
Bycatch and ship strikes of gray whales in U.S. and Canadian waters, 2008-2012

JONATHAN J. SCORDINO^{1*}, JIM CARRETTA², AND PAUL COTTRELL³

Contact email: jonathan.scordino@makah.com

ABSTRACT

The IWC held a workshop from 8 April to 11 April, 2014 to review the range-wide population structure and status of North Pacific gray whales. One of the objectives of the meeting was to develop a modelling framework to better assess the status of gray whales and the potential impact of human activities. The impacts of some human activities, such as hunting, are well documented whereas the impact of other human activities like shipping and fishing are not. In this paper we assessed the human-caused mortality, other than hunting, in Canada and US waters for 2008 through 2012. Whales observed alive with injuries from ship strikes or entanglement that likely had a compromised chance of survival were given a prorated level of mortality based on the observed known fate of North Atlantic right whales with similar distress following procedures established by NOAA (2012). We separated all observed incidents of human-caused mortality into regions defined as California (US border to 41°N), Pacific Coast Feeding Group (PCFG) Range (41°N to 52°N), Puget Sound, Southeast Alaska, Kodiak Island, and northern waters (>52°N) and by season to either migratory or feeding. We report three different models for apportioning the observed mortalities and injuries to the PCFG, Far North feeding group (FN), and Sakhalin Island feeding group (SI). We evaluated sighting data from the Cascadia Research Collective database of gray whale sightings to determine the availability of PCFG whales in each of the regions during the migratory and feeding seasons. The availability of PCFG and FN whales was used to proportion observed mortalities and serious injuries to these two feeding groups. To determine the possible proportion of whales that were from the SI group we multiplied migratory incidents by the median risk of 0.07 estimated by Moore and Weller (2013). During the 5-year period we observed 27.1 serious injuries and mortalities. We apportioned those mortalities and injuries using three methods which resulted in a range of mortality of 7 to 13 for PCFG, 25.1 to 31.1 for FN, and 0.05 for SI over the five-year period resulting in an annual rate of 1.4-2.6, 5.0-6.2, and 0.01 respectively. These estimates are minimum estimates because it is not likely that all whales killed by human activities are reported or drift to shore where they can be examined and documented.

INTRODUCTION

From 8 April through 11 April the IWC held a workshop to review the range-wide population structure and status of North Pacific gray whales. One of the objectives of the meeting was to develop a modelling framework to better assess the status of gray whales and the potential impact of human activities. Some human activities that directly cause whale mortality, such as hunting, are well documented whereas the impact of other human activities like shipping and fishing are not. Mortalities due to ship strikes and entanglement in fisheries gear and other marine debris cause conservation concern for other cetacean populations (e.g. North Atlantic right whales: Knowlton and Kruas 2001 and vaquita: D'agrosa *et al.* 2000). It is our goal in this

¹Marine Mammal Program, Makah Fisheries Management, Makah Tribe, Neah Bay, Washington

² Protected Resources Division, Southwest Fisheries Science Center, NOAA Fisheries, San Diego, California

³ Pacific Region Marine Mammal Program, Pacific Region, Department of Fish and Oceans Canada, Vancouver, British Columbia

paper to estimate the rates of this non-hunting human-caused mortality in US and Canadian waters for modeling by the IWC Scientific Committee to determine if these sources of mortality are a conservation concern for Pacific Coast Feeding Group (PCFG), Far North feeding groups (FN), or the Sakhalin Island (SI) feeding group. It is not our intention for this paper to be used in domestic marine mammal management in Canada or the US.

METHODS

Gray whale mortalities and injuries were documented through fisheries observer programs, fisher and sailing captain self-reports, reports from the public, and through examination of dead whales on the beach. Every report was documented in a database by the Canadian or US government in their respective areas.

All whales in which human interactions were assumed to have caused the mortality were recorded as a 1 for mortality. We utilized methods developed by NOAA (2012) to account for the likelihood of mortality for whales injured due to a ship strike or entanglement. Each injured whale was classified according to the large whale injury criteria table in NOAA (2012; Appendix 1). NOAA (2012) utilized the known fate of whales monitored in the past with similar injuries to determine a prorated value of mortality between 0 and 1 for each of the classifications.

The goal of this study is to apportion the observed mortalities to the Far North (FN) feeding group, Pacific Coast Feeding Group (PCFG), or Sakhalin Island feeding group (SI). The first step of apportioning these mortalities is to determine the region and season in which the mortality occurred. We assigned all mortalities and serious injuries (hereafter mortality) to the regions of FN (north of 52°N) with Kodiak Island and Southeast Alaska accounted separately for one analysis, Puget Sound, PCFG (41 to 52°N), and California (north of US/Mexico border and south of 41°N). All observations from June through November with one exception were assigned to the feeding season and all observations from December through May were assigned to the migratory season. The one exception for the feeding season was a whale observed on 15 June 2012 at Nitinat, British Columbia anchored to the bottom with multiple ropes in very decomposed condition. We decided to count this whale as having died in the migratory season given that its state of decomposition suggested it most likely died prior to 1 June.

Much of the observed mortality occurred at times or locations where the three feeding groups are mixed or are potentially mixed. As a result, without more information than time and location, it is not possible to allocate mortalities among the three feeding groups with certainty. To address this challenge we developed three methods for apportioning the observed mortalities. In all methods we assigned mortality in the PCFG during the migratory season equal to the availability of PCFG whales in Northwest Washington. We chose to use Northwest Washington rather than the availability of gray whales at all research segments in the PCFG because in areas outside Northwest Washington researchers target whales they believe are PCFG whales during surveys. Availability of PCFG whales was calculated by number of sightings of PCFG whales divided by total sightings in Northwest Washington during the time period of December through May. The first method used the strict definition of PCFG whales as only feeding in the range of 41° to 52° N and mortalities outside that range during the feeding season were assigned 100% to the FN. The second method assumed that all mortalities in California during the feeding season were of PCFG whales since the feeding group is spatially much closer to this region than is the FN or SI. For both methods one and two, the availability of PCFG whales during the migration in California was assumed to be equal to the ratio of the two population sizes. The last method used empirical data from the sighting database maintained by Cascadia Research Collective to

determine the availability of PCFG whales within all region and season combinations except for in the FN where data is too limited. Availability was calculated as the number of sightings of gray whales that met the IWC definition of PCFG whales divided by the total number of sightings within the region and season of interest for all sightings in the catalogue through 2012. Data for this analysis was accessed from the sighting database on 10 April 2014.

RESULTS

During the time period of 2008 through 2012 we observed 50 serious injuries and mortalities due to ship strikes or entanglements in US and Canadian waters (Appendix 2). To our knowledge, none of the whales were identified as PCFG whales in the Cascadia Research Collective catalog or were matched with the photo catalog for SI whales. Four whales were downgraded to a non-significant injury after being first documented as a serious injury because they were either successfully disentangled or disentangled themselves. The majority of human-caused injuries (70%) were due to entanglements in fishing gear or other marine debris. Five of the 35 entanglements occurred in Canada. We also recorded 15 ship strikes with one reported in Canada.

Availability of PCFG by region and season

Availability of PCFG whales by region and season was calculated from the sightings in the database maintained by Cascadia Research Collective and is reported in Table 1.

Table 1: Observed availability of PCFG whales by season and region with total numbers of observations reported.

Region	Feeding Season			Migratory Season		
	Observations of PCFG	Total Observations	Availability	Observations of PCFG	Total Observations	Availability
Kodiak	42	225	0.19	0	2	N/A
Southeast Alaska	21	37	0.57	0	0	N/A
Puget Sound	4	70	0.06	4	896	0.00
PCFG	16,321	17,316	0.94	97	270	0.36
California	13	43	0.30	3	35	0.09

Total observed mortality by region

Using method 1 we assigned whale mortalities during the feeding season using a strict application of the IWC definition of PCFG whales. During the migratory season we assigned whale mortalities in California and Puget Sound (PS) proportionally to the population size of the two groups (200 PCFG: 20,000 FN), resulting in an availability of 0.01. We assumed that no mortalities in the FN were PCFG whales. We assigned 0.2% of mortalities during the migration to SI whales based on the estimated risk to on an individual SI whale conducted by Moore and Weller (2013). This assessment concluded that the median estimate of the Makah hunt encountering a SI whale was 0.2% and assumed that there was zero probability of taking an SI whale during the feeding season. We estimated a total mortality of 7.0 PCFG, 31.1 FN, and 0.05 SI whales with an annual average of 1.4, 6.2, and 0.01 respectively from 2008 through 2012.

Table 2: Total observed non-hunting human-caused mortality for US and Canadian waters in 2008-2012 by region and season and apportionment of mortality to feeding group using a strict application of the IWC definition of PCFG whales.

Region	Feeding Group Proration						Observed Mortalities		Estimated mortalities		
	PCFG Feeding	PCFG Migrating	FN Feeding	FN Migrating	SI Feeding	SI Migrating	Feeding	Migrating	PCFG	FN	SI
Far North	0	0	1	1	0	0	2.75	1.5	0.0	4.3	0.00
Puget Sound	0	0.01	1	0.99	0	0.002	0	1	0.0	0.0	0.00
PCFG	1	0.359	0	0.641	0	0.002	4.02	7.75	6.8	5.0	0.02
California	0	0.01	1	0.99	0	0.002	6	16.05	0.2	21.9	0.03
Total							12.8	26.3	7.0	31.1	0.05
Average (2008-2012)									1.4	6.2	0.01

Method 2 used similar assumptions as method 1 with the exception that all mortalities in California during the feeding season were assigned to the PCFG because they are the closest feeding group spatially to where the mortality occurred. Using this method we estimated 13.0 PCFG, 25.1 FN, and 0.05 SI mortalities with an annual average of 2.6, 5.0 and 0.01 respectively for the 2008 through 2012 time period.

Table 3: Total observed non-hunting human-caused mortality for US and Canadian waters in 2008-2012 by region and season and apportionment of mortality to feeding group using the assumption that all mortalities in California during the feeding season were PCFG whales.

Region	Feeding Group Proration						Observed Mortalities		Estimated mortalities		
	PCFG Feeding	PCFG Migrating	FN Feeding	FN Migrating	SI Feeding	SI Migrating	Feeding	Migrating	PCFG	FN	SI
Far North	0	0	1	1	0	0	2.75	1.5	0.0	4.3	0.00
Puget Sound	0	0.01	1	0.99	0	0.002	0	1	0.0	0.0	0.00
PCFG	1	0.359	0	0.641	0	0.002	4.02	7.75	6.8	5.0	0.02
California	1	0.01	0	0.99	0	0.002	6	16.05	6.2	15.9	0.03
Total							12.8	26.3	13.0	25.1	0.05
Average (2008-2012)									2.6	5.0	0.01

Method 3 utilized the database of gray whale sightings maintained by Cascadia Research Collective to inform the availability of PCFG whales in each region by season. We added the regions of Southeast Alaska and Kodiak Island to provide better resolution to the availability estimates. Using this method we found 11.3 PCFG, 26.7 FN, and 0.05 SI mortalities with an annual average of 2.3, 5.3, and 0.01 respectively for the 2008 through 2012 time period.

Table 4: Total observed non-hunting human-caused mortalities for US and Canadian waters in 2008-2012 and apportionment by region and season using empirical data from the database of gray whale sightings maintained by Cascadia Research Collective.

Region	Feeding Group Proration						Observed Mortalities		Estimated mortalities		
	PCFG Feeding	PCFG Migrating	FN Feeding	FN Migrating	SI Feeding	SI Migrating	Feeding	Migrating	PCFG	FN	SI
Far North	0	0	1	1	0	0	0	0.75	0.0	0.8	0.00
Kodiak	0.185	0.01	0.815	0.99	0	0.007	0	0	0.0	0.0	0.00
SE Alaska	0.568	0.01	0.432	0.99	0	0.007	2.75	0.75	1.6	1.9	0.01
Puget Sound	0.06	0.004	0.94	0.996	0	0.007	0	1	0.0	0.0	0.00
PCFG	0.942	0.359	0.058	0.641	0	0.007	4.02	7.75	6.6	5.2	0.05
California	0.302	0.087	0.698	0.913	0	0.007	6	16.05	3.2	18.8	0.11
Total Average (2008-2012)							12.8	26.3	11.3	26.7	0.17
									2.3	5.3	0.03

DISCUSSION

We presented three methods for apportioning the total observed non-hunting human-caused mortality that occurs in US and Canadian waters to the PCFG, FN, and SI. All three methods count more mortalities than were documented because mortalities were 100% apportioned to the PCFG and FN before accounting for possible SI mortality. The risk of bycatch or ship strike of a SI whale is low enough that this weakness in the analysis is likely negligible. Of the three methods, method 3 is the strongest estimate because it uses observed values for the availability of PCFG whales by region and season rather than estimates based on the IWC-defined area and season of PCFG whales. Based on sighting data we know that some PCFG whales do feed in the FN during the summer but we felt that the available data was too limited to provide a meaningful estimate of the availability of PCFG whales in that region during the feeding season.

The methods used in this paper contrast strongly with the methods used in the US stock assessment report (SAR) for gray whales. In the SAR the IWC-defined area and season of PCFG whales is applied strictly and only mortalities from June to November in the range of 41°N to 52°N are included (Carretta *et al.* 2014a). At present the method employed by the US government may produce a stronger estimate than the methods in this paper because our methods assume that the likelihood of a whale being struck by a vessel or entangled in fishing gear or marine debris is equal to the proportion of times a whale observed by a research vessel was or was not a PCFG whale. Factors such as the whale's activity or sensitivity to boat noise will make it more or less available to be photographed by researchers. It is possible that the availabilities we used are biased high for PCFG whales during the migratory season because it is more likely that PCFG whales are feeding south of the Bering, Beaufort, and Chukchi seas feeding grounds and a feeding whale is easier to approach in a research vessel and easier to photograph. Accepting this potential bias in our methods, we calculated the availability of PCFG whales from sightings in the gray whale catalogue maintained by Cascadia Research Collective to make an informed assessment of how to apportion mortality based on the area and season in which the mortality was observed rather than making assumptions. In the future we recommend that photographs of whales recorded as dead or a serious injury be compared to the Cascadia

Research Collective's catalogue to determine if the apportionment estimates in this paper, particularly method 3, are accurate. As stated in the introduction, the purpose of this paper is inform the modeling associated with the range-wide workshop on gray whale stock structure and is not intended to replace domestic processes in the US or Canada for accounting of gray whale mortality.

Many of the mortality and serious injury reports used in this analysis were reports from the public. In most cases the reports are sound and very helpful but in many cases they lack sufficient detail to evaluate the nature of a whale's injury and to discern whether a single whale is reported on multiple occasions. Another limitation of reports from the public is that there are many PCFG gray whales known to have very visible, large, healed wounds (Figure 1). If these whales are reported by the public then they are included as a serious injury even though a trained observer would note that the injuries have healed.

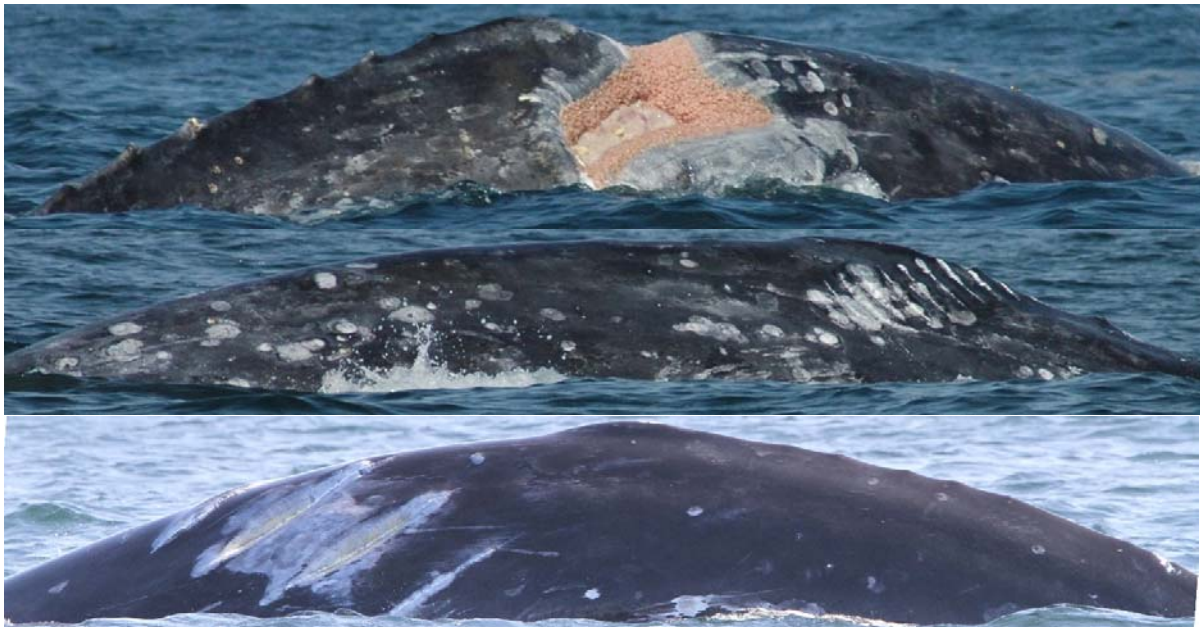


Figure 1: Large wound on CRC 204 (top) and propeller wounds on CRC 6 (middle) and CRC 144 (bottom) that may be reported by the public as a new injury despite the age of these wounds.

Scordino and Mate (2011) conducted a similar analysis of non-hunting human-caused mortality for California through British Columbia for 1990 through 2010. In that analysis they documented an annual PCFG mortality rate of 1.845 whales per year. This rate was 25% less than the estimate in this paper using method 3 (2.3 PCFG whales per year for 2008 through 2012). The difference in results may be due differences in methods such as the 2011 report not including Alaskan mortalities or the differences in how injuries were accounted as either a mortality or not. The different results may also show an increase in bycatch and ship strikes in recent years as compared to 1990 through 2010. Even with the greater estimates in this report, the total estimates of non-hunting human-caused mortality reported are minimum estimates because it is not likely that all whales killed by human activities are reported at-sea or drift to shore where they can be examined and documented and because this report does not report mortalities in Mexico.

LITERATURE CITED

- Carretta, J.V., S.M. Wilkin, M. Muto, K. Wilkinson, and J. Rusin. 2014b. Sources of human-related mortality for U.S. Pacific west coast marine mammal stock assessments, 2008-2012. Report PSRG-2014-09 for the Pacific Scientific Review Group meeting in Honolulu, Hawaii April 1-3, 2014. 84 p.
- D'agrosa, C., Lennert-Cody, C. E., and Vidal, O. 2000. Vaquita bycatch in Mexico's artisanal gillnet fisheries: driving a small population to extinction. *Conservation Biology*, 14:1110-1119.
- Knowlton, A. R., and Kraus, S. D. 2001. Mortality and serious injury of northern right whales (*Eubalaena glacialis*) in the western North Atlantic Ocean. *Journal of Cetacean Research and Management (Special Issue)*, 2:193-208.
- Moore, J.E. and D.W. Weller 2013. Probability of taking a western North Pacific gray whale during the proposed Makah hunt. NOAA Technical Memorandum NMFS-SWFSC-506
- NOAA. 2012. Federal Register 77:3233. National Policy for Distinguishing Serious From Non-Serious Injuries of Marine Mammals.
<http://www.nmfs.noaa.gov/op/pds/documents/02/238/02-238-01.pdf>
- Scordino, J. and B. Mate. 2011. Bycatch and ship strikes of gray whales on US West Coast 1990-2010 and in British Columbia 1990-1995. Annex C of report of the 2011 AWMP Workshop with a focus on eastern gray whales. Workshop held March 27-April 1 in La Jolla, CA USA.

Appendix 1: Summary of Large Cetacean Injury Categories and Criteria (Table 1 from NOAA 2012)

Instructions: Each large cetacean injury event is recorded to the appropriate injury/information category using all available information and scientific judgment, as described in the Procedural Directive. Criteria L10 - L12 accommodate events that lack details necessary for assignment to a more specific category. For a single injury event to which several categories apply, the injury determination with the highest level of severity is assigned. More detailed information or extended observation on an individual case/animal may justify a determination differing from the guidance of this table. An animal that is fully disentangled would generally be considered not seriously injured, unless there is additional evidence of a serious injury. Any injury leading to apparent significant health decline (e.g., skin discoloration, lesions near the nares, fat loss, increased cyamid loads) is a serious injury.

Category	Injury/ Information	Injury Determination	Criteria
L1	Ingested gear ² or hook(s)	SI ³	Swallowed, not simply draped through mouth
L2	Constricting wrap	SI	Tightly wrapped line anywhere on body that indents the skin or does not shift with whale's movement, or line that is likely to become constricting as the whale grows. Indication that a whale that is heavily weighted, anchored or has a discolored appendage is sufficient evidence of constricting gear
L3	Loose wrap, bridled or draped gear	NSI ⁴	Loosely wrapped gear that moves or shifts freely with whale's movement. Absence of constricting gear must be confirmed
L4	External hook	NSI	Fishing hook of any size on any part of the body (i.e., not ingested)
L5a	Deep lacerations	SI	Laceration with the potential to affect major artery (e.g., laceration or severing at insertion of flipper/fluke), penetrating body cavity, or cutting bone
L5b	Superficial laceration	NSI	Laceration not deeper than blubber layer, does not affect major artery, or cut bone
L6a	Vessel much greater in size than whale or vessel $\geq 65'$ and >10 knots	SI	Struck by vessel much greater in size than the whale and traveling greater than 10 knots, or struck by vessel equal or greater than 65' and traveling greater than 10 knots, and no information

			on injury to the whale
L6b	Vessel smaller in size than whale or vessel <65' and >10 knots	Prorate6: 0.20	Struck by vessel smaller in size than the whale and traveling greater than 10 knots, or struck by vessel less than 65' and traveling greater than 10 knots, and no information on injury to the whale. A strike to a calf by a vessel of any size and traveling greater than 10 knots will be considered a serious injury
L6c	Vessel any size ≤10 knots	NSI	Struck by vessel of any size traveling at equal or less than 10 knots and no information on injury to the whale
L7a	Vessel much greater in size than whale or vessel ≥65' and speed unknown	Prorate: 0.56	Struck by vessel much greater in size than the whale traveling at an unknown speed, or struck by vessel equal or greater than 65' and traveling at unknown speed, and no information on injury to the whale. A strike to a calf by a vessel of any size when speed is unknown will be considered a serious injury
L7b	Vessel smaller in size than whale or vessel <65' and speed unknown	Prorate: 0.14	Struck by vessel smaller than the whale traveling at an unknown speed, or struck by vessel less than 65' and traveling at unknown speed, and no information on injury to the whale. A strike to a calf by a vessel of any size when speed is unknown will be considered a serious injury
L8	Dependent7	SI	Dependent calf of a dead or seriously injured mother
L9	Brought on deck	SI	Whale removed from water and brought on deck

L10	Evidence of entanglement	Prorate: 0.75	Confirmed entanglement but insufficient information available to place in any of the L1-L4 criteria with a high degree of certainty
L11	Vessel strike laceration	Prorate: 0.52	Whale confirmed with non-entanglement related laceration but lacking details to place in either criteria L5a or L5b with a high degree of certainty. Includes observation of blood in water
L12	Vessel strike observed	Prorate: 0.36	Confirmed vessel strike report where there is insufficient detail to assign event to criteria L6a – L7b with a high degree of certainty. A strike to a calf by a vessel of unknown size traveling at an unknown speed will be considered a serious injury

Appendix 2: All observed mortalities and serious injuries in US and Canadian waters from 2008 through 2012.

DATE	INTERACTION TYPE	LOCATION	PROVINCE/ STATE	INITIAL INJURY ASSESSMENT	COMMENTS	FINAL INJURY ASSESSMENT	SI CODE	PRORATION	RANGE	SEASON
15-Oct-08	VESSEL STRIKE	TOFINO	BC	DEAD	CARCASS HAD PROPELLER LACERATION DORSAL SIDE	DEAD	NA	1	PCFG	FEEDING
17-May-09	MARINE DEBRIS	TOFINO	BC	SI	FREE SWIMMING ANIMAL HAD TAIL STOCK WRAP AND TRAILING ROPE	SI	L2	1	PCFG	MIGRATION
27-Aug-08	MARINE DEBRIS	NOOTKA	BC	SI	FREE SWIMMING ANIMAL HAD TAIL STOCK WRAP AND TRAILING ROPE (DO NOT HAVE PICTURES), NOT SURE IF THIS IS THE SAME ANIMAL FROM MAY 17, 2009)	SI	L2	1	PCFG	FEEDING
21-Mar-10	ROPE	MORSBY ISL	BC	SI	ANIMAL IS FREE SWIMMING AND HAS TAIL STOCK WRAP AND TRAILING ROPE, NOT ABLE TO RELOCATE	SI	L2	1	PCFG	MIGRATION
15-Jun-12	UNIDENTIFIED FISHERIES INTERACTION	NITINAT	BC	DEAD	ANIMAL DEAD (VERY DECOMPOSED) ANCHORED TO BOTTOM. MULTIPLE ROPES	DEAD	NA	1	PCFG	MIGRATION
2-Sep-12	UNIDENTIFIED FISHERIES INTERACTION	TOFINO	BC	SI	FREE SWIMMING WITH UNIDENTIFIED GEAR, ROPE AND TWO BUOYS, NOT RESIGHTED	SI	L10	0.75	PCFG	FEEDING
7-Feb-08	VESSEL STRIKE	ORANGE	CA	DEAD	CARCASS; PROPELLER-LIKE WOUNDS TO LEFT DORSUM FROM MID-BODY TO CAUDAL PEDUNCLE; DEEP EXTERNAL BRUISING ON RIGHT SIDE OF HEAD; FIELD NECROPSY REVEALED MULTIPLE CRANIAL FRACTURES	DEAD	NA	1	California	MIGRATION
1-Mar-08	VESSEL STRIKE	MEXICO	CA	DEAD	CARCASS BROUGHT INTO PORT ON BOW OF CRUISE SHIP; COLLISION OCCURRED BETWEEN PORTS OF SAN DIEGO & CABO SAN LUCAS BETWEEN 5:00 P.M. ON 2/28 & 7:20 A.M. ON 3/1	DEAD	NA	1	California	MIGRATION
31-Jan-09	UNIDENTIFIED POT/TRAP FISHERY ENTANGLEMENT	SAN DIEGO	CA	SI (PRORATE)	FREE-SWIMMING ANIMAL TOWING UNIDENTIFIED POT/TRAP GEAR; USCG REPORTED GEAR AS 4 LOBSTER POTS; FINAL STATUS UNKNOWN	SI (PRORATE)	L10	0.75	California	MIGRATION
25-Mar-09	GILLNET FISHERY	ORANGE	CA	SI (PRORATE)	FREE-SWIMMING ANIMAL WITH PINK GILLNET WRAPPED AROUND HEAD, TRAILING 4 FEET OF VISIBLE NETTING; REPORT RECEIVED VIA NATURALIST ON LOCAL WHALEWATCH VESSEL; NO RESCUE EFFORT INITIATED; FINAL STATUS UNKNOWN	SI (PRORATE)	L10	0.75	California	MIGRATION
4-Apr-09	VESSEL STRIKE	PACIFIC	WA	DEAD	NECROPSIED, BROKEN BONES IN SKULL; EXTENSIVE HEMORRHAGE HEAD AND THORAX; SUB-ADULT MALE	DEAD	NA	1	PCFG	MIGRATION

5-Apr-09	VESSEL STRIKE	ORANGE	CA	DEAD	DEAD STRANDING; 3 DEEP PROPELLER-LIKE CUTS ON RIGHT SIDE, JUST ANTERIOR OF GENITAL OPENING; CARCASS TOWED OUT TO SEA ON 6-APR, RESTRANDED AT 29TH STREET IN DEL MAR ON 10-APR; CARCASS TOWED OUT & RESTRANDED AT TORREY PINES STATE BEACH ON 12-APR; CARCASS EXAMINED BY LACMNH & SWFSC PERSONNEL	DEAD	NA	1	California	MIGRATION
9-Apr-09	MARINE DEBRIS ENTANGLEMENT	SITKA	AK	SI	THICK BLACK LINE WRAPPED TWICE AROUND WHALE'S BODY POSTERIOR TO THE EYES. PRIVATE CITIZEN CUT AND PULLED AWAY THE LINES. ANIMAL SWAM AWAY AND DOVE.	SI	L10	0.75	SE Alaska	MIGRATION
27-Apr-09	VESSEL STRIKE	ISLAND	WA	DEAD	LARGE AMOUNT OF BLOOD IN BODY CAVITY, BRUISING IN SOME AREAS OF BLUBBER LAYER AND IN SOME INTERNAL ORGANS. FINDINGS SUGGESTIVE OF BLUNT FORCE TRAUMA LIKELY CAUSED BY COLLISION WITH A LARGE SHIP.	DEAD	NA	1	Puget Sound	MIGRATION
1-May-09	VESSEL STRIKE	LOS ANGELES	CA	SI	CATALINA ISLAND TRANSPORT VESSEL COLLIDED WITH FREE-SWIMMING CALF ACCOMPANIED BY ADULT ANIMAL; CALF WAS SUBMERGED AT TIME OF COLLISION; PIECES OF FLESH & BLOOD OBSERVED IN WATER; CALF NEVER SURFACED; PRESUMED MORTALITY. VESSEL SIZE = 85 FT. SPEED = 27 KTS.	SI	L6A	1	California	MIGRATION
24-Jun-09	GILLNET FISHERY, TRIBAL	CLALLAM	WA	SI	WHALE CAUGHT IN THE BAG SECTION OF A TRIBAL SET GILLNET. WHALE ENCOUNTERED IN MORNING, UNKNOWN ENTANGLEMENT DURATION. NET HAD BEEN SET 8PM PREVIOUS DAY. WHALE WAS ABLE TO BREATHE, BUT COULD NOT FREELY SWIM AND WAS STATIONARY WITHIN NET. RIGHT PECTORAL FIN AND HEAD WERE WELL WRAPPED IN NET WEBBING. WHALE REACTED VIOLENTLY AND SWAM AWAY IN RESPONSE TO A DISENTANGLEMENT ATTEMPT. NET WAS RETRIEVED AND FOUND TO BE TORN IN TWO. NO CONFIRMATION THAT WHALE WAS COMPLETELY FREE OF NETTING. WHALE LAST SEEN AT 1030 AM. PRORATE L10 SERIOUS INJURY BECAUSE OF POSSIBLE EXISTING ENTANGLEMENT.	SI (PRORATE)	L10	0.75	PCFG	FEEDING
21-Jul-09	GILLNET FISHERY	HUMBOLDT	CA	SI	FREE-SWIMMING ANIMAL WITH GREEN GILLNET, ROPE & SMALL BLACK FLOATS WRAPPED AROUND CAUDAL PEDUNCLE. PHOTOS SHOW ROPE CUTTING INTO CAUDAL PEDUNCLE. REPORT RECEIVED VIA HSU RESEARCHER ON SCENE DURING RESEARCH CRUISE; ANIMAL RESIGHTED ON 3-AUG; NO RESCUE EFFORT INITIATED; WHALE IDENTIFIED BY J. CALAMBOKIDIS AS PCFG GRAY WHALE, RESIGHTED IN 2010 AND 2011, STILL ENTANGLED. In 2012 observed healthy with no entanglement.	NSI	L2	0	PCFG	FEEDING

9-Sep-09	VESSEL STRIKE	CLALLAM	WA	SI (PRORATE)	USCG VESSEL REPORTED TO BE TRAVELING AT 10 KNOTS WHEN THEY HIT A GRAY WHALE ON 9/9/2009. THE ANIMAL WAS HIT WITH THE PROP AND WAS REPORTED ALIVE AFTER BEING HIT, BLOOD OBSERVED IN WATER.	SI (PRORATE)	L11	0.52	PCFG	FEEDING
16-Feb-10	VESSEL STRIKE	SAN DIEGO	CA	SI (PRORATE)	FREE-SWIMMING ANIMAL WITH PROPELLER-LIKE WOUNDS TO DORSUM	SI (PRORATE)	L11	0.52	California	MIGRATION
5-Mar-10	UNIDENTIFIED FISHERY INTERACTION	SAN DIEGO	CA	SI	TOWING ORANGE/WHITE BUOY; UNIDENTIFIED FISHERY. NO RESCUE EFFORT INITIATED; NO RESIGHTINGS REPORTED; FINAL STATUS UNKNOWN	SI	L10	0.75	California	MIGRATION
12-Mar-10	VESSEL STRIKE	SANTA BARBARA	CA	SI	21 METER SAILBOAT UNDERWAY AT 13 KTS COLLIDED WITH FREE-SWIMMING ANIMAL; WHALE BREACHED SHORTLY AFTER COLLISION; NO BLOOD OBSERVED IN WATER; MINOR DAMAGE TO LOWER PORTION OF BOAT'S KEEL; FINAL STATUS UNKNOWN	SI	L6A	1	California	MIGRATION
16-Apr-10	CRAB POT FISHERY ENTANGLEMENT	CLATSOP	OR	DEAD	ENTANGLED IN CRAB POT LINES	DEAD	NA	1	PCFG	MIGRATION
7-May-10	CRAB POT FISHERY ENTANGLEMENT	LINCOLN	OR	SI (PRORATE)	ENTANGLED IN 3 CRAB POTS, WHALE NOT RELOCATED	SI (PRORATE)	L10	0.75	PCFG	MIGRATION
11-May-10	GILLNET FISHERY	ORANGE	CA	SI	FREE-SWIMMING ANIMAL ENTANGLED IN GILLNET; ANIMAL FIRST OBSERVED INSIDE DANA POINT HARBOR ON 5/11/10; ANIMAL SUCCESSFULLY DISENTANGLED ON 5/12/10 & SWAM OUT OF HARBOR; ANIMAL OBSERVED ALIVE IN SURF ZONE FOR SEVERAL HOURS ON 5/14/10 OFF DOHENY STATE BEACH BEFORE WASHING UP DEAD ON BEACH.	DEAD	NA	1	California	MIGRATION
17-Aug-10	CRAB POT FISHERY ENTANGLEMENT	MENDOCINO	CA	SI	CRAB POT LINE SPIRALED AROUND ANIMAL FROM HEAD TO FLUKES, TRAILING 20 FEET OF LINE ATTACHED TO CRAB POT; PECTORAL FIN SEVERED, ONLY NECROTIC TISSUE REMAINING. FREE-SWIMMING, BREACHING, MAKING SHALLOW DIVES; SUCCESSFUL DISENTANGLEMENT	SI	L2	1	California	FEEDING
22-Jan-11	VESSEL STRIKE	SAN DIEGO	CA	SI (PRORATE)	PLEASURE SAILBOAT COLLIDED WITH FREE-SWIMMING ANIMAL; ANIMAL DOVE IMMEDIATELY FOLLOWING CONTACT & WAS NOT RESIGHTED; NO BLOOD OBSERVED IN WATER; FINAL STATUS UNKNOWN. VESSEL SIZE ASSUMED LESS THAN 65 FT. AND SPEED UNKNOWN.	SI (PRORATE)	L7B	0.14	California	MIGRATION

12-Feb-11	VESSEL STRIKE	LOS ANGELES	CA	SI (PRORATE)	PRIVATE RECREATIONAL VESSEL COLLIDED WITH FREE-SWIMMING ANIMAL; ANIMAL BREACHED JUST PRIOR TO CONTACT, BOUNCING OFF SIDE OF VESSEL; DOVE IMMEDIATELY FOLLOWING CONTACT & WAS NOT RESIGHTED; NO BLOOD OBSERVED IN WATER; FINAL STATUS UNKNOWN; SKIN SAMPLE COLLECTED FROM VESSEL AND GENETICALLY IDENTIFIED AS A FEMALE GRAY WHALE. VESSEL SIZE ASSUMED LESS THAN 65 FT AND SPEED UNKNOWN.	SI (PRORATE)	L7B	0.14	California	MIGRATION
18-Apr-11	VESSEL STRIKE	SAN FRANCISCO	CA	DEAD	CRUSHED MANDIBLE	DEAD	NA	1	California	MIGRATION
11-Jun-11	VESSEL STRIKE	SAN MATEO	CA	DEAD	MASSIVE HEMORRHAGE INTO THE THORAX, BLOOD CLOTS AROUND LUNGS. LESIONS INDICATE MASSIVE TRAUMA. DUE TO CARCASS POSITION, THE SKELETON COULD NOT BE COMPLETELY EXAMINED (LYING ON BACK, TOP OF SKULL IN SAND)	DEAD	NA	1	California	FEEDING
13-Jul-11	UNIDENTIFIED FISHERY INTERACTION	SAN LUIS OBISPO	CA	SI	ANIMAL HAS BEEN IN AREA FOR ~5 WEEKS, OBSERVED FEEDING; THIS WAS FIRST OBSERVATION OF ENTANGLEMENT; GRAY LINE WITH BLACK AND WHITE FLOAT WRAPPED AROUND FLUKE/PEDUNCLE AREA, TRAILING LINE, 2 LACERATIONS IN THE FLUKE AREA, ONE DEEP ONE AT THE BASE AND ONE ON ONE OF THE BLADES CAUSING THE TIP TO CURL; ANIMAL OBSERVED ENTANGLED IN THE MORNING BUT AT 1330 OBSERVED WITHOUT ENTANGLEMENT; SHED GEAR ON ITS OWN; GEAR-FREE BUT INJURED	SI	L2	1	California	FEEDING
27-Jul-11	UNIDENTIFIED FISHERY INTERACTION	KITSAP	WA	NSI	INDICATIONS OF OLD HEALED ENTANGLEMENT SCAR ON FLUKE. OPEN ULCER/ LESIONS ON ABDOMEN OF UNKNOWN ORIGIN.	NSI	L5B	0	PCFG	FEEDING
25-Aug-11	UNIDENTIFIED NET FISHERY ENTANGLEMENT	PETERSBURG	AK	SI	ENTANGLED IN 50 LBS. HEAVY MONOFILAMENT WEBBING, CORK LINE, AND LEAD LINE, AS WELL AS OVER 200 LBS. OF BULL KELP ATTACHED TO GEAR; COMPLETELY DISENTANGLED; LEADING EDGE OF FLUKES HAD SIGNIFICANT CUTS AND ABRASIONS; OVERALL BODY CONDITION WAS POOR; MASSIVE INFESTATION OF WHALE LICE AND BARNACLES; ANIMAL VERY EMACIATED AND LACKED ANY VISIBLE SIGNS OF RECENT FEEDING; OBSERVED THE DAY AFTER DISENTANGLEMENT SWIMMING VERY SLOWLY. (APPARENT HEALTH DECLINE DUE TO CONSTRICTING AND WEIGHTED ENTANGLEMENT)	SI	L2	1	SE Alaska	FEEDING

25-Aug-11	UNIDENTIFIED POT/TRAP FISHERY ENTANGLEMENT	SAN MATEO	CA	SI	ONE WHITE "CRAB POT" BUOY NEXT TO BODY BY LEFT PECTORAL FIN; FLOAT STAYED NEXT TO BODY AND DID NOT CHANGE POSITION; ANIMAL REMAINED IN SAME POSITION - POSSIBLY ANCHORED; ONLY OBSERVED FOR ~2 MIN; NOT RESIGHTED, NO RESCUE, OUTCOME UNKNOWN	SI	L2	1	California	FEEDING
27-Sep-11	COD POT FISHERY ENTANGLEMENT	KODIAK	AK	SI	ENTANGLED IN COD POT GEAR; 3-5 WRAPS OF LINE AROUND PEDUNCLE AND WHALE IMMOBILIZED; 2-3 WRAPS OF FLOATING POLY BUOY LINES WRAPPED CLOSE TO FLUKES, SINGLE WRAP OF POT LINE AROUND PEDUNCLE EXTENDED DOWN TO THE POT AT AN ANGLE; FLUKES IMMOBILIZED; COMPLETELY DISENTANGLED AFTER 2 HRS AND OBSERVED SWIMMING SLOWLY. NON-SERIOUS INJURY BECAUSE WHALE'S CONDITION WAS REPORTED AS GOOD AND ALL GEAR REMOVED.	NSI	L2	0	Kodiak Island	FEEDING
17-Jan-12	COD POT FISHERY ENTANGLEMENT	ALEUTIANS EAST	AK	SI (PRORATE)	A 40' WHALE WAS CAUGHT IN COD POT GEAR NEAR UNIMAK PASS. LINES WERE CUT BY BOAT CREW AND BUOYS WERE RECOVERED, HOWEVER, THE POT AND SOME LINE REMAINED IN THE WATER. ANY LINE POSSIBLY REMAINING ON ANIMAL THOUGHT TO BE MINIMAL. GRAY WHALE DETERMINATION MADE FOLLOWING EXTENSIVE QUESTIONING BY KATE WYNNE. DETERMINATION: PRORATE AT L10 BECAUSE GEAR POSSIBLY REMAINS ON ANIMAL.	SI	L10	0.75	Far North	MIGRATION
22-Jan-12	MARINE DEBRIS ENTANGLEMENT	PACIFIC	WA	DEAD	POSSIBLE ENTANGLEMENT, DEEP CABLE-LIKE INDENTATION AROUND GENITAL AREA.	DEAD	NA	1	PCFG	MIGRATION
28-Jan-12	UNIDENTIFIED POT/TRAP FISHERY ENTANGLEMENT	SAN DIEGO	CA	SI (PRORATE)	ENTANGLED ANIMAL REPORT; TOWING TWO ORANGE BUOYS AND AT LEAST 150 FT OF LINE; UNKNOWN FISHERY, REPORTED AS POSSIBLE GILLNET; NO RESPONSE EFFORT	SI (PRORATE)	L10	0.75	California	MIGRATION
24-Mar-12	GILLNET FISHERY	LOS ANGELES	CA	SI	ENTANGLED ANIMAL REPORT; GILLNET GEAR AROUND PEDUNCLE; RESPONSE EFFORT RESULTED IN SUCCESSFUL DISENTANGLEMENT WITH >100 FT OF PINK GILLNET REMOVED FROM ANIMAL, BUT ANIMAL SUBSEQUENTLY OBSERVED DEAD ON 03/27 (FLOATING, SKIN SAMPLE TAKEN, NO NECROPSY). NET REMOVED ON 03/24 FOUND TO CONTAIN ONE DEAD CA SEA LION AND THREE DEAD SHARKS.	DEAD	L2	1	California	MIGRATION

28-Mar-12	UNIDENTIFIED FISHERY INTERACTION	ORANGE	CA	SI	ENTANGLED ANIMAL REPORT; LINE DEEPLY EMBEDDED AROUND TAIL STOCK AND UNDER FLUKE; ~45 FEET OF ROPE WITH HAND CARVED BUOY; ANIMAL SUCCESSFULLY COMPLETELY DISENTANGLED ON 3/29. FINAL OUTCOME UNKNOWN. ANIMAL SUCCESSFULLY DISENTANGLED AND ALL GEAR RECOVERED. ENTANGLEMENT NO LONGER LIFE THREATENING. CONDITION OF ANIMAL INDICATED THAT ANIMAL IS LIKELY TO SURVIVE.	NSI	L2	0	California	MIGRATION
17-Apr-12	UNIDENTIFIED FISHERY INTERACTION	ORANGE	CA	SI (PRORATE)	40-FOOT GRAY WHALE REPORTED ENTANGLED WITH APPROXIMATELY 150 FEET OF LINE TRAILING. FOUR SPONGEX BULLET BUOYS LIE ALONG THE LEFT SIDE OF THE ANIMAL. ENTANGLEMENT INVOLVES THE MOUTH, A WRAP OVER THE HEAD, AND THE LEFT PECTORAL FLIPPER. ENTANGLEMENT APPEARS RECENT. PARTIALLY DISENTANGLED 5/3/12 BY FISHERMEN.	SI (PRORATE)	L10	0.75	California	MIGRATION
21-Apr-12	UNIDENTIFIED FISHERY INTERACTION	SAN LUIS OBISPO	CA	DEAD	ROPE LIKE MARKS ON CAUDAL PEDUNCLE. ROPE IMPRESSION ON PECTORAL FIN. PHOTOS TAKEN.	DEAD	NA	1	California	MIGRATION
28-Apr-12	UNIDENTIFIED FISHERY INTERACTION	MENDOCINO	CA	SI (PRORATE)	SMALL GRAY WHALE OFF FORT BRAGG CA, IN COMPANY OF TWO OTHER ANIMALS, TRAILING TWO BUOYS.	SI (PRORATE)	L10	0.75	California	MIGRATION
5-May-12	MARINE DEBRIS ENTANGLEMENT	MONTEREY	CA	SI (PRORATE)	WHALE WATCH VESSEL NOTICED FROM IMAGES TAKEN OF A 20 - 25 FOOT GRAY WHALE THEY HAD BEEN OBSERVING EARLIER IN THE DAY, THAT ANIMAL WAS ACTUALLY ENTANGLED. A SMALL GAUGE LINE, LIKELY FROM RIGHT SIDE OF MOUTH GOES OVER THE ANIMAL'S BACK, AND OVER BLOWHOLES, TO LEFT SIDE OF MOUTH. NO BUOYS OR TRAILING LINE WERE OBSERVED. ANIMAL IN FAIR CONDITION. ANIMAL SIGHTED NEXT DAY BY WHALE WATCH VESSEL. CONFIRMED MOUTH ENTANGLEMENT, APPEARS TO BE STRAPPING MATERIAL.	SI (PRORATE)	L10	0.75	California	MIGRATION
8-May-12	DUNGENESS CRAB POT FISHERY ENTANGLEMENT	HUMBOLDT	CA	SI	ENTANGLED ANIMAL REPORT; DEEP CUTS FROM ROPE AROUND PEDUNCLE AND LACERATIONS AT FLUKE NOTCH AND LATERAL EDGE OF FLUKE; SUCCESSFULLY DISENTANGLED BUT LONG-TERM SURVIVAL NOTED AS QUESTIONABLE. GEAR WAS COLLECTED AND IDENTIFIED AS DUNGENESS CRAB POT GEAR. ANIMAL ENTIRELY FREED OF GEAR. ANIMAL IN FAIR CONDITION AND SLIGHTLY EMACIATED. DEEP CUTS (~ 2 INCHES) FROM THE ROPE AROUND THE PEDUNCLE REMAINED. GEAR WAS RECOVERED. RESULTS OF ENTANGLEMENT MAY STILL BE LIFE THREATENING.	SI	L2	1	PCFG	MIGRATION

11-May-12	DUNGENESS CRAB POT FISHERY ENTANGLEMENT	MARIN	CA	SI	ENTANGLED ANIMAL REPORT; LOOP BETWEEN CRAB POTS AND WEIGHTED LINE CAUGHT IN WHALE'S MOUTH; ENTANGLING GEAR STUCK IN ROCKS; ANIMAL ANCHORED WITH SMALL RADIUS OF MOVEMENT FOR 4 DAYS; SUCCESSFULLY DISENTANGLED. GEAR WAS COLLECTED.	NSI	L2	0	California	MIGRATION
13-May-12	UNKNOWN FISHERY INTERACTION	MONTEREY	CA	SI	ANIMAL ENTANGLED THROUGH MOUTH IN AT LEAST TWO SETS OF SUSPECTED POT GEAR THAT THAT HANG BELOW. ANIMAL ANCHORED WITH A SHORT SCOPE IN 28 FEET OF WATER TO SUSPECTED POTS. BUNDLE OF GEAR, INCLUDING 4 BUOYS LIE UNDER ANIMAL. ANIMAL HAVING SOME DIFFICULTY GETTING TO SURFACE. ANIMAL EVENTUALLY DISENTANGLED, BUT RESULTS OF ENTANGLEMENT MAY STILL BE LIFE-THREATENING.	SI	L2	1	California	MIGRATION
16-Jun-12	GILLNET FISHERY	VALDEZ-CORDOVA	AK	SI	30' GRAY WHALE IN PRINCE WILLIAM SOUND ENTANGLED IN GEAR. THRASHING AT SURFACE AND MOVING AT 4-5 KNOTS. NO WOUNDS OR CHAFING WAS OBSERVED. GILLNET, CORKLINE (ATLEAST 12 FLOATS), AND LEADLINE OBSERVED OVER ANIMAL'S ROSTRUM, BODY, AND TAILSTOCK. BOTH PECTORAL FLIPPERS APPEARED PINNED TO BODY. ANIMAL LATER APPEARED TIRED AND WAS SWIMMING AT 2 KNOTS. IT WAS NOT RELOCATED. ASSIGNED L2 BECAUSE GEAR APPEARS TO BE CONSTRICTING MOVEMENT OF WHALE'S FLIPPERS.	SI	L2	1	SE Alaska	FEEDING
22-Aug-12	GILLNET FISHERY	VALDEZ-CORDOVA	AK	SI (PRORATE)	WHALE SIGHTED BY TOUR BOAT. FEW DETAILS, OTHER THAN PART OF A FISHING NET WAS OBSERVED BEING TRAILED FROM A GRAY WHALE'S FIN. PHOTOS APPARENTLY AVAILABLE, BUT HAVE NOT BEEN LOCATED. PRINCE WILLIAM SOUND. EXTENT AND SEVERITY OF ENTANGLEMENT UNKNOWN.	SI	L10	0.75	SE Alaska	FEEDING
31-Aug-12	UNKNOWN FISHERY INTERACTION	LOS ANGELES	CA	SI (PRORATE)	ANIMAL FIRST DETECTED NEAR SAN DIEGO. SUBADULT GRAY WHALE REPORTED ENTANGLED WITH SMALL GAUGE, DARK-COLORED LINE DEEPLY EMBEDDED AROUND ITS TAIL STOCK. LITTLE GEAR TRAILS. ENTANGLEMENT WAS ONCE MORE INVOLVED AS INDICATED BY SCARS ON THE ANIMAL'S BODY. ANIMAL IN VERY POOR CONDITION - EMACIATED, SCARRED AND A HEAVY LOAD OF CYAMID AMPHIPODS. BLACK LINE AROUND PEDUNCLE, 20 FT TRAILING; OBSERVED OFF SAN DIEGO ON 8/31, COMPLETELY DISENTANGLED OFF LOS ANGELES 9/6, STRANDED DEAD 9/14/12.	DEAD	L2	1	California	FEEDING

13-Oct-12	GILLNET FISHERY	MENDOCINO	CA	SI	ENTANGLED ANIMAL REPORT; ANIMAL REPORTED WITH ROPE AROUND THE PEDUNCLE WHICH WASN'T SEEN IN PHOTOGRAPHS BUT PHOTOS DID SHOW GREEN GILLNET WITH CUTS TO THE HEAD; ANIMAL DISAPPEARED AND FINAL STATUS IS UNKNOWN	SI	L2	1	California	FEEDING
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