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Mortality Rate Estimates for Sea Turtles in Mid-Atlantic and Northeast Fishing Gear, 2012-2017

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ABSTRACT

The NMFS Northeast Sea Turtle Injury Workgroup reviewed all sea turtle interactions from 2012 to 2017 recorded by the Northeast Fisheries Observer Program (n=157) and At-Sea Monitoring (n=15) and interactions reported to the Sea Turtle Disentanglement Network (n=217). The workgroup first determined if the interaction occurred while the turtle was alive (e.g., not a carcass on the seafloor) and whether any injuries or other apparent effects were attributable to the interaction. If so, interactions were assigned to one of three injury categories with associated post-interaction mortality rates, or a determination of 100% mortality was applied according to the criteria in NMFS (2017). Sea turtle records are presented by major gear type for the fishery observer records (trawl, gillnet, dredge, pot gear) and by vertical fishing line, fish trap, or aquaculture gear for the entanglement records. The results are delineated by rolling 5-year periods (2012-2016; 2013-2017) to retain consistency with how previous regional results were presented and for applicability in Section 7 consultations. For the most recent 5-year time period (2013-2017), the resulting estimated mortality rate for observable interactions in trawl gear is 48%, gillnet gear is 73%, dredge gear is 40%, vertical line gear is 55% (or 61% if we include turtles that were not disentangled that we assumed died), and fish trap gear is 57%. The limited information on the aquaculture record precluded a mortality rate estimate for that gear. While NMFS calculated previous mortality rate estimates for trawl, gillnet, and dredge gear, this is the first estimate of post-interaction mortality rates in vertical fishing lines and fish traps (using entanglement data).

KEYWORDS

Sea turtles, Fisheries, Post-interaction mortality, Observer, Entanglement, Bycatch

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BACKGROUND

Mortality from incidental capture (bycatch) in fisheries can occur during the interaction or after turtles are released alive. The latter is referred to as post-interaction mortality (PIM) and results from delayed effects of physiological disturbances or trauma caused by capture. A determination of PIM is needed to characterize the full impact of federal fisheries on sea turtles, which is necessary under Section 7 of the Endangered Species Act (ESA).

NMFS defined criteria for estimating PIM in various fisheries (NMFS 2017). NMFS developed these criteria using available scientific studies in conjunction with veterinary and other expert opinion, primarily based on behavior and the presence and severity of injuries (Stacy *et al.* 2016). Information used to apply these criteria is collected by observers onboard commercial fishing vessels, through either the Northeast Fisheries Observer Program (NEFOP) or At-Sea Monitoring (ASM), or by personnel specifically trained and permitted to disentangle and release sea turtles. The latter personnel are part of the Northeast U.S. Sea Turtle Disentanglement Network (STDN), which was established in 2002 to reduce injuries and mortalities caused by entanglements primarily in the vertical lines of pot/trap fishing gear and to collect data on the interactions. The range of the STDN extends from Maine through Virginia. The STDN consists of a number of responders (see acknowledgement section), but the Center for Coastal Studies responds to the vast majority of entanglements in the Northeast.

Each NMFS region annually reviews records of incidental captures in trawl, net, and pot/trap fisheries to determine PIM (NMFS 2017). Previous estimates of PIM have been calculated for Northeast and Mid-Atlantic gillnet, trawl, and dredge fishing gear using Northeast-specific criteria and NEFOP/ASM data (Upite 2011, Upite *et al.* 2013, Upite *et al.* 2018). This document includes updated mortality rate estimates for those gear types using the national PIM criteria (NMFS 2017). Upite *et al.* (2018) reviewed one observed pot gear interaction, but the sample size was too small to produce a valid mortality rate estimate. The NMFS (2017) criteria included injuries often associated with the vertical lines of pot/trap gear, specifically those affecting the neck and appendages. Using the STDN data and the NMFS (2017) criteria, PIM for vertical fishing lines and fish traps can now be estimated.

METHODS

We applied NMFS' national PIM criteria (NMFS 2017) to records of incidental captures in Northeast and Mid-Atlantic U.S. trawl, gillnet, dredge, pot, vertical fishing line, and fish trap gear from 2012 through 2017. Information reviewed included the turtle photos, video (when available), and observer comments on the vessel and trip information logs, incidental take logs, and sea turtle biological sample logs (for fishery observer cases) or STDN responder comments on the Sea Turtle Entanglement Reporting Form (for entanglement cases). Each workgroup member determined whether the turtle was likely captured while alive (ante-mortem) and whether any injuries or other apparent effects were attributable to the interaction. Interactions not attributed to the observed haul/tow/set were noted as such and excluded from further analysis. For ante-mortem interactions, turtles were placed into one of four categories with associated PIM rates (Table 1). Workgroup members reviewed each case to make independent injury determinations, which were then compared and discussed to develop consensus determinations. In order to be consistent with previous mortality estimates in Northeast and Mid-Atlantic fishing gear (Upite *et al.* 2013, Upite *et al.* 2018) and for applicability to Section 7 consultations,

mortality estimates were calculated over rolling 5-year periods by gear type. Two separate 5-year periods (2012-2016 and 2013-2017) are included in this document. The criteria in NMFS (2017) apply to all sea turtle species and life phases, and we combined all species in the mortality rate estimates for each gear type.

Table 1. The estimated rate of post-interaction mortality for the respective risk categories, as defined in NMFS (2017).

	Low Risk		**Intermediate risk**	**High risk**	**Incompatible with survival (deceased)**
Category	1A[a]	1B[b]	2	3	
Estimated rate of post-interaction mortality	10%	20%	50%	80%	100%

[a]1A: fisheries at minimal risk of causing decompression sickness (DCS). Applies to fisheries operating at a depth less than 40 m (22 fathoms).
[b]1B: fisheries at risk of causing DCS. Applies to fisheries operating at a depth of 40 m (22 fathoms) or greater.

For those interactions where there was insufficient information on which to base the assessment, an injury category was not assigned. These cases were considered "unknown" and excluded from further analysis.

There were cases where a credible report verified an entanglement, but no response was mounted, the turtle was not located, or details were unclear on whether the turtle was disentangled. In these cases, the workgroup assumed the turtle was not released from the gear and eventually succumbed to the interaction (i.e., it was considered deceased). Because we made an assumption on mortality without a review of the injuries, but the entanglement report was credible and it is a reasonable assumption that the turtle died without any reported disentanglement, we calculated estimated mortality rates with and without these "assumed dead" cases.

In addition, there were other instances where the entanglement data were reviewed, but the case was not included in the overall mortality rate. This occurred when available information was unclear or sparse, but some assessment of the animal's condition was possible. In such cases, we assigned a PIM category determination to make the most use of all available observations; however, we had less confidence in the assignments and, therefore, excluded these results from the overall mortality rate. These cases are noted as Less Confident (LC) 1, 2, or 3 in the results. The following conditions had to be met for a case to receive a less confident determination (as opposed to an unknown determination): there was a photo or other reliable information (e.g., interview) to confirm the entanglement (regardless of whether the configuration or injury were visible); there was a description of the areas of the body involved; there was a notation of presence/absence of visible injury; and there was some description of behavior that informed assessment. If these criteria for "Less Confident" were not met, the case determination was unknown.

For each Category 1 case, the depth was determined by the value recorded in the observer database (typically for the haul or trip, not where the interaction occurred). Following previously published procedures (NMFS 2017), cases with depths less than 40 m were given a 10% mortality rate, while the mortality rate for cases at depths of 40 m or greater was 20% to reflect the relative risk of decompression sickness. All of the observed entanglements occurred at depths less than 40 m, so the mortality rate for each of those Category 1 cases was 10%.

RESULTS

Fishery Observer Data (NEFOP and ASM)

This evaluation includes records documented by fishery observers in Northeast and Mid-Atlantic U.S. fisheries from 2012 to 2017. Table 2 depicts the number of observed sea turtle interactions we reviewed by year and gear type for each of the two 5-year time periods featured in this report. Observed sea turtle species included the Northwest Atlantic Ocean loggerhead Distinct Population Segment (*Caretta caretta*), the North Atlantic green Distinct Population Segment (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), and Kemp's ridley (*Lepidochelys kempii*) turtles, as well as unidentified sea turtle species. The mortality rates include an assessment of PIM (e.g., our determination of Categories 1, 2, 3) and those turtles found dead as a result of the interaction.

Table 2. The number of observer records reviewed as well as the records excluded from overall mortality rate estimates from 2012 to 2017. T=trawl; G=gillnet; D=dredge; P=pot.

	2012			**2013**			**2014**				**2015**			**2016**			**2017**		
NEFOP records	34			24			27				31			20			21		
ASM records	5			1			9												
TOTAL records reviewed	39			25			36				31			20			21		
	T 27	G 12	D 0	T 20	G 4	D 1	T 23	G 12	D 0	P 1	T 14	G 15	D 2	T 12	G 5	D 3	T 13	G 6	D 2
Insufficient information	3			2			1				1			0			2		
	T 2	G 1		T 2			G 1				G 1						G 1	D 1	
Not attributable to observed fishery	0			4			0				0			2			1		
				T 3	D 1									D 2			D 1		
Total records with determinations 2012-2016	138																		
Total records with determinations 2013-2017				120															

Trawl Gear

2012-2016

From 2012-2016, there were 96 observed interactions in trawls. After the records with insufficient information (n = 4) and not attributable to the current gear interaction (n = 3) were removed, PIM determinations were made for 89 interactions involving trawl gear. The resulting estimated mortality rate for observable interactions in trawl gear from 2012-2016 is 47% (Table 3).

Table 3. The mortality rate assessment for sea turtles observed in trawl gear from 2012 to 2016.

	Category 1		*Category 2 50% mortality*	*Category 3 80% mortality*	*100% mortality*	**TOTAL**	**Estimated Mortality Rate**
	10% mortality	*20% mortality*					
Loggerhead	16	17	18	17	8	**76**	
Leatherback	0	0	1	0	1	**2**	
Kemp's ridley	4	0	0	2	0	**6**	
Green	1	0	1	1	1	**4**	
Unidentified	0	1	0	0	0	**1**	
TOTAL	**21**	**18**	**20**	**20**	**10**	**89**	
Percentage of turtles in each category^	24%	20%	22%	22%	11%		
Dead turtles (total * mortality %)	2.1	3.6	10	16	10	41.7	**47%**

^ The combined percentages do not equal 100% because of rounding.

2013-2017

The NEFOP and ASM databases included 82 observed interactions in trawl gear from 2013-2017. Post-interaction mortality determinations were made for 77 interactions involving trawl gear, after those cases with insufficient information (n = 2) and not attributable to the current gear interaction (n = 3) were removed. The resulting estimated mortality rate for observable interactions in trawl gear from 2013-2017 is 48% (Table 4).

Table 4. The mortality rate assessment for sea turtles observed in trawl gear from 2013 to 2017.

	Category 1		*Category 2 50% mortality*	*Category 3 80% mortality*	*100% mortality*	**TOTAL**	**Estimated Mortality Rate**
	10% mortality	*20% mortality*					
Loggerhead	13	12	12	15	7	**59**	
Leatherback	0	0	1	1	1	**3**	
Kemp's ridley	6	0	1	3	0	**10**	
Green	1	0	1	1	1	**4**	
Unidentified	0	1	0	0	0	**1**	
TOTAL	**20**	**13**	**15**	**20**	**9**	**77**	
Percentage of turtles in each category	26%	17%	19%	26%	12%		
Dead turtles (total * mortality %)	2	2.6	7.5	16	9	37.1	**48%**

Gillnet Gear

2012-2016

For gillnet gear, there were 48 records reviewed from 2012 to 2016. After the records with insufficient information (n = 3) were removed, PIM determinations were made for 45 interactions involving gillnet gear. The resulting mortality rate for observable interactions in gillnet gear is 78% (Table 5).

Table 5. The mortality rate assessment for sea turtles observed in gillnet gear from 2012 to 2016.

	Category 1		*Category 2 50% mortality*	*Category 3 80% mortality*	*100% mortality*	**TOTAL**	**Estimated Mortality Rate**
	10% mortality	*20% mortality*					
Loggerhead	3	0	4	2	17	**26**	
Leatherback	0	0	0	0	2	**2**	
Kemp's ridley	3	0	0	0	5	**8**	
Green	1	0	0	1	0	**2**	
Unidentified	1	0	0	0	6	**7**	
TOTAL	**8**	**0**	**4**	**3**	**30**	**45**	
Percentage of turtles in each category^	18%	0	9%	7%	67%		
Dead turtles (total * mortality %)	0.8	0	2	2.4	30	35.2	**78%**

^ The combined percentages do not equal 100% because of rounding.

2013-2017

From 2013-2017, there were 42 observed interactions in gillnets and after records with insufficient information (n = 3) were excluded, PIM determinations were made for 39 interactions. The resulting mortality rate for observable interactions in gillnet gear from 2013-2017 is 73% (Table 6).

Table 6. The mortality rate assessment for sea turtles observed in gillnet gear from 2013 to 2017.

	Category 1		*Category 2 50% mortality*	*Category 3 80% mortality*	*100% mortality*	**TOTAL**	**Estimated Mortality Rate**
	10% mortality	*20% mortality*					
Loggerhead	4	0	1	1	15	**21**	
Leatherback	1	0	0	0	1	**2**	
Kemp's ridley	4	0	0	0	5	**9**	
Green	0	0	1	1	0	**2**	
Unidentified	1	0	0	0	4	**5**	
TOTAL	**10**	**0**	**2**	**2**	**25**	**39**	
Percentage of turtles in each category	26%	0	5%	5%	64%		
Dead turtles (total * mortality %)	1	0	1	1.6	25	28.6	**73%**

Dredge Gear

The dredge fishing gear cases only involved scallop dredges. The resulting mortality rate for observable interactions in dredge gear for both 2012-2016 and 2013-2017 is 40% (Table 7). However, given the small sample size of observer records for this gear type (n=3; Table 2), there is uncertainty with this mortality rate estimate.

Table 7. The mortality rate assessment for sea turtles observed in dredge gear from 2012 to 2017. Note the two 5-year periods are combined below, as the results are the same.

	Category 1		*Category 2 50% mortality*	*Category 3 80% mortality*	*100% mortality*	**TOTAL**	**Estimated Mortality Rate**
	10% mortality	*20% mortality*					
Loggerhead	0	1	0	0	0	**1**	
Kemp's ridley	0	1	0	1	0	**2**	
TOTAL	**0**	**2**	**0**	**1**	**0**	**3**	
Percentage of turtles in each category	0	67%	0	33%	0		
Dead turtles (total * mortality %)	0	0.4	0	0.8	0	1.2	**40%**

Pot Gear

There was one pot record in 2014 (a dead leatherback). This is the only NEFOP/ASM reported interaction in this gear type, and thus the resulting estimated mortality rate for observable interactions in pot gear is 100%. However, given the extremely small sample size of observer records for this gear type, this mortality rate is highly uncertain. The STDN data described below may be more indicative of sea turtle mortality in pot gear.

Summary of Fishery Observer Data 2012-2017

In summary, Table 8 presents the mortality percentages for each gear type with observed sea turtle interactions in the NEFOP and ASM observer databases by the 5-year period analyzed.

Table 8. Overall estimated mortality rate by gear type from 2012 to 2016 and 2013 to 2017. The asterisked mortality rates are considered uncertain given the small sample sizes.

	Total Number of Records		**Overall Estimated Mortality Rate**	
	2012-2016	*2013-2017*	*2012-2016*	*2013-2017*
Trawl	89	77	47%	48%
Gillnet	45	39	78%	73%
Dredge	3	3	40%*	40%*
Pot/trap	1	1	100%*	100%*
TOTAL	138	120		

Sea Turtle Disentanglement Network Data

The STDN responds to and opportunistically collects information on any reported entanglement from Maine through Virginia, so the type of gear involved in each interaction can vary. We reviewed cases in the STDN database, housed at NMFS, that were identified as vertical fishing line, fish trap gear (e.g., pound nets, weirs), or aquaculture. We did not evaluate any cases involving non-fishery related entanglements, derelict gear, or unknown sources of line. Table 9 outlines the number of sea turtle entanglement cases we reviewed by year. The mortality rates are presented separately below for each gear type. The mortality rates include an assessment of PIM and those turtles found dead from the current interaction.

Table 9. The number of entanglement records reviewed from 2012 to 2017. The number in parentheses includes those assumed dead cases. LC = Less Confident, followed by the determination category.

	2012	**2013**	**2014**	**2015**	**2016**	**2017**
TOTAL records reviewed	43	61	31	20	27	35
Vertical fishing line records	41	57	29	18	21	28
Insufficient information	1	10	3	2	2	7
Assumed dead	2	8	2	3	2	0
Less confident		1 (LC3)	5 (all LC2)	1 (LC3)	2 (both LC2)	1 (LC2)
Total records with determinations 2012-2016	122 (139)					
Total records with determinations 2013-2017		104 (119)				
Fish trap gear records	2	4	1	2	6	7
Insufficient information					2	2
Less confident		1 (LC2)			1 (LC2)	
Aquaculture records			1			
Insufficient information			1			

Vertical Fishing Line

We analyzed all vertical fishing line entanglement records (excluding monofilament/longline gear), many of which were not identified to fishery. While most vertical line entanglements involve pot/trap gear, this cannot always be conclusively determined, so mortality rates are presented here for “vertical fishing line”. While most of the cases were from

Massachusetts (n=136), interactions occurred from Maine through Virginia. Estimated mortality rates for the two most recent 5-year periods (2012-2016 and 2013-2017) are presented in Tables 10 and 11. The estimated mortality rate includes cases with STDN responses and workgroup PIM reviews. However, to present all of the entanglement-related mortality data, we also included cases in the estimated mortality rate that we assumed were deceased (e.g., credible entanglement reports but no response or assessment) in parentheses.

Table 10. The mortality rate assessment for sea turtles found entangled in vertical fishing line gear from 2012 to 2016. The number in parentheses includes the "assumed dead" cases.

	Category 1 10% mortality	*Category 2 50% mortality*	*Category 3 80% mortality*	*100% mortality*	**TOTAL**	**Estimated Mortality Rate**
Loggerhead	2	0	0	5	**7**	
Leatherback	40	30	20	24 (41)	**114 (131)**	
Unidentified	0	0	0	1	**1**	
TOTAL	**42**	**30**	**20**	**30 (47)**	**122 (139)**	
Percentage of turtles in each category	34% (30%)	25% (22%)	16% (14%)	25% (34%)		
Dead turtles (total * mortality %)	4.2	15	16	30 (47)	65.2 (82.2)	**53% (59%)**

Table 11. The mortality rate assessment for sea turtles found entangled in vertical fishing line gear from 2013 to 2017. The number in parentheses includes the "assumed dead" cases.

	Category 1 10% mortality	*Category 2 50% mortality*	*Category 3 80% mortality*	*100% mortality*	**TOTAL**	**Estimated Mortality Rate**
Loggerhead	1	0	1	4	**6**	
Leatherback	35	21	19	22 (37)	**97 (112)**	
Unidentified	0	0	0	1	**1**	
TOTAL	**36**	**21**	**20**	**27 (42)**	**104 (119)**	
Percentage of turtles in each category	35% (30%)	20% (18%)	19% (17%)	26% (35%)		
Dead turtles (total * mortality %)	3.6	10.5	16	27 (42)	57.1 (72.1)	**55% (61%)**

Fish Trap Gear

In the STDN database, fish trap gear records consisted of weirs and pound nets. Of the 22 total records reviewed from 2012-2017 (Table 9), 19 involved pound nets. Fish trap interactions refer to actual entanglements. As indicated in NMFS (2017), free-swimming turtles freed from the pound are not included in this assessment. The results for 2012-2016 and 2013-2017 are noted below (Tables 12 and 13).

Table 12. The mortality rate assessment for sea turtles found entangled in fish trap gear from 2012 to 2016.

	Category 1 10% mortality	*Category 2 50% mortality*	*Category 3 80% mortality*	*100% mortality*	**TOTAL**	**Estimated Mortality Rate**
Loggerhead	0	0	0	3	**3**	
Leatherback	2	3	1	1	**7**	
Kemp's ridley	0	0	0	1	**1**	
TOTAL	**2**	**3**	**1**	**5**	**11**	
Percentage of turtles in each category	18%	27%	9%	45%		
Dead turtles (total * mortality %)	0.2	1.5	0.8	5	7.5	**68%**

Table 13. The mortality rate assessment for sea turtles found entangled in fish trap gear from 2013 to 2017.

	Category 1 10% mortality	*Category 2 50% mortality*	*Category 3 80% mortality*	*100% mortality*	**TOTAL**	**Estimated Mortality Rate**
Loggerhead	0	0	0	1	**1**	
Leatherback	4	4	2	2	**12**	
Kemp's ridley	0	0	0	1	**1**	
TOTAL	**4**	**4**	**2**	**4**	**14**	
Percentage of turtles in each category	29%	29%	14%	29%		
Dead turtles (total * mortality %)	0.4	2	1.6	4	8	**57%**

Aquaculture

Only one record in the STDN database from 2012-2017 involved aquaculture gear. The interaction occurred in 2014 and involved a leatherback, but the information was insufficient to make a PIM determination and therefore was given an unknown determination.

DISCUSSION

NMFS is required to evaluate the impacts of federal actions on listed species per Section 7 of the ESA. These estimations of sea turtle mortality rates in trawl, gillnet, dredge, vertical fishing lines, and fish trap gear will assist in the assessment of federal fishery impacts. The mortality rate can also be applied to sea turtle bycatch estimates (Murray 2013, Murray 2015) and entanglement data to estimate the overall number of lethal interactions in a particular gear type.

Using fishery observer data, previous mortality rate estimates for gillnet, trawl and dredge gear have been calculated (Upite *et al.* 2013, Upite *et al.* 2018). The 2011-2015 mortality rate estimate for observable interactions in trawl gear was 50% (n=93), and a similar mortality rate percentage was calculated for the most recent period in this report (48% for 2013-2017; n=77). The gillnet mortality rate estimates are also similar, but the most recent estimate is slightly lower with a comparable sample size: the estimate was 79% in 2011-2015 (n=44) and 73% in 2013-2017 (n=39). The dredge gear mortality rate estimates are much different among time periods, but the small sample size (n=3) in all years should be taken into consideration when reviewing the results. In 2011-2015, the dredge gear estimate was 67% (n=3), and in 2013-2017, it was 40% (n=3).

This effort was the first time entanglement data were evaluated for PIM. The overall estimated mortality rate percentage for vertical lines in 2013-2017 is 55% (n=104), or 61% (n=119) if including those turtles we assumed died (thus encompassing all credible reports of interaction). The fish trap mortality percentages varied the most between the two time periods analyzed – 68% mortality was estimated in 2012-2016 (n=11) and 57% in 2013-2017 (n=14). The differences are likely an artifact of the smaller sample sizes in this gear type, as one or two interactions with a Category 1 or dead determination would notably change the rates.

As stated, the mortality percentage for Category 1 cases varies depending on the depth of the interaction (NMFS 2017). We used the best available depth information for the haul/tow/set on which the bycatch occurred, but the chosen depth does not necessarily equate to the depth at the specific point of interaction, as that is unknown. Additionally, we are treating the depths reported on the hauls/tows/sets with observed turtle bycatch as accurate representations of the proportion of depths fished by commercial vessels across the fleet. Further consideration of mortality by fishing depth may be necessary for some applications of these results.

It is also important to acknowledge our assumption that those turtles without a documented disentanglement response die. While including those “assumed dead” cases in the mortality rate estimate is the most conservative approach for the species, we were not able to review those cases using the criteria in NMFS (2017), so the level of PIM review is not consistent among all records included in the estimate. Including the assumed dead cases increases the sample size and utilizes all of the available entanglement data, but introduces another degree of uncertainty. Ultimately, we do not know whether the turtle retained the gear, succumbing to injuries and dying, or if it was disentangled by an unknown party. For these reasons, we provided two mortality rate estimates – with and without those assumed dead cases. When the assumed dead cases were included in the mortality estimates, the overall mortality percentage increased by about five percent.

As this is the first time entanglement data were evaluated for these purposes, we identified several aspects of STDN data collection that will benefit future assessments. Most of the cases with low confidence involved the neck and our uncertainty in how extensively the line was constricting the airway. We recognize the STDN collects substantial data on these difficult entanglements (typically involving large, active leatherbacks) and operates in often unfavorable environmental conditions. However, future PIM assessments could be improved by consistently recording video of the turtle at initial sighting and release to better evaluate behavior, taking close-up photos of entanglement configurations and any abrasions to better assess injuries, noting whether there is any gear on the turtle at release, and improving documentation of entanglements involving the ventral neck in order to evaluate compression of the airway. The latter may involve revising the Sea Turtle Entanglement Reporting Form and/or instructions to discuss the encircling nature of the line around the ventral neck and stress the responders' assessment of line tightness.

Finally, we need the following information from all reporting parties to satisfy our criteria for classifying entanglement interactions:

1) a photo or other reliable information (e.g., interview) to confirm the entanglement;
2) a description of the areas of the body involved;
3) a notation of presence/absence of visible injury; and
4) some description of behavior that informs assessment.

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