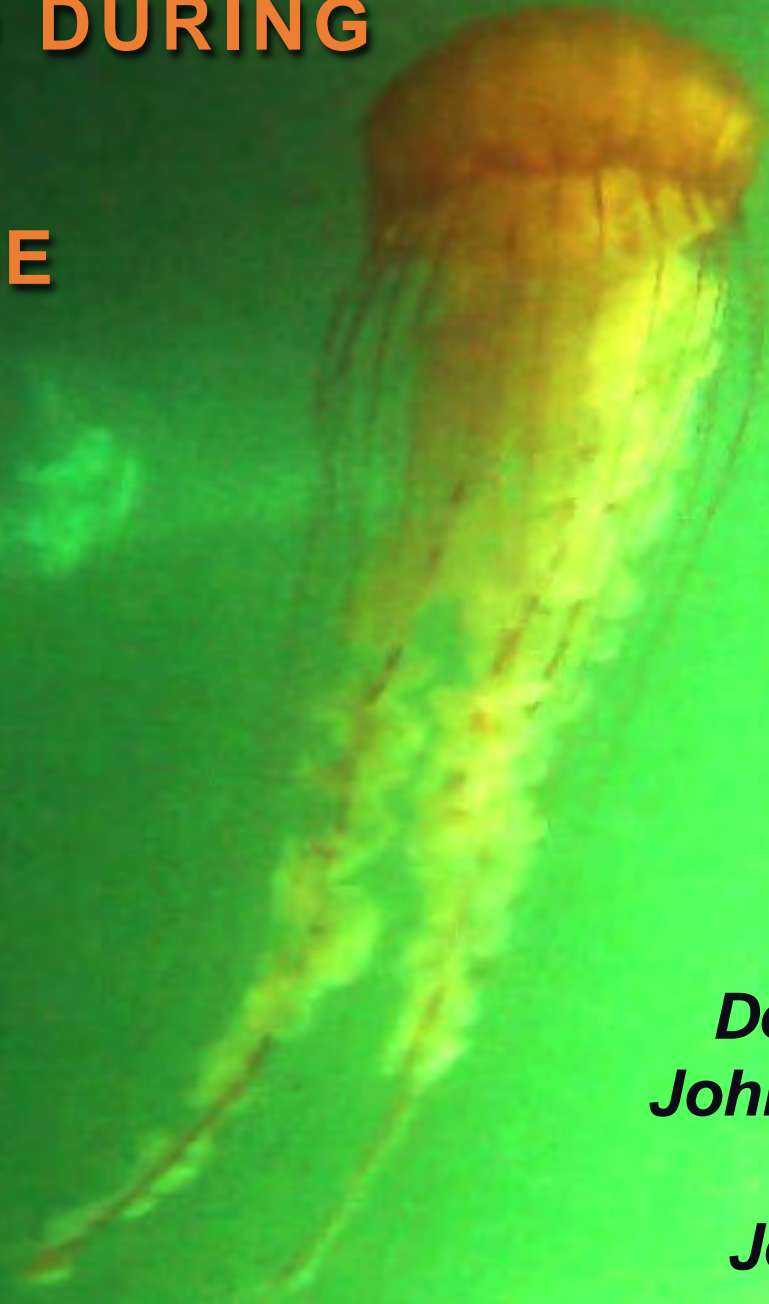


INFORMATION COLLECTED DURING LARGE WHALE ENTANGLEMENT RESPONSE



Doug Sandilands ¹
John Calambokidis ²
Kiirsten Flynn ²
Jenn Tackaberry ²

¹ *SR³ Sealife Response, Rehab & Research*

² *Cascadia Research Collective*

INFORMATION COLLECTED DURING LARGE WHALE ENTANGLEMENT RESPONSE

Images taken under NOAA's MMHSRP Permit #'s:
18786, 18786-02, 18786-03, 18786-04, 932-1905

Images captured by SR3 and/or CRC unless otherwise noted

Doug Sandilands¹
John Calambokidis²
Kiirsten Flynn²
Jenn Tackaberry²

PROBLEMS

- Managers rely on good information to make decisions on managing fisheries that entangle large whales
- Entanglements are rarely observed, rarely reported and even more rarely, well documented

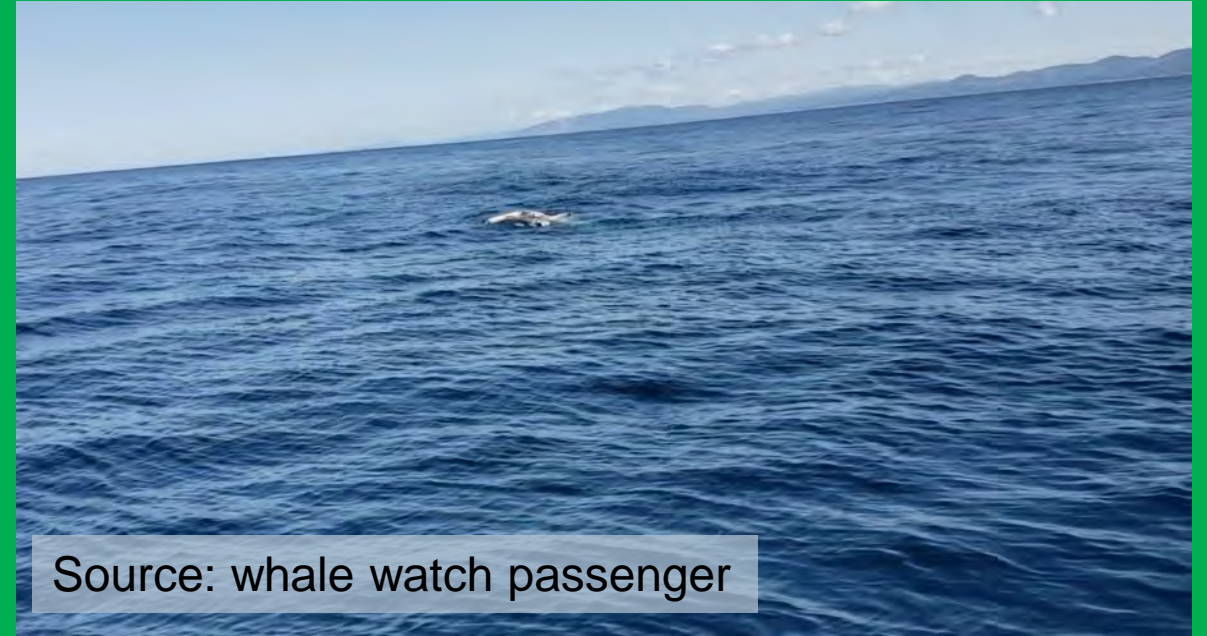
SOLUTIONS

- Entanglement reports provide a rare opportunity to learn directly about the problem of entanglements
 - if a trained team can respond^{1, 2}
 - Information collected by a trained team responding to a report provides information on:
Species ---- Individual ID of the whale ---- Gear type involved
Entanglement Configuration -- Injuries -- Body condition
- Scar studies collected during population studies can provide context for understanding the extent of the problem in a population and what proportion of entanglements and mortalities are observed

¹ Mattila, D.K., S. Landry, E.G. Lyman, J. Robbins, and T. Rowles. 2007. **Scientific information that can be gained through large whale disentanglement.** IWC, SC/59/BC1.

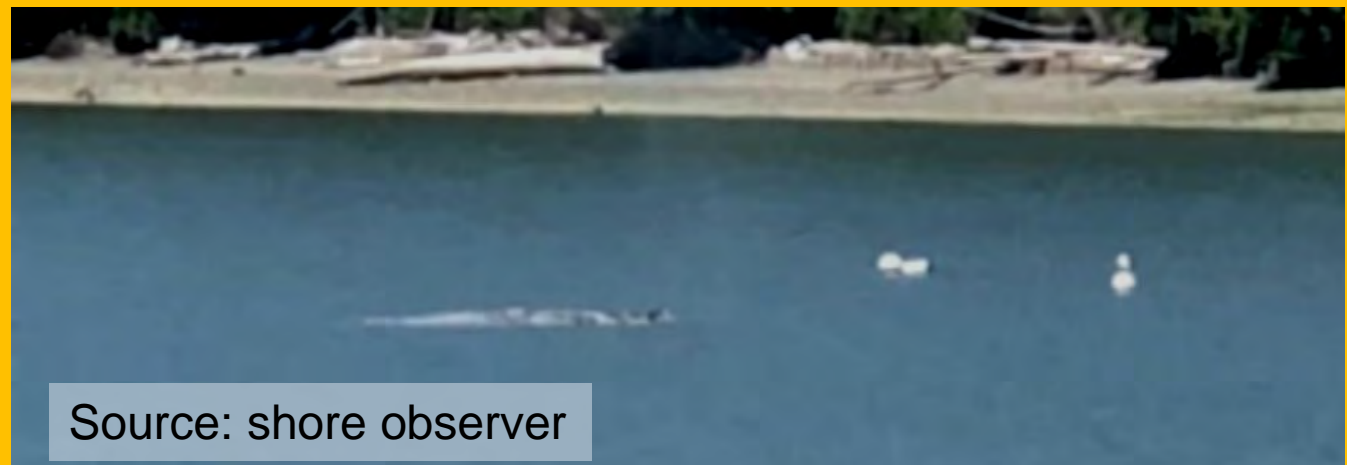
² Robbins J., J. Kenney, S. Landry, E. Lyman, and D. Mattila. 2007. **Reliability of eyewitness reports of large whale entanglement.** IWC, SC/59/BC2.

Typical Documentation from a Case with only a Public Report Unconfirmed



Percent Confirmed vs Unconfirmed

| | Humpback | Gray | Blue |
|-------------|----------|------|------|
| Confirmed | 85% | 79% | 80% |
| Unconfirmed | 15% | 21% | 20% |



Typical Documentation from a Case with only a Public Report Confirmed



Percent Confirmed vs Unconfirmed

| | Humpback | Gray | Blue |
|-------------|----------|------|------|
| Confirmed | 85% | 79% | 80% |
| Unconfirmed | 15% | 21% | 20% |

Best Case Documentation from a public report (usually from a whale watcher or network trained mariner)



Reliability of entanglement reporting sources

USA, East Coast data:

| Reporting source | % mis-reported | n |
|------------------|----------------|-----------|
| Inexperienced | 55.6 | 9 |
| Fishers | 41.7 | 12 |
| Whale community | 13.0 | 23 |

Generally lucky to get 5 to 10 images from these reports
- much about the entanglement remains unknown.

Robbins J., J. Kenney, S. Landry, E. Lyman, and D. Mattila. 2007.
Reliability of eyewitness reports of large whale entanglement. IWC, SC/59/BC2.

If either:

- 1) an entanglement is reported and the mariner stays with the whale until a trained response team can get there, or
 - 2) an entangled whale is found during research efforts with a team capable of responding and/or standing by
- the “rare” opportunity to learn about the problem of entanglement arises



- entanglement reported
- vessel stands by



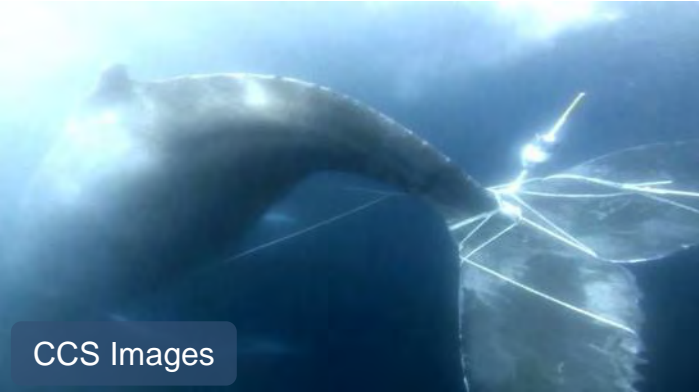
NOTE: Entanglement Response is Inherently Dangerous and Should Not Be Attempted by Untrained Responders

REPORTS OF ENTANGLEMENT \neq RATES OF ENTANGLEMENT

Reports $\rightarrow f(\#$ entangled whales, $\#$ potential observers with knowledge of how to report and willingness to report, network able to receive reports AND these observers find an entangled whale)

REPORTS OF ENTANGLEMENT \neq RATES OF ENTANGLEMENT

Scar Studies Provide Insight into the Size of the Problem



Reported entangled and 1st response Aug 30

Disentangled Sept 01

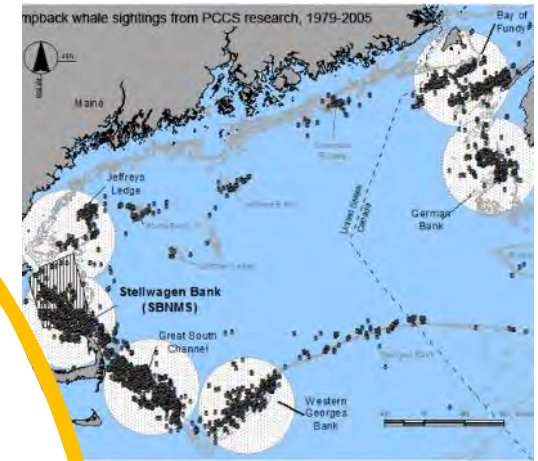
Resighted with healing wounds Sept 18

Resighted one year later with entanglement scars

- Using information collected during entanglement responses in concert with large whale research efforts we can see how these injuries resolve into scars on individual whales
- By looking at the proportion of the population with entanglement scars and annual scar acquisition of known individuals (from large whale research efforts) we can start to understand how big the problem is
- Efforts are underway (Cascadia and partners) to understand this for the west coast humpback whales

What is Known From Population and Scar Studies about Gulf of Maine Humpback Whale Entanglements

Gulf of Maine Humpback Whale Population



whales entangled annually (~17% of GOM humpback pop'n)

Proportion of GOM humpbacks entangled at least once (~70% based on scar studies)

whales reported entangled annually (< 10 % of whales entangled annually)

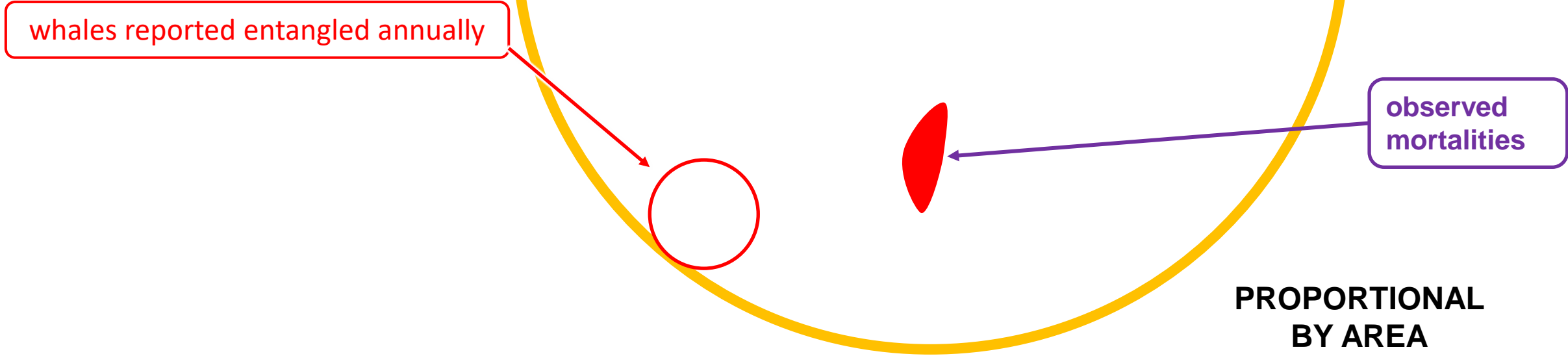
Estimated 2% to 4% annual mortality due to entanglement

observed mortalities

whales disentangled each year (~50% of reported annually) (~90% of whales disentangled where a response was possible)

PROPORTIONAL BY AREA

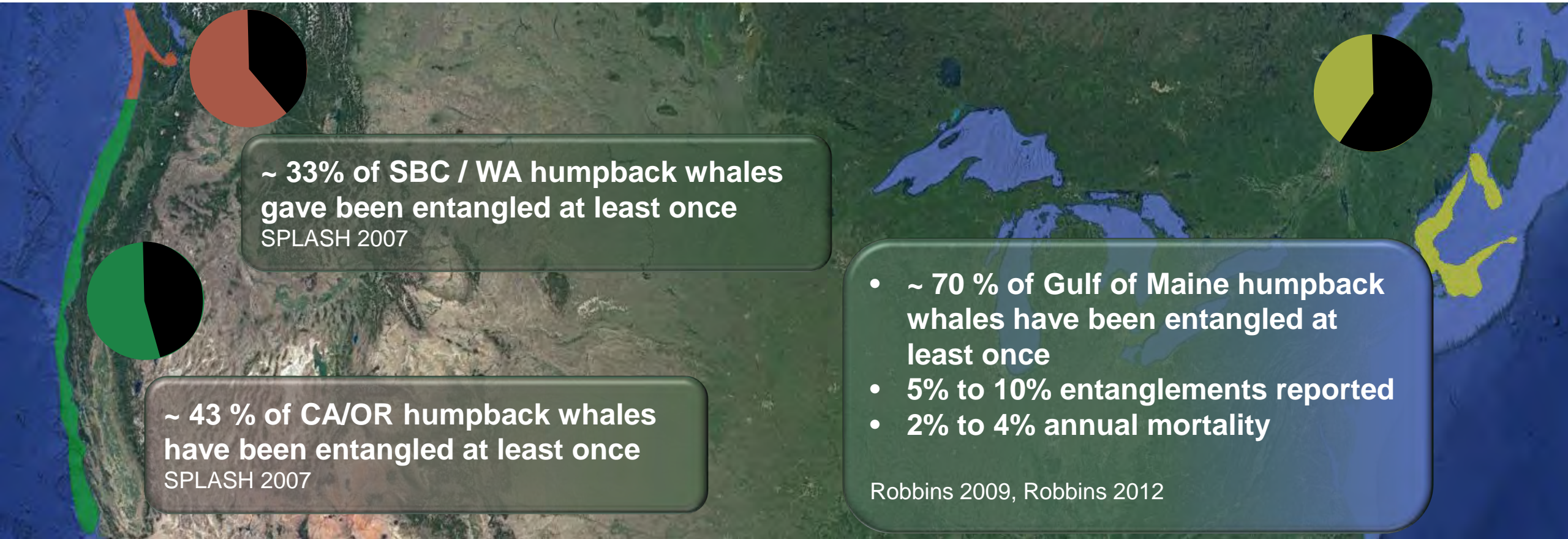
What is Understood Without Scar Studies



REPORTS OF ENTANGLEMENT ≠ RATES OF ENTANGLEMENT

On the west coast:

- there is no estimate of what proportion of entanglements are reported
- there is no estimate of actual mortality (only observed deaths and injuries likely to cause death)
- between 2004 and 2007 - 1/3 to 2/5 of West Coast humpbacks showed entanglement wounds
- yet we had fewer than 6 reports each of those years!



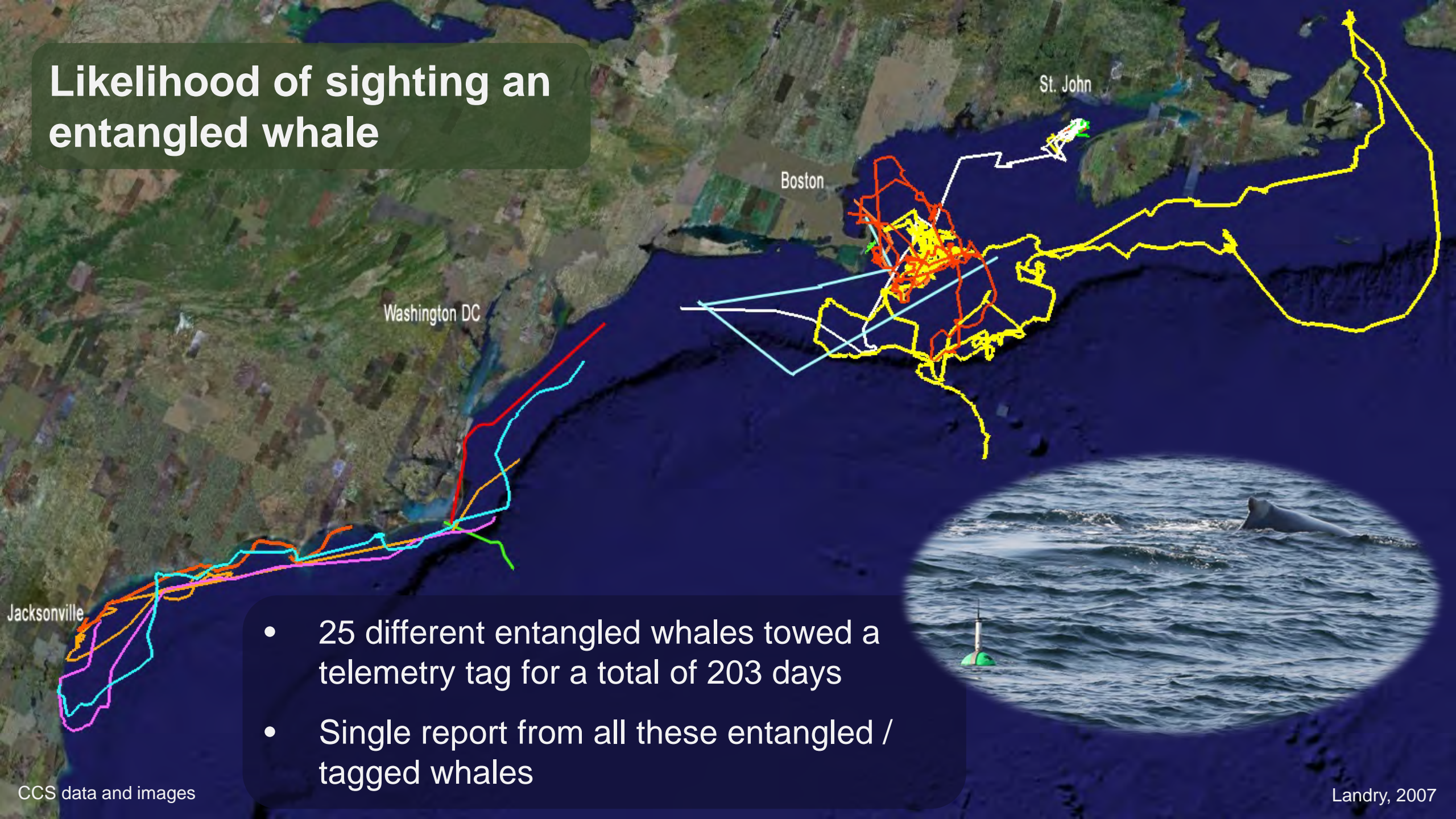
~ 33% of SBC / WA humpback whales
gave been entangled at least once
SPLASH 2007

~ 43 % of CA/OR humpback whales
have been entangled at least once
SPLASH 2007

- ~ 70 % of Gulf of Maine humpback whales have been entangled at least once
- 5% to 10% entanglements reported
- 2% to 4% annual mortality

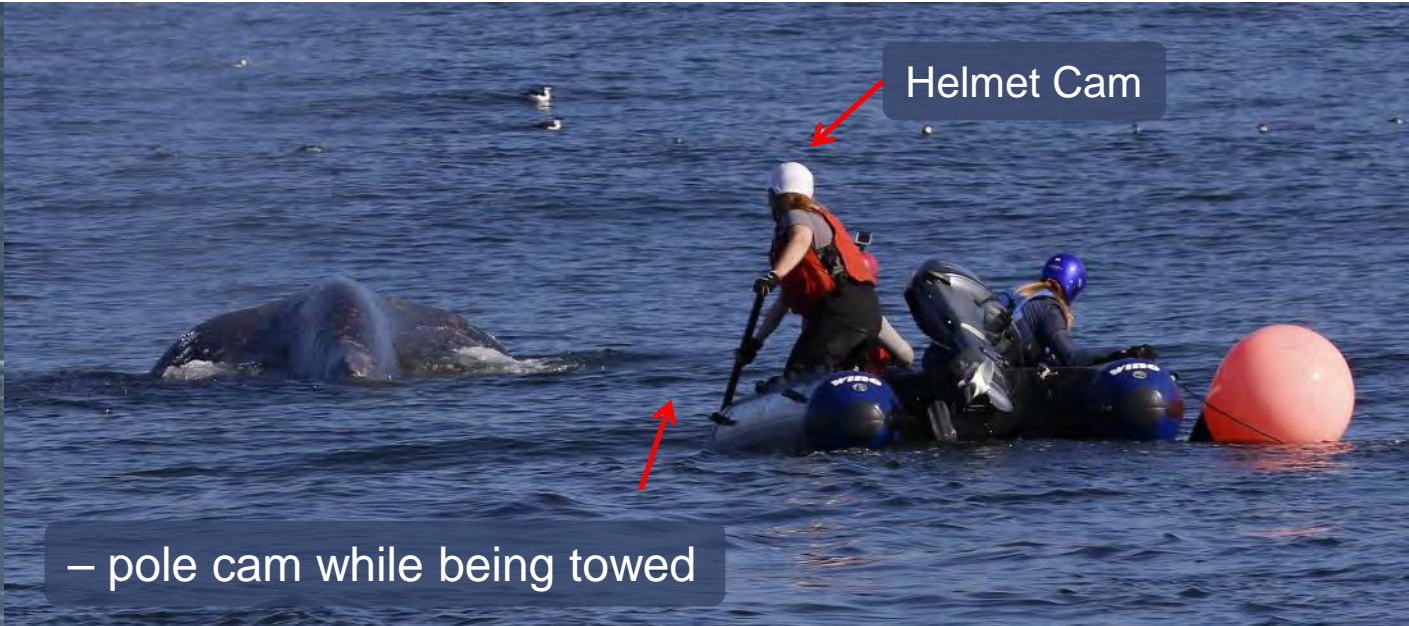
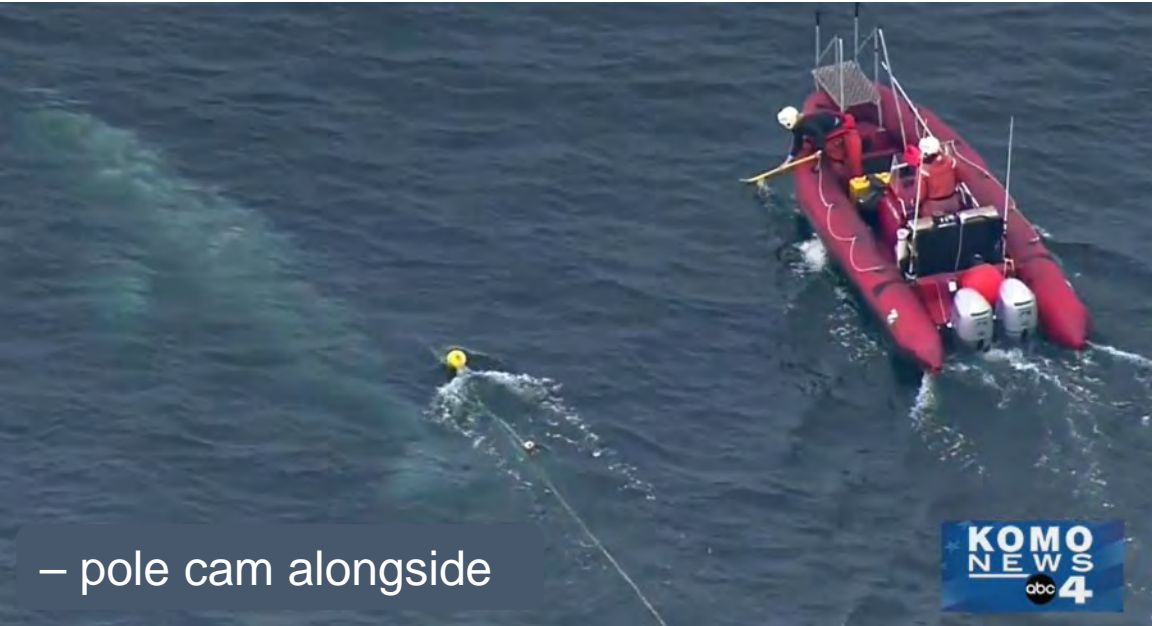
Robbins 2009, Robbins 2012

Likelihood of sighting an entangled whale



- 25 different entangled whales towed a telemetry tag for a total of 203 days
- Single report from all these entangled / tagged whales

Large Whale Entanglement Response – Documentation Opportunity



Typical Documentation from a Case with a Network Response

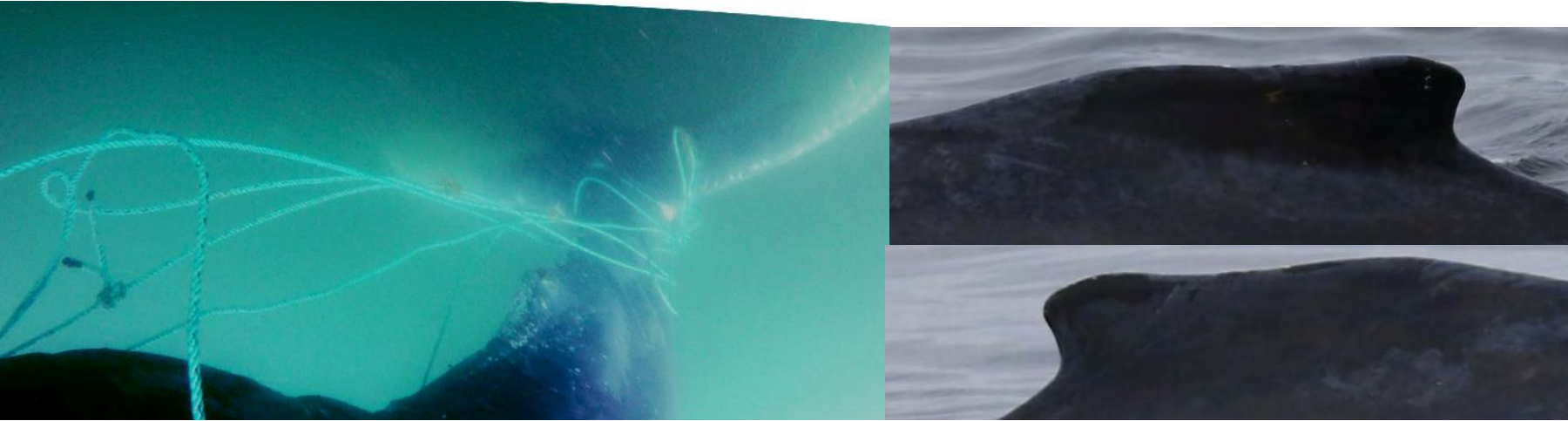
During a trained and authorized entanglement response, the team will collect:

- Over 1000 photos (from support boat)
- Up to several hours of helmet cam footage
- Underwater pole cam footage
- The gear removed from the whale
- Skin and blubber samples of the whale



Benefits of a Network Response

Photo ID

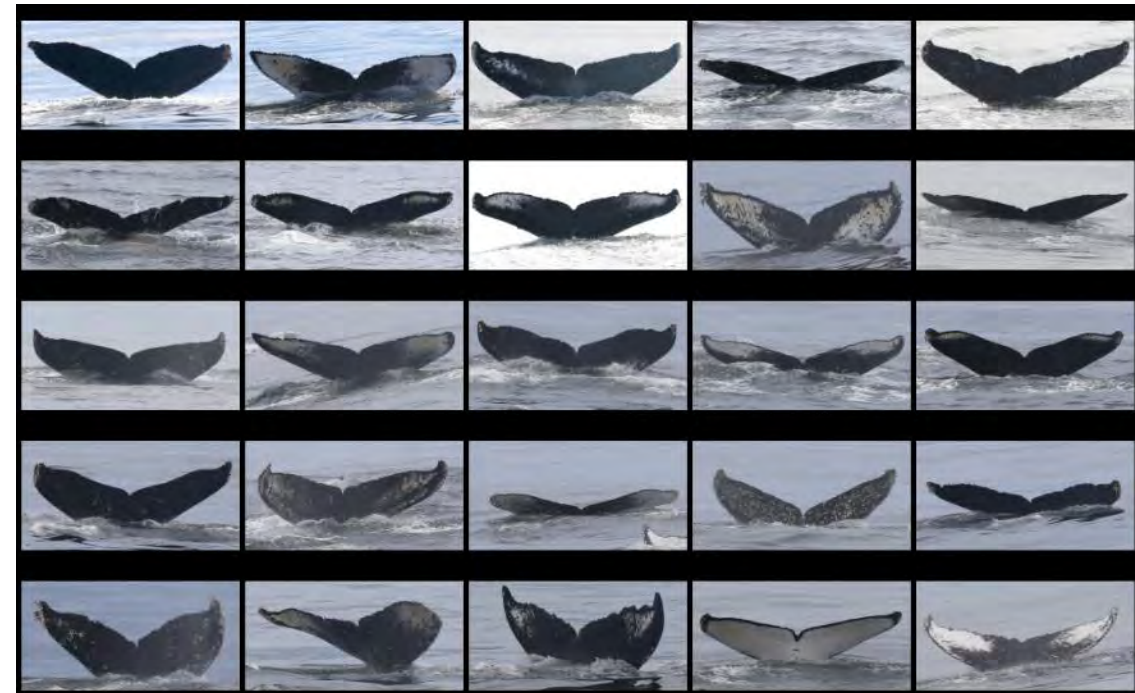


Matching entangled whale to known individuals

- Entangled whales rarely fluke
- Photo IDs based on flukes are difficult to get from an entangled whale
 - Responders go to great lengths to collect photo IDs including with a GoPro on a pole
 - Collecting dorsal fin images during research efforts

Worth noting that between 1982-2017 in the West Coast Region:

- ~70% of humpback IDs of entangled whales were collected by trained responders (IDs exist for only a small portion of total reports)



Images taken under permit #21678

Benefits of a Network Response

Body Condition

images documenting body condition

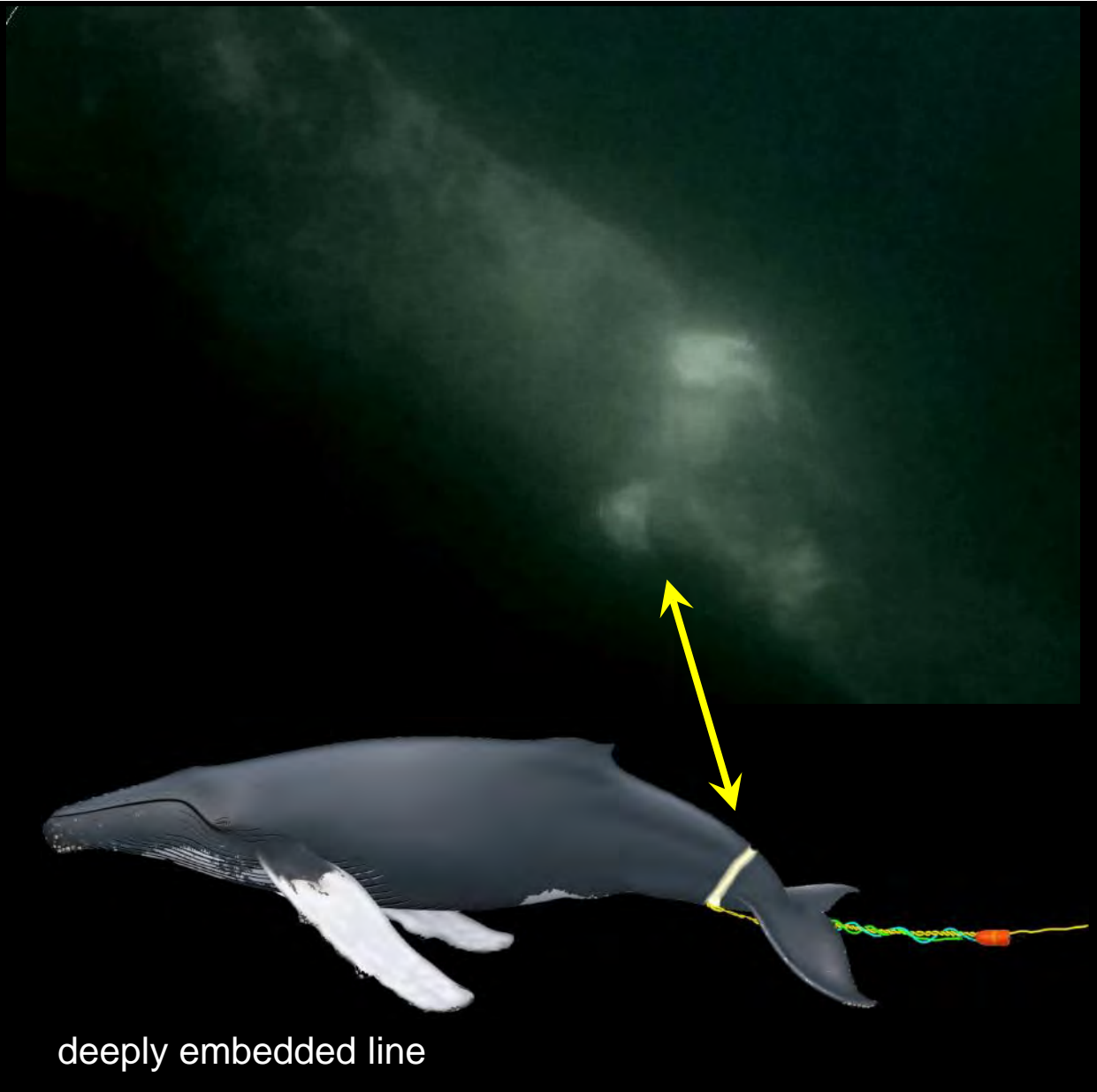
image taken from behind an entangled humpback that has lost significant body mass



... cyamid proliferation and skin condition

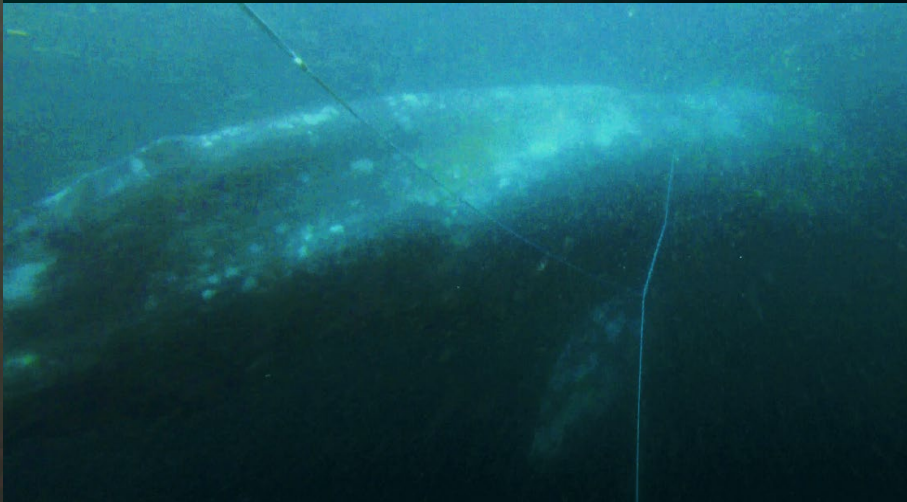
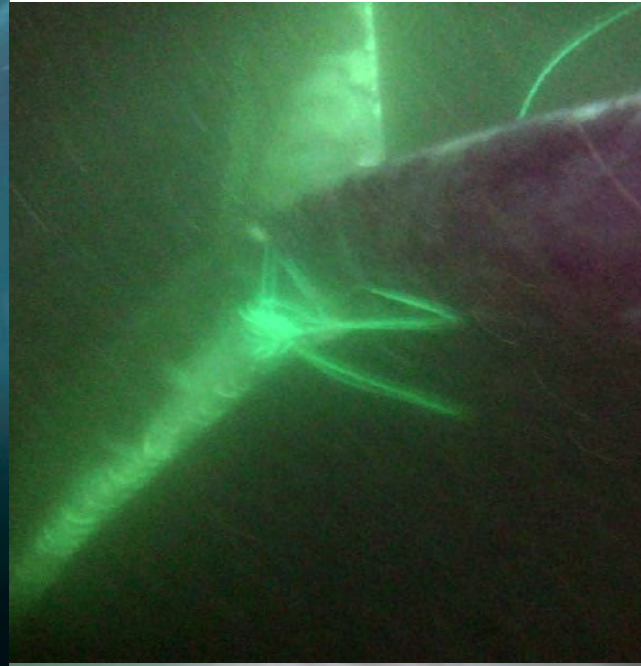
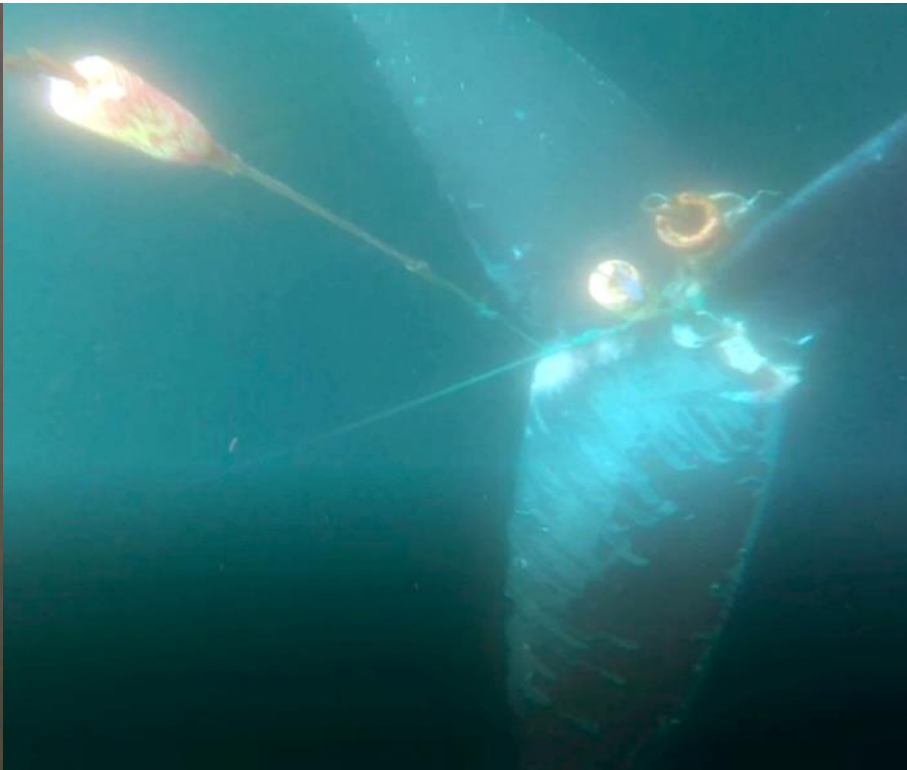
Benefits of a Network Response

Injuries

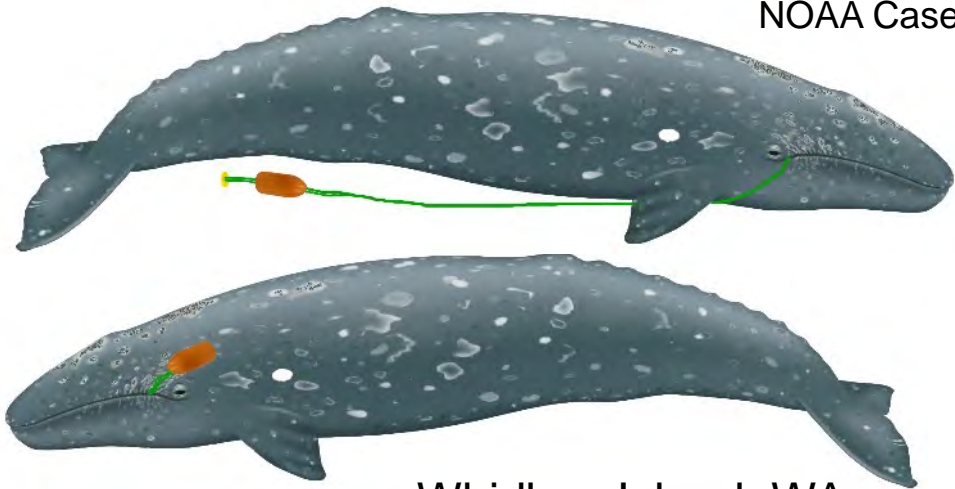


Benefits of a Network Response

ENTANGLEMENT
CONFIGURATION



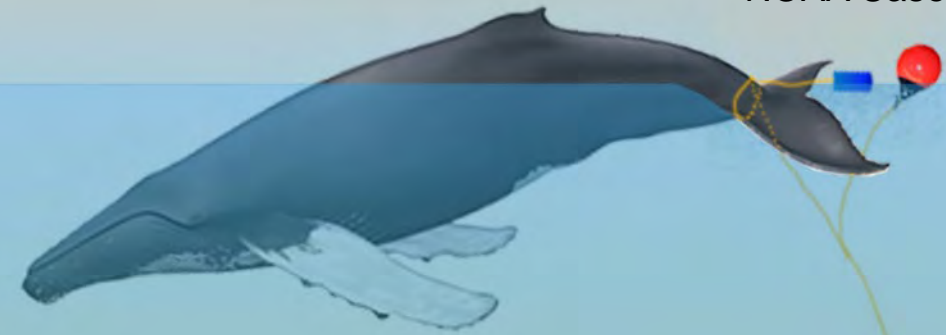
NOAA Case #: 20180413Er_1c



Whidbey Island, WA

- Free-swimming
- Likely disentangled with telemetry

NOAA Case #: 20180904Mr



Monterey Bay, CA

- Anchored in 620 ft of water
- Whale shed gear as response team arrived on scene

NOAA Case #: 20180508Er



20 nm west of La Push, WA

- Slowly dragging gear in 560 feet of water
- Some gear removed – life-threatening gear left
- Stranded dead 2 weeks later

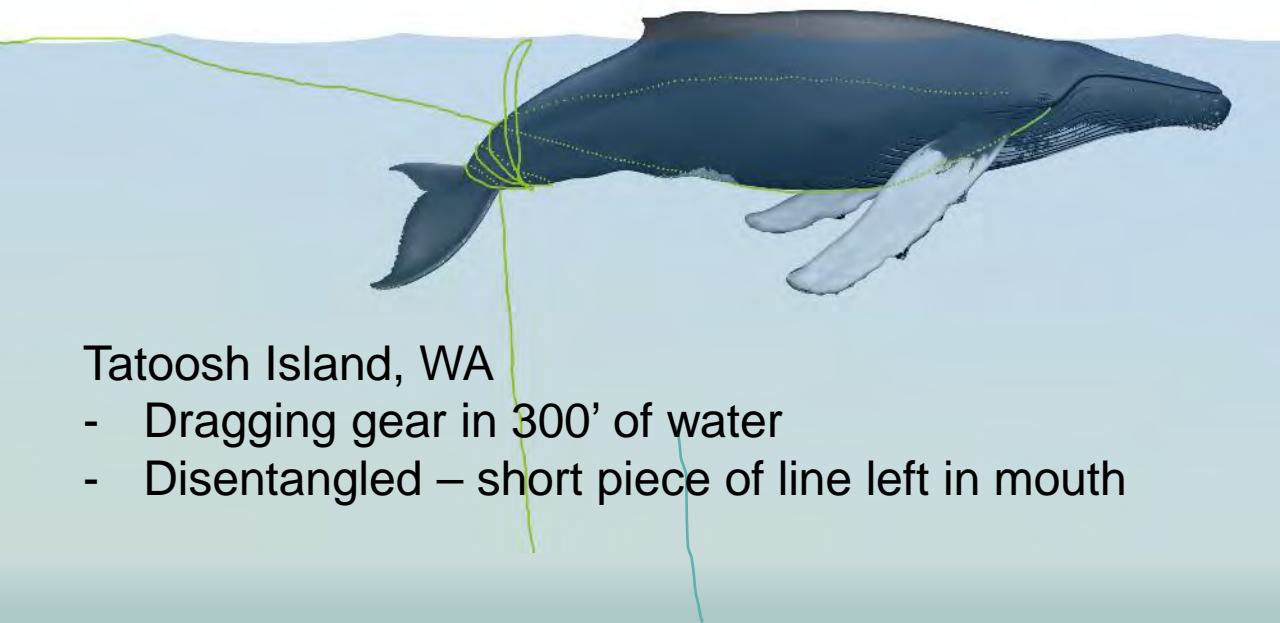
NOAA Case #: 20181012Mr



Half Moon Bay, CA

- Towing ~400 of line which was deeply embedded in peduncle
- Gear cut close to flukes
- Life-threatening embedded line left

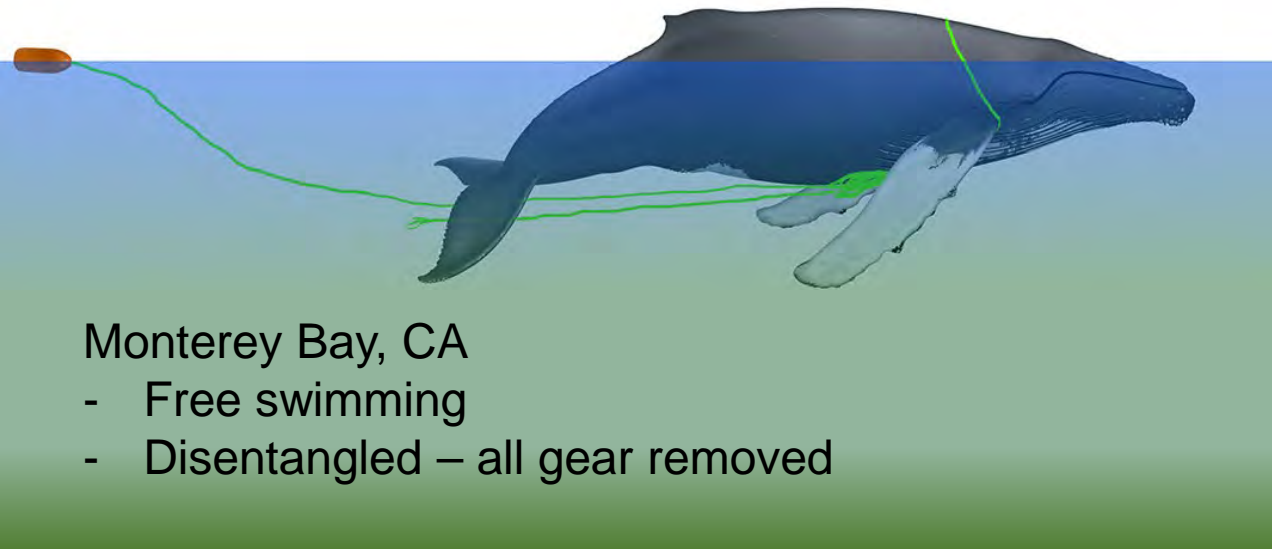
NOAA Case #: 20190808Mn



Tatoosh Island, WA

- Dragging gear in 300' of water
- Disentangled – short piece of line left in mouth

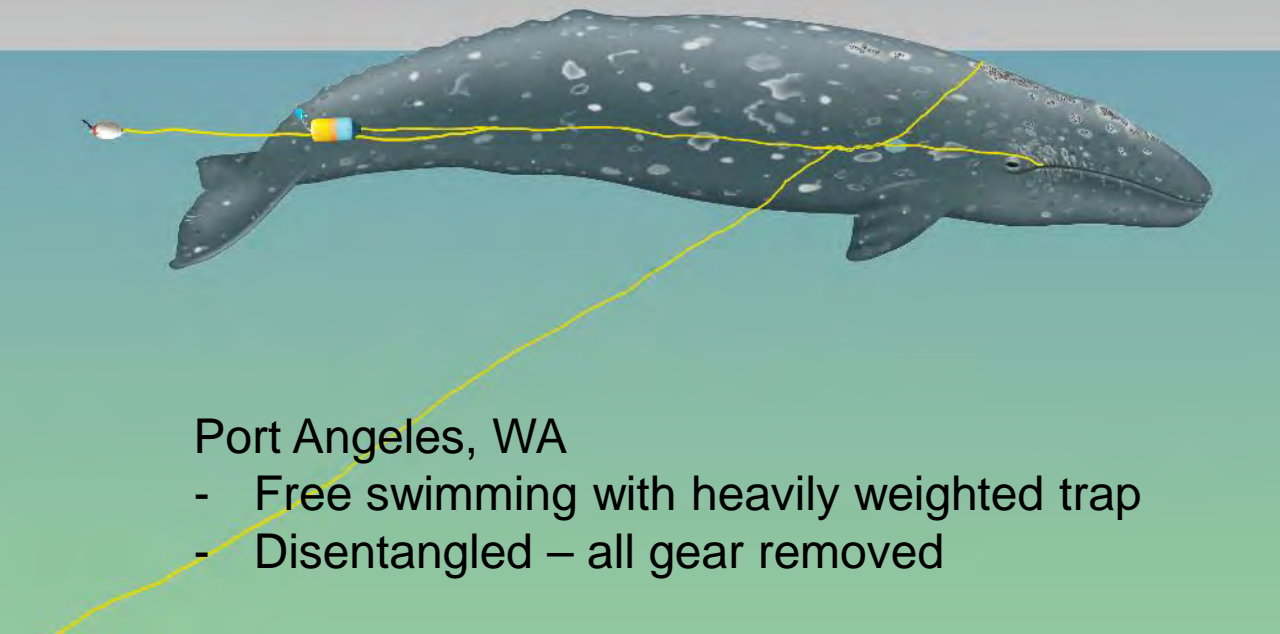
NOAA Case #: 20191209Mn



Monterey Bay, CA

- Free swimming
- Disentangled – all gear removed

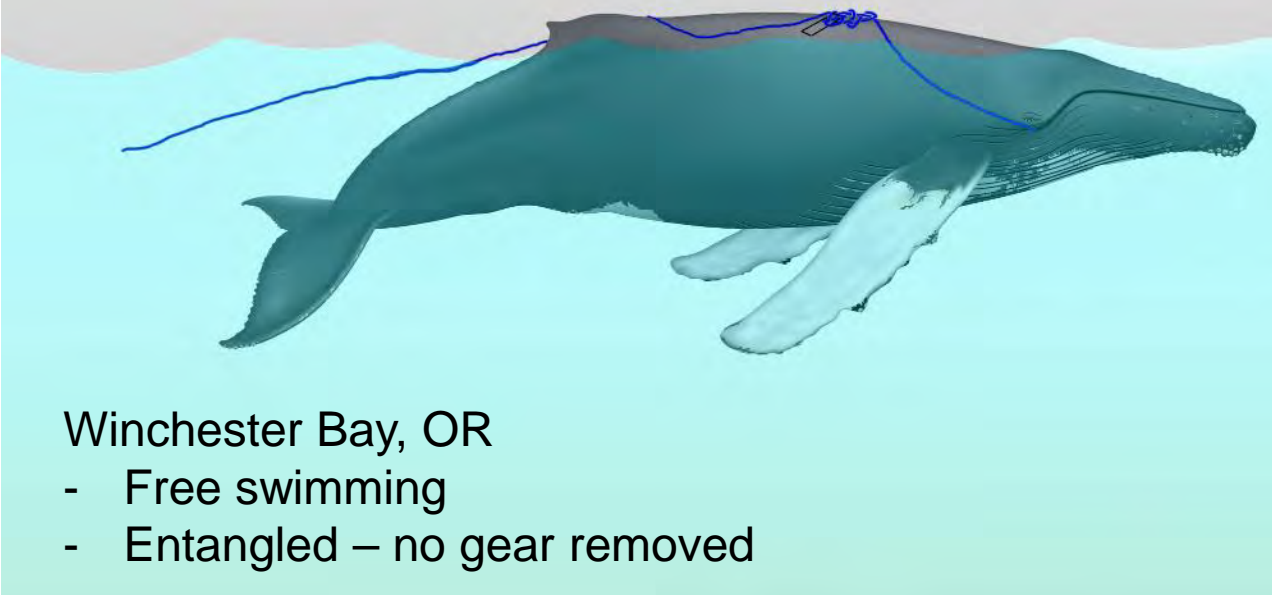
NOAA Case #: 20200424E



Port Angeles, WA

- Free swimming with heavily weighted trap
- Disentangled – all gear removed

NOAA Case #: 20180730Mr



Winchester Bay, OR

- Free swimming
- Entangled – no gear removed

Benefits of a Network Response

**BEHAVIOR
And
ENERGY LEVEL**



Evasive behavior

Images: Pacific Northwest Large Whale Entanglement Response Network



High energy level

Images: West Coast Large Whale Entanglement Response Network /
Marine Life Studies

Benefits of a Network Response

GEAR TYPE

Identifying the fishery and learning where and when the gear was set is rarely accomplished using only images taken while gear is attached to whale



Collection of the gear by entanglement response team provides a greater likelihood of identifying gear type, fishery and individual fishermen



Images: West Coast Large Whale Entanglement Response Network / Marine Life Studies

Information from each response is recorded in a database based on the IWC Entanglement Response Data Form

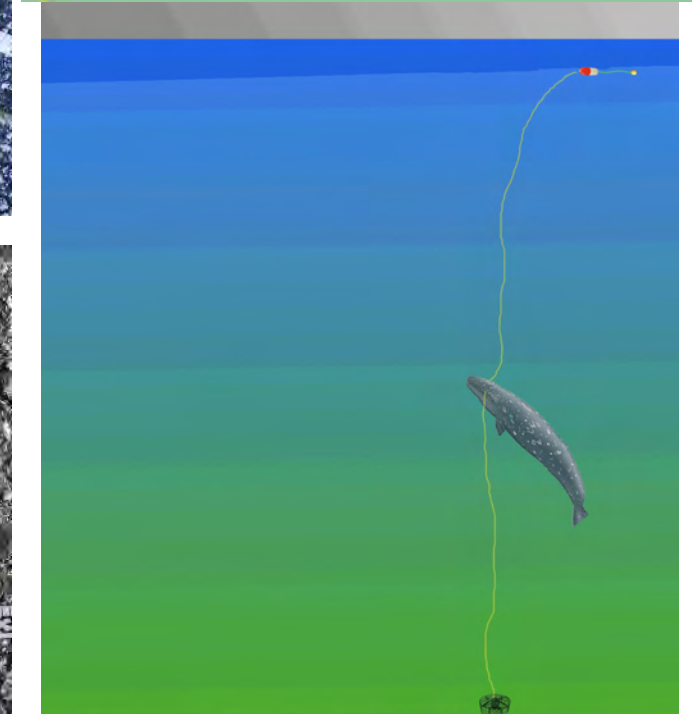
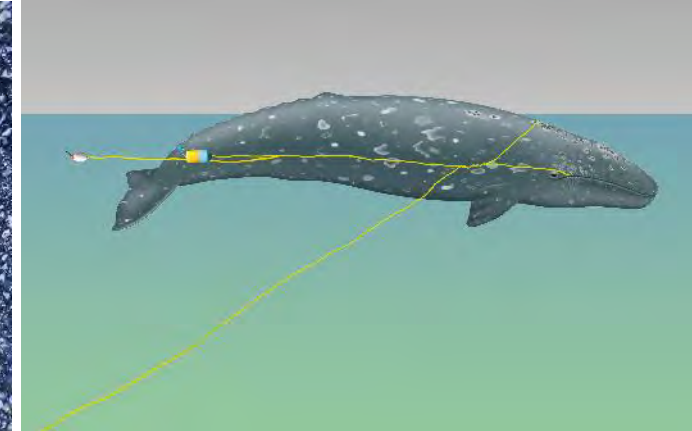
ENTANGLEMENT RESPONSE DATA FORM

| SUMMARY | | | | | | | | | | OUTCOME | | | | | |
|-----------------------------|--|--------------------------------------|-------|--------------------|-------|----------------|--|---|--------------|--------------------------------|--------------|---------------|----------|------|--|
| EVENT NUMBER: | | RESPONSE DATE: | | SPECIES: | | INDIVIDUAL ID: | | DX PARTIAL DX NO CHANGE TELEMETRY OTHER | | | | | | | |
| DATE OF FIRST REPORT: | | ARRIVAL AT SCENE: | | | | | | | | | | | | | |
| | DEPARTURE FROM SCENE: | | | | | | | | | | | | | | |
| TEAM | | | | | | | GEAR AND WOUND DETAILS | MOUTH | HEAD | BODY | LEFT FLIPPER | RIGHT FLIPPER | PEDUNCLE | TAIL | |
| INITIALS: | ROLE: | INITIALS: | ROLE: | INITIALS: | ROLE: | INITIALS: | ROPE color/size | | | | | | | | |
| | | | | | | | Gear Wrapping (Yes / No / Unk) | | | | | | | | |
| | | | | | | | Gear Constricting (Yes / No / Unk) | | | | | | | | |
| | | | | | | | Tissue Penetration (Epidermis only, Blubber, Muscle, Bone, Other for flippers and tail record % penetration) | | | | | | | | |
| | | | | | | | Tissue Penetration (Epidermis only, Blubber, Muscle, Bone, Other for flippers and tail record % penetration) | | | | | | | | |
| TIMELINE | TIME | LATITUDE | | LONGITUDE | | | | | | | | | | | |
| WHALE LOCATED | | | | | | | | | | | | | | | |
| WHALE ENGAGED | | | | | | | | | | | | | | | |
| WHALE DX LOST | | | | | | | | | | | | | | | |
| Anchored / Free swimming | Anchored | Trailing Gear (length behind flukes) | | (ft m) | | | | | | | | | | | |
| | Free Swimming | Trailing Profile | | floating sinking | | | | | | | | | | | |
| Visible Components | Free Swimming | Gear Type / Parts (if known) | | Gear Type in Area | | | | | | | | | | | |
| | Dragging | | | | | | | | | | | | | | |
| | Weighted Gear Unknown (circle one) | | | | | | | | | | | | | | |
| | | | | | | | Whale Movement | Stationary Circling Travel | | | | | | | |
| | | | | | | | Whale Posture | Normal Hunched Head Raised Tail Rased Other | | | | | | | |
| | | | | | | | Estimated Whale Length | ft m | Class | Calf Juvenile Mature Unk | | | | | |
| | | | | | | | Role (if applicable) | none mother other: | | | | | | | |
| | | | | | | | Body Condition | normal thin emaciated | | | | | | | |
| | | | | | | | Odor Detected (Description if Yes) | Breath | Wound | Gear | | | | | |
| | | | | | | | | Y N | Y N | Y N | | | | | |
| | | | | | | | Skin Condition (for species) | Normal Pale Sloughing Pitted | | | | | | | |
| | | | | | | | Cyamid Proliferation | Normal At Wounds At Blowholes Widespread | | | | | | | |
| BIO SAMPLES ATTAINED | None Biopsy Sloughed Skin Skin From Gear Scat Other | | | | | | PLEASE MAKE NOTES AND DIAGRAM ON BACK | | | Other Condition Details | | | | | |
| OTHER DATA COLLECTED | Photos Video Ventilation Rates Detailed Ethology Veterinary Procedures Rescue Boat Behaviour Other | | | | | | | | | | | | | | |

IWC, 2011. Report of the Second Workshop on Welfare Issues Associated with the Entanglement of Large Whales, With a Focus on Entanglement Response (IWC/64/WKM&AWI REP1)

Analyzing Information Collected - Network Response

GEAR ANALYSIS



Management and Science Uses for Data from an Entanglement Response

Serious Injury and Mortality Determination

- Injuries, body condition, energy and behavior post-release provide information on the effects of entanglement on an individual whale and the population (DPS) to which it belongs

Identify whale to a DPS

- Both photo ID and skin and blubber samples help identify the whale to a DPS

Survival Analysis

- Photo ID of an individual whale → sighting history and future re-sights to determine outcome

Assigning a Case to Fishery

- List of Fisheries
- Serious Injury and Mortalities

Collecting Gear Allows for an Interview with a Fisherman to Confirm When and Where Gear Was Set

- Timeframe of where and when the whale encountered the gear
 - how long it was entangled and distance it carried the gear
 - to better understand co-occurrence of whales and gear
- Understanding how different gear set-ups may affect the likelihood of entanglement

----- SUMMARY -----

REPORTS ≠ RATES OF ENTANGLEMENT

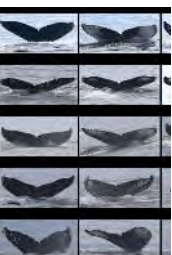
- Entanglements are severely unreported and not necessarily representative of the total number of entanglements occurring.
- Large whale population studies collecting images of entanglement scarring will provide a clearer understanding of the total number of entanglements occurring.

LARGE WHALE ENTANGLEMENT RESPONSE IS KEY TO UNDERSTANDING THE PROBLEM OF ENTANGLEMENT

- Without responses from a trained entanglement response team, there will be little to no information on DPS, which fishery is involved, where and when the gear was set, how to successfully modify gear, impacts to whales, nor an understanding of outcome and survival

This information cannot be collected in any other way

- Don't think of entanglement response as just saving individual whales.
It is an opportunity to gain knowledge that can prevent entanglements saving many many more whales.





Thanks to all the individuals and organizations conducting and supporting large whale entanglement response on the west coast



MAKAH TRIBE



INTERNATIONAL WHALING COMMISSION



USCG

