	12.3	27.4155	-97.3018
215		hawksbill	12.3	29.2262	-94.8968
216		hawksbill	12.4	25.734	-80.157
217		hawksbill	12.5	26.7791	-80.0313
218		hawksbill	12.5	36.3281	-75.8101
219		hawksbill	12.5	27.161	-97.371
220		hawksbill	12.7	25.9678	-80.1184
221		hawksbill	12.8	28.9821	-80.8602
222		hawksbill	13.0	30.2602	-85.9744
223		hawksbill	13.2	27.4723	-97.2752
224		hawksbill	13.3	26.1617	-97.1700
225		hawksbill	13.3	24.7399	-80.9824
226		hawksbill	13.5	28.3216	-96.438
227		hawksbill	13.8	26.1350	-97.1667
228		hawksbill	13.8	28.2312	-96.6182
229		hawksbill	13.9	27.7844	-97.0915
230		hawksbill	13.9	27.8333	-97.0483

Table 4
continued

Data that are bracketed with an * are CCL data					
Unique ID	Source/data file location	Species	SCL (cm)	Release Latitude	Release Longitude
231		hawksbill	14	24.9475	-80.5981
232		hawksbill	14	25.7799	-80.1285
233		hawksbill	14.1	27.9050	-97.0050
234		hawksbill	14.1	26.1641	-97.1719
235		hawksbill	14.1	30.2483	-87.6768
236		hawksbill	14.5	26.038	-80.1137
237		hawksbill	14.6	29.3267	-94.7367
238		hawksbill	14.7	27.5820	-97.2194
239		hawksbill	14.7	26.7241	-80.0346
240		hawksbill	14.8	27.5368	-97.2437
241		hawksbill	14.9	27.3915	-80.2602
242		hawksbill	15	29.0546	-95.1461
243		hawksbill	15.3	29.2117	-94.9200
244		hawksbill	15.4	35.0367	-76.0767
245		hawksbill	15.5	27.3475	-97.3264
246		hawksbill	15.5	26.3095	-80.0666
247		hawksbill	15.6	27.7571	-97.1124
248		hawksbill	15.7	32.335	-78.7233
249		hawksbill	15.8	28.2247	-96.6285
250		hawksbill	15.9	24.4650	-81.5527
251		hawksbill	16.0	28.2481	-96.5890
252		hawksbill	16	27.3471	-97.3272
253		hawksbill	16.1	28.6808	-95.7827
254		hawksbill	16.2	27.6833	-97.1633
255		hawksbill	16.2	27.7522	-97.1164
256		hawksbill	16.2	29.2087	-94.9260
257		hawksbill	16.3	27.4300	-97.3000
258		hawksbill	16.5	26.8232	-80.0379
259		hawksbill	16.6	28.3539	-80.6043
260		hawksbill	16.6	27.5845	-97.2189
261		hawksbill	16.7	29.2514	-94.8526
262		hawksbill	16.8	34.6702	-76.6070
263		hawksbill	16.8	29.6662	-81.2112
264		hawksbill	17.3	27.5820	-97.2195
265		hawksbill	17.4	24.7178	-81.022
266		hawksbill	17.5	29.0701	-95.1255
267		hawksbill	17.6	27.7684	-97.1038
268		hawksbill	17.7	27.0157	-82.4161
269		hawksbill	17.8	24.7226	-81.0515
270		hawksbill	17.8	29.1816	-94.9722
271		hawksbill	17.8	29.5065	-94.5013
272		hawksbill	17.9	29.2561	-81.0212
273		hawksbill	17.9	26.1231	-97.1703
274		hawksbill	18	29.0407	-80.8962
275		hawksbill	18.3	27.7500	-97.1183
276		hawksbill	18.4	26.0692	-80.1108
277		hawksbill	18.6	27.1956	-97.3659
278		hawksbill	18.9	27.1610	-97.3710
279		hawksbill	19.2	26.1333	-97.1667
280		hawksbill	19.2	27.5799	-97.2196
281		hawksbill	19.6	26.1282	-97.1671
282		hawksbill	19.7	24.4541	-81.8751
283		hawksbill	19.9	26.2629	-97.1862
284		hawksbill	20.4	25.8494	-80.1189
285		hawksbill	20.7	27.7444	-97.122
286		hawksbill	20.7	27.332	-97.3316
287		hawksbill	20.8	26.0688	-80.1110
288		hawksbill	21	26.3676	-80.0682
289		hawksbill	22	26.7497	-97.3372
290		hawksbill	22.2	26.0604	-97.1511
291		hawksbill	22.6	24.9000	-80.6544
292		hawksbill	22.7	27.75	-97.1167
293		hawksbill	23.1	28.278	-96.5306
294		hawksbill	23.6	28.0948	-82.8359
295		hawksbill	24.3	27.5294	-97.2473
296		hawksbill	25.5	26.628	-97.2997
297		hawksbill	25.7	26.4393	-80.0605
298		hawksbill	25.7	27.9472	-82.8357
299		hawksbill	26.4	29.0985	-95.0990
300		hawksbill	26.5	26.1656	-97.1700
301		hawksbill	26.5	27.4158	-97.3017
302		hawksbill	26.6	24.7285	-81.0033
303		hawksbill	26.9	26.5645	-97.2747
304		hawksbill	27.8	28.9719	-80.8534
305		hawksbill	29.5	29.1989	-80.9931
306		hawksbill	31.0	29.2974	-81.0416
307		hawksbill	31.9	24.6950	-81.1800
308		hawksbill	33.2	27.5657	-97.2286
309		hawksbill	34.1	26.5722	-97.2783
310		hawksbill	35.8	31.1473	-81.3652

Table 4
continued

Data that are bracketed with an * are CCL data					
Unique ID	Source/data file location	Species	SCL (cm)	Release Latitude	Release Longitude
311		hawksbill	38.1	28.9151	-80.8143
312		hawksbill	38.5	24.8536	-80.7313
313		hawksbill	39	27.1687	-82.493
314		hawksbill	40	27.9507	-82.8345
315		hawksbill	44.4	27.3453	-82.607
316		hawksbill	46.8	26.4899	-80.0533
317		hawksbill	48	26.742	-80.0147
318		hawksbill	49.6	25.1762	-80.3435
319		hawksbill	51.5	26.4258	-82.0616
320		hawksbill	54.9	26.7882	-80.0162
321		hawksbill	56.0	26.5947	-97.2883
322		hawksbill	56.2	29.1518	-80.9682
323		hawksbill	57.5	26.646	-80.0371
324		hawksbill	60.6	27.7463	-80.3868
325		hawksbill	61.0	26.0938	-80.0868
326		hawksbill	66.8	24.9950	-80.5000
327		hawksbill	70.1	26.7083	-80.0167
328		hawksbill	75.6	26.873	-80.0133
329		hawksbill	76.8	24.7269	-81.0066
330		hawksbill	77.1	26.4361	-80.0611
331		hawksbill	78.5	25.0245	-80.4941

Data that are bracketed with an * are CCL data					
Unique ID	Source/data file location	Species	SCL (cm)	Release Latitude	Release Longitude
332	Memorandum from Bonnie Ponwith on SEFSC Skimmer Trawl Observer Data and Analysis (Sea Turtle Captures and Percentage Released in TEDs) to Roy E. Crabtree (Aug. 16, 2012) (on file with Oceana).	kemps	19.3	N/A	N/A
333		kemps	21.4	N/A	N/A
334		kemps	21.6	N/A	N/A
335		kemps	[22.9]*	N/A	N/A
336		kemps	22.0	N/A	N/A
337		kemps	22.4	N/A	N/A
338		kemps	22.4	N/A	N/A
339		kemps	22.5	N/A	N/A
340		kemps	23.1	N/A	N/A
341		kemps	23.2	N/A	N/A
342		kemps	[25]*	N/A	N/A
343		kemps	24.0	N/A	N/A
344		kemps	[25.7]*	N/A	N/A
345		kemps	24.8	N/A	N/A
346		kemps	29.3	N/A	N/A
347		kemps	29.4	N/A	N/A
348		kemps	29.4	N/A	N/A
349		kemps	30.0	N/A	N/A
350		kemps	35.4	N/A	N/A
351		kemps	36.0	N/A	N/A
352		kemps	45.6	N/A	N/A

Endnotes

1 NOAA, NMFS, SERO. (2014). *Endangered Species Act - Section 7 Consultation* Biological Opinion (Biological Opinion). National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Southeast Regional Office (SERO). Retrieved from http://safmc.net/sites/default/files/meetings/pdf/Advisory%20Panels/2015/Shrimp_Apr/A1b_shrimp_biological_opinion_2014.pdf

2 NOAA. (2014, January 30). Bottom Trawls: Fishing Gear and Risks to Protected Species : NOAA Fisheries. Retrieved September 12, 2016, from http://www.nmfs.noaa.gov/pr/interactions/gear/bottomtrawl.htm

3 NOAA, NMFS, SERO. (2014). *Endangered Species Act - Section 7 Consultation Biological Opinion* (Biological Opinion). National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Southeast Regional Office (SERO). Retrieved from http://safmc.net/sites/default/files/meetings/pdf/Advisory%20Panels/2015/Shrimp_Apr/A1b_shrimp_biological_opinion_2014.pdf

4 NOAA SEFSC. (n.d.). Southeast Fisheries Science Center - NOAA - National Marine Fisheries Service. Retrieved September 30, 2016, from http://www.sefsc.noaa.gov/labs/mississippi/ted/history.htm

5 NOAA. (2014, January 30). Bottom Trawls: Fishing Gear and Risks to Protected Species :: NOAA Fisheries. Retrieved September 12, 2016, from http://www.nmfs.noaa.gov/pr/interactions/gear/bottomtrawl.htm

6 NOAA, NMFS, SERO. (2014). *Endangered Species Act - Section 7 Consultation Biological Opinion* (Biological Opinion). National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Southeast Regional Office (SERO). Retrieved from http://safmc.net/sites/default/files/meetings/pdf/Advisory%20Panels/2015/Shrimp_Apr/A1b_shrimp_biological_opinion_2014.pdf

7 Pulver, J. R., Scott-Denton, E., & Williams, J. (2012). *Characterization of the U.S. Gulf of Mexico Skimmer Trawl Fishery Based on Observer Data* (NOAA Technical Memorandum No. NMFS-SEFSC-636). Galveston, TX: Southeast Fisheries Science Center.

8 "Skimmer Trawls" used as substitute for skimmer, pusher head, and wing net trawls throughout report for ease.

9 NOAA, NMFS, SERO. (2014). *Endangered Species Act - Section 7 Consultation Biological Opinion* (Biological Opinion). National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Southeast Regional Office (SERO). Retrieved from http://safmc.net/sites/default/files/meetings/pdf/Advisory%20Panels/2015/Shrimp_Apr/A1b_shrimp_biological_opinion_2014.pdf

10 Id.

11 Sea Turtle Conservation; Shrimp Trawling Requirements, 77 Fed. Reg. 27411, 27412 (proposed May 10, 2012) (to be codified at 50 C.F.R. pt. 223).

12 Wildlife and Fisheries, 50 CFR § 223.206(d)(2)(ii)(A) (2015); Sea Turtle Conservation; Shrimp Trawling Requirements, 77 Fed. Reg. at 27412 (stating that skimmer trawls, pusher-head trawls, and wing nets (butterfly trawls), however, may employ alternative tow time restrictions in lieu of TEDs, which limit tow times to 55 minutes from April 1 through October 31, and 75 minutes from November 1 through March 31).

13 Sea Turtle Conservation; Shrimp Trawling Requirements, 77 Fed. Reg. at 27412.

14 *Id.* at 27413.

15 NOAA. (2012). New data prompts NOAA Fisheries to withdraw proposed rule to require turtle excluder devices in certain shrimp trawls. Retrieved from http://sero.nmfs.noaa.gov/news_room/press_releases/2012/press_release_skimmer_trawl_proposed_rule.pdf

16 The distance from the front of the shell to the back of the shell not including the arch.

17 Memorandum from Bonnie Ponwith on SEFSC Skimmer Trawl Observer Data and Analysis (Sea Turtle Captures and Percentage Released in TEDs) to Roy E. Crabtree (Aug. 16, 2012) (on file with Oceana).

18 Dominy Hataway & Jeff Gearhart, Draft 2016 TED Evaluations for Skimmer Trawls 2 (2016) (on file with Oceana).

19 National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2015). *Kemp's Ridley Sea Turtle 5-Year Review: Summary and Evaluation.*; Witherington, B., Hirama, S., & Hardy, R. (2012). Young sea turtles of the pelagic Sargassum-dominated drift community: habitat use, population density, and threats. *Marine Ecology Progress Series*, 463, 1–22. https://doi.org/10.3354/meps09970

20 NOAA, NMFS, SERO. (2014). *Endangered Species Act - Section 7 Consultation Biological Opinion* (Biological Opinion). National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Southeast Regional Office (SERO). Retrieved from http://safmc.net/sites/default/files/meetings/pdf/Advisory%20Panels/2015/Shrimp_Apr/A1b_shrimp_biological_opinion_2014.pdf

21 Greens that were captured were between 14.1 and 28.8 centimeters SCL and Kemp's ridleys were between 14.6 and 29.9 centimeters SCL

22 Putman, N. F., & Mansfield, K. L. (2015). Direct Evidence of Swimming Demonstrates Active Dispersal in the Sea Turtle "Lost Years." *Current Biology*, 25(9), 1221–1227. https://doi.org/10.1016/j.cub.2015.03.014

23 With the exception of Florida which requires TEDs in all trawls within state waters. http://www.biologicaldiversity.org/news/press_releases/2012/sea-turtles-06-01-2012.html

24 Marine Turtle Specialist Group. 1996. Lepidochelys kempii. The IUCN Red List of Threatened Species 1996: e.T11533A3292342. http://dx.doi.org/10.2305/IUCN.UK.1996.RLTS.T11533A3292342.en. Downloaded on 07 October 2016.

25 National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2015). *Kemp's Ridley Sea Turtle 5-Year Review: Summary and Evaluation.*

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27 Frequently associating with Sargassum macroalgae. Witherington, B., Hirama, S., & Hardy, R. (2012). Young sea turtles of the pelagic Sargassum-dominated drift community: habitat use, population density, and threats. *Marine Ecology Progress Series*, 463, 1–22. https://doi.org/10.3354/meps09970

28 National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2015). *Kemp's Ridley Sea Turtle 5-Year Review: Summary and Evaluation.*

Endnotes

29 Putman, N. F., & Mansfield, K. L. (2015). Direct Evidence of Swimming Demonstrates Active Dispersal in the Sea Turtle "Lost Years." *Current Biology*, 25(9), 1221–1227. https://doi.org/10.1016/j.cub.2015.03.014; Memorandum from Bonnie Ponwith on SEFSC Skimmer Trawl Observer Data and Analysis (Sea Turtle Captures and Percentage Released in TEDs) to Roy E. Crabtree (Aug. 16, 2012) (on file with Oceana); E-mail from Wendy Teas, NOAA Federal, to Jennifer Lee, NOAA Federal (May 31, 2013, 12:05 EDT) (on file with Oceana).

30 Straight carapace length (SCL) is the distance from the front to the back of the shell, not including the arch.

31 The oceanic juvenile stage can be defined as the pelagic phase or the time small juveniles spend in the oceanic current system predominately in the Gulf of Mexico, with a small portion traveling the Loop Current and into the Gulf Stream to the south and mid-Atlantic region. The secondary juvenile phase is defined as the transition from the pelagic environment to the neritic, or nearshore shallow coastal habitat (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2015).

32 Only 331 of the 352 data points were mapped. The 21 that were excluded were done so to comply with confidentiality of vessel locations.

33 Data included from administrative record and academic sources documenting "offshore" captures. Sea turtles located in inshore habitats including bays, estuaries and sounds were not included.

34 This data file (credit: Jo Williams, James Primrose, Rick Hart- NOAA Fisheries) consists of vessel locations collected from the Electronic Log Book (ELB) program from 2011–2015 that are classified as "trawling" based on vessel speed. Trawling duration (TOWSECS) were summed in a 5 kilometer grid, with any cells containing data collected from less than three vessels removed, as dictated by the Magnuson-Stevens Act in order to maintain confidentiality. While these data do not represent Gulf of Mexico shrimp fishery effort, it can be used to detect the presence or absence of shrimping activity from 2011-2015. The file contains data collected from 896 unique vessels, however, not all vessels were equipped with an ELB for the entire duration of this data set.

35 (ELB Data Credit: Jo Williams, James Primrose, Rick Hart- NOAA Fisheries; Coastline Data Credit: NOAA's Office of Ocean Resources Conservation and Assessment; Putman, N. F., & Mansfield, K. L. (2015). Direct Evidence of Swimming Demonstrates Active Dispersal in the Sea Turtle "Lost Years." *Current Biology*, 25(9), 1221–1227. https://doi.org/10.1016/j.cub.2015.03.014; Memorandum from Bonnie Ponwith on SEFSC Skimmer Trawl Observer Data and Analysis (Sea Turtle Captures and Percentage Released in TEDs) to Roy E. Crabtree (Aug. 16, 2012) (on file with Oceana); E-mail from Wendy Teas, NOAA Federal, to Jennifer Lee, NOAA Federal (May 31, 2013, 12:05 EDT) (on file with Oceana).

36 Pulver, J. R., Scott-Denton, E., & Williams, J. (2012). *Characterization of the U.S. Gulf of Mexico Skimmer Trawl Fishery Based on Observer Data* (NOAA Technical Memorandum No. NMFS-SEFSC-636). Galveston, TX: Southeast Fisheries Science Center.; Putman, N. F., & Mansfield, K. L. (2015). Direct Evidence of Swimming Demonstrates Active Dispersal in the Sea Turtle "Lost Years." *Current Biology*, 25(9), 1221–1227. https://doi.org/10.1016/j.cub.2015.03.014

37 NOAA SEFSC. (n.d.). Southeast Fisheries Science Center - NOAA - National Marine Fisheries Service. Retrieved September 30, 2016, from http://www.sefsc.noaa.gov/labs/mississippi/ted/history.htm

38 Body depth is the width from the bottom of the lower shell to the tallest part of the upper shell.

39 Putman, N. F., & Mansfield, K. L. (2015). Direct Evidence of Swimming Demonstrates Active Dispersal in the Sea Turtle "Lost Years." *Current Biology*, 25(9), 1221–1227. https://doi.org/10.1016/j.cub.2015.03.014; Memorandum from Bonnie Ponwith on SEFSC Skimmer Trawl Observer Data and Analysis (Sea Turtle Captures and Percentage Released in TEDs) to Roy E. Crabtree (Aug. 16, 2012) (on file with Oceana); E-mail from Wendy Teas, NOAA Federal, to Jennifer Lee, NOAA Federal (May 31, 2013, 12:05 EDT) (on file with Oceana).

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