Scientific information that can be gained through large whale disentanglement

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ABSTRACT

As the extent and impact of the entanglement of large whales in manmade materials has gradually been identified, attempts to release them from potentially lethal entanglements have also increased. In some countries these efforts have evolved into the establishment of trained teams and Networks which, in some instances, are mandated to document the entanglement (gear and whale), as thoroughly as possible. The authors review the type of data routinely (and experimentally) collected by two Networks in the United States, with discussion of how these data may be used to advance the work of the Scientific Committee in its work.

INTRODUCTION

At the 58th Scientific Committee meeting, the commission directed the Scientific Committee to review the potentially unique opportunities provided by the release of entangled large whales for the collection of scientific data of potential use to the work of the Commission. When this item was discussed within the SWG on Environmental Concerns (Agenda item 9), it was determined that information of interest might relate to the phenomenon of entanglement itself, or about the individuals, species and populations involved. The following is a review of the data that are being collected in some regions of the world during these events, along with a look at some potential ideas that are being explored.

A few countries have developed Networks of trained teams of large whale disentanglers (e.g. Australia, Canada, Mexico, New Zealand, South Africa, United Kingdom, and United States). Much of what we report here has come from data collected by two of these Networks: one on the Atlantic Coast of the United States and the other in the Hawaiian Islands. These networks operate under the authorization and oversight of the National Marine Mammal Health and Stranding Response Program, which is a part of NOAA Fisheries (U.S.), but are made up of many individuals from numerous institutions as well as State and Federal agencies. Along the U.S. Atlantic Coast the Provincetown Center for Coastal Studies has been contracted to continue to develop and improve techniques, to provide training for others in the Network and to lead many of the disentanglement efforts in the region. In Hawaii, experienced staff at the Hawaiian Islands Humpback Whale National Marine Sanctuary are playing much the same role in the community-based network developed there. Part of the mandate for the formation and authorization of these two networks is that, whenever possible (and prudent) they document the nature of the entanglement, the whale (e.g. species, sex, relative size, condition and type of injuries) and the entangling gear as thoroughly as possible, hence the focus on the data collected by these two Networks and their collaborators for this review.

SOME APPLICATIONS OF DISENTANGLEMENT DATA

Accuracy of opportunistic reports

Many countries have well designed Fisheries observer programs for documenting and estimating bycatch of non-target species, such as seabirds, turtles and small cetaceans. However, while these programs may place well trained observers on board vessels, they rarely see and/or document bycatch of large whales, as these latter often drag fishing gear away from its expected retrieval location. Therefore, many countries rely on opportunistic reports of large whale entanglements for assessing the rates of large whale bycatch for management purposes and documentation in their IWC national progress reports. These reports come from a variety of both experienced and inexperienced sources. Documentation of large whale entanglements by professional rescue (disentanglement) teams can provide, amongst other things, a level of verification of these otherwise opportunistic reports. SC/59/BC2 is a first attempt to compare the initial reports from opportunistic sources, with subsequent documentation by professional disentanglement teams. Therefore we do not report on that in detail here, except to say that SC/59/BC2 identifies often large discrepancies between what is reported and what is found. These differences can be as extreme as: misidentification of species (even: genus, family, order, class and phylum), severity of the entanglement and the type of manmade rope, net, debris or other material.

Determining what materials can (lethally) entangle a whale

Careful and systematic removal and documentation of manmade ropes and net taken from entangled whales has allowed it to be examined by fisheries and/or debris experts, and in many instances traced to its original fishery, location and sometimes owner. Johnson et al. (2005), summarized the analysis of the rope and net removed from whales along the U.S. and Canadian Atlantic Coast between 1997 and 2002, and found that, although 20% could not be traced, the rest provided a clearer insight into the types of manmade materials that could lethally entangle both right whales and humpback whales in that region. In addition Mattila and Lyman (2006) used information from disentangled whales in Hawaii (and elsewhere in the U.S.), to begin to shed light on the incidence of potentially lethal entanglements in marine debris. The results of these analyses so far indicate that virtually any passive rope or net in the water column that whales inhabit, whether actively fished, stored or derelict, is potentially implicated. Because the vast majority of this material is related to fisheries, they contribute the vast majority of rope and net found on entangled whales. However, rope, cable, strapping and net of other origins are also found and removed from whales.

Determining how whales become entangled

Careful documentation of what part of the body of a whale is entangled (e.g. in the mouth, flipper or tail) can provide insight into how a whale might become entangled. Our work disentangling large whales suggests that, without careful documentation by a trained team, this type of assessment of a large whale entanglement can often be misreported, even when the animal is anchored. Thorough documentation, combined with knowledge of the type of gear (if identified), can sometimes pinpoint the time, day and location of the entanglement, and the circumstances and/or behaviors that may lead to the interaction (Mattila and Lyman, 2006). In addition, documentation of the animal's sex, age class, behavior and health, can further inform the understanding of the circumstances surrounding entanglements. And, as Lien et. al. (1991) proposed this may even give insight into an animal's sensory capabilities. These data are essential a better understanding of where, when and how large whales become entangled, allowing managers to better assess which animals, populations, fisheries and regions are at greater risk, and ultimately helps to better mitigate the impact and monitor the success of mitigation.

Entanglement impacts (lethal and sub-lethal)

Recent studies of entanglement scarring on whales (Knowlton et al, 2001, Robbins and Mattila, 2001) suggest that the entanglement of large whales occurs much more frequently than previously believed. In fact Robbins and Mattila reported that approximately 20% of the humpback whale population of the Gulf of Maine (U.S.) becomes entangled each year. Obviously, scar studies only document those individuals that survive their entanglements and are sighted. The more difficult questions remain, "what percentage of large whale entanglements are lethal?", and "are there sub-lethal impacts from entanglement that affect the recovery of populations?" Careful collection of specific data during professional disentanglements can help to determine both lethal and sub-lethal impacts. For instance, simple photo-identification or genetic documentation of released animals can be compared with any subsequent strandings or floating carcasses to better understand survival and injuries related to the entanglement. This photo identification and biopsy information can be even more valuable when it is coupled with long-term identification studies in the region, as this may be used to determine ultimate survivorship and reproductive success of entangled animals. In addition, new techniques are being developed for assessing the health of large whales, through small tissue samples and/or visual means (Pettis et al, 2004, SC/59/DW2). Many aspects of the development of these techniques have used badly entangled whales as examples of poor health. In turn, the measures developed have been used in attempts to determine thresholds beyond which an animal is unlikely to survive, and therefore prognosticate survivorship.

Ground-truthing other research

Establishing true entanglement rates for large whales is very difficult. Events are often cryptic and rarely seen or reported by fisheries bycatch observers primarily because larger animals often break or drag gear away from its expected position of recovery. As mentioned above, one methodology that has been developed to gain insight into the rates at which large whales interact with fishing gear is to examine wounds and scars on their body through high quality images (Hamilton et al, 1998, Knowlton et al., 2001, Robbins and Mattila, 2001). Quality photo documentation of entangled whales, as gear is removed by trained teams, has provided a catalog of wounds known to be caused by entanglements. In addition, when tracking individuals over time is possible, the healing process and longevity of scars produced from these events can be determined (Robbins and Mattila, 2001). While this technique can only measure the encounter rate for individuals who survive their entanglement, it gives insight into relative risk of entanglement by geographic area (Mattila and Robbins, 2003, SC/59/BC*splash scar*) and species. An additional aspect of trained disentanglement networks is that they often "monitor" entangled whales that may not be candidates for "intervention" for a number of reasons, and through

this process determine the types of entanglements that whales can shed "naturally" and those that require intervention.

Opportunity for use of telemetry

When entangled large whales are anchored by their entangling gear, or brought under control using techniques developed for disentangling free-swimming whales (Lyman et al, 1999), there are opportunities to attach telemetry devices to the whale, prior to their release. In addition, in some areas telemetry buoys have been developed to track entangled whales until the conditions are safer for a disentanglement attempt (e.g. appropriate resources, weather, and time of day). While attached to the whale these provide information on their movement and behavior. Because entangled animals are often stressed, and their health can be severely compromised, the use and placement of telemetry must be carefully evaluated, and if telemetry is deemed appropriate, care needs to be used when interpreting such data. However, tracking to date has provided insights into foraging patterns and potential, previously unknown, habitats (Bowman et al, 2003, and example track Appendix A).

Insight into behavior

As humans interact more frequently, and in a greater variety of ways, with whales, there is a growing interest in understanding any potential negative impacts that different interactions may cause. Studies have focused on both short-term and long-term affects. Entangled whales are certainly stressed to varying degrees, and the process of disentanglement can temporarily raise that level of stress. Careful documentation of an animal's reaction to specific disentanglement activities can give insight into short-term behavioral responses to stress. This could range from potentially subtle changes in respiration and other dive characteristics and movement, to more obvious, violent defensive reactions.

Informing the development of safer fishing gear and practices

Perhaps most importantly for populations which may be negatively impacted, the careful and thorough documentation of entanglements and the gear removed from each animal by trained disentanglement teams can supply data for the development of fishing gear and/or practices which are less likely to entangle a whale, or which minimize the severity and associated risks of entanglements. These changes can also save fishermen the costs associated with the loss or destruction of their gear. A good example of disentanglement data, informing gear research which ultimately produces fishing gear modifications with a significant chance to mitigate large whale entanglements, can be found in the State of Massachusetts (U.S.) which mandated a switch from the floating rope used to connect multiple lobster traps sharing one buoy system, to sinking rope (McKiernan et al, 2002, Lyman and McKiernan, 2005). This reduced that amount of rope in the water column by up to 70% in some areas, resulting in a potential, concurrent reduction in entanglement risk of similar magnitude. Another example comes from Australia where the regional disentanglement network determined that many of the large whale entanglements along the West Coast of Australia, in particular, were in the excess floating buoy rope that resulted from lobster fishers moving traps from deeper offshore waters into shallower inshore waters, without shortening the retrieval buoy line. A "code of best practices" was developed recommending ways to avoid this excessive floating rope at the surface.

THE (SAFE) DOCUMENTATION OF WHALES AND GEAR DURING DISENTANGLEMENT EFFORTS

Safe Disentanglement techniques

It goes without saying that subduing and safely releasing large whales from life-threatening entanglements in fishing gear, whether they are anchored or free-swimming but still towing the gear, is a potentially dangerous undertaking, as proven by the death of a would-be rescuer in New Zealand in 2003 (Dye and Harris, 2003). As there can be considerable variability between the reaction of different species (Landry et al, 2003), and the circumstances of each entanglement (e.g. gear type, water depth, environmental conditions, resources at hand….etc.), it is not within the scope of this paper to describe all of the tools and techniques that have been developed by several teams over the last three decades. Some of the general principles are discussed in Clapham et al (2002), and some of the current difficulties and progress can be found in the report of the Disentanglement Workshop held in Boston (U.S.) in 2004 (report available online from U.S. NOAA Fisheries). We recommend that any institution or agency that wishes to initiate a professional disentanglement team or network should first consult the appropriate governmental agency in their country responsible for authorizing such activity, and then seek training from experienced institutions or individuals that have a track record of safe, successful professional

release of the same species likely to be encountered. In the U.S. system of networks a first training session takes two days, one in the classroom going over tools, techniques and safety, using case histories as examples, with a second day spent on the water practicing with the tools in simulated situations. For a sample agenda describing the type of training that is offered in the U.S., see Appendix B.

Most of the safe techniques that have been developed over the years, by Jon Lien in the late 1970's and staff from the Provincetown Center for Coastal Studies in the 1980's and 90's, involve tools and techniques for "controlling" the entangled whale, and releasing it while staying out of the water and in the rescue boat at as safe a distance as possible from the whale. This is done either through anchoring them (if they are not already so) providing that they are in sufficiently shallow water, or attaching floatation and drag to the gear already on them, in order to keep them at the surface and motionless or nearly so (Lyman et al, 1999). In this process specially developed grabbing and cutting tools are used on the end of telescoping poles to grab and cut the entangling lines systematically. Currently, techniques using sedatives and tail harnesses are being developed by a variety of institutions to help improve several aspects of disentangling, especially for species or individuals that are more aggressive (see NOAA Fisheries report of Disentanglement Workshop, 2004). The disentanglement Network in Western Australia has adapted many of the techniques developed in North America and improved efficiency and safety with the introduction of "Incident Control System" concepts for the organization, decision-making and response aspects of the work.

Ultimately in the disentanglement process, when an animal is subdued, a soft-bottom, low-sided inflatable is routinely used to assess the situation and cut the animal free. This "close in" work can offer a unique opportunity to document both the entanglement and the whale.

Some documentation techniques currently in use

Once again, most of the following techniques and approaches to the careful documentation of entangled whales during disentanglement procedures that we report here come from the Networks along the U.S. Atlantic Coast and Hawaii.

Types of platforms used:

Rescue vessel: As mentioned above, the preferred vessel for working in close proximity to an entangled whale is a light, soft-bottomed inflatable with low sides for easy access to the gear and whale. This also has many advantages for documentation, as it allows handheld deployment (either directly or on the end of a pole) of documentation equipment such as cameras, tissue or respiration collectors, and even syringes.

Support vessel: An indirect but important affect of using a smaller rescue vessel is that they must be used in conjunction with a support vessel, that transports the rescue boat and team to the site, stores and prepares rescue equipment for the team in the inflatable, and provides a safety backup in case the team is flipped or knocked into the water. This vessel is often a good secondary platform for imaging (still and video), and is the most appropriate platform from which to collect respiration and behavioral data. In addition, once the animal is released, this vessel can follow it for further image documentation (e.g. individual photo-identification, and the animal's wounds now free of gear), continued behavioral data collection and tissue sampling (e.g. biopsy).

Aerial support: For some disentanglement efforts, especially along the U.S. Atlantic Coast, aerial support has become a common part of the process. This is due in part to the numerous aerial surveys for northern right whales, which often find, document and stay with an entangled animal until a rescue team can arrive, or because the aerial support is contracted specifically for a particularly important or difficult rescue attempt. Regardless of the reason, photo or video images from above have provided key insights into the nature of the entanglement that otherwise may have been missed.

Imaging:

Of course whenever feasible, staff on the support vessel should take still images and video of as much of the whale and entanglement as possible. However, the most useful images and video are often taken from the rescue boat when it is up close to the whale. Using the disentanglement techniques employed discussed here, there is often time to wait for the animal to tire or "calm". During these "lulls" and/or while assessing the entanglement to determine the subsequent plan of action, still and video images can be taken directly from the rescue inflatable. High resolution still images should be taken of every aspect of the whale and the entanglement, from both above and below the surface (see Appendix C, image page), as long as the latter is possible without getting in the water and if water clarity allows. In addition, video can be taken using a variety of systems. We use video both above and below the surface. During the latter, the camera is either held in an underwater housing over the

side of the inflatable, or a waterproof "lipstick" type lens is placed on the end of a pole and held over the side, closer to the whale. This lens on a pole may also be held in the air directly above the whale in order to get a "bird's eye" perspective of the whale and entangling gear. In addition the same "lipstick" type lens can be attached to the top of safety helmets used during the rescue. With this lens connected to a small camcorder in either a backpack on a life vest, or in a "fanny pack", what the rescuer sees can be documented while allowing their hands to remain free to work. In this way some aspects of the entanglement, which might otherwise be missed, may be recorded for later analysis.

As mentioned above, images and video taken from an aircraft circling the event can be useful for an accurate understanding of the nature of the entanglement. This should be done very carefully with the appropriate aircraft at an appropriate altitude. This means that a strong telephoto lens should be used, and many photographers find that a lens with image stabilization capabilities helps to reduce the vibration often associated with these platforms.

Physical samples:

Currently, the most ubiquitous tissue sample that should be collected from an entangled whale is a biopsy. Generally this is done immediately upon freeing the whale from its entangling gear, in order to avoid any potential unnecessary stimulation of the whale during the disentanglement process itself. This usually requires that the person taking the biopsy should be in the support vessel, and it should be ready to follow the whale the moment it is released. This requires communication between the rescue boat and the support boat, as the former should announce when they are preparing to cut the last line free. As reported in SC/59/DW2, the tissue samples collected can be subdivided and stored in various ways (frozen, formalin, alcohol) for a multitude of analyses. With the improvement of genomic and proteomic techniques, biopsies are becoming ever more valuable as a source of valuable information. If a biopsy can not be taken, the disentanglers should carefully examine the rope and net that has been removed from the whale, as there are often pieces of skin and blubber embedded in the strands of the rope or the webbing of the net. Samples collected in this manner may be of more limited value, but have been used for genetic analyses at a minimum.

In addition to a biopsy, attempts have been made to draw blood from an entangled and immobile large whale. While a consistently effective method has not yet been developed, drugs (sedatives and analgesics) have been successfully administered to an entangled whale with a remote syringe system, suggesting that this avenue for restraining, and possible sampling, should continue to be pursued. Also, techniques are currently being developed to sample respiratory gases from entangled large whales. Such samples will provide information on stress, metabolic condition and health. Given the close proximity of the disentanglers, this does not appear to be too difficult with currently existing experimental systems.

Any of these sample collections should be done in close collaboration with veterinarians, and therefore with the proper handling and preservation techniques.

Gear documentation and follow up:

Every attempt should be made to fully document the gear and the entanglement prior to beginning the process of removing it. This can be done with all of the still and video imaging techniques mentioned above, as well as verbal and written descriptions. While the gear is being removed, the "helmet cams" described are helpful in documenting the order and position of the lines and net cut. One of the first steps that we take after freeing the whale is to either write down, or describe into the video camera, the orientation of the gear on the whale and which cuts were made by us. We attempt to label the position of each cut with tape or some other labeling device on the gear retrieved, so that when we return to land we can spread out the gear and recreate its orientation on the whale. This can indicate which part of the gear was initially encountered by the whale, giving insight into how it became entangled.

After we have done this, with video interviewing, written descriptions, photographs and drawings to document the gear and the entanglement, we turn it over to gear experts who can often determine what fishery it came from, as well as what region of the world it came from. If there are identification numbers or tags, it can sometimes be traced to the individual fisherman who can subsequently be interviewed about where and how it was set, and when it was lost. This can sometimes be hundreds to thousands of kilometers from the whale's eventual release (SC/59/BC2).

Appendix C is included as an example of documentation from a recent disentanglement event conducted by the Hawaiian Islands Disentanglement Network, coordinated by NOAA, and provides an example of some of the documentation being collected by trained teams in some parts of the world. In addition, the following data were also collected:

- Respiration and behavior data.
- A tissue biopsy (immediately after release of the whale).
- Both surface (support vessel and helmet cam) and underwater video (using a housing held over the side of the rescue inflatable) was collected.
- Recent follow up investigation of the gear by NOAA Fisheries and Sanctuary staff identified its owner and found that it came from Kodiak, Alaska and was crab gear modified for use in trapping cod fish in that area.

CONCLUSIONS

It is clear from SC/59/BC2 and this review that professionally trained disentanglement teams with the proper instructions, personnel and equipment can accomplish a level of data collection and documentation of these events that can be very valuable for many uses, along with having been successful in freeing whales. It should also be stressed however, that safety and a successful release of the impacted animal are the highest priority, and should not be compromised by the collection of these data. The authors recommend that anyone intending to establish large whale disentanglement teams or networks should work together with the appropriate governmental agencies and seek professional training.

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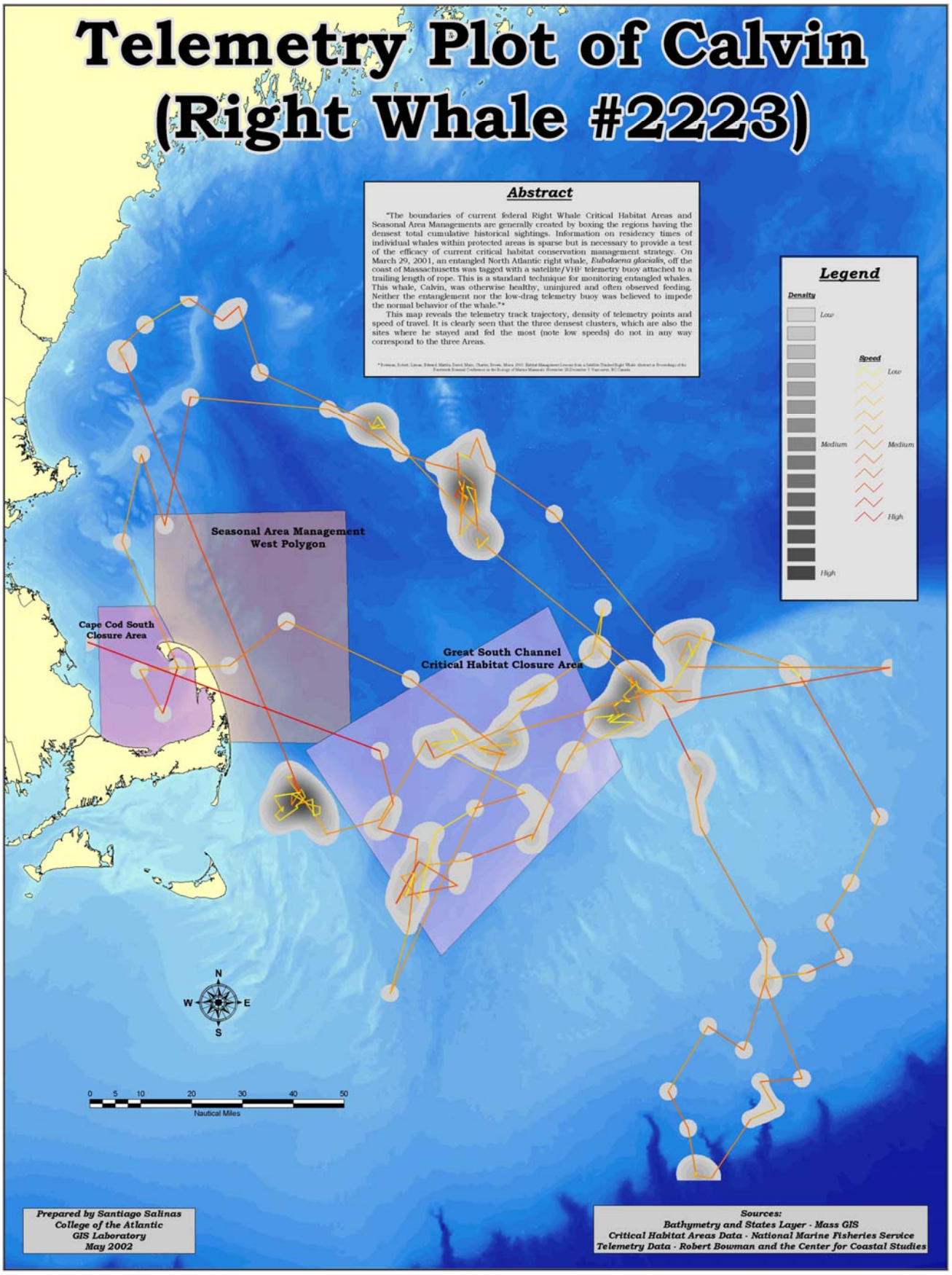
Appendix A


Telemetry Plot of Calvin
(Right Whale #2223)
Abstract
"The boundaries of current federal Right Whale Critical Habitat Areas and Seasonal Area Managements are generally created by boxing the regions having the densest total cumulative historical sightings. Information on residency times of individual whales within protected areas is sparse but is necessary to provide a test of the efficacy of current critical habitat conservation management strategy. On March 29, 2001, an entangled North Atlantic right whale, Eubalaena glacialis, off the coast of Massachusetts was tagged with a satellite/VHF telemetry buoy attached to a trailing length of rope. This is a standard technique for monitoring entangled whales. This whale, Calvin, was otherwise healthy, uninjured and often observed feeding. Neither the entanglement nor the low-drag telemetry buoy was believed to impede the normal behavior of the whale."*
This map reveals the telemetry track trajectory, density of telemetry points and speed of travel. It is clearly seen that the three densest clusters, which are also the sites where he stayed and fed the most (note low speeds) do not in any way correspond to the three Areas.
Legend
Density
Low
Medium
High
Speed
Low
Medium
High
Seasonal Area Management
West Polygon
Cape Cod South
Closure Area
Great South Channel
Critical Habitat Closure Area
N
W
E
S
0 5 10 20 30 40 50
Nautical Miles
Prepared by Santiago Salinas
College of the Atlantic
GIS Laboratory
May 2002
Sources:
Bathymetry and States Layer - Mass GIS
Critical Habitat Areas Data - National Marine Fisheries Service
Telemetry Data - Robert Bowman and the Center for Coastal Studies

Appendix B

Example of Disentanglement Training Agenda

DAY ONE

Introduction
- *Overview of existing Networks*
- *Issues specific to the Audience (e.g. fishermen, biologists, government…etc.)*
- *Issues specific to the region or country being trained*

Criteria for Selection and Authorization
- Example of Disentanglement Training Agenda *Is special permission required?*
- *Personnel characteristics (e.g. level-headedness, relevant experience…etc.)*
- *This training does not imply authorization*

Response
- *Verify, stand by, initial documentation*
- *Getting responders to scene*

Assessment
- *Intro - rationale*
- *Common Misconceptions:*
- *Condition of animal*
- *Assessment of gear*
- *Assessment of response conditions*
- *Potential actions*

Telemetry
- *Intro*
- *Rationales*
- *Case histories*
- *Preparation of buoy*
- *Attaching buoy*

Disentanglement Procedures
- *Common misconceptions*
- *Brief general overview and history*

  Freeing an anchored whale
  - *Approach techniques*
  - *Adding buoys to keep the whale at the surface*
  - *Carefully assess the entanglement*
  - *Special problems and techniques for removing gear*
  - *Case histories*

  Controlling a free-swimming whale
  - *Intro: A modification of historic whaling technique*
  - *Attaching to the whale - techniques*
  - *Slowing the whale and keeping it at the surface*
  - *Applying additional force*
  - *Formulating the disentanglement plan*
  - *Special equipment*
  - *Case histories*

Documentation and follow-up
- *Documenting whale (ID and species) including injuries*
- *Documenting gear*
- *Retrieving and archiving gear (local Fisheries agencies)*
- *Reporting to Network (e.g. use of near real time web site)*
- *Research and development*

Potential role of local or national Search and Rescue networks
- *Overview of potential roles*
- *Memorandums of Agreement*
- *Communications*
- *Stand by*
- *Transport rescue team*

Safety
- *General Prudential Rules*
- *Support vessel and plane*
- *Approaches to whale*
- *Personnel equipment*
- *Procedure*
- *Whale behavior and behavior around whales*

Future Goals
- *Network goals*
- *Hands on training and advancement of Network members*
- *Maintaining preparedness*
- Equipment and other resource needs

DAY TWO

On water training
- Familiarization with tools on land first
- Grabbing moving rope with special grapples and "flying" release hooks
- How to conduct a safe, modern-day "Nantucket sleigh ride"
- Progressively attaching "kegs" and sea anchors
- Using special cutting tools, including "flying" release knives
- Debriefing

Appendix C
Example of disentanglement documentation
humpback whale disentangled off Maui, Hawaii: March 2, 2007

HAWAIIAN ISLANDS DISENTANGLEMENT NETWORK

A collaborative effort between NOAA's Marine Mammal Health and Stranding Response Program, Office of Protected Resources, the Hawaiian Islands Humpback Whale National Marine Sanctuary, the Pacific Islands Regional Office, and the Pacific Islands Fisheries Science Center; Hawaii's Department of Land and Natural Resources; the United States Coast Guard; and many private organizations.

Entangled Humpback off Lahaina, Maui:

Date/ Time: *3/2/07; 10:15* ***Case #:*** *105*
Field #: *MMD07105Mn-121* ***Species:*** *Humpback*
Location: *2.0 nm off of Lahaina, Maui*
Lat/ long : *20° 50.94'N / 156° 42.49' W* ***Fix accuracy:*** *GPS*

Event description: *Animal has heavy gauge line through mouth and trails aft under flippers to twist together behind dorsal fin forming a bridle. Lines continue to trail another 40 - 50 feet with two polyballs attached.*

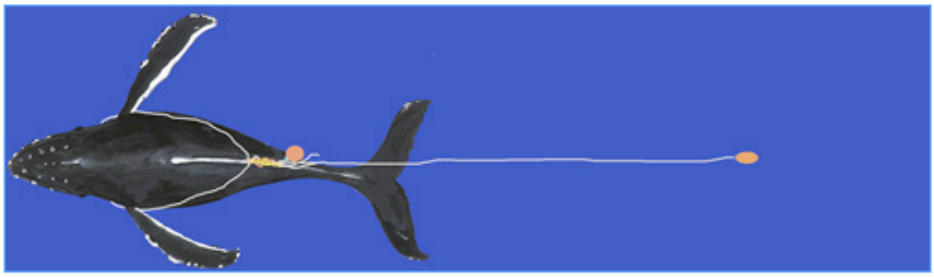
Status: *Confirmed/ Threat exists* ***Prognosis:*** *Life-threatening; animal in fair condition*

Outcome: *Animal totally disentangled - Animal sighted and reported by multiple tour boat operators, including Wiki Wahine and Sea Safari's Lanakali. Tourboat vessels took turns standing by until whale researchers from The Dolphin Institute and the Center for Whale Studies were able to take over. The Hawaiian Islands Humpback Whale National Marine Sanctuary response vessel, Seacat, was only 4 nm away and was able to respond fairly quickly to the report. The United States Coast Guard assisted by transporting the rescue inflatable and the rest of the team out to the animal. Team of Mattila, Lyman and Hebard(HIHWNMS) aboard soft-bottom inflatable launched from USCG 47-footer (47313) performed additional assessment, documentation, and began kegging the animal by adding polyballs to the trailing line. Center for Whale Studies vessel stoodby for support. At approximately 1 hour and 45 minutes after arrivingt he team successfully frees the whale of all gear by using a flying cutter deployed from the end of a pole to cut the line on the right side of the body. With this line cut, the drag on the left side pulls the line from the whale's mouth, totally freeing it. All gear was recovered and will be analyzed for gear type, origin and set configuration.*

Action: *Monitor*

Select chart to enlarge

Select image to enlarge



Narrative

3/2/07:

10:15 Animal reported entangled by Safari Boat's Lanakila. Report relayed over VHF and called into NOAA Fisheries Marine Mammal Hotline. Reporting vessel stands by and eventually passes duty off to tour boat, Wiki Wahine. Hawaiian Islands Humpback Whale National Marine Sanctuary's response vessel, Seacat, already out performing research, hears VHF call and immediately makes plans to respond. United States Coast Guard (Maalaea Harbor station) assistance is requested for transporting remainder of response team and gear.

11:00 The Dolphin Institute (TDI) relieves Wiki Wahine and continues to assess and document the entanglement from a safe distance.

11:30 Center for Whale Studies takes over from TDI. TDI underway to relieve Seacat of duties. USCG 47-footer, 47313, underway from Maalaea Harbor with David Mattila, Amanda Cummins, Dano Phippen, and Allan Ligon aboard, along with rescue inflatable and outboard.

11:45 TDI rendevous with Seacat. Transfer personnel and Seacat heads to entangled animal

11:58 Seacat rendevous with Center for Whale Studies, which is standing by animal at 20° 49.641'N/ 156° 42.95'W. Animal is heading in a WSW heading at approximately 3 kts. Animal undergoing 4 - 6 minute dives with around 4 breaths.

12:05 USCG 47-footer arrives and begins deploying the rescue inflatable.

12:20 Inflatable deployed.

12:32 Inflatable with Mattila and Lyman aboard makes forst approach to whale and attached a working line by throwing grab grapple into trailing gear.

12:40 First kegging buoy added and whale easily pulls it under.

12:48 Second large, A1 buoy added and whale still able to dive.

13:04 Two whales join the entangled animal. A third kegging buoy added soon after. Entangled whale slowed and staying at surface almost entirely. Alastair Hebard now in inflatable along with Mattila and Lyman.

13:27 Team pulls up to just behind whale and attached a flying cutter to the line exiting the mouth on the right side. Line attached to knife is held for some time without success, so team leaves line with an A3 polyball and heads for support vessel for fixed knife.

13:38 Teams attempts to cut line exiting leftside of the mouth with a fixed knife on the end of 3 - 5-foot poles. They are able to make partial cuts, but before complete knife is dislodged.

13:43 Whale attempts a dive and with added buoyancy force of submerged buoy attached to flying cutter, flying cutter cuts through line. Drag on leftside of animal ends up pulling line from whale's mouth, totaly freeing the animal of all gear.

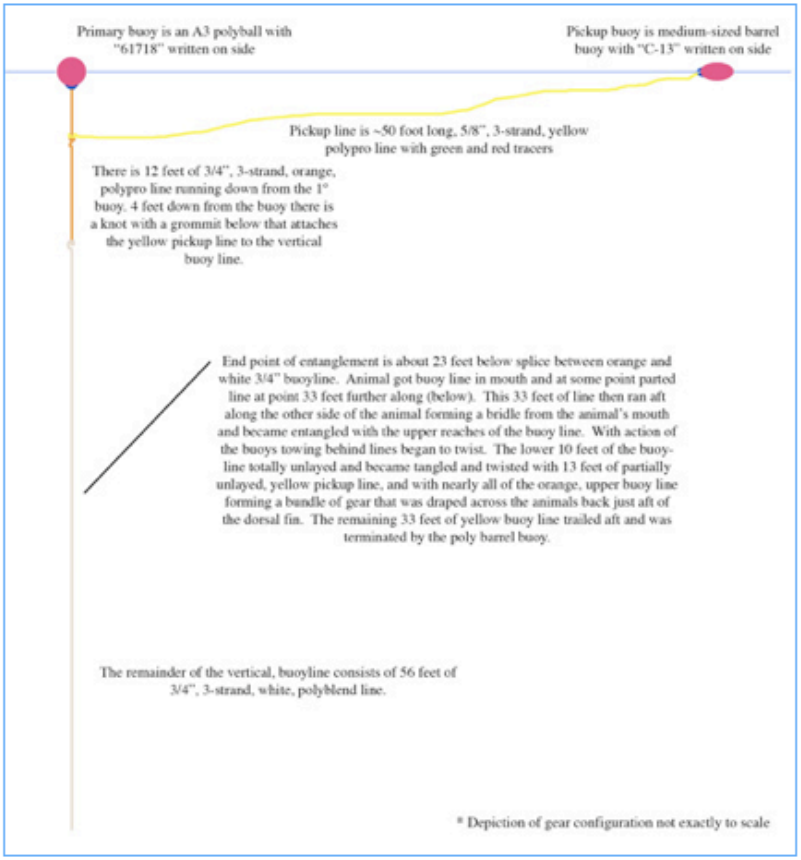
13:55 Seacat continues to follow the now free animal and Amanda Cummins obtains a biopsy sample.

14:00 Several attempts are made and are successful at getting underwater documentation of the now disentangled animal.

14:20 Response team hauls inflatable aboard and heads for port

16:00 Seacat back at Maalaea Harbor

Initial gear analysis:3/6/2007



A3 buoy "61718"

Knot to A3 buoy

Barrel buoy "13"

3/4" orange, 3-strand poly

5/8" yellow, 3-strand pickup line

Grommit attaching pickup line to main buoyline

3/4" white, 3-strand polyblend line

Knot splice on buoyline

Bundle of gear found over animal's back

The bridle of line through the whale's mouth was made up of approximately 45 feet of 3/4" white polyblend line.

The bundle of gear that rode just aft of the animal's dorsal fin was made up of 14 feet of 3/4" orange poly, 10 feet of 3/4" white polyblend, and about 17 feet of 5/8" yellow poly line. It also included the A3 polyball.

Approximately 33 feet or the remainder of the 5/8" yellow polyline trailing aft of the bundle or about 23 feet behind the animal.

The total amount of line removed from the animal was approximately 122 feet.

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Images

Entangled Humpback off Lahaina, Maui
March 2, 2007

Click on image to enlarge

Image 1 (3/2/07); CWS

Image 2 (3/2/07); CWS

Image 3 (3/2/07); HIHWNMS

Image 4 (3/2/07); HIHWNMS

Image 5 (3/2/07); HIHWNMS

Image 6 (3/2/07); HIHWNMS

Image 7 (3/2/07); HIHWNMS

Image 8 (3/2/07); HIHWNMS

Image 9 (3/2/07); HIHWNMS