

# Pinniped Entanglement Response Best Practices

## Executive Summary

Entanglement in, hooking by, and ingestion of, marine debris and fishing gear is a global problem affecting hundreds of marine species. Pinnipeds can become entangled in active and derelict fishing gear and marine debris (e.g., plastic packing bands, large rubber bands, garbage), as well as ingest fishing gear and marine debris, causing injury and death. Responding to entangled animals is often difficult or impossible due to the inaccessibility of the animal, inability to relocate the animal, inclement weather, lack of experienced and trained personnel, human safety concerns, and more. **PREVENTION** is key to reducing entanglements and should be uppermost in the minds of all those involved in entanglement response. Until the influx of debris and entangling materials into the marine environment is reduced, responders must do their best, within the constraints of human safety and logistical concerns, to disentangle pinnipeds that are injured as a result of human behavior. This document provides pinniped entanglement response Best Practices based on currently used methods. Best Practices include preparation and planning for a response, necessary authorization and qualifications, human and animal safety, and risk assessment and mitigation. *Although this document includes Best Practices, responders should never stop striving for innovative and new methods and training to increase the safety and success of an entanglement response. These protocols are meant as overall Best Practices and should not limit advances in techniques or animal welfare responses.*

## **Statement of Inclusivity**

The Best Practices principles and guidelines outlined in this document are primarily meant for use by authorized and trained responders and managers, as well as, members of federal and state agencies, NGOs, researchers, industries (fisheries, tour), and others from the on-water and coastal communities that might provide authorized pinniped entanglement response support under NOAA's MMHSRP. The MMHSRP is committed to building a safe and inclusive environment in which we leverage diversity (including, but not limited to, the representation of all ages, races, national, cultural, religious, and socio-economic backgrounds, genders, gender identities, sexual orientations, and physical and mental abilities) to achieve our mission goals and objectives, and maximize the potential of the U.S. Pinniped Entanglement Response Network as a whole for the conservation of pinnipeds. The MMHSRP values the unique capabilities, experiences, and perspectives of all our partners, and nothing should preclude people from becoming involved in the U.S. Pinniped Entanglement Response Network to the best of their abilities. Diversity, equity, and inclusion improves creativity, productivity, and the vitality of the marine mammal community in which the MMHSRP engages.



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# 1. Introduction

## 1.1. Background

Marine debris, which is defined by the National Oceanic and Atmospheric Administration (NOAA) as any persistent solid material that is manufactured or processed and directly or indirectly disposed of, or abandoned into the marine environment, is a significant global stressor on the marine and coastal environment. Marine debris injures and kills marine life, interferes with navigational safety, and poses a threat to human health and safety. The majority of marine debris is composed of various forms of plastic that are highly persistent, and chemically harmful either because they are themselves potentially toxic (Lithner *et al.* 2011) or because they absorb other pollutants from the surrounding seawater (Teuten *et al.* 2009, Rochman *et al.* 2013a). The impact of marine debris is of global concern, affecting at least 914 species through entanglement and/or ingestion (Kuhn and van Franeker 2020). The number of species impacted by marine debris has substantially increased from the first overview reported in 1997 by Laist (1997) with 267 species and second overview reported in 2015 by Gall and Thompson (2015) with 693 species.

Increasing concern over plastics in the ocean led to the introduction of Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) which prohibits the at-sea disposal of plastic wastes. Annex V was signed in 1973, although a complete ban on the disposal of plastics at sea was not enacted until the end of 1988. However, despite 134 nations agreeing to eliminate plastic disposal at sea, oceanic sampling indicates that the problem has worsened since MARPOL was signed (Rochman *et al.* 2013b) and formally adopted in 1988. Illegal dumping of plastics, fishing gear, and garbage is difficult to enforce and continues to be a threat to marine life.

Entanglements have been identified as a significant cause of injury or mortality to pinnipeds (*i.e.*, seals and sea lions) throughout the world. Entangling materials may cause drowning, lacerations, infection, asphyxiation, increased energy expenditure (especially while dragging large fragments of net), and may result in premature death and/or dependent offspring mortality. Common examples of marine debris that harm pinnipeds include plastic packing bands/straps, fishing gear, rope, and large rubber bands used on crab and other fishery pots (Harcourt *et al.* 1994, Hanni and Pyle 2000, Page *et al.* 2004, Raum-Suryan *et al.* 2009, Franco-Trecu *et al.* 2017). Ingestion of microplastics (small plastic pieces less than five millimeters) is also of concern as it could provide a pathway for transport of harmful chemicals (Teuten *et al.* 2009, Rochman *et al.* 2013a).

Bycatch in active fishing gear (*e.g.*, commercial trawl, purse seine, longline, gillnet, troll) is one of the

largest threats to marine mammal populations (including pinnipeds) worldwide (Woodley and Lavigne 1991, Read 2008, Reeves *et al.* 2013, Hamilton and Baker 2019). Pinnipeds may interact with fisheries while pursuing the same fishery target species, while being attracted to fishery discards by being fed intentionally or unintentionally, or when encountering fishing gear and bait in the water (Hamer and Goldsworthy 2006, Raum-Suryan *et al.* 2009, Hamer *et al.* 2013, Reeves *et al.* 2013, Hamilton and Baker 2019). These interactions may result in the animal being caught in active fishing gear (e.g., hooks), or entangled in nets and lines (Hamilton and Baker 2019). Pinniped depredation at aquaculture facilities also can result in fatal entanglements (Kemper *et al.* 2003, Price *et al.* 2016).

To address the root of the entanglement problem - primarily plastic debris in the ocean or interactions with fisheries - stakeholders, industry, non-governmental organizations, local, state and federal governments, and Native organizations must **work together to solve the problem**. A number of agencies and organizations have developed various methods to respond to entangled pinnipeds. However, responding to entanglements is limited for many reasons, with response reaching only a small fraction of entangled animals. Although there have been successful changes in fishing practices and fishing gear modifications (e.g., seal and sea lion exclusion devices) (Hamer and Goldworthy 2006, Hamilton and Baker 2015, Königson *et al.* 2015), acoustic deterrent devices that elicit a startle reflex (e.g., Götz and Janik 2010, 2011, 2013, 2015, 2016) and other fishing techniques used to reduce the threat and impacts to pinnipeds and the fishing industry (Werner *et al.* 2006), pinniped injury and mortality as a result of marine debris and fishery interactions continues. We must continue to explore innovative and effective methods to reduce pinniped entanglements. **Prevention** of debris entering our waterways is essential.

## 1.2. Legislation pertinent to pinniped entanglement response

There are two key pieces of legislation that govern interactions with marine mammals in the United States, the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). In 1992, the Marine Mammal Health and Stranding Response Program (MMHSRP), under the National Marine Fisheries Service (NMFS), was established by Congress under Title IV of the MMPA. The MMHSRP coordinates marine mammal stranding response efforts in the United States under Title IV of the MMPA as well as a NMFS MMPA/ESA permit. The MMHSRP works to standardize regional network operations and define national stranding response policy.

**MMPA:** The MMPA, signed into law in 1972, prohibits the “take” of marine mammals. Take, as defined under the MMPA, means “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal” (16 U.S.C. 1362). The MMPA divides responsibility for marine mammal species between the Secretary of Commerce, who oversees NMFS, and the Secretary of the Interior,

who oversees the United States Fish and Wildlife Service (USFWS). NMFS is responsible for the protection and conservation of all cetacean and pinniped species (with the exception of walruses), and their habitat and USFWS oversees the management of walruses, polar bears, sea otters, and manatees, and their habitat. The 1992 amendments to the MMPA included Title IV of the MMPA, which established the MMHSRP under NMFS to collect and disseminate information about the health of marine mammals and health trends of marine mammal populations.

**ESA:** The ESA, enacted in 1973, provides for the conservation of species listed as endangered (in danger of extinction) or threatened (at risk of becoming endangered in the foreseeable future). The ESA also contains a prohibition on “take” with certain exceptions, which means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” (16 U.S.C. § 1531).

### **1.3. Best Practices purpose and intended uses**

**These best practices have been developed to serve as guidance and recommendations. This document is not intended for independent use as a training manual, and does not by itself qualify the reader for any actions or authorizations.** These best practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. In some situations, responders may choose a course of action not outlined in these documents, but consultation with NMFS is encouraged if the course of action will vary greatly from the best practices outlined in this document. These best practices are a “living document,” and as such, we plan to periodically review and update them as new information becomes available. Responders should never stop striving for innovative and new methods and training to increase the safety and success, and nothing in these best practices should prevent or limit advances in technology, techniques, and training.

NMFS and the MMHSRP have developed Best Practices for responding to live pinnipeds observed with life-threatening entanglements or that have ingested fishing gear, to ensure the health, welfare, and safety of both human responders and the impacted animals. These Best Practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. For more information on general stranded marine mammal rescue and rehabilitation, visit the [MMHSRP website](#) or see *Marine Mammals Ashore* (Geraci and Lounsbury 2005) and the *CRC Handbook of Marine Mammal Medicine* (Gulland *et al.* 2018). Human and animal safety is the top priority for NMFS and the Marine Mammal Stranding and Entanglement Networks (Network). As each event is unique, NMFS and the Network evaluate several factors before making the decision to intervene.

These Best Practices highlight general procedures specific to pinnipeds that have either become entangled in or ingested marine debris or fishing gear. These Best Practice protocols and procedures should only be used for pinnipeds. Protocols and procedures for use with small and large cetaceans can be found in the NMFS Small Cetacean or Large Whale Entanglement Response Best Practices Guides, respectively. Practices may vary between phocids (earless or true seals) and otariids (eared seals such as sea lions and fur seals). Additionally, these practices are designed to be paired with more specific regional annexes to address any concerns, including species-specific issues (e.g., endangered species response), more appropriately addressed at regional or state levels. These practices represent the culmination of years of evaluating response efforts and providing information that has been deemed safe (i.e., tools and procedures that reduce risk to animals and responders). However, risks still exist. These protocols are meant as overall Best Practices and should not limit advances in techniques or animal welfare.

These Best Practices include guidance for entanglement response techniques using physical restraint and sedation. Although physical restraint has been used successfully to capture many species of entangled free-ranging pinnipeds, safe capture and restraint of large, unpredictable animals, such as Steller sea lions (*Eumetopias jubatus*; up to 900 kg) greater than four years of age and adult California sea lions (*Zalophus californianus*; up to 600 kg) is difficult and, in some cases, impossible. Remote sedation (darting) using a zolazepam-tiletamine combination (“Telazol”) has been effective, except for the possibility of drowning should the darted animal enter the water (Heath *et al.* 1996). Recently, remote sedation techniques using a combination of medetomidine, midazolam, and butorphanol have greatly improved capture success of some individual otariids (Melin *et al.* 2013, Haulena 2014, Baylis *et al.* 2015, Frankfurter *et al.* 2016). This combination has been shown to provide effective sedation of otariids without inhibiting normal respiratory functions (Melin *et al.* 2013, Haulena 2014). A variation of this drug combination using midazolam and medetomidine also has been successfully used to capture and disentangle gray seals (*Halichoerus grypus*) (Sharp *et al.* 2016). These remote sedation techniques are explained in greater detail in section six of the document.

To ensure that this Best Practices document incorporates the most current, safe, and relevant entanglement response protocols, a questionnaire was sent to the MMHSRP stranding coordinators and their network members, to members of the international [Pinniped Entanglement Group \(PEG\)](#), and to other veterinarians and entanglement response personnel. The questionnaire included questions about

- 1) preparation, 2) equipment and drugs, 3) procedures, 4) risk and mitigation, 5) gaps and future research needs, and 6) any relevant protocols, data forms, or Best Practices currently in use. Responses

were received from personnel working in Alaska, Hawaii, the west and east coasts of the United States, Canada, and the United Kingdom. All responses were compiled, summarized, and incorporated into this document.

## **1.4. Structure of the document**

This document is organized as follows: Planning for a pinniped entanglement response (Section 2); Pinniped entanglement response techniques – physical on land (Section 3); Pinniped entanglement response techniques – physical in-water (Section 4); Pinniped entanglement response techniques – local/hand sedation (Section 5); Pinniped entanglement response techniques – remote sedation (Section 6); Gaps and future research needs (Section 7); Conclusions (Section 8); Acknowledgements (Section 9); References (Section 10); and Appendices (Section 11).

**This document is structured so that each section can be used as a stand-alone Best Practices guide for the appropriate entanglement scenario (e.g., physical on land, remote sedation, etc.).** Each section provides a broad overview of Best Practices for each response type. The appendices provide additional forms, datasheets, checklists, etc. that have been used during entanglement response.

## **1.5. Funding**

The John H. Prescott Marine Mammal Rescue Assistance Grant Program provides funding for eligible Network members and collaborators through an annual competitive grant process (subject to annual appropriation from Congress). These grants support the rescue and rehabilitation of stranded marine mammals (including pinniped entanglement response), data collection from living or dead stranded marine mammals for health research, and facility operation costs. However, as these grants are competitive and there is insufficient funding to cover all costs of the Network, individual Network members must also support many of the costs for normal operations. Determining whether funding is available for an intervention is an important first consideration, as lack of funds or available in-kind donations (e.g., boat use) may limit available options for responses.

## 2. Planning for pinniped entanglement response

### 2.1. Authorization

Pinniped entanglement responses are conducted under MMPA authorization either under a 112c agreement issued by NMFS to Network members through a Stranding Agreement, under 109 (h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt pinniped entanglement response. Response efforts may also rely on state and federal agencies (including law enforcement agencies and the United States Coast Guard), non-governmental organizations, fishermen, and other groups to respond to needed interventions.

Under the authorization of an MMHSRP MMPA/ESA research permit, responders are allowed to disentangle all pinniped species, including species listed as endangered or threatened under the ESA, and use remote sedation techniques for entanglement response. NMFS Office of Protected Resources (OPR) must be consulted for approval prior to conducting entanglement response activities, release, euthanasia, or necropsy of an ESA-listed pinniped; however, if working in remote locations where ESA-listed pinnipeds may be encountered, prior approval may be granted for entanglement response by contacting the Principal Investigator (PI) and/or Regional Stranding Coordinator (RSC) before departure to the field. All procedures requiring sedation, anesthesia, surgery, or euthanasia must be performed under the direct or indirect supervision of a veterinarian. Entanglement response should only be attempted if the entanglement is deemed to be causing, or has the potential to cause, a life-threatening injury (see pp 34-35 [NMFS Serious Injury Procedure](#) for details).

Responders are trained in proper techniques for safe capture, restraint, and removal of gear from various marine mammal species. Training workshops (*e.g.*, Safe Capture, Canadian Association of Zoo and Wildlife Veterinarians, Alaska Department of Fish and Game Chemical Immobilization of Wildlife) have been offered to members of the Network. Additionally, opportunities for apprenticeships or assistant roles to gain the necessary hands on expertise can be arranged. Specific training issues or requirements may exist for certain activities (*e.g.*, in-water captures) and are more appropriate to address at regional or state levels by working with the RSC.

### 2.2. Preparation

**Prior to any operation:** Entanglement response requires extensive logistical preparation, including training of personnel, development of strategies for successful mitigation, and identification of appropriate supplies, equipment, and vessel support. Once approval from NMFS has been received and

prior to any operation, an experienced team should be selected and roles and if applicable, boat crews assigned. An Incident Command System (ICS) Incident Action Plan (IAP) and safety protocols should be distributed to the team for review. Contingencies for rehabilitation should be identified in case it is determined that the injury is too severe to warrant immediate release on-site. All equipment (*e.g.*, medical, communication, response, vessels, vehicles, tags, animal transport gear, etc.), should be cleaned, organized, packed, and ready for operations on short notice. Tide, current, and navigational charts should be reviewed to decide the best tide window and potential locations for an appropriate, safe response.

#### **24 – 72 hours prior to operation:**

- Check weather forecasts
- Notify appropriate entities (*e.g.*, NMFS RSC, law enforcement, harbor master, park personnel, lifeguards, etc.)
- Ensure appropriate authorization (*i.e.*, if response on park, preserve, private land)
- For human safety, have a permanent point of contact (POC) familiar with the drugs used, and/or notify local hospital or emergency medical services (EMS) and describe drugs to be used, including reversals available
- If applicable, contact rehabilitation facilities to inquire if there is space available

#### **Immediately prior to operation:**

- Conduct safety briefing
- Re-check weather forecasts
- Consult decision matrix – prior to operations and on scene, determine if conditions allow for safe operations and make a final decision about response

### **2.3. Training**

Responders must be trained in safe capture, handling, monitoring under restraint, etc. by experienced personnel. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP or RSC can direct personnel toward resources relevant to the species of interest, whenever available.

### **2.4. Human and Animal Safety**

Because of the inherent risks encountered during an entanglement response, methods used to capture and restrain an animal should minimize risk, stress, and pain to the animal while also ensuring the safety of responders and animals. A broad list of human and animal safety procedures can be found below.

## **HUMAN SAFETY**

- Human safety always comes before animal rescue.
- Create a written risk assessment and safety protocol with emergency numbers to be kept with first aid kits.
- All anticipated drugs should be recorded on an emergency response sheet in case of accidental exposure, so EMS can quickly evaluate human exposure. Local hospitals should be notified prior to response.
- Conduct an appropriate assessment of the entanglement and impact to animal and operational assessment to mitigate any risk to responders.
- Responders should only conduct procedures for which they meet minimum qualifications and training.
- Personnel should wear appropriate personal protective equipment (PPE) such as strong, non-slip footwear, gloves, and protective clothing as necessary and all persons handling delivery devices or drugs should be wearing proper PPE (*e.g.*, non-permeable gloves, safety glasses, and masks when loading darts or syringes).
- Ensure first aid kits are available and located with each response group. If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal and cut away from yourself. Stow the cutting implement safely when finished.
- Do not wrap net or line around arms, hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear of lines and nets. Watch other people when possible to ensure they are clear of line and net.
- If drugs will be used, all responders should be familiar with drugs and reversals, including symptoms of accidental exposure and if/when/how to treat prior to the arrival of medical personnel.
- Never initiate an action that has not been thoroughly discussed and thought through, and if warranted, authorized.
- When in doubt, stand down, and/or regroup (*i.e.*, attempt on another day with better support, conditions, and/or resources).
- Do not be pressured into an action by weather, time of day, onlookers, media, or the need to “just do something”. There is no obligation to respond.
- Once a response is mounted, there are obligations (*e.g.*, standard operating procedures) to be met.

## **ANIMAL SAFETY**

- Use a decision matrix (see Section 2.12) prior to capture to ensure risks and mitigation are anticipated and accounted for by all responders and properly mitigated.

- Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Every effort should be made to lessen the chance of flushing non-target and target animals into the water. If the response is likely to flush more than 50 seals/sea lions, responders should consult with the Regional Stranding Coordinator before proceeding or discuss prior to departure if response will be conducted in a remote location.
- Entanglement response should not be attempted in locations that are likely to disturb mother/pup pairs.
- Prior to restraint or darting of the target animal, personnel will cease efforts if significant injury to target or non-target animals appears imminent.
- Responders should minimize the unavoidable stress that comes with animal capture by minimizing the duration of restraint and/or captivity, remaining calm and quiet around the animal, and minimizing manipulations and transport of the animal.
- Responders should only use appropriate, species-specific handling and sedation methods with trained personnel to make the capture response as efficient as possible and to minimize negative effects.
- When the animal is in hand, ensure it is secured appropriately so that it is still able to breathe comfortably with the jaw held shut (*e.g.*, hoop net, towel) to reduce the risk of bite. Pinnipeds cannot breathe through a wet towel so ensure any towel used does not restrict breathing. A kinked neck or constricted airway can cause mortality, and all animal handlers should be briefed about this hazard prior to response.
- Prevent potential thermoregulatory stress by considering and managing temperature, wind, sun, and shade. In warm conditions, preventatively keep animals cool by pouring water over flippers and minimizing handling time. If the animal becomes too cold, hot water bottles, emergency blankets, or hot pads can be used to warm the animal.
- The animal's eyes should be covered with a UV-resistant and non-abrasive material during restraint to protect the eyes, and to reduce stimulus to the animal. For sedated animals, a gel-based solution of artificial tears can be applied to protect the eyes if physical eye protection is not feasible (*e.g.*, in-water).
- All procedures requiring sedation, anesthesia, surgery, or euthanasia must be performed under the direct or indirect supervision of a veterinarian.
- During restraint and/or sedation for disentanglement, the animal should be constantly monitored for changes in breathing or other signs of distress or complications. Respiratory rate, at a minimum should be recorded every 5-10 minutes and trends should be tracked and managed appropriately.
- When embedded, peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this should minimize pain and prevent further injury.
- Once incident is complete, clean and sterilize any sampling tools that came into contact with the animal.

## 2.5. Incident Command System

The ICS as it applies to an entanglement response is a standardized approach to establish common processes for planning and managing the response. ICS enables a coordinated effort among all responders, and allows for the integration of equipment, personnel, procedures, and communications

among responders. ICS is based on decades of lessons learned, the achievement of response objectives, the efficient use of resources, and helps ensure the safety of responders and the animals. ICS uses standard terminology and common terms to ensure understanding among all responders. ICS establishes a clear chain of command, transfer of command, ensures integrated communications, professionalism, accountability, and organizational structure.

The Incident Commander (IC) is responsible for the overall operation, including the performance of the response, and while usually found onsite with the response team, does not generally participate directly in the operation. This enables the IC to remain focused on the larger picture of the response. By using ICS, each team member knows their exact role in the response, the response plan, and any mitigation measures should there be an emergency during the response. An Incident Action Plan (IAP) documents incident goals and objectives, disseminates information about the response, and is revised on a regular basis to maintain consistent, up-to-date guidance. For more information about ICS and how to take a free course, see: <https://training.fema.gov/emiweb/is/icsresource/TrainingMaterials.htm>.

## 2.6. Team member roles

The capture and handling of pinnipeds has inherent risk for both responders and animals. Clarifying team member roles and responsibilities prior to any response, and ensuring that responders meet minimum qualifications for each role, is essential to a safe and successful response. Disentangling pinnipeds should always be conducted by trained personnel. When controlled substances are used for local or remote sedation, extra training and licensing requirements are required, and safety protocols should always be in place.

Detailed descriptions of team member roles and responsibilities are described in greater detail within each of the entanglement response method sections below. All personnel should be familiar with the MMHSRP permit and the minimum qualifications for each role if handling ESA species or using remote sedation techniques. In general, roles and responsibilities might include but are not limited to:

1. Incident Commander (IC)
2. Safety Officer (SO) – if short on responders, this role can be combined with the IC
3. Licensed Doctor of Veterinary Medicine (DVM) or equivalent or Veterinary Technician
4. Animal herders
5. Animal restrainers
6. Boat operators
7. Marksman if darting

8. Spotters if darting
9. Monitors
10. Data collection
11. Documentation (still and video photography)
12. Unmanned aerial system (UAS) pilot
13. Crowd/Security control (this could be performed by law enforcement, park personnel, volunteers, etc.)
14. Communication Officer

## 2.7. Communication

Clear communication is essential before, during, and after an entanglement response. Roles should be clearly defined and understood by everyone prior to the response. The IC should go over the plan just prior to implementation and give each responder a chance to respond to any safety or other concerns at this time. There must be clear communication when planning for the response, and among team members during the response (*e.g.*, among boat operators, between boat operators and shore personnel, between response team and emergency personnel, members of the public, law enforcement, harbormasters, Native communities, etc.). To reduce stress to the animals and responders during the response, talking should be kept to a minimum unless there is a safety concern, and these concerns should be communicated directly to the IC and/or SO.

Common forms of verbal communication include using very high frequency (VHF) marine radios, satellite phones, cell phones, and two-way radios (*e.g.*, walkie talkies). Some applications for phones (*e.g.*, Zello) allow a cell phone to be used as a walkie talkie. Non-verbal communication may also be required while approaching an animal. Responders should ensure all non-verbal communication gestures are understood by the entire response team and practiced prior to each response.

The IC must coordinate with the MMHSRP, RSC, and the NMFS Office of Communications concerning media contacts relating to high-profile entanglement response events, as necessary. If responders are contacted by the media for an interview, they should notify a NOAA Office of Public Affairs Communications Specialist before responding if possible, or soon after the event. If a Communications Specialist cannot be contacted prior to a response to the media, an email summary of the interview (including name and contact information of the reporter, and media outlet) should be provided. It is best to work through public affairs for news media, such as news releases, news conferences, and media interviews. All media interviews should be considered "on the record". Human safety always comes first, followed by the entanglement response. The response team should never feel pressured by anyone, including the media, to respond. **Responders are NOT required to speak to the news media.** (See examples of frequently asked questions regarding pinniped entanglement response

in Appendix A).

## 2.8. Environmental conditions

Consideration of weather forecasts, the features of the response area, the entangled animal and conspecifics, and other wildlife in the area are essential prior to response. Responders should consider: wind, precipitation, fog, sea state, and incoming storm systems or any other changes in weather. Environmental conditions that should be assessed include: tides, currents, substrate (*e.g.*, rocks, slippery kelp, coral, cultural resources at risk), submerged hazards (*e.g.*, sunken debris, aquaculture, oysters, crab pots), emergent hazards (*e.g.*, pilings, docks, jetties, etc.), land hazards (*e.g.*, bears, snakes, etc.), predators (*e.g.*, sharks, killer whales, alligators, etc.), other marine organisms (*e.g.*, stingrays, jellies, etc.), and surf. The temperature should also be considered. If it is too hot, the responders or animals could become overheated. If too cold, it could be a safety risk for responders and the animal.

## 2.9. Equipment

Each type of response (physical restraint on land, physical restraint in the water, local sedation, and remote sedation) requires specific equipment. It is essential that the proper equipment be clean, tested, charged, packed, and immediately available before response. Table 2-1 summarizes general equipment used for the various types of responses. Specific equipment is outlined in individual sections later in this document.

**Table 2-1. Overview of general equipment used for physical restraint on land and water, and hand and remote sedation methods.**

General Equipment	Physical restraint - land	Physical restraint - water	Local (hand) sedation	Remote sedation
Communications ( <i>e.g.</i> , marine radio, cell phone, satellite phone)	X	X	X	X
Data supplies ( <i>e.g.</i> , datasheets, pencils, etc.)	X	X	X	X
Safety equipment/Protective clothing/PFD	X	X	X	X
Medical equipment for humans ( <i>e.g.</i> , First Aid)	X	X	X	X
Medical equipment for animals ( <i>e.g.</i> , sedation, antibiotics, 'crash kit')	X	X	X	X

General Equipment	Physical restraint - land	Physical restraint - water	Local (hand) sedation	Remote sedation
Sampling (e.g., blood, skin, swab, etc. collection), marking (e.g., hair dye, hot branding), and tagging (e.g., roto, Allflex, or satellite-linked) equipment	X	X	X	X
Crowding/herding boards	X		X	possible
Capture/Restraint equipment (e.g., nets, poles, etc.)	X	X	X	X
Vehicles	X	X	X	X
Vessels	possible	possible	X	X
Local sedation equipment (e.g., hand inject, pole syringe, etc.)			X	
Remote sedation equipment (e.g., dart projector, darts, etc.)				X
Recording equipment (e.g., cameras, Go Pros, etc.)	X	X	X	X
Cleaning/disinfectant supplies	X	X	X	X
UAS	possible	possible	possible	possible

## 2.10. Data collection

Capture and sampling equipment and data needs must be well thought out prior to the start of any entanglement response program. Instructions should be followed and data forms completed during a response. Capture and sampling equipment checklists should be developed and used. Important forms for preparation prior to response may include: applicable permits; [Level A and Human Interaction Forms](#) (Appendix B – Level A and Human Interaction Form); gear checklists (e.g., Appendix F - Gear Checklist); disentanglement forms (e.g., Appendix G – Disentanglement form); remote sedation worksheets (e.g., Appendix H - Remote Sedation Worksheet); drug interaction forms (e.g., Appendix I – Drug interaction Form); and sedation worksheets for otariids (e.g., Appendix J – Otariid sedation worksheets) or phocids (e.g., Appendix K – Phocid sedation worksheet). All entangling gear should be retained if possible, documented on the Level A and Human Interaction Form, and stored in a centralized location.

## 2.11. Risks and mitigation

To minimize risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a decision matrix or Go/No Go criteria should be established to guide responders in making safe decisions regarding the response to entangled

pinnipeds. Responders should prepare, plan, and practice for possible risks and identify mitigation measures (Table 2-2) for these risks prior to any response. After each response, the team should conduct a thorough de-brief and summarize lessons learned that can be applied to future responses. When responding to entangled pinnipeds, the list of risks and mitigations is never complete. ***There is always room for improvement and documents should be updated continually.***



**Table 2-2. A general risk and mitigation checklist to use for an entanglement response.**

General Risk and Mitigation Checklist	✓
Approval for response from NMFS	
Approval for response from NMFS permit holder (if applicable, e.g., ESA species, unintentional harassment)	
Assign an IC and SO	
Veterinary support if sedation is required	
Make arrangements for possible transfer to rehabilitation facility	
Alert NOAA/permit holder	
Alert harbormaster, land owners, and Native organizations (if applicable)	

Alert area Emergency Medical Services (EMS) especially of use of drugs and darts	
File a float plan with designated Point of Contact (POC)	
Check vessel, trailer, and vehicle operation	
Prepare for follow-up monitoring ( <i>e.g.</i> , obtain and program tags)	
Assign and explain team member roles	
Review authorization/permit and decision matrix or Go/No Go	
Check weather forecasts and tides	
Review safety plans	

## Risk Management Assessment

Assessment of risks and mitigation starts long before initiating a response. Risks to humans and animals should be identified, and mitigation measures established. Specific risk and mitigation measures will be listed under individual sections later in the document. Some examples of general risk and mitigation measures are listed below.

### RISKS TO HUMANS

#### Risks:

- Injury or death as a result of drowning; slips, trips, or falls; entanglement in capture equipment; trauma associated with animal restraint (*e.g.*, bites, scratches, bruises, breaks); changeable environmental conditions; injuries from other organisms (*e.g.*, stingrays, sharks, coral, oysters, etc.)
- Accidental injection, ingestion, or absorption of drugs during capture or at a later date if the animal is harvested for consumption as part of Alaska Native subsistence harvest activities
- Exposure to pollutants, biotoxins, etc.

#### *Mitigation:*

- Preparation, planning, practice, proper training, and use of decision matrices
- Licensed Doctor of Veterinary Medicine (DVM) or equivalent if sedation drugs will be used during the response
- IC and SO to oversee operations

- Wear appropriate PPE
- Use luer lock syringes with hand injectable drugs (to reduce likelihood of spray back)
- If working in Alaska, native communities should be notified prior to any captures using sedatives and animals that have been given sedatives should be well marked (on the flipper tag, use a permanent marker to write “**Do not eat if harvested before xxx date**”, which is past the withdrawal time of 45 days) so that the Native community can identify the animal prior to possible subsistence use
- Do not wrap line around any body part and keep feet clear. Practice shuffling feet near line when possible to minimize entanglement risk

## RISKS TO ANIMALS

### Risks:

- Injury or death to an entangled animal from responders, capture equipment, drug overdose, other animals, falls, or drowning
- Injury to surrounding non-entangled animals (including pups) from stampeding, trampling, accidental darting

### *Mitigation:*

- Preparation, planning, practice, and use of decision matrices
- Captures only performed by highly trained and sufficient number of personnel
- Adequate survey of capture area to ensure no risk to pups or non-entangled animals in the area
- Adequate amount of appropriate reversal agents to be administered by licensed DVM or equivalent, if sedation drugs will be used during the response

## 2.12. Intervention criteria/decision matrix

The most important question to ask prior to an entanglement response is: **Is the entanglement life threatening?** Entanglement response should only be attempted if the entanglement is deemed to be causing, or has the potential to cause, a life-threatening injury, and that the potential risks of capture are necessary for the survival of the animal, due to the serious nature of the entanglement (e.g., see pp 34-35 [NMFS Serious Injury Procedure](#) for details).

For entangled pinnipeds, NMFS, in consultation with experts and veterinarians, will determine if the entanglement is a serious injury and life-threatening. This is achieved through field observations by biologists/researchers/veterinarians/veterinary technicians, analysis of photos and/or videos, the animal’s behavior and appearance, and prior experience with similar entanglements.

If the entanglement is determined to be life threatening, the next step is to determine the most

appropriate method of intervention. If intervention is not an option, the animal may be monitored, usually by local researchers or NMFS biologists, to determine whether an intervention may be possible at a later date (*e.g.*, the animal moves to a more suitable area for rescue, the animal live strands, the animal becomes lethargic and more approachable, weather improves, etc.).

If the decision to intervene is made, then there are two main tools to aid in determining if a response should occur: 1) The Risk Factor Model (Table 2-3), and 2) The Go/No Go Decision Matrix (Figure 2-1):

- 1) **The Risk Factor or GAR (Green-Amber-Red) Model** (Table 2-3). The GAR model allows for time critical risk assessment and generates communication concerning the response risks. This communication then helps identify the risk and leads to the appropriate mitigation. This model is not a strict Go/No Go because it is focused on identifying risks and mitigations. If the cumulative risk levels across multiple areas (*i.e.*, team composition, mission complexity) are above a certain threshold, teams must work with the IC and/or contact the permit principal investigator (*i.e.*, the MMHSRP) if acting under the permit, prior to acting to discuss mitigation measures or to stand down.

**Table 2-3. The GAR (Green-Amber-Red) General Model Table based on table provided by [The Hawaiian monk seal research program, NMFS](#).**

Risk Factor	Risk Factor Category						Risk Level
	Very Low - 1	Low - 2	Medium - 3	Medium High - 4	High - 5	Very High - 6	
Environment	Very Acceptable	Acceptable	Moderately Acceptable	Moderately Dangerous	Dangerous	Very Dangerous	
Team Selection and Fitness	Excellent Team	Good Team	Appropriate Team	Marginal Team	Poor Team	Very Poor Team	
Animal selection and condition	Healthy	Healthy	Injured/Compromised		Highly Compromised		
Permits & Authorization	Excellent		Good		Poor		

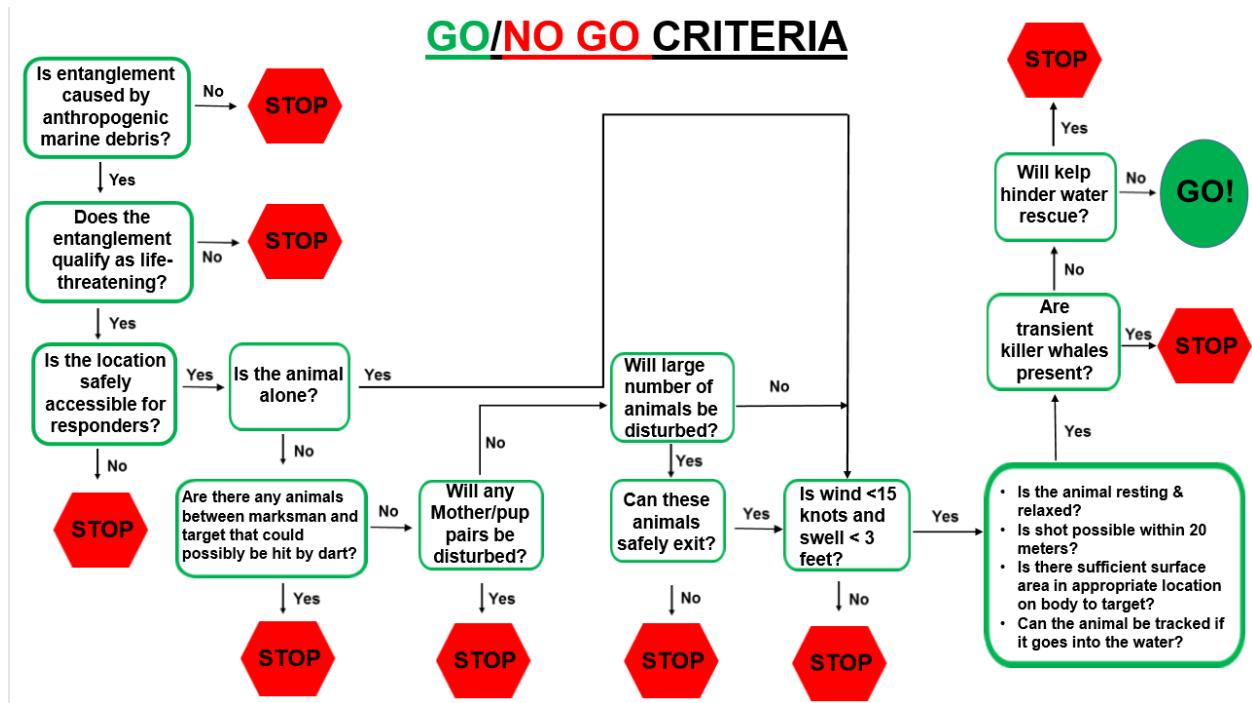
Resources: Equipment, PPE, communication, etc.	Excellent		Good	Not Prepared		
Mission Complexity: New or experimental, time sensitive, etc.	Simple	Standard	Moderately Complex	Very Complex	Extremely Complex	
If any risk level equals:	Any medium-high	Contact project lead or immediate supervisor before proceeding				
	Any high – very high	Contact project lead or veterinarian before proceeding				

#### Key considerations or questions to be asked in the Risk factor analyses (GAR):

- **Molt:** Molt stage should be considered for some species, as it is highly energetically costly and may make individuals less capable of withstanding the stress of capture.
- **Pregnancy:** Adult females require additional consideration. Adult females are likely to be pregnant during part of the year and some drugs (or stress) could lead to late term abortions. Pregnant females should only be captured if their survival, and the survival of their unborn pup, is in eminent danger due to the entanglement.
- **Health and behavior assessment:** Observe body condition, responsiveness (responds normally to natural stimuli), or if there are any external or behavioral abnormalities (Appendix C provides an example of an assessment guide).
- **Weather and tide concerns:** Does weather pose a threat to the animal or responders (*i.e.*, heat stress or hypothermia or threatening storms)? If so, is there a way to mitigate it? Depending upon climate/season, captures during the middle of the day should be avoided unless overcast/cool. Consider the animal's body temperature before, during, and after handling. Is the tide coming in or going out, how high/low is it and how can it impact the event?

- **Habitat concerns:** Habitat (*i.e.*, geographic location, substrate type, navigation hazards, water depth, currents, etc.) should be assessed for hazards to animals and responders.
- **Equipment:** Is all necessary gear functional, available, and ready? This includes, but is not limited to, crowding, capture, tagging, sampling, instrumentation, disentanglement, emergency equipment, temperature mitigation gear (*e.g.*, shade, bucket for water), and transport gear (*e.g.*, cage, truck, boat).
- **Presence of other animals:** Are there other pinnipeds, pups, or other wildlife in the area that may be disturbed by the handling? Is there a potential for other pinnipeds to approach and disrupt the target animal or responders during capture? Consider other natural and cultural resources nearby.
- **Egress:** Has the team assessed all possible hazards in the capture zone? Is there a safe place for the non-entangled animals to egress? Is the entangled animal in a safe location if remotely sedated? What hazards are in the capture zone that could potentially cause injury to the entangled and surrounding animals?
- **Team composition:** Are there adequate responders with the appropriate level of expertise and experience to safely complete the mission and address unforeseen situations? If a veterinarian or veterinary technician is necessary, there should be sufficient personnel to assist the entanglement response so the veterinarian/veterinary technician can monitor the animal. Ensure that all involved fully understand their roles and everyone understands warning signs to look for. Designate a safety officer to monitor fatigue, injury, the animal, and personnel throughout the response.
- **Public presence:** Is the capture going to be in a public area? Ensure adequate crowd control and outreach. If in a crowded public area, consider a public briefing before and after the event. Expect to be recorded or live streamed and ensure that all involved behave appropriately. Carefully consider clothing/logos that will be seen by the public, to help the public recognize the professionalism of the team.

2) **The Go/No Go Decision Matrix** (Figure 2-1). The Go/No Go Decision Matrix is a flow chart based on permit requirements. This flow chart enables responders to think through the current response scenario to determine if the response is feasible based on a risk assessment.



**Figure 2-1. General example of a Go/No Go decision matrix based on permit requirements (created based on flowchart provided by the Alaska Department of Fish and Game Steller sea lion program). This flowchart can be modified to best fit individuals regions.**

## 2.13. Procedure

Procedures will vary depending on the type of entanglement response and will be presented in greater detail in each section below. Across all types of responses, the general sequence of events include:

1. Use a decision matrix to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated. Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed.
2. Hold a team briefing prior to the response so team members know their duties (include a practice run).
3. If responding in areas with a large number of entangled animals, survey the area and select the animal(s) based on NMFS authorization.
4. Estimate the weight of the animal if sedatives will be used and select the appropriate dosage. Be consistent in method of estimation, verify method if possible.
5. Ensure there is adequate security and crowd control in place if necessary.

6. The IC will ensure all personnel and equipment is ready and perform the final Go/No Go determination (if there is ANY question of safety, abort).
7. All camera and video monitoring equipment is operational and recording; photos of the gear in place are taken.
8. The team gets into position, approaches and captures the animal.
9. The animal is immediately monitored and assessed for any signs of respiratory or circulatory distress and treated accordingly.
10. The animal is disentangled, marked or tagged (if safe to do so), sex and morphometrics are determined, data are recorded, the wound is cleaned and treated, and sedative reversals are administered if drugs are used. Euthanasia solutions should be kept nearby in case there is a need for euthanasia. Antibiotics may be used to treat injuries.
11. The animal is released, or if additional care is warranted, transported to a rehabilitation center or euthanized if the injury is too severe. If euthanized, the carcass is either necropsied on-site or transported to a necropsy facility for complete necropsy.
12. The entangling material should be retained (if possible), documented, and archived or sent to a NMFS gear repository.
13. The team conducts a thorough debrief and completes a thorough and fully documented report, which includes the required Level A and Human Interaction forms (*e.g.*, Appendix B – Level A and Human Interaction Form).
14. The gear is cleaned, packed, and organized for the next response.

### **3. Pinniped Entanglement Response Techniques – Physical On land**

**This section can be used as a stand-alone overview of how to safely respond and physically restrain entangled pinnipeds that are on land.**

#### **3.1. Preparation**

**Prior to any operation:**

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Select a location for operations.
- Consult tide charts for optimal tide windows and determine cut off time due to tides or darkness.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vehicles (fuel and maintenance if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal, and better control of onlookers in the area.
- If using satellite-linked transmitters, ensure transmitters are programmed and ready to deploy.
- Ensure all equipment is clean, organized, packed, and ready for operations.

**24 - 72 hours prior to operation:**

- Check weather forecasts.
- Notify appropriate entities such as: NOAA Regional Stranding Coordinator (RSC), law enforcement, EMS or local hospital, Native communities (in Alaska), and rehabilitation facility to inquire about available space.
- Ensure appropriate authorization (*i.e.*, if response on park, preserve, or private land).

**Immediately prior to operation:**

- Conduct safety briefing.
- Re-check weather forecasts.
- Consult decision matrix – prior to operations and on scene, determine if conditions allow for safe operations then make a final decision about response.

## **3.2. Training**

Pinniped entanglement responses are conducted under MMPA authorization either under a 112c agreement issued by NMFS to Network members through a Stranding Agreement, under 109 (h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt pinniped entanglement response. Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP or RSC can direct responders toward resources relevant to the species of interest, whenever available.

## **3.3. Human/animal safety**

Because of the inherent risks encountered during an entanglement response, methods used to capture and restrain an animal should minimize risk, stress, and pain to the animal while also ensuring the safety of both the animal and responders. A broad list of human and animal safety procedures can be found below.

### **HUMAN SAFETY**

#### **Equipment and personal protective equipment (PPE)**

- Keep a written safety protocol, including emergency numbers, with first aid kits.
- All personnel must wear appropriate PPE and dress suitably for the weather conditions and have appropriate footwear.
- Pinniped restrainers, samplers, taggers, and others who may have physical contact with the animal should wear protective clothing and appropriate footwear.
- Handlers who may come into contact with bodily fluids must wear non-permeable gloves such as nitrile or latex exam gloves. Cloth gloves may be worn over non-permeable gloves if added grip or protection is needed.
- Other recommended protective gear includes eyewear (including sunglasses – preferably polarizing) and kneepads. Masks should be available for use at handler discretion, based on risk and environment.

## **Safety equipment**

- Ensure first aid kits are available and located with each response group. If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.
- Radio/other communication equipment are charged and operational.
- Knives and restraint equipment (*e.g.*, capture pole, net, etc.) are clean, functional, and ready for use.
- If vessels will be used to access animals on land, vessels should contain safety equipment that conforms to United States Coast Guard regulations and be appropriate to the role each vessel plays in the response operation. Safety items should include:
  - A personal flotation device for each person on the vessel
  - Fire extinguisher(s)
  - Distress signals (flares, horn, etc.)
  - Navigation lights as appropriate

## **Operational safety**

- Responders must meet minimum qualifications and training prior to conducting procedures.
- Assess the size, weight, and strength of the animal to determine how many people and what equipment would be needed to safely capture and secure it.
- Designated safety persons should be assigned to continually watch over all personnel involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated personnel should be watching for and warning team of hazards such as waves and other animals.
- Do not wrap net or line around arms, hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear of lines and nets. Watch other people when possible to make sure they are clear of line and net.
- Assess how to safely reach the animal and egress after capture. Consider terrain, substrate, tide, weather, time of day, distance from access point to animal, other environmental factors (*e.g.*, unstable cliffs, ledges, working at height, working near water), and other animals in the area.

## **Predators/other wildlife**

- Check for predators (*e.g.*, bears) or other organisms (*e.g.*, snakes) before operations and have a spotter during operations.

## **Report injuries, incidents, or PPE failures to the Safety Officer immediately.**

- Any significant accident or injury requires that operations cease and the event, person, or injury is immediately addressed.
- Depending on the situation, the decision is made by the Incident Commander (IC) whether to continue or discontinue operations for the day.
- Appropriate response staff are trained in basic first aid and CPR. First aid kits, including

- tourniquets, water and saline for flushing, are readily available.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal and cut away from yourself. Stow the implement safely when finished.

### **Presence of public or bystanders**

- If capture is in a public area, ensure there is sufficient crowd control and outreach.
- Ensure observing public are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

## **ANIMAL SAFETY**

- Use a decision matrix prior to capture to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated.

### **Temperature/weather**

- Prevent potential thermoregulatory stress by considering and managing temperature, wind, sun, and shade. If animals become overheated, cool flippers and substrate under/around the animal with water. If the animal becomes too cold, hot water bottles, emergency blankets, or hot pads can be used to warm the animal.
- Limit handling of larger (and fatter) animals to periods of cooler ambient temperatures (*i.e.*, early morning, late afternoon, or when skies are overcast).

### **Minimize stress**

- Responders should minimize the unavoidable stress that comes with animal capture by minimizing the duration of restraint and/or captivity, remaining calm and quiet around the animal, and minimizing manipulations and transport of the animal.
- Eyes should be covered with a UV-resistant and non-abrasive material during restraint to protect the eyes, and to reduce stimulus to the animal.

### **Environmental hazard assessment**

- Prior to capture, survey the surroundings to identify any environmental hazards that might pose a threat to the animal.
- Consider the potential hazards to animals that may flush into the water, such as high surf, shark predation, or aggressive conspecifics.
- Ensure a safe and easy release path for the animal to transit once released from restraint.

### **Disturbance (other seals and wildlife)**

- Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Every effort should be made to lessen the chance of flushing non-target and target animals into the water. If the response is likely to flush more than 50 seals/sea lions, responders should consult with the

Regional Stranding Coordinator before proceeding or discuss prior to departure if response will be conducted in a remote location.

- Entanglement response should not be attempted in locations that are likely to disturb mother/pup pairs.
- Prior to restraint of the target animal, personnel will cease efforts if significant injury to target or non-target animals appears imminent.
- Reduce all forms of disturbance to the entangled animal and any nearby animals (*e.g.*, if animal is within a group) as much as possible by keeping noise and movement to a minimum, and avoiding bright colors that can be spotted easily and spook the animals into the sea.

### **Time limits**

- Minimize herding and restraint time (for most handlings of unsedated Hawaiian monk seals, a maximum herding/restraint time of  $\leq 10$  minutes is recommended).

### **Restraint devices and capturing/restraining animals**

- Where possible, approach or maneuver the capture team so that they will be closest to the animal and also able to cut off the quickest escape route(s) of the animal to the water.
- Beware of the animal's proximity to the water and the potential of becoming submerged while held in the net.
- Ensure that the appropriate capture net (*i.e.*, weight, pole length, net length) and mesh size is used to prevent animal injury and maximize successful capture. Determine how the animal will be removed from the net after capture (a cod end of the net may make release easier).
- Never hold on to the entangling material as a form of capture or to slow the animal down, as the animal is likely to roll and spin, causing further injury and pain.
- When the animal is in hand, ensure it is secured suitably so that it is still able to breathe comfortably with the jaw held shut (*e.g.*, hoop net, towel) to reduce the risk of bite. Pinnipeds cannot breathe through a wet towel so ensure any towel used does not restrict breathing. A kinked neck or constricted airway can cause mortality during captures, and all animal handlers should clearly understand this hazard prior to the response.
- If not possible prior to capture, assess where the entangling material is easiest to access and cut away. Also identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal.
- Peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this will minimize pain and prevent further injury. Double check to ensure all entangling material is removed.
- Assess whether the animal is suitable for immediate release, requires transport to rehabilitation, or requires euthanasia and act as appropriate.
- Ensure the transport container is safe and secure for the size and strength of the animal.
- Sterilize any sampling tools that came into contact with the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

### 3.4. Team member roles

The capture and handling of pinnipeds has inherent risk for both the responders and the animals. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. The recommended roles that follow are based, in part, on implementation of the ICS as defined by the Federal Emergency Management Agency. This system provides a structure for clarity of communications and roles, and efficient management of resources. The System is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on this System. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 3-1).

**Table 3-4. Suggested number of personnel needed to perform pinniped physical restraint – on land entanglement response. Responders can fulfill multiple roles and some roles are \*optional.**

Team member role	Number of suggested personnel
Incident Commander/Safety Officer	1-2
Animal herder(s)	1-12
Animal handler(s)/restrainer(s)	1-5
Data collection/documentation	1-2
Security/crowd control	variable
*Optional – Veterinarian/Veterinary Technician	1
*Optional - Communication Officer	1
*Optional – UAS pilot	1

Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*i.e.*, IC and SO; documentation and data collection).

- **Incident Commander (IC)** - The IC is responsible for the overall operation and the performance of the response and usually does not participate directly in the operation. This

enables the IC to remain focused on the larger picture of the response and objectively ensure that the response is safe for responders, the public, and animals.

- ***Qualifications*** – Experience in previous pinniped response, ability to oversee all operations, communicate with the team to adjust strategy or call off the effort as necessary. Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations.
- **Safety Officer (SO)** – The SO is responsible to continually watch over all personnel involved in a response and have the ability to communicate to the team and adjust the strategy of the response as needed.
  - ***Qualifications*** – Experience in previous pinniped response, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.*, waves, other animals). Willingness to stop operations if there is a safety concern, despite momentum (and pressure) to move forward.
- **Animal herders** - The animal herders are responsible for safely herding the animal to a safe location for capture, ensuring responders are safe from animal bites and scratches and minimizing disturbance to other animals.
  - ***Qualifications*** – Experience in previous pinniped response and safely herding pinnipeds.
- **Animal handlers/restrainers** – The animal handlers/restrainers are responsible for handling the animal to ensure it is safely restrained and all personnel around the animal are safe from potential injury such as animal bites and scratches.
  - ***Qualifications*** - Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Advancement requires hands-on experience under the direct supervision of experienced response staff. This handling experience may occur in a rehabilitation hospital setting. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.
- **Data collector** – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets, the animal is given an identifying number, all marks, flipper and satellite-linked tag numbers are

recorded, and all samples are properly recorded and labeled.

- ***Qualifications*** – Familiarity with data sheet and information to be recorded and ability to accurately record data legibly.
- **Documentation** – This person is responsible for operating still or video photography to document the capture. This person may also serve as the data collector.
  - ***Qualifications*** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, and take clear and meaningful photos and video.
- **Security/crowd control** – The IC should ensure that the proper authorities in the area have been notified of the response and the area is closed to public access during the response.
  - ***Qualifications*** – Knowledge of proper authorities to notify.
- **Veterinarian/Veterinary technician (\*optional)** – The veterinarian/veterinary technician is responsible for the health and monitoring of the entangled animal during capture and until the animal is safely released and on its own.
  - ***Qualifications*** – A licensed Doctor of Veterinary Medicine (DVM) or equivalent or veterinary technician who is EXPERIENCED in pinniped medicine.
- **Unmanned aerial system (UAS; \*optional)** - If permitted to operate a UAS during the capture, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the capture or causing any disturbance to the target or other animals.
  - ***Qualifications*** – a certified pilot's license, a permit to operate during a capture, follow all existing FAA and other regulations, and experience operating a UAS during previous pinniped field operations.
- **Communication Officer (\*optional)** – If there are an adequate number of responders available, the communication officer can communicate information about pinniped entanglement response.
  - ***Qualifications*** – Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.

### 3.5. Environmental conditions

Create a risk assessment tool (Appendix D – Risk Factor Table) or decision matrix (Appendix E – Decision Matrix (Go/No Go)) to determine whether or not an entanglement response is safe for responders and pinnipeds based on environmental conditions. Assess the following environmental conditions prior to pinniped restraint on land:

- Weather conditions (*e.g.*, rain, snow, fog, wind, approaching storm systems, heat, cold)
- Substrate (*e.g.*, slippery or sharp rocks, kelp, barnacles, coral, tide pools, cultural resources at risk)
- Location of the animal in relation to the surf zone
- Tide (*i.e.*, incoming tide, increased surf)
- Time of day (*i.e.*, response too close to sunset leading to activities occurring at night)
- Presence of other animals (*e.g.*, conspecifics or otherwise – brown bears, snakes, alligators, etc.)

### 3.6. Equipment

#### Data and recording supplies

- Capture/handling forms (*i.e.*, Level A, Human Interaction, Capture form, etc.)
- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro), extra batteries
- Binoculars

#### Sampling, tagging, and marking supplies

- Measuring kit (*e.g.*, tape measure, calipers, ruler)
- Tagging kit (*e.g.*, plastic flipper tags, satellite-linked tags, tagging equipment)
- Marking kit (*e.g.*, hair dye, paint stick)

#### Protective clothing

- Footwear appropriate for substrate
- Protective clothing (*e.g.*, coveralls, raingear, etc.)
- Non-permeable gloves (*e.g.*, nitrile or latex)
- Optional - eyewear, knee pads, cotton gloves, helmets

## Human medical equipment

- First aid kit
- If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.

## Animal medical equipment

- Disentanglement instruments (*e.g.*, hemostats)
- Wound care kit
- Blood collection
- Ballistics or trained personnel with ballistics (if you cannot euthanize with drugs); ensure local firearm laws are followed

### Cutting tools (below)

There are a variety of different cutting tools that can be used to cut entangling material. Always cut away from the body, the animal, and always peel the entanglement off of the neck. NEVER pull or slide the entanglement as it could cause further injury. When using a “hooked fixed pole knife” to cut an entanglement without restraining the animal, a stainless steel knife fabricated into a “V” shape with a threaded fitting that attaches to an aluminum or carbon fiber pole that can be extended by adding sections, works well.



*Jim Rice, Oregon State University*



*Jim Rice, Oregon State University*

## Capture/restraining gear and herding equipment

The equipment used for physical restraint of pinnipeds on land varies by species. Equipment may include but is not limited to: 1) crowding/herding boards, 2) kennels, 3) towels and/or blankets, 4) restraint boards, 5) hoop nets, 6) capture nets, 7) stretcher nets, 8) cages, and 9) shore pens.

**Crowding/herding boards (below)** – Used as a barrier to safely herd pinnipeds. Handles should be used to prevent injury. Boards can be constructed from plywood with integrated handles in the wood or handles on the back of the board. “Hog” herding boards also can be used and may be lighter and easier to maneuver.



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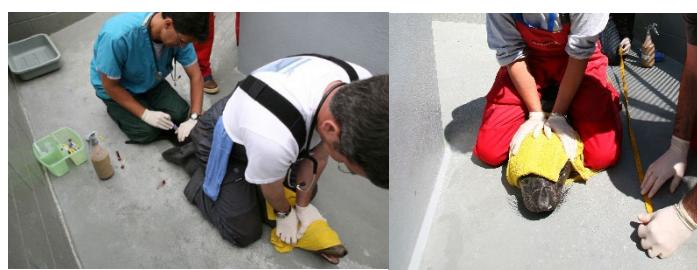
**Kennels (below)** – For smaller pinnipeds up to ~ 5 feet. Kennels are appropriate for transport in small spaces such as helicopters, small airplanes, and small skiffs.



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**Towels/blankets (below)** – Towels or blankets can be wrapped over the animal’s eyes and head to reduce stress. Do not “sit” on the animal. Provide gentle restraint with your knees and hands while allowing the animal to breath. Keep the towel off of the nose or mouth.



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**Restraint boards (below)** – Restraint boards are used to safely restrain a pinniped to remove an entanglement, take samples, etc. For example, the dimensions used for the restraint board for northern fur seals (shown below) is 50”L by 29” W by 11” H.



**Hoop net with handle (below)** – To capture small seals or juvenile or adult female sea lions for safe handling on land. Fiberglass poles hold the net open and can be easily removed once an animal is inside the net. (*Note: do not use duct tape to secure hoop net poles together between uses; tape damages the poles*).



**Capture net (below)** – Custom designed pinniped capture nets such as those designed and made by Telaio (<https://www.telaioclothing.com/sea-lion-capture-nets>) are durable and lightweight, and can be custom-sized.



**Stretcher nets (below)** - Used to capture, restrain, and transport small animals. They have been used by the Hawaiian monk seal research program (HMSRP) for shallow water captures and can assist with controlling an animal that may be struggling in another type of net. Stretcher nets also are very useful for restraining small animals in boats.



**Cages (below)** – Cages are used to contain and transport seals and sea lions. Doors lift completely out and can be used as crowding/herding boards. The cage can be lifted by a team or by forklift and has bridle attachment points to be lifted by crane or helicopter. Placing a cage in shallow (<2 feet) water may aid a compromised animal with entry/ exit in conjunction with other tools such as crowding/herding boards. Three different cage sizes are pictured below.



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**Squeeze cage (below)** – Larger pinnipeds can be herded into a squeeze cage to safely restrain them.

They can then be manually sedated. (*Note: squeeze cages can cause injury and should only be used by personnel trained in their use*).



**Capture cage (below)** – The capture cage depicted below is a modified floating dock enclosed on four sides by a 2.8 m wide by 4 m long by 2.15 m high galvanized steel structure, with sliding doors on two sides. Once an entangled sea lion hauls out inside the cage, responders can use a boat to approach the open door of the cage, block, then securely close the door to keep the entangled animal inside. The sea lion can be sedated with a jab stick, the entanglement removed, and the sea lion released out through the door. For additional information see Wright *et al.* (2010).



### Cleaning/disinfecting supplies

- Antibacterial soap/hand sanitizer
- Disinfectant solution
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s) to separate gear and clothing

### Miscellaneous supplies

- Backpack (to carry supplies)
- Bucket (to carry supplies and/or to hold water to cool animals)
- Line, bungee cords

## **3.7. Data Collection**

It is important that supply checklists and data needs are well thought out prior to the start of any entanglement response. Data forms and instructions should be accessible during a response. Important forms to have accessible could include: applicable permits; [Level A and Human Interaction Forms](#) (Appendix B – Level A and Human Interaction Form); gear checklists (Appendix F - Gear Checklist); and disentanglement forms (Appendix G – Disentanglement form). All entangling gear should be retained, documented on the Level A and Human Interaction Forms, and stored in a centralized location or sent to a NMFS gear repository.

## **3.8. Risks and Mitigation**

To minimize risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a risk analysis matrix should be completed to guide responders in making safe decisions regarding the response to entangled pinnipeds. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough debrief with lessons learned that can be applied to the next response. When responding to entangled pinnipeds, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

This section outlines and assesses risks specific to physical restraint of pinnipeds on land and how to mitigate these risks.

## RISKS TO HUMANS

**Risk:** *Injury or death to personnel by falling or stepping on hazards*

- Appropriate personnel should investigate and decide if location is safe for herding.
- Herders should wear appropriate PPE such as strong, non-slip footwear, gloves, protective clothing, and helmets as necessary.
- Designated safety persons should be assigned to continually watch over all personnel involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated personnel should be watching for and warning the team of hazards such as waves and other animals.

**Risk:** *Injury to personnel from crowding/herding boards, pen panels, or nets*

***Mitigation:***

- Herders should wear appropriate PPE such as strong, non-slip footwear, gloves, protective clothing, and helmets as necessary.
- Herders should use crowding/herding boards with appropriate handles to avoid pinch points.
- Herders and net handlers should be trained to minimize injury to themselves and others and maintain an impenetrable barrier when near the animal and actively herding.
- All herding materials and nets should be inspected for hazards prior to use.

**Risk:** *Injury to personnel from pinniped bite or scratch*

***Mitigation:***

- Personnel should wear appropriate PPE such as strong, non-slip footwear, gloves, and protective clothing as necessary.
- Personnel should be trained to minimize injury to themselves and to maintain an impenetrable barrier when near the animal and actively herding.
- Personnel should consider connecting panels together as necessary before approaching an animal.
- Personnel should be trained in proper restraint techniques to minimize bite risk.

## RISKS TO ANIMALS

**Risk:** *Injury to animal from crowding/herding boards, pen panels, nets, and/or from animal having to haul itself out, especially if the animal is trailing fishing gear*

- Conduct proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Consider cutting any foreign attachments to the animal before or during crowding to reduce

injury to the animal.

- Herders should be trained in the use of crowding/herding boards and the animal should be herded in a slow and controlled manner towards a good capture/holding area using the safest route possible.
- The designated SO should continually communicate to the team to adjust strategy or call off the effort as necessary.
- Use an adequate number of personnel to increase safety.
- Evaluate medical care capacity (*i.e.*, emergency resuscitation, rehabilitation, euthanasia) prior to capture.

**Risk:** *Injury to animal from nearby objects*

***Mitigation:***

- Hazards in the area should be identified and removed or mitigated by experienced personnel.
- If a hazard cannot be removed, it may be mitigated by assigning someone to guard it with a crowding board or pad.
- Conduct proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Evaluate medical care capacity (*i.e.*, emergency resuscitation, rehabilitation, euthanasia) prior to capture.

**Risk:** *Unintentional capture or disturbance of non-target animals*

***Mitigation:***

- Evaluate the possibility of unintentional capture of non-target animals before and during capture.
- Complete appropriate “take” (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals.
- Always consider efforts to minimize disturbance to non-target animals.
- Designated personnel should continuously watch for the presence of non-target animals in and around the capture area throughout the response, and communicate with the team appropriately.

**Risk:** *Animal fatality*

***Mitigation:***

- Personnel should be trained in techniques that minimize injury to animals.
- During restraint for disentanglement, the animal should be constantly monitored for changes in breathing or other signs of distress or complications. Respiratory rate, at a minimum, should be recorded every 5-10 minutes and trends should be tracked and managed appropriately.

- The Regional Stranding Coordinator and permit's Principle Investigator should be notified, a full necropsy should be performed as soon as possible, and a final report sent to NOAA.
- Entanglement response activities should immediately cease until necropsy is completed and new mitigation measures are approved by NMFS.

### **3.9. Intervention Criteria/Decision Matrix (go/no go)**

A risk assessment tool (Appendix C - Example Pinniped Entanglement Assessment Guide, Appendix D – Risk Factor Table) or decision matrix (Appendix E – Decision Matrix (Go/No Go)) should always be used prior to any response. For a land response, factors that should be considered include environmental conditions, team selection and fitness, pinniped selection and condition, permission, resources, and mission complexity.

### **3.10. Procedure**

#### **Optimal capture situation**

- Animal is on the beach without any hazards nearby
- Solitary
- Sleeping – the element of surprise can be advantageous
- Animal is lying on its ventrum
- Away from the water's edge – animals will attempt to flee into the water, become slippery to handle when wet, and the water may pose a drowning risk
- Facing inland and uphill if beach is sloped – it is more difficult for a seal to move uphill than downhill

#### **Animal capture and restraint**

1. **Identify candidate animal:** The entangled animal will be identified, and its position, size, age, sex (if possible to determine), and placement among other animals will be noted.
2. **Risk assessment tool or Go/No Go determination:** Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices. Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed and ensure there is a safe egress area for non-target animals.
3. **Secure the area:** If necessary, onlookers will be notified and asked to clear the area.
4. **Assign team roles and review plan:** Before handling any animal, be sure everything is ready.

Double check all the equipment and supplies. Identify the IC, review the capture scenario and all procedures, any emergency response, and the sequence of the activities. Discuss when a capture should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the capture, and confirm the team members fully understand, are capable, and are mentally prepared. Review animal warning signs to monitor and the appropriate emergency response actions. The IC will ensure all personnel and equipment are ready and perform the final Go/No Go determination.

5. **Modify protective clothing and personal effects to minimize getting caught in net during handling event:** Remove rings from fingers or wear gloves, tie hair back, check clothing for buttons (even pant cuffs) and modify as appropriate to reduce entanglement/tripping risks.
6. **Documentation:** The photographer/videographer will ensure all photo and video equipment is operational and recording.
7. **Time limits:** Record the time of day, herding, and restraint time (from when the animal is first touched until released).
8. **Approach:** The team will get into position, approach quietly and calmly, and capture the entangled animal using appropriate equipment (hoop net, etc. – see restraint section below). To improve capture success, care should be taken to quietly approach the target animal from downwind and out of the animal's field of view. Some or all of the capture team should be between the animal and the water, to block its escape route.
9. **Capture:** Upon capture, controlling the animal's head is the most critical part of the restraint. Once the animal is in a hoop net, the best way to control the head is by holding the net on either side of the head at the base of the skull. When there is more than one restrainer, the order of restrainers getting on the animal is from the head to the tail, and in reverse order when the animal is released. **Use minimum amount of body weight, never your full weight, to restrain the animal.** Do not stand or kneel on the animal's flippers.
10. **Restraint:** Confirm that the restrainers have control over the animal before conducting any procedures on the animal. Typically an animal does not struggle the entire time under restraint, and will often take a deep breath just prior to struggling. The head restrainer monitors the



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animal's breathing and response level. Animals may lift their heads abruptly so beware. When sampling, tagging, etc., the person performing these activities quietly states what procedure is next so the restrainers can prepare for the animal's reaction.



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Restraining with a net: When restraining with a net, watch that the animal's foreflippers and teeth are not caught in the mesh and that the head is not at an unnatural angle. Adjust as necessary. Use care that the handling team's fingers do not get caught in the netting. Animals may still roll while in a net, but the net does provide some control over the animal.

Stretcher net: Stretcher nets can be used for restraining and/or moving smaller animals. To capture, one restrainer holds the poles at each end of the net, then both restrainers simultaneously lay the net over the animal so the end of the netting is a minimum of 1-1.5' past the nose of the animal. This provides a buffer in case the animal moves forward in the net. Typically the person closest to the animal's head will then straddle the animal, holding the animal's head and using her/his knees and lower legs to hold the side poles of the net against the animal's body. Check that the foreflippers do not get bent along the net poles. Once the animal is under control, the net may then be moved up towards the animal's head so the hindflippers and more posterior body can more easily be accessed for tagging or other procedures.

To move an animal in a stretcher net, two people hold the ends of the poles and place it over the animal as described above and in one motion the animal is rolled onto its side and the poles brought together. The lines of rope woven through each end of the netting are then cinched so the animal's head and hindflippers are held in the net. The ends of these lines can then be wrapped around the poles to secure the poles together. The animal can then be carried by two people.



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Hoop net restraint: One person, typically the head restrainer, holds the large open end of the net and pulls the net over the animal's head and down its body. To facilitate capture, another person may assist by stretching out the end of the net so it does not collapse closed and assist in pulling the net over the animal. Once inside the net the handling team restrains the animal

(the head restrainer on first), the two fiberglass poles that hold open the net can be pulled out of the net to avoid injury to the animal and the team if the animal struggles. To prevent the animal's muzzle from being tight against the end of the net, either manually restrain the animal before it reaches the end of the net, or tie off about one foot of the narrow end of the net with a quick release knot so that once the animal is in the net, the line can be removed and the net will become longer, giving the animal's muzzle more space. To release the animal from the net, one to two people pull the net forward towards the animal's head and off its body.

11. **Monitoring and assessment:** The animal should be immediately assessed for any signs of respiratory or circulatory distress and treated accordingly. Ensure the animal's muzzle is not tight against the end of the net or buried in the sand or its flippers are bent out of alignment. For most restraints, the front restrainers are responsible for monitoring the animal's level of alertness and respirations throughout the restraint period. It is important to make sure that chest expansion is occurring with each breath. The entire team should be notified if the animal's vitals start to change. The animal's breathing pattern will probably be somewhat irregular, and it may breath-hold or only breathe through one nostril, so vigilance is key. Either a sudden change in breathing pattern, whether an increase or decrease, or a decrease in responsiveness to stimuli raises concern. Check the animal's eyes to see if they are responsive (*i.e.*, is the animal looking around, does it respond to your hand or something that you move into its field of view?). Tap its head gently behind the eye with your finger. If it doesn't show some response or its response is slow and the animal does not appear to be attentive, then abandon the procedure, stimulate the animal and/or add cool water and immediately, release the animal and monitor it. Responders should be conservative in decision-making and err on the side of caution.



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12. **Data collection:** Morphometrics, sex, and if appropriate, samples, should be taken and all data recorded completely on [Level A and Human Interaction Forms](#), and any other necessary capture forms.
13. **Disentanglement:** Using an appropriate cutting tool (*e.g.*, knife, scissors, wire cutters, etc.), the entangling material should be cut away from the animal and handler and removed by peeling the entangling material out of the wound rather than dragging it out from one side to

minimize pain and prevent further injury. Double check to ensure all entangling material has been removed. All entangling gear should be retained (if possible), documented under [Level A and Human Interaction Forms](#) (Appendix B – Level A and Human Interaction Form), and archived or sent to a NMFS gear repository.

14. **Wound care:** The wound is investigated to assess the extent of tissue damage and to ensure that all foreign material has been removed. The wound (if any) may be cleaned with antiseptic and treated topically, though this should be balanced with animal handling time and stress. Many entanglement wounds are open and will be easily flushed with seawater, making wound care less critical. However if needed, responders can conduct wound debridement or administer antibiotics. A broad-spectrum, long-acting antibiotic can be used to treat injuries, but the choice to administer this (or other drugs) is at veterinary discretion. Dilute povidone-iodine may be used to flush deep wounds or areas that are not likely to be easily flushed on their own. Euthanasia solutions should be kept nearby in case there is a need for euthanasia. In the case of a severe wound and if the animal is small enough to transport to a rehabilitation center, surgery may be considered.
15. **Marking and tagging:** Temporary (e.g., hair dye, paint stick) identifying marks or tags (flipper and/or satellite-linked) can be applied for more visible and long-term identification.
16. **Releasing the animal:** If appropriate, pour water on the animal's hindflippers to cool it down just prior to release. Confirm that the animal has a safe and clear escape route. The head restrainer directs the release, and the restrainer closest to the animal's tail is the first off after the head restrainer gives the okay, followed in order up to the head restrainer who is last off. During release, each restrainer quietly says when they are off the animal, so the next restrainer knows when to get off. All handling and other gear is collected, and the team quickly leaves the area. Always monitor the animal post-release from a distance for at least 10 minutes (or until the animal swims away), while keeping a low profile, particularly for non-pups, as older animals may become more easily stressed from handling. (*Note: weaned Hawaiian monk seal pups may approach the team post-release, so quickly leave the area.*) Most animals go into the water shortly after release.
17. **Post-recovery:** After recovery, the animal should be either released or if additional monitoring or rehabilitation is required, transported to a rehabilitation center.
18. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to

the final report.

19. **Disinfecting/disposal:** If protective reusable clothing (*e.g.*, coveralls, footwear, kneepads, cloth gloves) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including restraining nets, measuring gear (*e.g.*, tape measures and scales), tagging supplies (*e.g.*, tagging pliers/hole punches, etc.), specimen supplies, and other miscellaneous items (*e.g.*, buckets, clipboards, writing implements, etc.). Dispose of used non-permeable gloves in the trash. Place used needles/scalpels in a “SHARPS” container (do not recap needles).
20. **Submit reports:** Ensure all datasheets and reports are complete and submitted where appropriate. Appropriate “take” (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals also should be completed.
21. **Prepare again:** Clean and organize gear so it is ready for future use.

## 4. Pinniped Entanglement Response Techniques - Physical In-water

### 4.1. Preparation

**This section can be used as a stand-alone overview of how to safely respond and physically restrain entangled pinnipeds that are in the water.**

**Prior to any operation:**

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Select a location for operations.
- Consult tide charts for optimal tide windows and determine cut off time due to tides or darkness.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vehicles and vessels (fuel and maintenance if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal, and better control of onlookers in the area.
- If using satellite-linked transmitters, ensure transmitters are programmed and ready to deploy.
- Ensure all equipment is clean, organized, packed, and ready for operations.

**24– 72 hours prior to operation:**

- Check weather forecasts.
- Notify appropriate entities such as: NOAA Regional Stranding Coordinator (RSC), law enforcement, Emergency Medical Services (EMS) or local hospital, and rehabilitation facility to inquire about available space.
- Ensure appropriate authorization (*i.e.*, if response on park, preserve, or private land).

**Immediately prior to operation:**

- Conduct safety briefing.
- Re-check weather forecasts.
- Consult decision matrix – prior to operations and on scene, determine if conditions and time of day allow for safe operations and make a final decision about response.

## 4.2. Training

Pinniped entanglement responses are conducted under MMPA authorization either under a 112c agreement issued by NMFS to Network members through a Stranding Agreement, under 109 (h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt pinniped entanglement response. All in-water entanglement response must be conducted under a MMHSRP or research permit. Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Additionally, personnel must be trained in small boat operations, have experience operating boats while pinnipeds and nets are in the water, and have experience handling and tending nets in the water. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP or RSC can direct responders toward resources relevant to the species of interest, whenever available.

## 4.3. Human/animal safety

### **HUMAN SAFETY**

#### **Equipment and Personal Protective Equipment (PPE)**

- Keep a written safety protocol, including emergency numbers, with first aid kits.
- All personnel must be wearing appropriate PPE, dress suitably for the weather conditions, carry a line cutter, and personnel handling the net should wear protective gloves when feasible.
- Pinniped restrainers, taggers, and others who may have physical contact with the animal should wear protective clothing and appropriate footwear.
- Handlers who may come into contact with bodily fluids must wear non-permeable gloves such as nitrile or latex exam gloves. Cloth gloves may be worn over non-permeable gloves if added grip or protection is needed.
- Other recommended protective gear includes eyewear (including sunglasses – preferably polarizing), kneepads, and helmets as necessary. Masks should be available for use at handler discretion, based on risk and environment.

#### **Safety equipment**

- Ensure first aid kits are available and located with each response group. If working in a remote area and emergency services are not readily available, automated external defibrillators (AED)

- can be included (not required) with kits if responders are experienced in their use.
- Radio/other communication equipment are charged and operational.
- Knives and restraint equipment (*e.g.*, capture pole, net, etc.) are clean, functional, and ready for use.
- Safety equipment for vessels should conform to United States Coast Guard regulations and be appropriate to the role each vessel plays in the response operation. Safety items should include:
  - A personal flotation device for each person on the vessel
  - Fire extinguisher(s)
  - Distress signals (flares, horn, etc.)
  - Navigation lights as appropriate

## **Operational safety**

- Float plans should list an assigned point of contact (POC) on land and boat logs should be filled out for each vessel.
- Responses should not be conducted in poor weather or sea conditions.
- Ensure that there are enough personnel to lift nets or animals. Use mechanical lifts when possible. Rotate personnel if needed.
- If vessels are used for in-water captures, a minimum of two boats is required.
- Have appropriate two-way marine radios or other communication devices so boats and the shore team can coordinate in real-time.
- Designated Safety Officer(s) should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated Safety Officer(s) should be watching for and warning the team of hazards.
- Assess how to safely reach the animal and egress after capture. Consider terrain, substrate, tide, currents, weather, time of day, distance from access point to animal, other environmental factors (*e.g.*, surf, submerged hazards), and other animals in the area.

## **Net or capture pole handling**

- Do not wrap net or line around arms, hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear of lines and nets. Watch other people when possible to make sure they are clear of line and net.
- Communicate with the boat operator and other net/pole handlers.
- Have dedicated net observers in case target animal or incidental animal(s) get entangled in the net.

## **Predators/other wildlife**

- Check for predators (*e.g.*, sharks, killer whales, alligators) or other marine organisms (*e.g.*, stingrays, jellies) before operations and have a spotter during water operations, including

checking the net for incidentally entangled sharks, or other marine wildlife.

### **Report injuries, incidents, or PPE failures to the Safety Officer immediately**

- Any significant accident or injury requires that operations cease and the event, person, or injury is immediately addressed.
- If treatment is needed or the person(s) involved need to be transported to land or mother ship, a boat with a team member should break away for transport and assistance.
- Appropriate responders should be trained in basic first aid and CPR. First aid kits, including tourniquets, water and saline for flushing, should be readily available.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal and cut away from yourself. Stow the implement safely when finished.
- Depending on the situation, the decision is made by the Incident Commander (IC) whether to continue or discontinue operations for the day.

### **Presence of public or bystanders**

- If the capture is in a public area, ensure that there is sufficient crowd control and outreach.
- Ensure observing public are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

### **ANIMAL SAFETY**

- Use a decision matrix prior to capture to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated.

### **Temperature/weather**

- Prevent potential thermoregulatory stress by considering and managing temperature.

### **Minimize stress/time limits**

- Responders should minimize the unavoidable stress that comes with animal capture by minimizing the duration of pursuit (if any), restraint and/or captivity, remaining calm and quiet around the animal, and minimizing manipulations and transport of the animal.
- Eyes should be covered with a UV-resistant and non-abrasive material during restraint to protect the eyes, and to reduce stimulus to the animal.

### **Environmental hazard assessment**

- Prior to capture, survey the surroundings to identify any environmental hazards or predators (sharks, aggressive conspecifics, killer whales) that might pose a threat to the animal.

### **Disturbance (other pinnipeds or wildlife)**

- Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Every effort should be made to lessen the chance of flushing non-target animals into the water. If the response is likely to flush more than 50 seals/sea lions, responders should consult with the Regional Stranding Coordinator before proceeding or discuss prior to departure if response will be conducted in a remote location.
- Entanglement response should not be attempted in locations that are likely to disturb mother/pup pairs.
- Prior to restraint or darting of the target animal, personnel will cease efforts if significant injury to target or non-target animals appears imminent.
- Consider the potential effects of response to non-entangled animals and/or species within the response areas and take precautions to minimize disturbance.
- Reduce all forms of disturbance to the entangled animal and any others close by (*e.g.*, if it is within a group) as much as possible by keeping noise and movement to a minimum.

### **Restraint devices and capturing/restraining animals**

- Never hold on to the entangling material as a form of capture or to slow the animal down, as the animal is likely to roll and spin, causing further injury and pain.
- Ensure that the appropriate capture net (*i.e.*, weight, pole length, net length) and mesh size is used to prevent animal injury and maximize successful capture. Determine how the animal will be removed from the net after capture (a cod end of the net may make release easier).
- When the animal is captured, ensure it is secured appropriately so that it is still able to breathe comfortably. A kinked neck or constricted airway can cause mortality during captures, and all animal handlers should clearly understand this hazard prior to the response.
- Once captured, if not possible prior to capture, assess where the entangling material is easiest to access and cut away. Also identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal. Always cut away from the animal and peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this will minimize pain and prevent further injury.
- Assess whether the animal is suitable for immediate release, requires transport to rehabilitation, or requires euthanasia, and act as appropriate.
- Ensure the transport container is safe and secure for the size and strength of the animal.
- Sterilize any sampling tools that came into contact with the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

### **4.4. Team member roles**

The capture and handling of pinnipeds has inherent risk for both the responders and the animals. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. The recommended roles that follow are based, in part, on implementation of the Incident Command System as defined by the Federal Emergency Management Agency. This system provides a structure for clarity of communications and roles, and efficient management of resources. The System is scalable and can be

modified to fit the needs of the operation. Safety is always at the center of any plan based on this System. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 4-1).

**Table 4-5. Suggested number of personnel needed for a physical restraint – in water entanglement response. Responders can fulfill multiple roles and some roles are \*optional.**

Team member role	Number of suggested personnel
Incident Commander/Safety Officer	1-2
*Optional – Veterinarian/Veterinary Technician	1-2
Animal herders	2-12
Net handlers	3-6
Animal handler(s)/restrainer(s)	1-5
Boat or jet ski operator(s)	2-3
Data collection/documentation	1-2
Security/crowd control	variable
*Optional - Communication Officer	1
*Optional – UAS pilot	1

Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*i.e.*, IC and SO; documentation and data collection).

- **Incident Commander (IC)** - The IC is responsible for the overall operation and the performance of the response and does not generally participate directly in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that the response is safe for responders, the public, and animals.
  - ***Qualifications*** – Experience in previous pinniped response, ability to oversee all operations, communicate with the team to adjust strategy or call off the effort as necessary. Completion of

the ICS free or paid courses, and the ability to remain objective to ensure safe operations.

- **Safety Officer (SO)** – The SO is responsible to continually watch over all personnel involved in a response and has the ability to communicate to the team and adjust the strategy of the response as needed. The role of IC and SO can be performed by one person if necessary.
  - ***Qualifications*** – Experience in previous pinniped responses, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.*, waves, other animals). Willingness to stop operations if there is a safety concern, despite momentum (or pressure) to move forward.
- **Veterinarian/veterinary technician (\*optional)** – The licensed veterinarian/veterinary technician is responsible for the health and monitoring of the entangled animal and any unintentionally entangled or injured animals during capture operations until the animal is safely released and on its own.
  - ***Qualifications*** - A licensed Doctor of Veterinary Medicine (DVM) or equivalent who is EXPERIENCED in pinniped medicine.
- **Animal herders** - The animal herders are responsible for herding the animal to a safe location for capture, ensuring responders are safe from animal bites and scratches.
  - ***Qualifications*** – Experience in previous pinniped response and safely herding pinnipeds.
- **Net handlers** – The net handlers are responsible for handling the animal to ensure it is safely restrained and all personnel around the animal are safe from potential injury such as animal bites and scratches.
  - ***Qualifications*** – Net handlers must be trained in safe capture by experienced personnel. Advancement requires hands-on experience under the direct supervision of experienced response staff. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.
- **Animal handlers/restrainers** – The animal handlers/restrainers are responsible for handling the animal to ensure it is safely restrained and all personnel around the animal are safe from potential injury such as animal bites and scratches.
  - ***Qualifications*** – Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Advancement requires hands-on experience under the direct supervision of experienced response staff. This handling experience may occur in a rehabilitation hospital setting. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.
- **Boat, kayak, or Jet Ski operator** – For water captures, the boat operators are an essential component to a successful operation. The boat operators are responsible for ensuring that the boats are in the proper

placement for capture, that the boat can be safely maneuvered around animal(s) in the water, and that the vessel can be safely handled in all types of weather and sea state conditions such as inclement weather, currents, tides, kelp, wind, surrounding vessel traffic, etc. Boat operators should be experienced with animal approaches, capture methods, and translocation of animals in the boat and alongside the boat.

- ***Qualifications*** – United States Coast Guard boat training or equivalent. Because many of these duties are outside the scope of normal boat operations, skills should be practiced prior to working with pinnipeds in or around the boat. Experience maneuvering in tight spaces, ability to remain calm under pressure, and remain focused under potentially hectic circumstances.
- **Data collector** – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets, the animal is given an identifying number, all marks, flipper and satellite-linked tag numbers are recorded, and all samples are properly recorded and labeled.
  - ***Qualifications*** – Familiarity with data sheet and information to be recorded, attention to detail, and ability to accurately record data legibly.
- **Documentation** – This person is responsible for operating still or video photography to document the capture. This person may also serve as the data collector.
  - ***Qualifications*** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, and take clear and meaningful photos and video.
- **Security/crowd control** – The IC should ensure that the proper authorities in the area have been notified of the response and, if possible, the area is closed to public access during the response.
  - ***Qualifications*** – Knowledge of proper authorities to notify.
- **Unmanned aerial system (UAS; \*optional)** - If permitted to operate a UAS during the capture, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the capture or causing disturbance to the target or other animals.
  - ***Qualifications*** – A certified pilot's license, a permit to operate during a capture, follow all existing FAA and other regulations, and experience operating a UAS during previous pinniped field operations.
- **Communication Officer (\*optional)** – If there are an adequate number of responders available, the communication officer can communicate information about pinniped entanglement response. For high profile cases or cases conducted under the permit, messages should be coordinated with all participating organizations and cleared with NMFS.

- **Qualifications** – Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.

## 4.5. Environmental conditions

Create a risk assessment tool (Appendix D – Risk Factor Table) or decision matrix (Appendix E – Decision Matrix (Go/No Go)) to determine whether or not an entanglement response is safe for responders and pinnipeds based on environmental conditions. Assess the following environmental conditions prior to pinniped in-water capture:

- Weather conditions (*e.g.*, rain, snow, fog, wind, approaching storm systems, heat, cold)
- Substrate (*e.g.*, slippery or sharp rocks, kelp, barnacles, coral, tide pools, cultural resources at risk, rocks or reef near haul-out that could affect ability to maneuver capture vessel, ice)
- Submerged hazards (*e.g.*, sand bars, coral reefs, sunken debris, crab pots, aquaculture, oyster bars, etc.) and emergent (*e.g.*, pilings, docks, jetties, etc.) hazards
- Location of the animal in relation to the surf zone
- Tide (*i.e.*, incoming tide, increased surf)
- Time of day (*i.e.*, response too close to sunset leading to activities occurring at night)
- Conspecifics (*i.e.*, other animals in the area)
- Predators (*e.g.*, sharks, killer whales, alligators) and other hazardous wildlife (*e.g.*, stingrays, jellies, etc.)

## 4.6. Equipment

### Data and recording supplies

- Capture/handling forms (*i.e.*, Level A, Human Interaction, Capture form, etc.)
- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro), extra batteries
- Binoculars

### Sampling, tagging, and marking supplies

- Measuring kit (*e.g.*, tape measure, calipers, ruler)
- Tagging kit (*e.g.*, plastic flipper tags, satellite-linked tags, tagging equipment)
- Marking kit (*e.g.*, hair dye, paint stick)

### Protective clothing

- Footwear appropriate for substrate
- Protective clothing (*e.g.*, wetsuits, coveralls, etc.)
- Non-permeable gloves (*e.g.*, nitrile or latex)
- Optional - eyewear, knee pads, cotton or Kevlar gloves, helmet as necessary

### Human medical equipment

- First aid kit
- If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.

### Animal medical equipment

- Disentanglement instruments (*e.g.*, hemostats)
- Wound care kit
- Blood collection
- Ballistics or trained personnel with ballistics (if you cannot euthanize with drugs); ensure local firearm laws are followed.

### Cutting tools (below)

There are a variety of different cutting tools that can be used to cut entangling material. Always cut away from the body and always peel the entanglement off of the neck. NEVER pull the entanglement as it could cause further injury. When using a “hooked fixed pole knife” to cut an entanglement without restraining the animal, a stainless steel knife fabricated into a “V” shape with a threaded fitting that attaches to an aluminum or carbon fiber pole that can be extended by adding sections works well (see photo below).



*Jim Rice, Oregon State University*

## Capture/restraining gear and herding equipment

Equipment used for physical restraint of pinnipeds in water varies by species. Equipment may include, but is not limited to: 1) crowding/herding boards, 2) kennels, 3) floating mats, 4) stretcher nets, 5) beach or seine net, 6) hoop nets, 7) cargo nets, 8) scoop net, 9) nearshore shark net, and 10) small boat transport, 11) Jet Ski, and more.

**Crowding/herding boards (right)** – Used as a barrier to safely herd animals in shallow water. Handles should be used to prevent injuries. Playpen panels should be considered as they move through water easier.



*Hawaiian monk seal research program, NOAA Fisheries*

**Kennels (right)** – For smaller pinnipeds up to ~ 5 feet. Kennels are appropriate for transport in small spaces such as helicopters, small airplanes, and small skiffs.



*Hawaiian monk seal research program, NOAA Fisheries*

**Floating haulout mat (below)** – Can be used as a flat surface or closed to contain an animal. Can be paddled by a person in good conditions or towed by boat. Adding material to close ends may be considered. When opened, the mat can float an animal in a stretcher or other net and 3-4 persons. (*Note: This is appropriate only for specific species and circumstances (e.g., sea state) and may not be sufficient restraint or safe for all pinniped species*).



*Hawaiian monk seal research program, NOAA Fisheries*

**Stretcher nets (below)** - Used to capture, restrain, and transport small animals. They have been used by the *Hawaiian monk seal research program* (HMSRP) for shallow water captures and can assist with controlling an animal that may be struggling in another type of net. Stretcher nets also are very useful for restraining small animals in a boat.



*Hawaiian monk seal research program, NOAA Fisheries*



*Hawaiian monk seal research program, NOAA Fisheries*



*Hawaiian monk seal research program, NOAA Fisheries*

**Beach seine net for harbor seal captures (below)** – Capture net is approximately 120 m to 170 m in length, formed of five to seven panels, each approximately 24 m long by 8 m deep. Netting can be either 20 cm or 30 cm stretch mesh #36 nylon, dyed green. Paired floats are spaced every 1 m on the floatline, and the leadline contains 454 g of lead every 2 m (Jeffries *et al.* 1993). Two boats are used for this method, the lead boat carries the capture net on a platform set above the transom and the outboard motor (Jeffries *et al.* 1993). **Tools – seine net, knives, two open deck boats, hoop nets.**

*Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require specialized training.*



Kim Raum-Suryan



Kim Raum-Suryan

**Hoop nets (right)** – Hoop nets consist of 5-cm diameter rubber hose formed into a 1 m diameter circle to which is attached a 2 m long bag formed of 2.5 cm stretch knotless nylon mesh. The nylon mesh is drawn together at the end to form a bag, but could be untied if the animal needs to be released through the closed end. The flexible hose of the hoop net can be bent backward to expose the posterior portion of the harbor seal.



Kim Raum-Suryan

**Beach or seine net (below)** – May be appropriate for use in shallow, near shore waters, an approximately 36 m by 6 m beach seine net creates a barrier around an animal while bringing it towards the shore for capture. For in-water capture, the net, with a weighted bottom and floating top, should be deployed via wading or by vessel around the ocean side of the animal and pulled in toward the shoreline from the ends (Jeffries *et al.* 1993). Attaching a containment boom, or similar, to a beach seine net may improve its effectiveness in keeping an animal from breaching over the top of the net. Avoid one-inch mesh because it is heavy and catches current. Beach sets may require people in the water to remove substrate snags and keep an animal from jumping over the top or diving under the net (HMSRP).

**Tools– seine net, snorkel gear, knives, crowding/herding boards, Jet Ski, kayak, two small boats.** *Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require specialized training.*



*Hawaiian monk seal research program, NOAA Fisheries*

**Cargo net (not pictured)** – An approximately 8 m by 5 m lightweight polyethylene net composed of 5 cm mesh works well for a “scoop net” application (*Note: 10 cm mesh size may be too big and cause injury to animal*). Small weights may be needed to offset positive buoyancy of the net.

**Scoop net (below)** – The scoop net is a 3 m by 4.5 m flat, circle, square or similar net with minimal attachments meant to be handled at the perimeter by a team and placed under an animal on or near the substrate for the animal to swim over it before the edges are lifted and the animal is contained (HMSRP). **Tools - scoop net, clip-on weights and floats, extra line, snorkel gear, knives, Jet Ski, kayak, small boat, fenders.**



*Hawaiian monk seal research program, NOAA Fisheries*



*Hawaiian monk seal research program, NOAA Fisheries*

**Nearshore Shark Net (below)** – Set as a compact tube prior to an animal being in position, the shark net sits weighted on the substrate inconspicuously until deployed via scuba tank releasing the floating tube and capturing the animal. This has not been used in recent efforts to disentangle pinnipeds, but may be an option for further expansion in the future.



*Hawaiian monk seal research program, NOAA Fisheries*

**Small Boat Transport (right)** – Small boats including rigid hull inflatables, inflatables, and Whalers are useful in transporting animals. Animals must be contained in a net or a carrier.



*Hawaiian monk seal research program, NOAA Fisheries*

### Cleaning/disinfecting supplies

- Antibacterial soap/hand sanitizer
- Disinfectant solution
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s) to separate gear and clothing

### Miscellaneous supplies

- Backpack (to carry supplies)
- Bucket (to carry supplies and/or to hold water to cool animals)

## 4.7. Data collection

It is important that supply checklists and data needs are well thought out prior to the start of any entanglement response program and data forms and instructions are accessible during a response. Important forms to have accessible could include: applicable permits; [Level A and Human Interaction Forms](#) (Appendix B – Level A and Human Interaction Form); gear checklists (Appendix F - Gear Checklist); and disentanglement forms (Appendix G – Disentanglement form); All entangling gear should be retained, documented on the Level A and Human Interaction Form, and stored in a centralized location or sent to a NMFS gear repository.

## 4.8. Risks and Mitigation

To minimize risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a decision matrix or Go/No Go criteria should

be established to guide responders in making safe decisions regarding the response to entangled pinnipeds. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough de-brief and come up with lessons learned that can be applied to the next response. When responding to entangled pinnipeds, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

## RISKS TO HUMANS

**Risk:** *Injury or death to personnel by drowning, falling or stepping on hazards*

***Mitigation:***

- Appropriate personnel should investigate and decide if location is safe for herding.
- Herders should wear appropriate PPE such as strong, non-slip footwear, gloves, PFDs, and helmets as necessary.
- Designated Safety Officer(s) should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated Safety Officer(s) should be watching for and warning the team of hazards.

**Risk:** *Injury to personnel from crowding/herding boards, pen panels, or nets*

***Mitigation:***

- Herders should wear appropriate PPE such as strong, non-slip footwear, gloves, PFDs and helmets as necessary.
- Herders should use crowding/herding boards with appropriate handles to avoid pinch points.
- Herders and net handlers should be trained in techniques that minimize injury to themselves and others during in-water capture and herders should maintain an impenetrable barrier when near an animal and actively herding.
- All herding materials and nets should be inspected for hazards prior to use.

**Risk:** *Injury to personnel from pinniped bite or scratch*

***Mitigation:***

- Personnel should wear appropriate PPE such as strong, non-slip footwear, gloves, protective clothing, and PFDs.
- Personnel should be trained and maintain an impenetrable barrier when near an animal and actively herding.
- Personnel should use crowding/herding boards and pen panels in a manner that the animal cannot reach through gaps.

- Personnel should consider connecting panels together as necessary before approaching an animal.

## RISKS TO ANIMALS

**Risk:** *Injury to an animal from crowding/herding boards, pen panels, nets, and/or from an animal having to haul itself out, especially if the animal is trailing fishing gear*

***Mitigation:***

- Conduct proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Consider cutting any foreign attachments to the animal before or during crowding to reduce injury to the animal.
- Herders should be trained to use crowding/herding boards, and the animal should be herded in a slow and controlled manner towards a good capture/holding area using the safest route possible.
- Personnel should be trained in techniques that minimize injury to the animal.
- Use an adequate number of personnel to increase safety.
- Evaluate medical care capacity (*i.e.*, emergency resuscitation, rehabilitation, euthanasia) should be evaluated prior to capture.

**Risk:** *Injury to animals from nearby objects*

***Mitigation:***

- Hazards in the area should be identified and removed or mitigated by experienced personnel.
- If a hazard cannot be removed, it should be mitigated by assigning someone to guard it with a crowding board or pad.
- Conduct proper evaluation of existing animal injuries, and potential for further injuries before any capture attempt.
- Evaluate medical care capacity (*i.e.*, emergency resuscitation, rehabilitation, euthanasia) prior to capture.

**Risk:** *Unintentional capture or disturbance of non-entangled animals*

***Mitigation:***

- Evaluate the possibility of unintentional take of non-entangled animals before and during capture.
- Complete appropriate take approval and documentation.
- Always consider efforts to minimize disturbance to non-entangled animals.
- Designated personnel should continuously watch for the presence of non-entangled protected species in and around the capture area, and communicate with the team appropriately.

**Risk:** *Animal fatality*

***Mitigation:***

- Personnel should be trained in techniques that minimize injury to an animal.
- During restraint for disentanglement, the animal should be constantly monitored for changes in breathing or other signs of distress or complications. Respiratory rate, at a minimum, should be recorded every 5-10 minutes and trends should be tracked and managed appropriately.
- The Regional Stranding Coordinator and permit's Principle Investigator should be notified, a full necropsy should be performed as soon as possible, and a final report sent to NOAA.
- Entanglement response activities should immediately cease until the necropsy is completed and new mitigation measures are approved by NMFS.

#### **4.9. Intervention Criteria/Decision Matrix (Go/No Go)**

A risk intervention tool (e.g., Appendix D – Risk Factor Table) or decision matrix (e.g., Appendix E – Decision Matrix (Go/No Go)) should always be used prior to any response. For an in-water physical restraint response, factors that should be considered include environmental, team selection and fitness, pinniped selection and condition, permission, resources, and mission complexity.

#### **4.10. Procedure**

##### **Optimal capture situation**

- Solitary
- Calm or resting

##### **Animal capture and restraint**

1. **Identify candidate animal:** The entangled animal should be identified, and its position, size, age and sex (if possible to determine), and placement among other animals should be noted.
2. **Risk assessment tool or Go/No Go determination:** Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices. Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed and ensure there is a safe egress area for non-target animals.
3. **Secure the area:** If necessary, onlookers should be notified and asked to clear the area.

4. **Assign team roles and review plan:** Before handling any animal, be sure everything is ready. Double check all the equipment and supplies. Identify the IC, review the capture scenario and all procedures, any emergency response, and the sequence of the activities. Discuss when a capture should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the capture, and confirm team members fully understand, are capable, and are mentally prepared. Review animal warning signs and the appropriate emergency response actions. The IC should ensure all personnel and equipment are ready and perform the final Go/No Go determination.
5. **Modify protective clothing to minimize getting caught in a net during a handling event:** Remove rings from fingers or wear gloves, tie hair back, check clothing for buttons (even pant cuffs) and modify as appropriate to reduce entanglement/tripping risks.
6. **Documentation:** The photographer/videographer should ensure all photo and video equipment is operational and recording.
7. **Time limits:** Record the time of day, and total capture and restraint time (from when the animal is first touched until released).
8. **Approach:** The team should get into position, approach and capture the entangled animal.
9. **Capture (see below):**

### **Herding to shore**

A barrier should be deployed on the ocean side of an animal and drawn in, bringing the animal to the beach. Crowding/herding boards are normally used for herding. Other options are playpen panels, fencing material or large objects such as plywood, kayaks, or other types of boards or small nets. Deployment of the barrier may be easiest by wading if the water depth, conditions, and substrate are suitable. (*Note: crowding/herding boards will require constant communication and teamwork among responders to create a barrier without gaps*). A capture technique analysis matrix (Table 4-2) can help guide decisions about which capture technique to employ when used in conjunction with the risk factor table.

**Tools - crowding/herding boards, playpen panels, cage, stretcher net, beach seine net, kayak, other boards.**

### **Beach Seine Net**

Beach seine nets are meant for use in shallow, nearshore waters. Sections of approximately 15-30 m could be connected to increase length if necessary. Similar to shallow water herding, beach seine nets create a barrier around the animal while bringing it towards the shore for capture.

**Example - Seal in-water capture:** (*Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require special training*). The net should be deployed via wading or vessel around the ocean side of the seal similar to that described in Jeffries et al (1993) and pulled in to the shoreline from the ends. A weighted bottom and floating top are usually helpful. Vertical poles/bars may be attached to the net at intervals to keep it open. Straps, Velcro, or bungees may be used during deployment to hold the net together to keep the weighted bottom from snagging substrate. Using many people spaced out along the net should help to deal with snags on the substrate and hold the top of the net above the surface to keep the animal from breaching the top. People comfortable in the water should be considered for these tasks. They should be equipped with masks and knives to be able to untangle or cut the net from the substrate if caught. Attaching a containment boom or similar to a beach seine net may improve its effectiveness in keeping a seal from breaching over the top of the net.

**Tools – beach seine net, snorkel gear, knives, crowding/herding boards, Jet Ski, kayak, small boat.**

**Example - harbor seal beach seine net capture (based on Jeffries et al. 1993):** (*Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require special training*). The lead boat, carrying the capture net on a platform set above the transom and the outboard motor, slowly approaches the seals resting onshore, eventually attaining a maximum speed of approximately 20 knots as the seals start to enter the water. Within 20 m of the haulout site and 10 m offshore, a 0.5 m diameter float attached to one end of the capture net is thrown toward shore, then makes an arc in front of the haulout. (*Note: Careful stacking of the capture net allows for rapid deployment*). The first boat lands ashore with approximate 7-10 m of net remaining on the platform. The team members in the second boat recover the float, and pull it to shore on the opposite side of the haulout. Both ends of the capture net should be onshore within two minutes. Each end is then pulled along shore keeping the lead line on the bottom, until the net with the seal(s) is ashore. Seals are individually removed from the capture net, placed headfirst in individual hoop nets, then physically restrained.

**Tools – beach seine net, buoy, knives, hoop nets, two boats.**

### **Scoop Net**

*(Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require special training).* The scoop net is a flat, circle, square, or similar net with minimal attachments handled at the perimeter by a team. The scoop net is placed under an animal or set on or near the substrate for the animal to swim over it before the edges are lifted and the animal is contained. It can be used in conjunction with herding an animal over the scoop net, or with a large containment net set around the area first. Due to its simplicity, it can be adapted to be set by divers or from a vessel or a combination. Weights, floats, carabiners or line can be added anywhere on the net to increase the chance of success. The scoop net can be used delicately on an injured animal by controlling net tautness and how high the perimeter is lifted. It can be used to contain and then safely transport the animal to the shore or a boat while supporting the animal at the surface and allowing it some freedom of movement. It could be used to lift or parbuckle an animal into a boat by itself or in conjunction with a floating mat, straps, tarp, backboard, stretcher net, or similar tool. This technique requires a sufficient number of people distributed around the perimeter of the net to keep it from dipping below the surface and allowing an animal to escape. If the animal is relatively alert and wary of the net, and the people manipulating the net, a smaller team of 3-6 people could attempt the initial approach while other net handlers stand by. Efforts to avoid scaring the animal should be made by all net handlers. A scoop net may be handled from boats controlling the perimeter and eventually lifting an animal into a boat or driving/floating an animal to the shore. This makes it easier for handlers to keep the net perimeter above the animal and pull the net in with control.

**Tools – scoop net, clip-on weights and floats, extra line, snorkel gear, knives, Jet Ski, kayak, small boat, fenders.**

### **Nearshore Shark Net (i.e., surprise net)**

*(Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require special training).* The surprise net is approximately 30 m long by 3.6 m deep with a floating top and a chain weighted bottom. It is designed to be set while contained in a nylon strip fastened with Velcro that releases when an air tube is inflated via scuba tank. The air tube is connected to the top of the net and the chain and nylon strip are connected to the bottom of the net. Its main advantage is its ability to be set prior to

an animal entering an area. Once an animal enters the area, the net can be fully deployed in ~12 seconds.

**Tools – Surprise net, full scuba tank, regulator, extra line, snorkel gear, knives, Jet Ski, kayak, small boat, fenders.**

### **Purse Seine Net**

*(Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require special training).* For use in deep water, the purse seine net should be deployed off the side of a boat circling the animal. Once the circle is complete and the ends of the net are connected, the bottom can be cinched closed. The net and animal can then be hauled onto a boat. If large enough, a purse seine net can be deployed without the animal's awareness, or at least while maintaining a distance from the animal so as not to scare it. The net should be cinched shut while the animal is at the surface to avoid alarming the animal and having it escape out of the open bottom. It could also be used to set around an animal as an initial containment net before attempting other techniques and tools.

**Tools – purse seine net, snorkel gear, knives, crowding/herding boards, Jet Ski, kayak.**

### **Parbuckle animal onto boat or haul-out mat**

The parbuckle technique could be used to roll a heavy animal into a boat. The animal must be secured alongside a small boat with a low gunwale. Lines, straps, or net (possibly the capture net itself) should be secured to the boat and wrapped under the animal then pulled up and towards the boat while rolling the animal into the boat. If this is not possible, a floating haul out mat could be employed along with the parbuckle technique to achieve similar results. Once the animal is secure on the mat, it can be towed to shore. This is most likely to be used after the animal is contained and under control with another technique. Sliding an animal head or tail first onto the mat may also be considered, depending on the size and mobility of the animal. It is important to consider the boat platform when attempting this technique. The uneven weight distribution of the animal and responders in the vessel may make the boat unstable and proper precautions should be taken to avoid capsizing.

**Table 4-6. Capture technique analysis matrix – This guide can be used to aid in a decision about which capture technique to employ when used in conjunction with the risk factor table.**

Capture technique	Animal's condition
<b>1 = Ideal 5 = No-go</b>	<b>Entangled</b>
<b>Herding to shore</b>	1
<b>Beach Seine Net</b>	1
<b>Snare Net</b>	2
<b>Parbuckle</b>	4
<b>Purse Seine Net</b>	3

10. **Restraint:** Once the animal has been captured in the water and brought to shore, it should be restrained to remove the entangling material. First, confirm that the restrainers have control of the animal before conducting any procedures.



*Hawaiian monk seal research program, NOAA Fisheries*

Controlling the animal's head is the most critical part of the restraint. Once the animal is in a hoop net, the best way to control the head is by holding the net on either side of the head at the base of the skull. When there is more than one restrainer, the order of restrainers getting on the animal is from the head to the tail, and in reverse order when the animal is released. Use minimum amount of body weight, never your full weight, to restrain the animal. Do not stand or kneel on the animal's flippers. When sampling, tagging, etc., the person performing these activities quietly states what procedure is next so the restrainers can prepare for the animal's reaction.

**Restraining with a net:** When restraining with a net, watch that the animal's foreflippers and teeth are not caught in the mesh and that the head is not at an unnatural angle. Adjust as necessary. Use care that the handling team's fingers do not get caught in the netting. Animals may still roll while in a net, but the net does provide some control over the animal.

**Small boat transport:** Small boats such as rigid hull inflatable boats (RHIBs), inflatables, and whalers are useful in transporting animals. Once an animal is secure in a net, backboard, mat, or kennel, it can be secured on a small boat and driven to shore for treatment or transport. Inside the boat animals may be secured against the gunwale or other object to avoid excess movement.

As with any transport, one person, usually the veterinarian or veterinary technician, should devote their attention to the animal and monitor it constantly. Animals should not be transported in any vessel through a surf zone or in rough conditions where there is a possibility of capsizing because of the risk of the animal drowning if contained in a net or cage. If an animal cannot be lifted into a boat, it may be necessary to rig it so that it can be safely towed slowly alongside. Two boats can be used together to transport an animal contained within a net in the water. Fenders or ridged poles may be used to maintain a safe space between the boats.

11. **Monitoring and assessment:** The animal is immediately assessed for any signs of respiratory or circulatory distress and if found, treated accordingly. The respiration rate, heart rate, and body temperature should be continually monitored. The animal's breathing pattern may be somewhat irregular, and it may only breathe through one nostril. However, if there is a sudden change in breathing pattern, either a rapid increase or sudden decrease, this raises concern. Check the animal's eyes to see if they are responsive (*i.e.*, is the animal looking around, does it respond to your hand or something that you move into its field of view?) Tap its head gently behind the eye with your finger. If it does not show some response or its response is slow and the animal does not appear to be attentive, then abandon the procedure, stimulate the animal and/or add cool water, and immediately, release the animal and monitor it. Be conservative in your decision-making and err on the side of caution.
12. **Data collection:** Morphometrics, sex, and if appropriate, samples, should be taken and all data recorded completely on [Level A and Human Interaction Forms](#), and any other necessary capture forms.
13. **Disentanglement:** Using an appropriate cutting tool (*e.g.*, knife, scissors, wire cutters, etc.), the entangling material should be cut away from the animal and handler and removed by peeling the entangling material out of the wound rather than dragging it out from one side to minimize pain and prevent further injury. Double check to ensure all entangling material has been removed. All entangling gear should be retained (if possible), documented under [Level A and Human Interaction Forms](#) (Appendix B – Level A and Human Interaction Form), and archived or sent to a NMFS gear repository.
14. **Wound care:** The wound (if any) may be cleaned with antiseptic and treated topically, though this should be balanced with animal handling time and stress. Many entanglement wounds are open and will be easily flushed with seawater, making wound care less critical. However if needed, responders can conduct wound debridement or administer antibiotics. A broad-spectrum, long-acting antibiotic can be used to treat injuries, but the choice to administer this

(or other drugs) is at veterinary discretion. Dilute povidone-iodine may be used to flush deep wounds or areas that are not likely to be easily flushed on their own. Euthanasia solutions should be kept nearby in case there is a need for euthanasia.

15. **Marking/tagging:** Temporary (e.g., hair dye, paint stick) identifying marks or tags (i.e., flipper and/or satellite-linked) should be applied for more visible and long-term identification.
16. **Releasing the animal:** If the animal is brought to shore to disentangle and if appropriate, pour water on the animal's hindflippers to cool it down just prior to release. Confirm the animal has a safe and clear escape route. The head restrainer directs the release, and the restrainer closest to the animal's tail is the first off the animal after the head restrainer gives the okay, followed in order up to the head restrainer who is the last off the animal. During release, each restrainer quietly says when they are off the animal, so that the next restrainer knows when to get off. All handling and other gear is collected, and the team quickly leaves the area. Always monitor the animal post-release from a distance, for at least 10 minutes (or until the animal swims away), while keeping a low profile, particularly for non-pups, as older animals may become more easily stressed from handling. (*Note: weaned Hawaiian monk seal pups may approach the team post-release, so quickly leave the area*). Most pinnipeds go into the water shortly after release.
17. **Post-recovery:** After recovery, the animal should be released or, if additional monitoring or rehabilitation is required, transported to a rehabilitation center.
18. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.
19. **Disinfecting/disposal:** If protective reusable clothing (e.g., coveralls, footwear, kneepads, cloth gloves) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including retraining nets, measuring gear (e.g., tape measures and scales), tagging supplies (e.g., tagging pliers/hole punches, etc.), specimen supplies, and other miscellaneous items (e.g., buckets, clipboards, writing implements, etc.). Dispose of used non-permeable gloves in the trash. Place used needles/scalpels in a "SHARPS" container (do not recap needles).
20. **Submit reports:** Ensure all datasheets and reports are complete and submitted where appropriate. Appropriate "take" (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals also should be

completed.

21. **Prepare again:** Clean and organize gear so that it is ready for future use.

## 5. Pinniped Entanglement Response Techniques - Local/hand sedation

This section can be used as a stand-alone overview of how to safely respond and capture entangled pinnipeds using local/hand sedation techniques.

### 5.1. Preparation

This section will provide an overview of pinniped entanglement response using hand or pole syringe to sedate the animal.

#### Prior to any operation:

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Select an appropriate location for operations.
- Consult tide charts for optimal tide windows and determine cut off time due to tides or darkness.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vehicles (fuel and maintenance if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal, and better control of onlookers in the area.
- If using satellite-linked transmitters, ensure transmitters are programmed and ready to deploy.
- Ensure all equipment is clean, organized, packed, and ready for operations.

#### 24– 72 hours prior to operation:

- Check weather forecasts.
- Notify appropriate entities such as: NOAA Regional Stranding Coordinator (RSC), law enforcement, EMS or local hospital, Native communities (in Alaska), and rehabilitation facility to inquire about available space.
- Ensure appropriate authorization (*i.e.*, if response on park, preserve, or private land).

#### Immediately prior to operation:

- Conduct safety briefing.
- Re-check weather forecasts.
- Consult decision matrix – prior to operations and on scene, determine if conditions allow for safe operations and make a final decision about response.

## **5.2. Training**

Pinniped entanglement responses are conducted under MMPA authorization either under a 112c agreement issued by NMFS to Network members through a Stranding Agreement, under 109 (h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt pinniped entanglement response. Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP or RSC can direct responders toward resources relevant to the species of interest, whenever available.

## **5.3. Human/animal safety**

### **HUMAN SAFETY**

#### **Drugs, equipment, and personal protective equipment (PPE)**

- Keep a written safety protocol, including emergency numbers, with first aid kits.
- All drugs to be used should be recorded on an emergency response sheet in case of accidental exposure, so EMS can quickly evaluate human exposure. Local hospitals should be notified prior to response.
- Human reversal drugs should be drawn and readily available prior to sedatives being drawn. All responders should have a general understanding of drugs and reversals being used, where to immediately access human reversals, understand the symptoms of accidental exposure, and field treatment if EMS is not an immediate option.
- All personnel must wear appropriate PPE, helmets as necessary, and dress suitably for the weather conditions.
- Pinniped restrainers, taggers, and others who may have physical contact with the animal should wear protective clothing and appropriate footwear.
- Handlers who may come into contact with bodily fluids must wear non-permeable gloves such as nitrile or latex exam gloves. Cloth gloves may be worn over non-permeable gloves if added grip or protection is needed.
- Personnel that may come into contact with drugs must wear non-permeable gloves, and safety goggles, splash guard mask, splash box, or safety screen when handling drugs.
- Other recommended protective gear includes eyewear (including sunglasses – preferably polarizing) and kneepads. Masks should be available for use at handler discretion, based on risk and environment.

## **Safety equipment**

- Ensure first aid kits are available and located with each response group. If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.
- Radio/other communication equipment are charged and operational.
- Knives and restraint equipment (*e.g.*, capture pole, net, etc.) are clean, functional, and ready for use.
- Safety equipment for vessels should conform to United States Coast Guard regulations and be appropriate to the role each vessel plays in the response operation. Safety items should include:
  - A personal flotation device for each person on the vessel
  - Fire extinguisher(s)
  - Distress signals (flares, horn, etc.)
  - Navigation lights as appropriate

## **Operational safety**

- If using vessels, float plans should list an assigned point of contact (POC) on land and boat logs should be filled out for each vessel.
- Responders must meet minimum qualifications and training prior to conducting procedures.
- Assess the size, weight, and strength of the animal to determine how many people, and what equipment, should be needed to safely capture and secure it.
- Designated Safety Officer(s) should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated Safety Officer(s) should be watching for and warning the team of hazards such as waves and other animals.
- Assess how to safely reach the animal and egress after capture. Consider terrain, substrate, tide, weather, time of day, distance from access point to animal, other environmental factors (*e.g.*, unstable cliffs, ledges, working at height, working near water), and other animals in the area.

## **Net or capture pole handling**

- Do not wrap net or line around arms, hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear of lines and nets. Watch other people when possible to make sure they are clear of line and net.
- Communicate with other net/pole handlers.

## **Predators/other wildlife**

- Check for predators (*e.g.*, bears, sharks) or other organisms (*e.g.*, snakes, jellies, stingrays) before operations and have a spotter during operations.

**Report injuries, incidents, or PPE failures to the Safety Officer immediately.**

- Any significant accident or injury requires that operations cease and the event, person, or injury is immediately addressed.
- If treatment is needed, or person(s) involved need to be transported to land or mother ship, a boat with a team member should break away for transport and assistance.
- Appropriate response staff should be trained in basic first aid and CPR. First aid kits, including tourniquets, water and saline for flushing, are readily available.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal, and cut away from yourself. Stow the implement safely when finished.
- Depending on the situation, the decision is made by the IC whether to continue or discontinue operations for the day.

**Presence of public or bystanders**

- If capture is in a public area, ensure there is sufficient crowd control and outreach.
- Ensure public onlookers are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

**ANIMAL SAFETY**

- Use a decision matrix prior to capture to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated.

**Temperature/weather**

- Prevent potential thermoregulatory stress by considering and managing temperature, wind, sun, and shade. If animals become overheated, cool flippers and substrate under/around the animal with water. If the animal becomes too cold, hot water bottles, emergency blankets, or hot pads can be used to warm the animal.
- Limit handling of larger (and fatter) animals to periods of cooler ambient temperatures (*i.e.*, early morning, late afternoon, or when skies are overcast).

**Minimize stress**

- Responders should minimize the unavoidable stress that comes with animal capture by minimizing the duration of restraint and/or captivity, remaining calm and quiet around the animal, and minimizing manipulations and transport of the animal.
- Eyes should be covered with a UV-resistant and non-abrasive material during restraint to both protect the eyes and to reduce stimulus to the animal. For sedated animals, a gel-based solution of artificial tears can be applied to protect the eyes.

**Environmental hazard assessment**

- Prior to capture, survey the surroundings to identify any environmental hazards that might pose a threat to the animal or responders.

- Consider the potential hazards to animals that may flush into the water, such as high surf, shark predation, or aggressive conspecifics.
- Ensure there is a safe and clear path for the animal following restraint and release.

### **Disturbance (other animals)**

- Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Every effort should be made to lessen the chance of flushing non-target animals into the water. If the response is likely to flush more than 50 seals/sea lions, responders should consult with the Regional Stranding Coordinator before proceeding or discuss prior to departure if response will be conducted in a remote location.
- Entanglement response should not be attempted in locations that are likely to disturb mother/pup pairs.
- Prior to restraint of the target animal, personnel will cease efforts if significant injury to target or non-target animals appears imminent.
- Reduce all forms of disturbance to the entangled animal and any nearby animals (e.g., if the animal is within a group) as much as possible by keeping noise and movement to a minimum, and avoiding bright colors that can be spotted easily and spook the animals into the sea.

### **Time limits**

- Minimize handling and sedation time as much as possible.
- Ensure a timekeeper/data recorder keeps track of time and indicates timepoints (e.g., 5 minutes on-animal, 10 minutes on animal, etc.) to inform the team how long the procedure is taking.

### **Restraint devices and capturing/restraining animals**

- If not possible prior to capture, assess where the entangling material is easiest to access and cut away. Also identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal.
- Peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this will minimize pain and prevent further injury.
- Assess whether the animal is suitable for immediate release, requires transport to rehabilitation, or requires euthanasia, and act as appropriate.
- Ensure the transport container is safe and secure for the size and strength of the animal.
- When releasing, make sure the animal has recovered fully from sedation prior to releasing, especially on rocky shorelines or shorelines with cliffs.
- Sterilize any sampling tools that came into contact with the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

## **5.4. Team member roles**

The capture and handling of pinnipeds has inherent risk for both the responders and the animals.

Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. The recommended roles that follow are based, in part, on implementation of the Incident Command System as defined by the Federal Emergency Management Agency. This system provides a structure for clarity of communications and roles, and efficient management of resources. The System is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on this System. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 5-1).

**Table 5-7. Suggested number of personnel needed for a local hand sedation entanglement response. Responders can fulfil multiple roles and some roles are \*optional.**

Team member role	Number of suggested personnel
Incident Commander/Safety Officer	1-2
Veterinarian/Veterinary Technician	1
Animal herders	2-12
Animal handler/restrainer	1-5
Boat operators (if applicable)	2
Data collection/documentation	1-2
Security/crowd control	variable
*Optional - Communication Officer	1
*Optional – UAS pilot	1

### **Drug handling and licensing**

- The veterinarian must have a Doctor of Veterinary Medicine (DVM) or equivalent degree. This individual maintains the proper registration to purchase, store, and administer controlled substances, experimental drugs, and other drugs required for remote sedation, including ensuring that the appropriate reversal agents are available in sufficient quantity. Any licensed practitioner who distributes, prescribes, or dispenses any controlled substances (narcotics and dangerous drugs that fall under the jurisdiction of the Controlled Substance Act) must be

registered with the Drug Enforcement Administration (DEA).

- All personnel that handle controlled substances must receive training on safe handling of drugs.
- New personnel should be required to receive training on immobilization and anesthesia of pinnipeds prior to working on projects involving the use of these drugs on pinnipeds.
- All personnel must be currently certified in first aid and CPR training.
- Wildlife Immobilization courses such as those taught by the Canadian Association of Zoo and Wildlife Veterinarians, American Association of Wildlife Veterinarians, various veterinary schools, SafeCapture or Global Wildlife Resources are acceptable introductory or refresher immobilization training. However, additional supervised training in the field with experienced personnel should be required prior to administration of chemical capture of pinnipeds. A refresher course is recommended every five years especially if field responses have been limited, but may be taken more frequently as methods and procedures evolve or personnel work with different species.

### Specific roles

All personnel should be familiar with the permit and the minimum qualifications for each role. In general, roles and responsibilities include:

- **Incident Commander (IC)** - The IC is responsible for the overall operation and the performance of the response and usually does not participate directly in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that the response is safe for responders, public, and animals.
  - ***Qualifications*** – Experience in previous pinniped response, ability to oversee all operations, communicate with the team to adjust strategy or call off the effort as necessary. Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations.
- **Safety Officer (SO)** – The SO is responsible to continually watch over all personnel involved in a response and have the ability to communicate to the team and adjust the strategy of the response as needed.
  - ***Qualifications*** – Experience in previous pinniped response, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.*, waves, other animals). Willingness to stop operations if there is a safety concern, despite momentum (and pressure) to move forward.
- **Veterinarian/Veterinary Technician** – The veterinarian/veterinary technician is responsible for the health and monitoring of the entangled animal during capture and until the animal is safely released and on its own.
  - ***Qualifications*** - A licensed Doctor of Veterinary Medicine (DVM) or equivalent, or Veterinary Technician (RVT) who is EXPERIENCED in pinniped medicine.

- **Animal herders** - The animal herders are responsible for safely herding the animal to a safe location for capture, ensuring responders are safe from animal bites and scratches.
  - ***Qualifications*** – Experience in previous pinniped response and safely herding pinnipeds.
- **Animal Handlers/Restrainers** – The animal handlers/restrainers are responsible for handing the animal to ensure it is safely restrained and all personnel around the animal are safe from potential harm such as biting.
  - ***Qualifications*** - Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.
- **Pole syringe/hand injection** – The person operating the pole or hand syringe is responsible for safely handling the syringes at all times, cleaning the equipment, and ultimately safely sedating the entangled animal.
  - ***Qualifications*** – This is either performed by or under the direction of a veterinarian or veterinary technician.
- **Data collector** – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets, the animal is given an identifying number, all satellite-linked tag numbers are recorded, and all samples are properly recorded and labeled.
  - ***Qualifications*** – Familiarity with data sheet and information to be recorded and ability to accurately record data legibly.
- **Documentation** – This person is responsible for operating still or video photography to document the capture. This person may also serve as the data collector.
  - ***Qualifications*** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, and take clear and meaningful photos and video.
- **Security/crowd control** – The IC should ensure that the proper authorities in the area have been notified of the response and the area is closed to public access during the response.
  - ***Qualifications*** – Knowledge of proper authorities to notify.
- **Communication Officer (\*optional)** – If there are an adequate number of responders available, the communication officer can communicate information about pinniped entanglement response.
  - ***Qualifications*** – Effective communicator in writing and speaking. Communication should be

clear, concise, accurate, coherent, and courteous.

- **Unmanned aerial system (UAS; \*optional)** - If permitted to operate a UAS during the capture, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the capture or causing any disturbance to the target or other animals.
  - **Qualifications** – a certified pilot’s license, a permit to operate during a capture, and experience operating a UAS during previous pinniped field operations.

## 5.5. Environmental conditions

Create a risk analysis tool (*e.g.*, Appendix D – Risk Factor Table) or decision matrix (*e.g.*, Appendix E

– Decision Matrix (Go/No Go)) to determine whether or not an entanglement response is safe for responders and pinnipeds based on environmental conditions. Assess the following environmental conditions prior to response:

- Weather conditions (*e.g.*, rain, snow, fog, wind, approaching storm systems, heat, cold)
- Substrate (*i.e.*, kelp that could obscure the animal in the water, rocks or reef near haul-out that could affect ability to maneuver capture vessel, ice)
- Location of the animal in relation to the surf zone
- Tide (*i.e.*, incoming tide, increased surf) and currents
- Time of day (*i.e.*, length of response time in relation to sunset, etc.)

## 5.6. Equipment

### Data and recording supplies

- Capture/handling forms (*i.e.*, Level A, Human Interaction, Capture form, etc.)
- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro), extra batteries
- Binoculars

### Sampling, tagging, and marking supplies

- Measuring kit (*e.g.*, tape measure, calipers, ruler)
- Tagging kit (*e.g.*, plastic flipper tags, satellite-linked tags, tagging equipment)
- Marking kit (*e.g.*, hair dye, paint stick)

## Protective clothing

- Footwear appropriate for substrate
- Protective clothing as appropriate for conditions, PFD
- Non-permeable gloves
- Eye protection
- Optional - knee pads, cotton or Kevlar gloves

## Human medical equipment

- First aid kit
- If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.

Animal medical equipment and drugs (see example in Appendix F - Gear Checklist for field response)

- Controlled drug kit including sedatives, reversals and euthanasia solution
- Crash kit (*e.g.*, dopram, atropine, epinephrine)
- Medical kit (*e.g.*, injectable antibiotics, pain medications, IV fluids)
- Disentanglement instruments (*e.g.*, hemostats)
- Oxygen and Airway kit
- Field anesthesia machine (otariids)
- Monitoring equipment (*e.g.*, temperature, heart rate, PO<sub>2</sub> monitor)
- Wound care kit
- Blood collection
- Ballistics or trained personnel with ballistics (if you cannot euthanize with drugs); ensure local firearm laws are followed.

## Sedation/capture/restraining equipment

Equipment used for sedation by hand/pole injection varies. Equipment may include, but is not limited to pole syringe, crowding/herding boards, capture nets, etc.

### Sedation

There are two main methods of drug administration: **1) hand injection** and **2) pole syringe injection**. Hand injecting a drug requires capture and restraint. Pole syringes can be used for situations in which capture is not necessary or feasible. The preferred pole syringe is spring loaded (*e.g.*, Dan Inject Jab Stick). The other type of pole syringe uses a plunger (*e.g.*, SafeTFlex pole syringe), and is best used as

backup equipment.

**Hand injection** - Sedatives may be injected by hand delivery if the animal is already safely restrained.

**Spring loaded pole syringe (below)** - A spring-loaded pole syringe may be used to deliver sedatives for approachable, isolated, animals on land that require sedation for safe-handling.



*Hawaiian monk seal research program, NOAA Fisheries*

**Plunger pole syringe (not pictured)** – A pole syringe provides a safe, fast, and simple means of injecting animals in situations where adequate restraint facilities, or space, are not available.

**Cutting tools (right)** - There are a variety of different cutting tools (e.g., knives, scissors, diagonal pliers, wire cutters, etc.) that can be used to cut entangling material. Always cut away from the body and always peel the entanglement off of the neck. NEVER pull the entanglement as it could cause further injury.



*K. Raum-Suryan*

**Crowding/herding boards (below)** – Used as a barrier to safely herd pinnipeds to a safe location for sedation if necessary. Handles should be used to prevent injury. Boards can be constructed from plywood with integrated handles in the wood or handles on the back of the board. “Hog” herding boards can also be used and may be lighter and easier to maneuver.



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### Cleaning/disinfecting supplies

- Antibacterial soap/hand sanitizer
- Disinfectant solution
- Spray bottle for disinfectant solution

- Garbage bag(s) or other container(s) to separate gear and clothing

#### **Miscellaneous supplies**

- Backpack (to carry supplies)
- Bucket (to carry supplies and/or to hold water to cool animals)

### **5.7. Data collection**

It is important that supply checklists and data needs are well thought out prior to the start of any entanglement response program and data forms and instructions are accessible during a response. Important forms to have readily available could include: applicable permits; [Level A and Human Interaction Forms](#) (e.g., Appendix B – Level A and Human Interaction Form); gear checklists (e.g., Appendix F - Gear Checklist); and disentanglement forms (e.g., Appendix G – Disentanglement form). All entangling gear should be retained (if possible), documented on the Level A and Human Interaction Forms, and stored in a centralized location or sent to a NMFS gear repository.

### **5.8. Risks and Mitigation**

To minimize risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a decision matrix or Go/No Go criteria should be established to guide responders in making safe decisions regarding the response to entangled pinnipeds. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough de-brief and come up with lessons learned that can be applied to future responses. When responding to entangled pinnipeds, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

#### **RISKS TO HUMANS**

**Risk:** *Human exposure to drugs by injection, absorption, or ingestion*

The doses of immobilization and sedative drugs required to achieve an adequate response in large pinnipeds are all potentially lethal if accidentally injected into a human. Therefore, drug safety procedures must be carefully followed at all times.

***Mitigation:***

- Prior to using a particular chemical immobilizer or tranquilizer, it is each project leader's

responsibility to determine and document that all personnel are familiar with the human safety aspects of the drug. These instructions should include knowledge of the symptoms following accidental injection; emergency treatment procedures, including cardiopulmonary resuscitation (CPR); and name, location, and dosage of a reversal agent (if any). Written instruction should be close by and easily accessible at all times during a response.

- PPE: Basic safety precautions must be taken by all personnel to prevent exposure to drugs. These include wearing non-permeable gloves, safety goggles, splash guard mask, splash box, or safety screen when handling drugs/darts/wounds with drugs that can be absorbed across intact skin.
- OSHA Universal Standards for handling sharps are used  
<https://www.osha.gov/SLTC/etools/hospital/hazards/sharps/sharps.html>.
- Marine radios and cell phones ensure that emergency rescue personnel can be alerted should a team member be exposed to a drug. Local EMS should be notified prior to operations and informed of drug types and concentration, work locations, number of personnel, and safety equipment on board.
- All response staff are CPR certified.
- Reversal drugs are kept readily available.

**Risk:** *Human exposure through subsistence uses*

**Mitigation:**

- Inform Native communities in the region that a pinniped entanglement response may occur in their area.
- On the flipper tag, use a permanent marker to write “***Do not eat if harvested before xxx date***”, which is past the withdrawal time of 45 days.
- Provide identifying details (tag number, dye-mark number, etc.) about chemically immobilized sea lions or seals in the area.
- Provide a “safe to consume” date to Alaska Native organizations.

**Risk:** *Injury or death to personnel by drowning, falling or stepping on hazards*

**Mitigation:**

- Appropriate personnel should investigate and decide if the location is safe for herding.
- Wear appropriate PPE such as strong, non-slip footwear, gloves, and helmets and protective equipment as necessary.
- Designated Safety Officer(s) should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated Safety Officer(s) should be watching for and warning the team of hazards.

**Risk:** *Injury to personnel from crowding/herding boards, pen panels, or capture nets*

**Mitigation:**

- Herders should wear appropriate PPE such as strong, non-slip footwear, gloves, protective clothing, and helmets as necessary.
- Herders should use crowding/herding boards with appropriate handles to avoid pinch points.
- Herders and handlers should be trained to minimize injury to themselves and others and maintain an impenetrable barrier when near the animal and actively herding.
- All herding and net materials should be inspected for hazards prior to use.

**Risk:** *Injury to personnel from pinniped bite or scratch*

***Mitigation:***

- Personnel should wear appropriate PPE such as strong, non-slip footwear, gloves, and protective clothing as necessary.
- Personnel should be trained to minimize injury to themselves and to maintain an impenetrable barrier when near the animal and actively herding.
- Personnel should be trained in proper restraint techniques to minimize bite risk.

## **RISKS TO ANIMALS**

**Risk:** *Injury to animal from capture equipment*

***Mitigation:***

- Personnel should be trained in techniques that minimize injury to the animal.
- Use an adequate number of capture net/pole handlers to increase safety.
- Conduct a proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Evaluate medical care capacity (*i.e.*, emergency resuscitation, rehabilitation, euthanasia) prior to capture.

**Risk:** *Unintentional capture or disturbance of non-entangled animals*

***Mitigation:***

- Evaluate the possibility of unintentional take of non-entangled animals before and during capture evolution.
- Complete appropriate “take” (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals.
- Always consider efforts to minimize disturbance to non-entangled animals.
- Designated personnel should continuously watch for the presence of non-entangled protected species in and around the capture area throughout the evolution, and communicate with the team appropriately.

**Risk:** *Animal fatality*

***Mitigation:***

- Personnel should be trained in techniques that minimize injury to the animal.
- During restraint and/or sedation for entanglement response, the animal should be constantly monitored for changes in breathing or other signs of distress or complications. Respiratory rate, at a minimum, should be recorded every 5-10 minutes and trends should be tracked and managed appropriately.
- The Regional Stranding Coordinator and permit's Principle Investigator should be notified, a full necropsy should be performed as soon as possible, and a final report sent to NOAA.
- Entanglement response activities should immediately cease until necropsy is completed and new mitigation measures are approved by NMFS.

## **5.9. Intervention Criteria/Decision Matrix (Go/No Go)**

A risk analysis tool (e.g., Appendix D – Risk Factor Table) or decision matrix (e.g., Appendix E – Decision Matrix (Go/No Go)) should always be used prior to any response. For a local hand/pole syringe sedation response, factors that should be considered include environmental, team selection including availability of veterinarian/veterinary technician and drugs, pinniped selection and condition, permission, resources, and mission complexity.

## **5.10. Procedure**

### **Optimal capture situation**

- Animal is on the beach without any hazards
- Solitary
- Sleeping – the element of surprise can be advantageous
- Animal is lying on its ventrum
- Away from the water's edge – animals will attempt to flee into the water, become slippery to handle when wet, and the water may pose a drowning risk
- Facing inland and uphill if beach is sloped – it is more difficult for a seal to move uphill than downhill

### **Animal capture and restraint**

1. **Identify candidate animal:** The entangled animal will be identified, and its position, size, age, sex (if possible to determine), and placement among other animals will be noted.
2. **Risk Assessment Tool or Go/No Go Determination:** Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices. Potential

effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed and ensure there is a safe egress area for non-target animals.

3. **Secure the area:** If necessary, onlookers will be notified and asked to clear the area.
4. **Assign team roles and review plan:** Before handling any animal, be sure everything is ready. Double check all the equipment and supplies. Identify the IC for the capture, review the capture scenario and all procedures, any emergency response, and the sequence of the activities.

Discuss when a handling should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the handling event, and confirm the team members fully understand, are capable, and are mentally prepared. Review animal warning signs to monitor and the appropriate emergency response actions. The IC will ensure all personnel and equipment are ready and perform the final Go/No Go determination. Only trained personnel are authorized to administer medications to pinnipeds.

5. **Modify protective clothing and personal effects to minimize getting caught in nets during handling events:** Remove rings from fingers or wear gloves, tie hair back, check clothing for buttons (even pant cuffs) and modify as appropriate to reduce entanglement/tripping risks.
6. **Weight estimate:** Weight of the animal is estimated individually by each team member without discussion and the median weight is used. The veterinarian has discretion to modify the weight estimation if necessary.
7. **Drug selection:** The veterinarian will select the appropriate drug combination and dosage. Final sedative selection is at the discretion of the veterinarian within the confines of the approved protocols (*i.e.*, Institutional Animal Care and Use Committee [IACUC], permit) or with special permission from NOAA for novel drugs. A listing of common pinniped sedatives can be found in the CRC Handbook (Gulland *et al.* 2018). Euthanasia solutions should be kept on hand in case there is a need for euthanasia. Antibiotics may be used to treat injuries.

#### **Important notes**

- The type, dose, method, and route will only be determined by a veterinarian.
- Double check all labels before drawing up medications. Also check expiration dates.
- Avoid contaminating needles or the top of the medication vial. Always inject animals with a fresh needle (not the one used to draw up medications).
- Follow-up doses: May be authorized by the veterinarian for some medications.

## **Injections**

IM: Intramuscular – either the gluteal region (behind the hips but in front of the hindflippers, or the epaxial muscle on either side of the spine.

### **Needle size**

Select needle size based on viscosity of drug and size of animal.

### **Syringe size**

Pole syringes have standard sizes. To draw up and measure drug volumes accurately, use a syringe that is slightly larger than the amount of medication you will be giving (ex: 8 ml of drug in a 10 ml syringe, 1.5 ml of drug in a 3 ml syringe). For rapidly administering hand injections, it may be desirable to transfer the drug to an even larger syringe (e.g., 5 mL of drug in a 20 mL syringe).

### **Methods of administration**

There are two main methods of drug administration:

- 1) Hand injection - hand injecting a medication requires capture and restraint.
- 2) Pole syringe injection - Pole syringes can be used for situations when capture is not necessary or feasible.

#### **Hand injection:**

IM: Keep the needle at a 90 degree angle to the animal. Insert needle at full length. Pull back on the syringe to confirm no blood comes up. If no blood present, administer medication. If blood appears, pull the needle out and re-stick with a new needle.

#### **Pole syringe:**

Drugs are administered through the pole syringe by manual pressure applied by the person giving the injection. The pressure applied to the handle will push the syringe contents into the animal. If possible, wait until the animal is sleeping and sneak up behind the animal to give the injection. Follow through with a forward motion until you are certain the full dose of drug is given. Let the motion of the animal as it moves away from you withdraw the needle.

**Spring loaded pole syringe:** \*REMINDER\* NEVER discharge the pole syringe without having the syringe attached and filled with a fluid. Doing so will damage the mechanisms internally and could render the unit useless.



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8. **Documentation:** The photographer/videographer should ensure all photo and video equipment is on and recording. This role can be combined with data collection.

9. **Approach:** – hand inject: Hand injecting a medication requires capture and restraint. The team will get into position, approach quietly and calmly, and capture the entangled animal using appropriate equipment (hoop net, etc.). To improve capture success, care should be taken to quietly approach the target animal from downwind and out of the animal's field of view. Some or all of the capture team should be between the animal and the water, to block its escape route.



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10. **Restraint:** Confirm that the restrainers have control over the animal before conducting any procedures on the animal. Typically an animal does not struggle the entire time under restraint, and will often take a deep breath just prior to struggling. The head restrainer monitors the animal's breathing and response level. Animals may lift their heads abruptly so beware. When sampling, tagging, etc., the person performing these activities quietly states what procedure is next so the restrainers can prepare for the animal's reaction.

## Restraining with a Net

When using a net for restraint, watch that the animal's foreflippers and teeth are not caught in the mesh and that the head is not at an unnatural angle. Adjust as necessary. Use care that the handling team's fingers do not get caught in the netting as well. Animals may still roll while in a net, but the net does provide some control over the animal.



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## **11. Approach – pole syringe:**

- Move safety of spring loaded pole syringe to OFF position.
- Approach the animal quietly from behind to avoid detection.
- The pole syringe is triggered when pressure is applied to the aluminum tip. It's essential to use enough force to trigger the syringe (practicing on inanimate objects with water before using the pole syringe on a live animal is required).
- Aim to administer the drug IM in the flank (see below) of the animal if possible.
- The animal will immediately pull away from the syringe once the needle goes into the skin. To anticipate that movement, imagine pressing the pole syringe several feet PAST the animal. That way you move with the animal. (Be aware that the natural instinct is to immediately pull pole syringe away from the animal but it is important to continue forward).
- Quietly and slowly walk away so as to not disturb the animal further. Give the animal space and allow the sedative time to take effect.
- Dispose of all used needles in a "SHARPS" container.

## **12. Monitoring and assessment:** The animal is immediately assessed for any signs of respiratory or circulatory distress and if found treated accordingly. The respiration rate, heart rate, body temperature, and O<sub>2</sub> saturation should be continually monitored (O<sub>2</sub> saturation and heart rate are monitored continuously when the pulse oximeter is connected).



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13. **Data collection:** Morphometrics, sex, and if appropriate, samples, will be taken and all data recorded completely on [Level A and Human Interaction Forms](#), and any other necessary capture forms.
14. **Disentanglement:** Using an appropriate cutting tool (e.g., knife, scissors, wire cutters, etc.), the entangling material should be cut away from the animal and handler and removed by peeling the entangling material out of the wound rather than dragging it out from one side to minimize pain and prevent further injury. Double check to ensure all entangling material has been removed. All entangling gear should be retained (if possible), documented under [Level A and Human Interaction Forms](#) (Appendix B – Level A and Human Interaction Form), and archived or sent to a NMFS gear repository.
15. **Wound care:** The wound is investigated to assess the extent of tissue damage and to ensure that all foreign material has been removed. The wound (if any) may be cleaned with antiseptic and treated topically, though this should be balanced with animal handling time and stress. Many entanglement wounds are open and will be easily flushed with seawater, making wound care less critical. However if needed, responders can conduct wound debridement or administer antibiotics. A broad-spectrum, long-acting antibiotic can be used to treat injuries, but the choice to administer this (or other drugs) is at veterinary discretion. Dilute povidone-iodine may be used to flush deep wounds or areas that are not likely to be easily flushed on their own. Euthanasia solutions should be kept on hand in case there is a need for euthanasia. In the case of a severe wound and if the animal is small enough to transport to a rehabilitation center, surgery may be considered.
16. **Antibiotics and fluids:** At the discretion of the veterinarian//veterinary technician, antibiotics, pain medications, or fluids may be given.
17. **Marking and tagging:** Temporary (hair dye, paint stick) identifying marks or tags (flipper and/or satellite-linked) should be applied for more visible and long-term identification.
18. **Sedative reversals:** Reversal administration can occur at any time during the procedure at the discretion of the veterinarian//veterinary technician and depending on the animal's condition. Syringes are pre-loaded with appropriate reversals, and should be kept readily available should an emergency situation occur.
19. **Releasing the animal:** All responders should move out of sight of the animal before it wakes up. The veterinarian//veterinary technician will monitor the animal until it is fully awake and responsive. Responders will ensure there is a clear and hazard-free path between the animal

and the water and that there are no predators in the vicinity prior to release.

20. **Post-recovery:** After recovery, the animal should be released, or if additional monitoring or rehabilitation is required, transported to a rehabilitation center or euthanized if the injury is severe.
21. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.
22. **Disinfecting/disposal:** If protective reusable clothing (*e.g.*, coveralls, footwear, kneepads, cloth gloves) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including retraining nets, measuring gear (*e.g.*, tape measures and scales), tagging supplies (*e.g.*, tagging pliers/hole punches, etc.), specimen supplies, and other miscellaneous items (*e.g.*, buckets, clipboards, writing implements, etc.). Dispose of used non-permeable gloves in the trash. Place used needles/scalpels in a “SHARPS” container (do not recap needles).
23. **Submit reports:** Ensure all datasheets and reports are complete and submitted where appropriate. Appropriate “take” (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals also should be completed.
24. **Prepare again:** Clean and organize gear so it is ready for future use.

## 6. Pinniped Entanglement Response Techniques - Remote Sedation

**This section can be used as a stand-alone overview of how to safely respond and capture entangled pinnipeds using remote sedation techniques.**

One of the primary advantages of using remote sedation is that capture stress can be reduced or even eliminated if done properly and no direct pre-sedation contact is made with the animal. Champagne *et al.* (2012) reported that animals chemically immobilized without physical restraint did not show a significant increase in stress (cortisol) levels compared to those that were physically restrained, which showed a nearly 3-4 fold increase in stress levels. Remote sedation can reduce physical risk to both responders and pinnipeds if the initial capture and restraint is avoided. There is less risk of responders being bitten by the animal, one of the biggest concerns of any method that involves physical restraint (Lynch *et al.* 1999), and less chance of the animal being injured. Remote sedation provides access to specific entangled individuals and certain species and age classes (*e.g.*, large, adult male Steller sea lions) that previously were nearly impossible to safely capture. Remote sedation can also be safer for surrounding animals as well. Remote sedation can lead to smaller and more controlled flushing of adjacent animals compared to rushing a group to get a net or pole syringe to the target animal.

### 6.1. Preparation

This section will provide an overview of a pinniped entanglement response using remote sedation.

#### **Prior to any operation:**

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Select an appropriate location for operations.
- Consult tide charts for optimal tide windows and determine cut off time due to tides or darkness.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vehicles (fuel and maintenance if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal, and better control of onlookers in the area.
- If using satellite-linked transmitters, ensure transmitters are programmed and ready to deploy.
- Ensure all equipment is clean, organized, packed, and ready for operations.

#### **24– 72 hours prior to operation:**

- The marksman should practice with the equipment to be used for the upcoming incident. Practice should include ensuring the accuracy and precision of the projector and darts, the effective and consistent deployment of the dart contents, and any predicted shot scenarios for the outing (distance of shot, uphill/downhill shots, wind and wave conditions, etc.).
- All critical sedation gear should be tested for function, including the projector, darts to be deployed, animal location aids if used (e.g., hydrophone and transmitters, drones), field anesthesia machine, etc.
- Check predicted marine conditions, weather and wind forecasts.
- Notify appropriate entities such as: NOAA Regional Stranding Coordinator (RSC), law enforcement, EMS or local hospital, Native communities (in Alaska), and rehabilitation facility to inquire about available space.
- Ensure appropriate authorization (*i.e.*, if response on park, preserve, or private land).

#### **Immediately prior to operation:**

- Conduct safety briefing.
- Re-check weather and marine forecasts.
- Consult decision matrix – prior to operations and on scene, determine if conditions allow for safe operations and make a final decision about response.

## **6.2. Training**

Pinniped entanglement responses are conducted under MMPA authorization either under a 112c agreement issued by NMFS to Network members through a Stranding Agreement, under 109 (h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt pinniped entanglement response. Responders must be trained by experienced personnel in safe capture, handling, animal health monitoring, safe and effective restraint, etc. All remote sedation entanglement responses must be conducted under a MMHSRP or research permit. Responders must be trained in safe capture, handling, monitoring under restraint, etc. by experienced personnel. Additionally, personnel must be trained in small boat operations and have experience operating boats while pinnipeds are in the water near the boat. Remote delivery via the dart projector requires additional training and practice. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP or RSC can direct

responders toward resources relevant to the species of interest, whenever available.

### **6.3. Human/animal safety**

#### **HUMAN SAFETY**

##### **Drugs, equipment, and personal protective equipment (PPE)**

- Keep a written safety protocol, including emergency numbers, with first aid kits.
- All drugs should be recorded on an emergency response sheet in case of accidental exposure, so EMS can quickly evaluate human exposure. Local hospitals should be notified prior to response.
- Human reversal drugs should be drawn and readily available prior to sedatives being drawn. All responders should have a general understanding of drugs and reversals being used, where to immediately access human reversals, understand the symptoms of accidental exposure, and field treatment if EMS is not an immediate option.
- All personnel must wear appropriate PPE, helmets as necessary, and dress suitably for the weather conditions.
- Pinniped restrainers, taggers, and others who may have physical contact with the animal should wear protective clothing, PFDs, and appropriate footwear.
- Handlers who may come into contact with bodily fluids must wear non-permeable gloves such as nitrile or latex exam gloves. Cloth gloves may be worn over non-permeable gloves if added grip or protection is needed.
- Other recommended protective gear includes eyewear (including sunglasses – preferably polarizing) and kneepads. Masks should be available for use at handler discretion, based on risk and environment.

##### **Safety equipment**

- Ensure first aid kits are available and located with each response group. If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.
- Radio/other communication equipment are charged and operational.
- Knives and restraint equipment (*e.g.*, capture pole, net, etc.) are clean, functional, and ready for use.
- Safety equipment for vessels should conform to United States Coast Guard regulations and be appropriate to the role each vessel plays in the response operation. Safety items should include:
  - A personal flotation device for each person on the vessel
  - Fire extinguisher(s)
  - Distress signals (flares, horn, etc.)
  - Navigation lights as appropriate

##### **Operational safety**

- Float plans should list an assigned point of contact (POC) on land and boat logs should be filled out for each vessel.
- Responders must meet minimum qualifications and training prior to conducting procedures.
- Assess the size, weight, and strength of the animal to determine how many people, and what equipment, should be needed to safely capture and secure it.
- Designated Safety Officer(s) should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated Safety Officer(s) should be watching for and warning the team of hazards such as waves and other animals.
- Assess how to safely reach the animal and egress after capture. Consider terrain, substrate, tide, currents, weather, time of day, distance from access point to animal, other environmental factors (*e.g.*, unstable cliffs, ledges, working at height, working near water, thick kelp beds), and other animals in the area.

### **Net or capture pole handling**

- Do not wrap net or line around arms, hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear of lines and nets. Watch other people when possible to make sure they are clear of line and net.
- Communicate with other net/pole handlers.

### **Predators/other wildlife**

- Check for predators (*e.g.*, bears, sharks) or other organisms (*e.g.*, snakes, jellies, stingrays) before operations and have a spotter during operations.

### **Report injuries, incidents, or PPE failures to the Safety Officer immediately**

- Any significant accident or injury requires that operations cease and the event, person, or injury is immediately addressed.
- If treatment is needed, or person(s) involved need to be transported to land or mother ship, a boat with a team member should break away for transport and assistance.
- Appropriate responders should be trained in basic first aid and CPR. First aid kits, including tourniquets, water and saline for flushing, are readily available.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal and cut away from yourself. Stow the implement safely when finished.
- Depending on the situation, the decision is made by the IC whether to continue or discontinue operations for the day.

### **Presence of public or bystanders**

- If capture is in a public area, ensure there is sufficient crowd control and outreach.
- Ensure public onlookers are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

## ANIMAL SAFETY

- Use a decision matrix prior to capture to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated.

### Temperature/weather

- Prevent potential thermoregulatory stress by considering and managing temperature.

### Minimize stress/time limits

- Responders should minimize the stress that comes with animal capture by minimizing the duration of pursuit (if any), restraint and/or captivity, remaining calm and quiet around the animal, and by minimizing manipulations and transport of the animal.
- Eyes should be covered with a UV-resistant and non-abrasive material during restraint to protect the eyes, and to reduce stimulus to the animal. For sedated animals, a gel-based solution of artificial tears can be applied to protect the eyes.
- Ensure a timekeeper/data recorder keeps track of time and indicates timepoints (e.g., 5 minutes on-animal, 10 minutes on-animal, etc.) to keep the team aware of how long the procedure is taking.

### Environmental hazard assessment

- Prior to capture, survey the surroundings to identify any environmental hazards or predators (sharks, aggressive conspecifics, killer whales) that might pose a threat to the animal.

### Disturbance (other pinnipeds or wildlife)

- Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Every effort should be made to lessen the chance of flushing non-target and target animals into the water. If the response is likely to flush more than 50 seals/sea lions, responders should consult with the Regional Stranding Coordinator before proceeding or discuss prior to departure if response will be conducted in a remote location.
- Entanglement response should not be attempted in locations that are likely to disturb mother/pup pairs.
- Prior to restraint or darting of the target animal, personnel will cease efforts if significant injury to target or non-target animals appears imminent.
- Reduce all forms of disturbance to the entangled animal and any others close by (e.g., if it is within a group) as much as possible by keeping noise and movement to a minimum.

### Restraint devices and capturing/restraining animals

- Never hold on to the entangling material as a form of capture or to slow the animal down, as the animal is likely to roll and spin, causing further injury and pain.
- Ensure that the appropriate capture net (*i.e.*, weight, pole length, net length) and mesh size is

used to prevent animal injury and maximize successful capture. Determine how the animal will be removed from the net after capture (a cod end of the net may make release easier).

- When the animal is captured, ensure it is secured appropriately so that it is still able to breathe comfortably. A kinked neck or constricted airway can cause mortality during captures, and all animal handlers should clearly understand this hazard prior to the response.
- Once captured, if not possible prior to capture, assess where the entangling material is easiest to access and cut away. Also identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal. Peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this will minimize pain and prevent further injury. Every entanglement should be carefully examined to ensure all of the entangling material is removed. Consider that some animals have been sighted with two separate plastic packing bands around their necks.
- Assess whether the animal is suitable for immediate release, requires transport to rehabilitation, or requires euthanasia, and act as appropriate.
- Ensure the transport container is safe and secure for the size and strength of the animal.
- Sterilize any sampling tools that came into contact with the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

#### **6.4. Team member roles**

The capture and handling of pinnipeds has inherent risk for both the responders and the animals. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 6-1).

**Table 6-8. Suggested number of personnel needed for a remote sedation entanglement response.**  
**Responders can fulfil multiple roles and some roles are \*optional.**

<b>Team member role</b>	<b>Number of suggested personnel</b>
Incident Commander/Safety Officer	1-2
Veterinarian/veterinary technician	1-2
Animal handler/restrainer	2-5
Netter (phocids only)	2
Marksman	1
Spotter	1

Team member role	Number of suggested personnel
Monitor	3-6
Boat operator	2-3
Data collection/documentation	1-2
*Optional – UAS pilot	1
*Optional - Communication Officer	1

## Drug handling and licensing

- The veterinarian must have a Doctor of Veterinary Medicine (DVM) or equivalent degree. This individual maintains the proper registration to purchase, store, and administer controlled substances, experimental drugs, and other drugs required for remote sedation, including ensuring that the appropriate reversal agents are available in sufficient quantity. Any licensed practitioner who distributes, prescribes, or dispenses any controlled substances (narcotics and dangerous drugs that fall under the jurisdiction of the Controlled Substance Act) must be registered with the Drug Enforcement Administration (DEA).
- All personnel that handle controlled substances must receive training on safe handling of drugs.
- New personnel should be required to receive training on immobilization and anesthesia of pinnipeds prior to working on projects involving the use of these drugs on pinnipeds.
- All personnel must be currently certified in first aid and CPR training.
- Wildlife Immobilization courses such as those taught by the Canadian Association of Zoo and Wildlife Veterinarians, American Association of Wildlife Veterinarians, various veterinary schools, SafeCapture or Global Wildlife Resources are acceptable introductory or refresher immobilization training. However, additional supervised training in the field with experienced personnel should be required prior to administration of chemical capture of pinnipeds. A refresher course is recommended every five years especially if field responses have been limited, but may be taken more frequently as methods and procedures evolve or personnel work with different species.

## Specific roles

The recommended roles that follow are based, in part, on implementation of the Incident Command System as defined by the Federal Emergency Management Agency. This system provides a structure for clarity of communications and roles, and efficient management of resources. The System is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on this System.

- **Incident Commander (IC)** - The IC is responsible for the overall operation and the performance of the response and does not participate directly in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that the response is safe for responders, bystanders, and animals.
  - ***Qualifications*** – Experience in previous pinniped response, ability to oversee all operations, communicate with the team to adjust strategy or call off the effort as necessary. Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations.
- **Safety Officer (SO)** – The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate to the team and adjust the strategy of the response as needed.
  - ***Qualifications*** – Experience in previous pinniped response, ability to continually watch over all personnel involved, communicate with the team to adjust strategy or call off the effort as necessary, and watch for hazards. Willingness to stop operations if there is a safety concern, despite momentum (and pressure) to move forward.
- **Veterinarian/veterinary technician** – The veterinarian/veterinary technician is responsible for the health and monitoring of the entangled animal during capture and until the animal is safely released and on its own.
  - ***Qualifications*** - A licensed Doctor of Veterinary Medicine (DVM) or equivalent who is EXPERIENCED in pinniped medicine.
- **Animal Handlers/Restrainers** – The animal handlers/restrainers are responsible for handling the animal to ensure it is safely restrained and all personnel around the animal are safe from potential harm such as biting.
  - ***Qualifications*** - Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.
- **Boat operator** – Boat operators should be experienced with animal approaches, capture methods, and translocation of animals in the boat and alongside the boat. Boat operators should also be comfortable with deploying personnel on and off rocks, operating around many pinnipeds in the water or on shore, and staying calm under pressure.
  - ***Qualifications*** – United States Coast Guard boat training or equivalent. Because many of these duties are outside the scope of normal boat operations, skills should be practiced prior to working with pinnipeds in or around the boat.

- **Marksman** – The marksman is ultimately responsible for safe and effective functioning of the dart, placement of the dart on the target animal, and follow-up security and cleaning of the darting equipment. The marksman determines the appropriate approach to the target as well as the optimal distance and angle of the shot attempt. Once the Spotter confirms that it is safe to attempt a shot (opens the shot window) and communicates this to the marksman, the marksman may make an attempt at their discretion until the Spotter closes the shot window. The marksman should have extensive practice using the dart projector prior to darting a live animal. Specifically, practice should be organized and methodical, with marksman shooting a target a) from various distances, b) with different pressures, c) in all types of weather conditions (e.g., rain, snow, wind), and d) from different angles. The marksman should be well versed in how to safely handle the dart projector, darts, CO<sub>2</sub> cartridges, pressurizing and depressurizing the projector and be able to demonstrate accuracy in hitting a target under the various conditions described above.
  - ***Qualifications*** – Demonstrated proficiency in skills and experience described above. The marksman does not need to be a veterinarian and should work under the direction of a veterinarian regarding the drugs used in the darts. Thorough knowledge of the anatomy of the target species will increase safety and effectiveness of dart placement selection and delivery.
- **Spotter** – This person is paired with the marksman and is in charge of both opening and closing the shot window for the marksman. The Spotter uses a range finder to measure out distances to the target animal, ensures that the area immediately surrounding the target remains clear of non-target animals or other hazards, and communicates with other personnel to direct proper placement of the vessel for the marksman.
  - ***Qualifications*** – Ability to use a range finder, experience approaching animals quietly, ability to communicate with marksman using hand signals, communicate with personnel on vessels, and experience around dart projector and drugs.
- **Monitors** – Monitors keep an eye on the animal prior to, during, and after darting. If the animal jumps into the water after darting, monitors use the “man overboard” drill and always keep eyes on where the animal was last seen, pointing to where the animal submerged so the boat operator is constantly informed, and keeps watch of the animal until it is safely restrained.
  - ***Qualifications*** – Knowledge of “man overboard” drill, experienced observer with binoculars, and comfortable in boats.
- **Data collector** – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets, the animal is given an identifying number, all satellite-linked tag numbers are recorded, and all samples are properly recorded and labeled.

- ***Qualifications*** – Familiarity with data sheet and information to be recorded and ability to accurately record data legibly.
- **Documentation** – This person is responsible for operating still or video photography to document the capture. This person may also serve as the data collector.
  - ***Qualifications*** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, and take clear and meaningful photos and video.
- **Security/crowd control** – The IC should ensure that the proper authorities in the area have been notified of the response and the area is closed to public access during the response.
  - ***Qualifications*** – Knowledge of proper authorities to notify.
- **Unmanned aerial system (UAS; \*optional)** - If permitted to operate a UAS during the capture, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the capture or causing any disturbance to the target or other animals.
  - ***Qualifications*** – a certified pilot's license, a permit to operate during a capture, and experience operating a UAS during previous pinniped field operations.
- **Communication Officer (\*optional)** – If there are an adequate number of responders available, the communication officer can communicate information about pinniped entanglement response.
  - ***Qualifications*** – Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.

## 6.5. Environmental conditions

Create a risk analysis tool (e.g., Appendix D – Risk Factor Table) or decision matrix (e.g., Go/No Go; see 6.8) to determine whether or not an entanglement response is safe for responders and pinnipeds based on environmental conditions. Assess environmental conditions such as the examples below before executing a remote sedation attempt.

- Weather conditions (e.g., rain, snow, fog, wind, approaching storm systems, heat, cold)
- Marine conditions (e.g., swells, chop, surge)
- Conditions at landing site (e.g., amount of surf – can responders get safely on and off shore)
- Substrate (e.g., kelp that could obscure the animal in the water, rocks or reef near haul-out that could affect ability to maneuver capture vessel, ice, cultural resources at risk)
- Submerged hazards (e.g., sand bars, coral reefs, sunken debris, crab pots, aquaculture, oyster bars, etc.)

- Location of the animal in relation to the surf zone
- Tide (*i.e.*, time and level of high/low tide) and currents
- Time of day (*i.e.*, length of response time in relation to sunset, etc.)
- Conspecifics (*i.e.*, other animals in the area)
- Predators (*e.g.*, sharks, killer whales, alligators) and other hazardous wildlife (*e.g.*, stingrays, jellies, etc.)

## 6.6. Equipment

Equipment needs vary substantially between target species and target size/age, environmental conditions, and operational goals (*e.g.*, immediate patient release versus transport to a rehabilitation facility). Examples of each type of capture are outlined below.

### Data, observation, and recording supplies

- Capture/handling forms (*i.e.*, Level A, Human Interaction, Capture form, etc.)
- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro), extra batteries
- Rangefinder
- Binoculars

### Sampling, tagging, and marking supplies

- Measuring kit (*e.g.*, tape measure, calipers, ruler)
- Tagging kit (*e.g.*, plastic flipper tags, satellite-linked tags, tagging equipment)
- Marking kit (*e.g.*, hair dye, paint stick)

### Protective clothing

- Footwear appropriate for substrate
- Protective clothing as appropriate for conditions, PFD
- Non-permeable gloves
- Eye protection
- Optional - knee pads, cotton or Kevlar gloves

### Human medical equipment

- First aid kit
- If working in a remote area and emergency services are not readily available, automated

external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.

### **Medical and sampling equipment (see example in Appendix F - Gear Checklist for field response)**

- Controlled drug kit including sedatives, reversals and euthanasia solution
  - See Appendix J – Otariid sedation worksheets for example of *Steller sea lion* and *California sea lion* sedation worksheets.
  - See Appendix K – Phocid sedation worksheet for example of *gray seal* and *Hawaiian monk seal* sedation worksheets.
- Crash kit (e.g., dopram, atropine, epinephrine)
- Medical kit (e.g., injectable antibiotics, pain medications, IV fluids)
- Disentanglement instruments (e.g., hemostats)
- Oxygen and Airway kit
- Field anesthesia machine
- Monitoring equipment (e.g., temperature, heart rate, PO<sub>2</sub> monitor)
- Wound care kit
- Blood collection
- Ballistics or trained personnel with ballistics (if you cannot euthanize with drugs); ensure local firearm laws are followed.

**Cutting tools (right)** - There are a variety of different cutting tools (e.g., knives, scissors, diagonal pliers, wire cutters, etc.) that can be used to cut entangling material. Always cut away from the body and always peel the entanglement off of the neck. NEVER pull the entanglement as it could cause further injury.



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### **Cleaning/disinfecting supplies**

- Antibacterial soap/hand sanitizer
- Disinfectant
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s) to separate gear and clothing

### **Miscellaneous supplies**

- Backpack (to carry supplies)
- Bucket (to carry supplies and/or to hold water to cool animals)

## Delivery system

**Projector (right)** - Remotely delivered drugs may be administered by a CO<sub>2</sub> dart gun (e.g., Daninject JM Standard CO<sub>2</sub> dart projector with 11 mm and 13 mm barrels or Pneu- Dart). CO<sub>2</sub> dart projectors have a smaller gauge needle than a pole syringe, can incorporate telemetry, and seems to cause less stress to the entangled animal than the pole syringe.



**Darts** - There are two dart options, transmitter and static. Transmitter darts require the use of a barbed needle while static darts do not. The type of dart and needle used will depend on the lead veterinarian's sedation preference and the darting location (e.g., public area) or species-specific response to sedation (e.g., phocids diving to the bottom). The dart system is capable of using 1.0, 3.0, 5.0, and 10.0 ml darts. The 3.0 ml is most commonly used for California sea lions (up to ~ 300.0 kg) and the 5.0 ml dart for Steller sea lions (up to ~ 800 kg). The Dan-inject tailpiece that holds the transmitter is listed to fit both the 1.0 ml and 3.0 ml darts. The Marine Mammal Center (TMMC; <http://www.marinemammalcenter.org/>) tested the tailpiece on the 5.0 ml and 10.0 ml darts and found that this configuration functions effectively as well.

**Transmitter dart specifications** - Pneu-Dart 3 ml dart with a 1.5 inch or 2 inch single or double barbed needle. A custom tailpiece holds the acoustic transmitter.



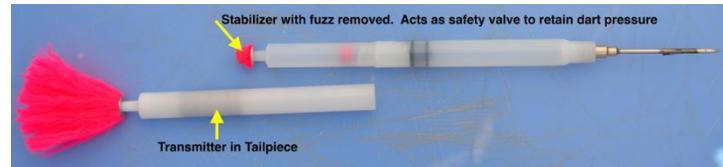
**Transmitter** - VEMCO V9-1H continuous acoustic transmitter, 9 mm diameter by 24 mm length, 3.6g weight in air, 2.2 g weight in water. Power output is 151 dB re 1uPa@1 m continuously transmits ping every 2000 mg at 69 kHz for up to 14 days.



**Static dart specifications:** S300 syringe dart 3.0 cc.

**Needles – transmitter darts** - Daninject barbed needles are used for darts that include transmitters or when it is advisable to have the dart stay in the animal as a visual aid for tracking and capture. Daninject produces barbed darts in 25.0 mm, 30.0 mm, and 40.0 mm lengths. The smallest gauge needed is always preferable. Daninject does not produce a 60.0 mm barbed dart, therefore TMMC custom fabricates a 60.0mm barbed dart from Daninject's non-barbed 60.0 mm and stainless steel wire.

**Needles – static darts (right):** Non-barbed needles in the sizes listed above are used when the dart does not need to stay in the animal. Examples of when to use static darts include:



- No transmitter is necessary and visual tracking can be done effectively without the visual cue of the dart.
- If an animal has been injected with a barbed dart and transmitter, but needs additional sedation.
- If an animal is sedated, but has entered an area where responders are unable to capture it, reversals can be administered using a static dart.

### Receiver/hydrophone (right)

Ultrasonic receivers (e.g., VEMCO VH110, HTI, Sonotronics, etc.) are designed for manual tracking of aquatic animals from small boats. The directional hydrophone is hydro-dynamically shaped so



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that it can easily move through water while receiving acoustic signals.

- The hydrophone itself is mounted on a custom fabricated, extendable pole. For most small boat applications, a 15-foot cable is preferable to the 30-foot cable provided with the system.
- The Vemco V9 acoustic transmitter is used in several frequencies. This allows responders to track several signals concurrently. This is very convenient if a transmitter ends up on the bottom of the ocean and is still transmitting.
- The Daninjekt USA transmitter tailpiece for the V9 transmitter has been the most effective. The tailpiece has to be modified to accept the transmitter by using a 5/8" drill bit to increase the diameter of the tailpiece to accommodate the transmitter. With some batches of the tailpieces, it is also possible to bore a 5/64" hole into the end of the tailpiece to allow the use of a push rod to release the transmitter from the tailpiece. The tailpiece should be colored black (e.g., with a permanent pen) so it is less obvious to the animal once it is darted.
- TMMC has found that double “capping” the dart is necessary to have close to 100% deployment of the sedative. Without this modification failure rates can be as high as 25% - 50% because the inner valve would allow premature depressurization of the dart (TMMC, personal communication).



## Tracking

### **Acoustic transmitter and hydrophone**

- Transmitter darts are the main method of location and tracking sedated animals when this method is used.
- A sonic fish fisher, live stream underwater camera, and an avalanche pole also may be used to help locate sedated animals below the surface.

## **Visual**

- Human observers with binoculars
- UAS

## Capture retrieval tools

Nets and hooks are used to retrieve sedated animals. Nets may also be used for the capture of alert, isolated animals. Additional retrieval options may be added including a noose pole. Current examples of handheld retrieval devices include:

**Hoop net (right)** - (schedule 40,  $\frac{3}{4}$ " or 1", PVC): 30" – 36" diameter hoop with five-foot integral handle. The woven 7/8" net is preferable as it is lighter, easier to handle, and does not seem to abrade the patient's cornea as severely as a knotted net.



**Landing net (below)** - foldable net with telescoping handle.



**Rescue "Shepherd's" hook (right)** – Can be used with or without a telescoping pole.



**Capture pole (below; see Appendix M – Capture Pole- for information about how to construct).**

**Seine net (not pictured)** - Used specifically for gray seal captures on the east coast – An approximately 91 m by 6 m seine net (12.7 cm square twisted-twine mesh with float line and lead core line) properly packed into the deployment bin, with the buoy and sea anchor.



## Vessels

A variety of vessels have been used for remote sedation. The key to a successful in-water capture is using a capture vessel that has a low gunwale so responders can easily hold the animal alongside the vessel. Propeller guards are very helpful.

**Soft-bottom inflatable with center console** - This is an effective boat for darting, especially around jetties and other hard terrain. The low gunwale allows for safer and more effective handling of the animal. The center console puts the operator in a much better position to visualize the environment and the animal than a vessel with a tiller (crew of up to six).

**Rigid-hulled inflatable Buoyancy (RHIB)** - A RHIB is a lightweight but high-performance and high-capacity boat constructed with a rigid hull bottom joined to side-forming air tubes that are inflated with air to a high pressure so as to give the sides resilient rigidity along the boat's topsides. The inflated collar acts as a life jacket, ensuring that the vessel retains its buoyancy, even if the boat is taking on water. The RHIB is used as a support and safety platform. Its larger size allows for many functions, but it does not maneuver well in tight quarters. This vessel (holds crew up to ten) is a good platform for the IC, UAS operators, SO, etc.).

**Specially designed 6.7 m aluminum capture boat (right)** - The Alaska Department of Fish and Game (ADF&G) has a capture boat specially designed for Steller sea lion captures. This vessel works well in larger seas, has a specially designed tower to enable responders to gain height for viewing sea lions in the water, has a detachable gunwale, and can hold a crew of up to six comfortably.



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**SAFE boat** – SAFE boats have a self-bailing deck, aluminum hull, and a full-sized 100% foam collar system. The SAFE boat is commonly used as the support and safety platform during a capture. ADF&G uses a 6.7 m SAFE boat during captures (crew of up to five).

**Kayaks** - When working in tight, protected areas, kayaks can be used to see in blind spots (*e.g.*, opposite side of jetty from entangled animal), assist with crowd control, and aid in visual tracking in areas that are difficult to access with the larger vessels. Tandem kayaks (hold up to two persons) work best, as one person can have their hands free for radio communications, etc.).

## 6.7. Data collection

Supply checklists and data needs are well thought out prior to the start of any entanglement response program and data forms and instructions are available during a response. Important forms to have accessible include: applicable permits; Level A and Human Interaction Forms (*e.g.*, Appendix B – Level A and Human Interaction Form); gear checklists (*e.g.*, Appendix F - Gear Checklist); disentanglement forms (*e.g.*, Appendix G – Disentanglement form); remote sedation worksheets (*e.g.*, Appendix H - Remote Sedation Worksheet); drug interaction form (*e.g.*, Appendix I – Drug interaction Form); and otariid sedation (*e.g.*, Appendix J – Otariid sedation worksheets) or Phocid sedation (*e.g.*, Appendix K – Phocid sedation worksheet) worksheets. All entangling gear should be retained (if possible), documented on the Level A and Human Interaction Forms, and stored in a centralized location or sent to a NMFS gear repository.

## 6.8. Risks and Mitigation

To minimize the risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a decision matrix or Go/No Go criteria should be established to guide responders in making safe decisions regarding the response to entangled pinnipeds. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough de-brief that is recorded in the entanglement response report and come up with lessons learned that can be applied to the next response. When responding to entangled pinnipeds, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

Additional possible risks and mitigation measures are listed below.

- All remote sedation and in-water disentanglement capture attempts must be approved by the RSC and the PI, on a case-by-case basis, prior to attempting the capture.
- Approved remote sedation capture protocol documents, including a list of drug combinations and a list of trained personnel that must include a veterinarian/veterinary technician, should be on file with the RSC and PI prior to any remote capture attempt. Updated lists of trained personnel should be provided annually to the RSC and PI.

- Situation specific documentation (including general location, specific location including if working off of a specific haul-out, dock, or within a harbor, proposed date and time for remote sedation capture attempt, maximum number of possibly entangled animals including size and species in the area, approach method to be used [by land or boat], number of boats [if used], number of personnel, and a specific personnel list) for remote sedation and in-water disentanglement capture attempts must be provided to the RSC for approval 24 hours prior to the capture or in the case of a real-time emergency situation verbal or text authorization must be obtained from the RSC prior to capture.
- After each remote sedation and in-water disentanglement capture attempt in which sedation is used, an entanglement response written report should be filed with the RSC and PI within 72 hours of the capture attempt when feasible and within two to four weeks if the response was conducted remotely in the field. This written report must include a detailed description of the effects of the drug combination on the pinniped including dose administered, time to effect, duration of effect, reversal agent if used and dosage, time to recovery, and any negative impacts of the drug combination including emergency support procedures needed (see example in Appendix G – Disentanglement form).
- For all procedures and samples, follow all animal handling and collection procedures as outlined in the existing Institutional Animal Care and Use Committee [IACUC] and only take additional samples if appropriate for animal condition and behavior.
- All remote sedation activities performed on phocids must have a seine net available for deployment in case the seal sinks while under sedation.

## RISKS TO HUMANS

### ***Risk: Human exposure to drugs by injection, absorption, or ingestion***

The doses of immobilization and sedative drugs required to achieve an adequate response in large pinnipeds are all potentially lethal if accidentally injected into a human. Therefore, drug safety procedures must be carefully followed at all times.

### ***Mitigation:***

- Prior to using a particular chemical immobilizer or tranquilizer, it is each project leader's responsibility to determine and document that all personnel are familiar with the human safety aspects of the drug. These instructions shall include knowledge of the symptoms following accidental injection; emergency treatment procedures, including cardiopulmonary resuscitation (CPR); and name, location, and dosage of a reversal agent (if any). Written instruction should be close by and easily accessible at all times during a response.
- PPE: Basic safety precautions must be taken by all personnel to prevent exposure to drugs. These include wearing gloves when handling drugs/darts/wounds with drugs that can be absorbed across intact skin. Additional safety measures are required to prevent drug exposure across mucous membranes (eyes, mouth) when filing, charging or disassembling darts. Equipment should include at least one of the following in addition to gloves: safety goggles, splash guard mask, splash box or safety screen.
- OSHA Universal Standards for handling sharps are used  
<https://www.osha.gov/SLTC/etools/hospital/hazards/sharps/sharps.html>.
- Marine radios and cell phones ensure that emergency rescue personnel can be alerted should a team member be exposed to a drug. Local EMS should be notified prior to operations and

informed of drug types and concentration, work locations, number of personnel, and safety equipment on board.

- All response staff are CPR certified.
- Reversal drugs are kept readily available.

**Risk:** *Human exposure through subsistence uses*

***Mitigation:***

- Inform Alaska Native or other indigenous communities in the region that a pinniped entanglement response may occur in their area.
- On the flipper tag, use a permanent marker to write “***Do not eat if harvested before xxx date***”, which is past the withdrawal time of 45 days.
- Provide identifying details (tag number, dye-mark number, etc.) about chemically immobilized sea lions or phocids in the area.
- Provide a “safe to consume” date to Alaska Native organizations.

**Risk:** *Injury or death to personnel by drowning, falling or stepping on hazards*

***Mitigation:***

- Appropriate personnel should investigate and decide if location is safe.
- Wear appropriate PPE such as strong, non-slip footwear, gloves, PFDs, and helmets as necessary.
- Designated SO should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated SO should be watching for and warning the team of hazards.

**Risk:** *Injury to personnel during capture*

***Mitigation:***

- Appropriate PPE (e.g., helmets around poles, gloves, etc.).
- Net and pole handlers should be trained in techniques that minimize injury to themselves and others during in-water capture.
- All nets and poles should be inspected for hazards prior to use.

**Risk:** *Injury to personnel from pinniped bite or scratch*

***Mitigation:***

- Personnel should wear appropriate PPE such as strong, non-slip footwear, gloves, and protective clothing as necessary.

- All personnel should be alerted immediately prior to a procedure that may elicit a response from the entangled animal.
- Personnel should be trained in proper restraint techniques to minimize bite risk.

## RISKS TO ANIMALS

**Risk:** *Injury to animal after sedation by rolling into water, being trampled, or being injured by another pinniped*

***Mitigation:***

- Use a risk assessment tool or decision matrix to assess the capture location from many angles and only attempt capture once the scene is assessed to be safe.
- Ensure there is a plan to safely haze nearby animals away from the sedated animal.

**Risk:** *Injury to animal from capture equipment*

***Mitigation:***

- Personnel should be trained in techniques that minimize injury to the animal.
- Use an adequate number of net handlers to increase safety.
- Conduct a proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Evaluate medical care capacity (*i.e.*, emergency resuscitation, rehabilitation, euthanasia) prior to capture.

**Risk:** *Injury to animal from nearby objects*

***Mitigation:***

- Hazards in the area should be identified and removed or mitigated by experienced personnel.
- Conduct a proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Evaluate medical care capacity (*i.e.*, emergency resuscitation, rehabilitation, euthanasia) prior to capture.

**Risk:** *Unintentional capture or disturbance of non-entangled protected species*

***Mitigation:***

- Evaluate the possibility of unintentional take of non-entangled animals before and during capture.

- Complete appropriate “take” (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation.
- Always consider efforts to minimize disturbance to non-entangled animals.
- The safety officer(s) should continuously watch for the presence of non-entangled animals in and around the capture area throughout the capture, and communicate with the team appropriately.
- If animals are flushed into the water and haul-out later, a maximum of two attempts per day at the same haul-out should be performed. Animals hauled out toward the margins of the group will be preferred over those in the middle of the group, with the hope of disturbing fewer animals and to take advantage of increased visibility.
- In addition to limiting the number of attempts on a single haul-out, a monitoring plan should be instituted during operations as follows:
  - Prior: Just prior to each operation and between operations, a survey of the haul-out should be conducted. Surveys are conducted to determine where animals are hauling out, how many animals and how many entangled animals are observed on the haul-out, where entangled animals are in relation to the rest of the animals, the nature of the entanglements, the body condition and size of potential entangled animals, and to assess risk to animals and personnel.
  - During: Once the dart is administered, several monitors positioned on each vessel should observe the movements of the entangled animal. If the animal enters the water, monitors should note its location. If the seine net is used, the monitors should observe the entangled animal and the net for any other non-entangled animals. Non-entangled animals should be allowed to swim away from the entangled animal (presumably the entangled animal will be slowed down) before deploying the net. The support vessel should release non-entangled animals from the net as quickly as possible.
  - After: Once the animal has been disentangled, tagged, marked, reversed and released, it should be monitored from a distance at first from the beach haul-out and then from a vessel. Prior to leaving the beach, all personnel should scout the area and remove any response debris, especially darts and, syringes, and drugs. Monitors should observe the entangled animal and other animals in the area for any signs of distress.

**Risk: Animal flees into water before sedative takes effect**

A darted entangled animal fleeing to the water before the sedatives have taken effect is a likely scenario with these species and under these circumstances.

***Mitigation:***

- Dart when the animal is high on the beach, farther from the water (typically at low tide) to ensure maximum distance between animal and water.
- Get as close to the entangled animal as possible and use the lowest possible pressure so there is less of a startle response.
- If possible, wait until the animal has been asleep or calm for at least 30 minutes – the less active the animal, the better chance it will stay on land.
- All personnel should continuously observe the animal and consider transmitter darts to better track the animal.

- Re-calculated dosage charts for crash drugs and keep reversal nearby for rapid dosing.

**Risk:** *Animal develops an adverse emergency reaction to sedatives*

**Mitigation:**

- Reversal agents, and if needed, crash drugs and fluids should be administered per the direction of the veterinarian.
- The decision to intubate should be based on human and animal safety, and necessity. Intubation decisions should be left to the discretion of the veterinarian.
- An Istat- hand-held blood analyzer should be available for detection of metabolic derangement during emergency situations and to facilitate proper treatment.
- Thermoregulatory methods to cool (cold water and ice) or warm (Mylar blankets, self-heating blankets, hot water bottles) the animal should be available if the animal has difficulty thermo-regulating while under sedation.

**Risk:** *Non-entangled animal is hit with a loaded dart*

- Every effort should be made to track and retrieve the animal, administer a reversal agent, and monitor the animal.
- If retrieval is not possible, an attempt to administer a reversal agent via dart should be made.

**Risk:** *Non-entangled animal sinks after being hit with a loaded dart*

**Mitigation:**

- All mitigations listed above should be utilized until the animal is located and recovered.
- All other survey or potential capture operations should cease to focus efforts on the darted animal.
- Use a seine net to retrieve the animal from the bottom and reverse at the surface.

**Risk:** *Animal fatality*

**Mitigation:**

- During restraint and/or sedation for entanglement response, the animal should be constantly monitored for changes in breathing or other signs of distress or complications. Respiratory rate, at a minimum, should be recorded every 5-10 minutes and trends should be tracked and managed appropriately
- Every effort should be made to recover the carcass for necropsy.
- External documentation should be performed immediately upon carcass recovery.
- The Regional Stranding Coordinator and permit's Principle Investigator should be notified, a full necropsy should be performed as soon as possible, and a final report sent to NOAA.
- Entanglement response activities should immediately cease until necropsy is completed and new mitigation measures are approved by NMFS.

## Additional risks for phocids

### **Risk: Animal sinks after sedative has taken affect**

This presents the highest level of danger for phocids during these operations. Timely retrieval of these animals is essential.

#### ***Mitigation (these are suggestions and may not apply to every situation):***

- *Modify* drug dose or combination.
- Attempt early approaches. Use seine net earlier in process if conditions allow.
- Use additional tracking and retrieval equipment (e.g., shepherd crook and underwater pole camera with live feed to locate the animal).
- Seine (or other appropriate) nets should be available when darting phocids so bottom retrieval can be possible, if a seine (or other appropriate) net is not available, then remote sedation of phocids will not be approved.
- Modifications to the seine net set up, and protocol such as adding additional floats and lead line to enlarge the net (situation dependent).
- Use of a fish finder or transmitter darts to locate animals that have sunk.
- Limitations on locations that animals should be darted (e.g., not in areas more than ~4.5 m deep and/or with strong current).

## **6.9. Intervention Criteria/Decision Matrix (Go/No Go)**

The Go/No Go Decision Matrix (see Figure 6-1 for an otariid example and Figure 6-2 for a phocid example) is a flow chart based on permit requirements. This flow chart enables responders to think through the current response scenario to determine if the response is feasible based on a risk assessment.

## Otariids

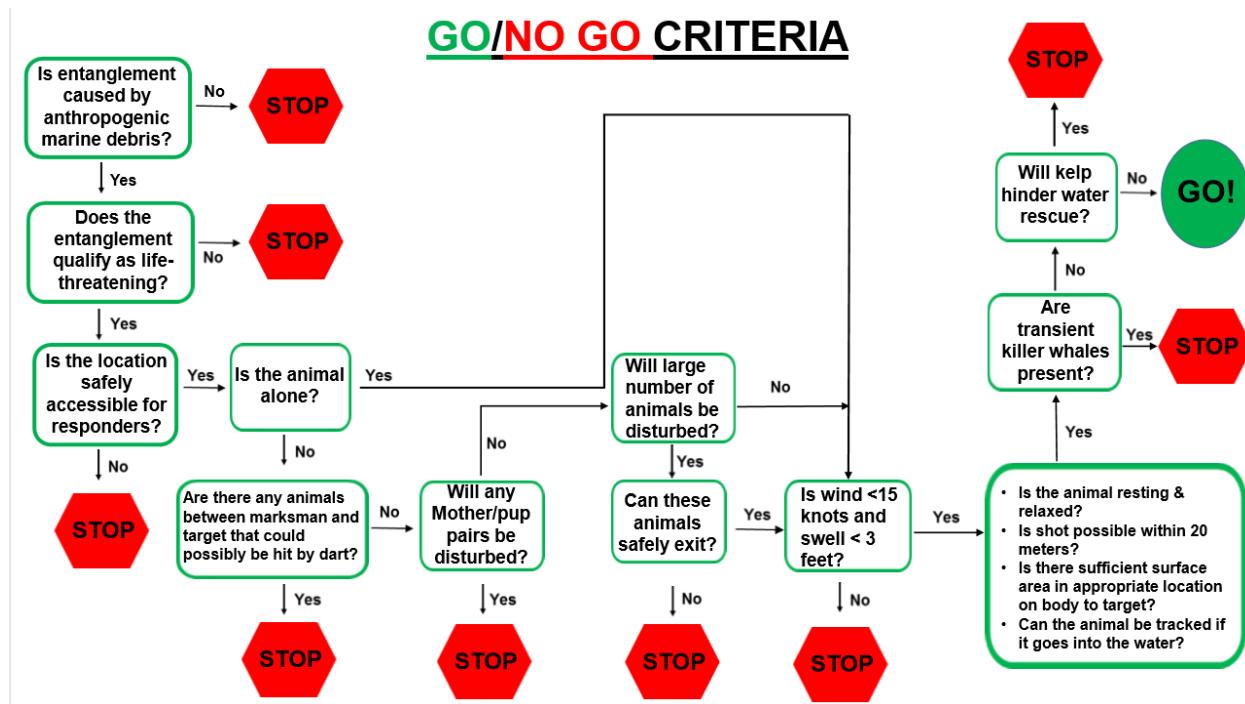


Figure 6-2. Example of a Go/No Go decision matrix used for remote sedation of entangled otariids.

## Phocids

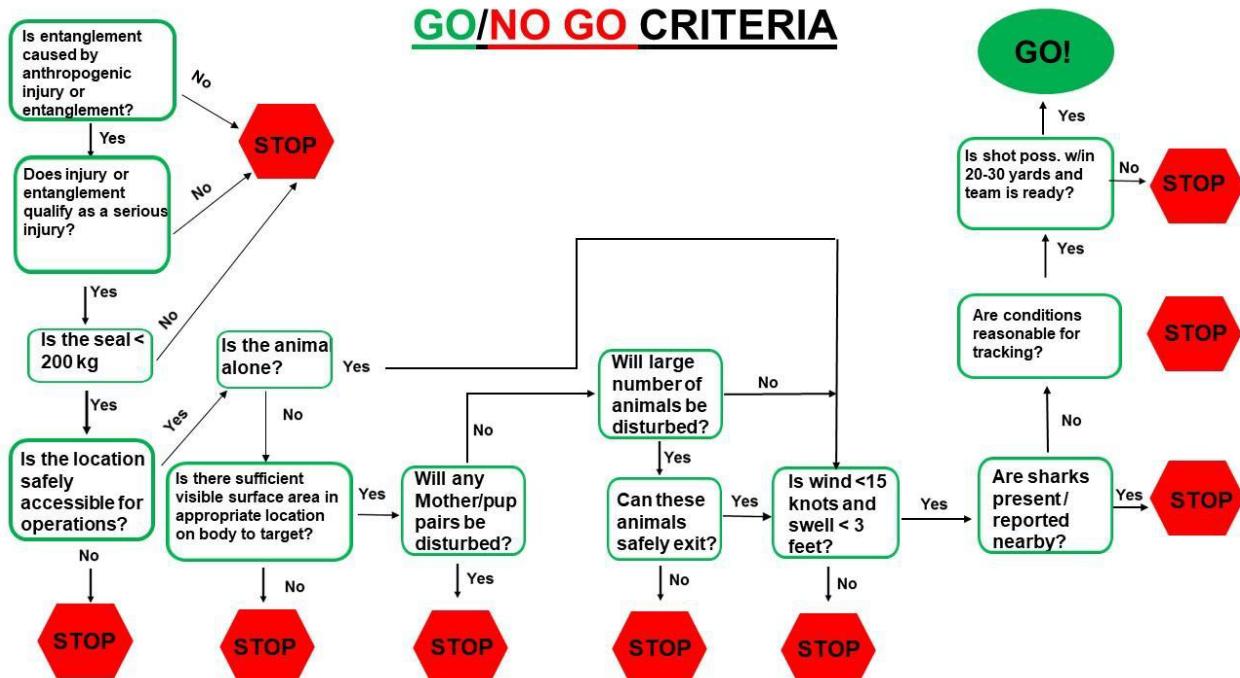


Figure 6-3. Example of a Go/No Go decision matrix used for remote sedation of phocids.

## 6.10. Procedure

### Optimal capture situation

- Animal is in a location without any hazards
- Solitary
- Sleeping – there is a chance the animal may stay onshore
- Away from the water's edge – reduces chance that the animal will flee into the water

### Otariids

#### Steller sea lion and California remote sedation procedure

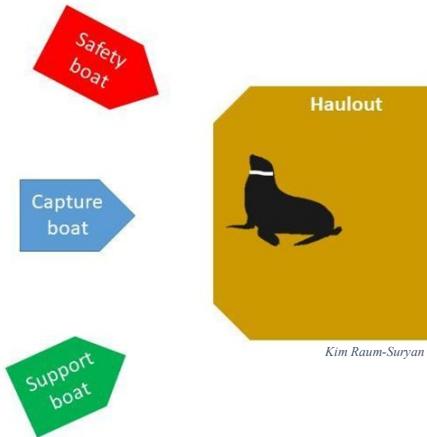
A minimum of six personnel are required for an otariid remote sedation entanglement response. Two personnel (marksman and spotter) can be dropped off on shore, two personnel (boat driver and handler) remain in the capture skiff, and two personnel (boat driver and monitor) remain in the safety boat. A maximum of nine personnel can be involved in the operation if a third boat is available.

**Identify candidate animal:** The entangled animal will be identified, and its position, size, age and sex (if possible to determine), and placement among other animals will be noted.

1. **Risk Assessment Tool or Go/No Go Determination:** Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices. Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed and ensure there is a safe egress area for non-target animals.
2. **Secure the area:** If necessary, onlookers will be notified and asked to clear the area.
3. **Assign team roles and review plan:** Before handling any animal, be sure everything is ready. Double check all the equipment and supplies. Identify the IC for the capture, review the capture scenario and all procedures, any emergency response, and the sequence of the activities. Discuss when a handling should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the capture, and confirm the team members fully understand, are capable, and are mentally prepared. Review the animal warning signs to monitor and the appropriate emergency response actions. The IC will ensure that all personnel and equipment are ready and determine the final Go/No Go.



4. **Modify protective clothing and personal effects to minimize getting caught in net during handling events:** Remove rings from fingers or wear gloves, tie hair back, check clothing for buttons and modify as appropriate to reduce entanglement/tripping risks.
5. **Documentation:** The photographer/videographer will ensure all photo and video equipment is operational and recording.
6. **Time limits:** Record the time of day, total capture and restraint time (from when the animal is first touched until it is released).
7. **Weight estimate:** To prevent bias, each team member estimates the weight and establishes a median. The veterinarian has the discretion to modify the weight estimation if necessary.
8. **Positioning:** There are at least two boats used during remote sedation, but three are preferable. One boat is the primary darting/capture boat, the second boat is the safety boat, and the third boat is a support boat to help monitor the animal should it flee into the water.



9. **Sedatives and reversal drugs:** The veterinarian/veterinary technician will select the appropriate drug combination and dosage based on the animal's estimated weight (see Appendix L for example of weight/dose card). Darts and or syringes pre-loaded with appropriate reversals will be kept readily available should an emergency situation occur in which reversal would increase the likelihood of the survival of the animal or should a non-target animal be hit with a dart.
  - Human and animal reversals are drawn into syringes before the sedative dart is fired.
  - Euthanasia solutions should be kept nearby in case there is a need for euthanasia.
10. **Procedure to minimize disturbance:**
  - Entanglement response should not be attempted in locations within breeding rookeries that

are likely to disturb mother/pup pairs.

## 11. Approach:

- **Distance** - Using a rangefinder, the spotter calls out the distance from the target so that the marksman can select the ideal distance and correctly set the projector pressure.
- **Land shot** - If darting from shore, only the marksman and spotter should go ashore. They will stalk carefully, go slow, wear camouflage gear and use natural cover, remain quiet, and approach from downwind. With skill and patience, the marksman and spotter can get within feet of the entangled animal.
- **Water shot** – If darting from the boat, ensure all personnel on the vessel are quiet, and stay low in the boat. Spend time driving the boat parallel to shore getting closer each time so that the animals become accustomed to the boat. Use a rangefinder to determine distance to the entangled animal. Try to determine where the animal might go once hit by the dart. Wait until the animal is quiet and asleep to maximize the possibility that the animal will stay on shore and not jump in the water.

## 12. Darting:

- **Wind** - Wind can have a significant effect on the success of darting. With appropriate projector pressure, darting with less than 15 knot head- and cross- winds is successful. Tail winds are to be avoided as they significantly alter the accuracy and precision of the shot.
- **Currents** – Currents can present an additional challenge when darting from a boat. Make practice approaches prior to taking the actual shot to determine the best angle of attack, speed, etc. to allow the marksman a reasonable chance of success.
- **Dart preparation** - Use a dart with a drug plunger that moves smoothly and easily to ensure all sedative is released upon impact. Add a drop of lubricant if needed. To ensure maximum safety, the projector should not be pressurized until the marksman is ready to take the shot. If pressurized too soon, there is a chance that the projector could lose pressure.
- **Angle of shot** – The angle of the shot is important to take into consideration. The only way to know how the dart will react to an upward or downward angle is to practice and record the shot (*i.e.*, if shooting upward from 10 meters away, determine where you should aim to make the correct shot).
- **Taking the shot** – Ensure the marksman is within 20 m of the target animal. It is best to get as close as possible to minimize the pressure of the dart, thus minimizing the startle response of the animal. If other animals are in the vicinity, there is a greater chance that the target animal will remain on shore. The marksman warns the team “darting” and fires the projector. Aim for the shoulder or flank. Do not aim at the head, thorax, or abdomen.



13. **Surveillance:** At full dose, it may take from approximately five to 25 minutes for an animal to become fully sedated. If the full dose was not injected, the veterinarian has the discretion to give an additional dose via dart or hand injection.

- **Land** – As soon as the animal is darted, have all personnel keep their eyes on the target animal. Vessels should remain a good distance away (50 - 100 m or more), ensuring the boat's presence does not cause the animal to jump in the water, but close enough that personnel with binoculars can keep eyes on the animal. Continue monitoring the animal until it has been asleep for a couple of minutes and the veterinarian informs personnel that it is safe to approach the animal.
- **Water** – Keep an eye on the animal prior to and after darting. If the animal flees into the water, use the “man overboard” method of always having someone with eyes on the animal and pointing to the location it was last observed prior to submerging. It is ideal to have three vessels spread out, one at either end of the haul-out and one in the middle, to have the best chance of observing the animal as it comes up to the surface. The animal is immediately assessed for any signs of respiratory or circulatory distress and if found treated accordingly. The respiration rate, heart rate, and body temperature should be continually monitored.



#### 14. Retrieval:



**Steller sea lion:** Once a darted Steller sea lion starts to slow down and swim in a smaller area, the boat approaches closer to the animal. The sea lion may come up to breathe, then slowly sink, blowing bubbles, he may lunge out of the water to take a breath, then slowly go underwater, or he may just swim slowly around in a small area, rolling his head to the side to get a breath. Once the sea lion shows one of these behaviors, the capture boat approaches. Two different members of the team have a capture noose-pole ready to noose the animal (see example in Appendix M – Capture Pole). The responder nooses the sea lion, brings the sea lion alongside the boat, with the head toward the bow and the tail toward the stern. While the first responder holds the head out of the water, the second responder uses a rope to loop around the foreflipper at the surface of the water to help hold the middle of the animal in a horizontal position. A third responder can help hold the animal's rear flippers. Once the animal is secured alongside the boat, it is helpful for the boat operator to put the boat in gear and travel slowly forward. The forward momentum helps keep the animal horizontal in the water, which is safer

get a breath. Once the sea lion shows one of these behaviors, the capture boat approaches. Two different members of the team have a capture noose-pole ready to noose the animal (see example in Appendix M – Capture Pole). The responder nooses the sea lion, brings the sea lion alongside the boat, with the head toward the bow and the tail toward the stern. While the first responder holds the head out of the water, the second responder uses a rope to loop around the foreflipper at the surface of the water to help hold the middle of the animal in a horizontal position. A third responder can help hold the animal's rear flippers. Once the animal is secured alongside the boat, it is helpful for the boat operator to put the boat in gear and travel slowly forward. The forward momentum helps keep the animal horizontal in the water, which is safer

for the animal and the responders holding up the animal.

**California sea lion:** Hoop nets are commonly used to contain the animal. If necessary, the hoop nets have a quick release system that allow the responder to detach the hoop from the net and stow the hoop. If the animal is small enough, it is placed in the bow of the boat and crowding/herding boards are used to protect responders from bites. Moving the animal into the boat allows the veterinarian team to better monitor the animal and improves boat handling because the animal is not in the water while underway. When it is necessary to leave the animal in the water while underway, responders ensure that the animal's airway is protected, that the veterinarian team has visual access to the patient, and that all team members are wearing appropriate PPE.

15. **Monitoring and assessment:** If adequately sedated, the animal is immediately assessed visually for any signs of respiratory or circulatory distress and if found treated accordingly. The respiration rate, and if on land, body temperature (rectal thermometer), are continually monitored and the animal is given intranasal oxygen (2-5 L/min) while other procedures occur. If a static dart was used and has not fallen out, it is removed and placed in a hard-shell case. If a transmitter dart was used, the dart body is removed from the needle to prevent further tissue damage.



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16. **Data collection:** Morphometrics, sex, and samples should be taken and all data recorded completely.

17. **Disentanglement:** Using an appropriate cutting tool (e.g., knife, scissors, wire cutters, etc.), the entangling material should be cut away from the animal and handler and removed by peeling the entangling material out of the wound rather than dragging it out from one side to minimize pain and prevent further injury. Double check to ensure all entangling material has been removed (some



animals have been observed with two plastic packing bands). All entangling gear should be retained (if possible), documented under [Level A and Human Interaction Forms](#) (Appendix B – Level A and Human Interaction Form), and archived or sent to a NMFS gear repository.

18. **Wound care:** The wound is investigated to assess the extent of tissue damage and to ensure that all foreign material has been removed. The wound (if any) may be cleaned with antiseptic and treated topically, though this should be balanced with animal handling time and stress. Many entanglement wounds are open and will be easily flushed with seawater, making wound care less critical. However if needed, responders can conduct wound debridement or administer antibiotics. A broad-spectrum, long-acting antibiotic can be used to treat injuries, but the choice to administer this (or other drugs) is at veterinary discretion. Dilute povidone-iodine may be used to flush deep wounds or areas that are not likely to be easily flushed on their own. Euthanasia solutions should be kept nearby in case there is a need for euthanasia. In the case of a severe wound and if the animal is small enough to transport to a rehabilitation center, surgery may be considered.
19. **Antibiotics and fluids:** At the discretion of the veterinarian, antibiotics (e.g., oxytetracycline) or fluids may be given.
20. **Sampling:** Depending on permit approval, samples such as skin, whisker, hair, or blood may be taken.
21. **Marking and tagging:** Temporary (hair dye, paint stick) identifying marks should be applied for more visible identification. Plastic Allflex numbered tags can be attached to foreflippers to identify individuals. If in an area where pinnipeds may be used for subsistence, ensure that tags indicate the “safe to consume” date by writing “***Do not eat if harvested before xxx date***” on tags with a permanent marker. Flipper or head-mount satellite-linked tags can be attached to determine post-capture survival and movement patterns.
22. **Branding:** If permitted, a one or two digit hot brand can be applied to the left shoulder for long-term, permanent identification.



23. **Sedative reversals:** Reversal administration can occur at any time during the procedure at the

discretion of the veterinarian and dependent on the animal's condition. All equipment should be removed from the area around the animal and a clear path to the water should be available. Once reversal is administered all personnel except the veterinarian and second person (e.g., finishing sampling) should be out of sight and quietly watching so there is little or no external stimuli once the animal wakes up. If a recently wakened animal is surprised, it may rush into the water before it is ready.

24. **Post-recovery:** After recovery, the animal should be either released or if additional monitoring or rehabilitation is required, placed into a transport carrier and transported to a rehabilitation center for additional treatment. During field disentanglement the animal may be provided supplemental inhalant anesthesia and oxygen using a custom field anesthesia machine and mask. Reversals would then be given prior to release.
25. **Dart retrieval:** wearing gloves, if using a static dart, retrieve and secure inside a protective case until dart can be cleaned.
26. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.
27. **Disinfecting/disposal:** If protective reusable clothing (raingear, footwear, kneepads, cloth gloves) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including retraining nets, measuring gear (tape measures and scales), tagging supplies (tagging pliers/hole punches), specimen supplies, and other miscellaneous items (buckets, clipboards, writing implements, etc.). Dispose of used nitrile gloves in the trash. Place used needles/scalpels in a "SHARPS" container (do not recap needles).
28. **Submit reports:** Ensure all datasheets and reports are complete and submitted where appropriate. Appropriate "take" (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals also should be completed.
29. **Prepare again:** Clean and organize gear so it is ready for the next response.

## Phocids

### Gray seal remote sedation procedure

A minimum of seven personnel (maximum of eight with four on each of two vessels) are required for seine net operations. No more than 16 personnel should be involved in an operation. Other personnel (additional animal handlers etc.) should be dropped off at an appropriate beach location where the targeted animal should be brought for disentanglement.



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1. **Identify candidate animal:** The entangled animal will be identified, and its position, size, age, sex (if possible to determine), and placement among other animals will be noted.
2. **Risk assessment tool or Go/No Go determination:** Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices. Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed and ensure there is a safe egress area for non-target animals.
3. **Secure the area:** If necessary, onlookers will be notified and asked to clear the area.
4. **Assign team roles and review plan:** Before handling any animal, be sure everything is ready. Double check all the equipment and supplies. Identify the IC for the capture, review the capture scenario and all procedures, any emergency response, and the sequence of the activities. Discuss when a handling should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the capture, and confirm the team members fully understand, are capable, and are mentally prepared. Review animal warning signs to monitor and the appropriate emergency response actions. The IC will ensure all personnel and equipment are ready and perform the final Go/No Go determination.
5. **Modify protective clothing and personal effects to minimize getting caught in net during handling events:** Remove rings from fingers or wear gloves, tie hair back, check clothing for buttons and modify as appropriate to reduce entanglement/tripping risks.
6. **Documentation:** The photographer/videographer will ensure all photo and video equipment is operational and recording.
7. **Time limits:** Record the time of day, total capture and restraint time (from when the animal is

first touched until released).

8. **Drug dosages:** The veterinarian should select the appropriate drug combination and dosage and load the dart (e.g., see Appendix K – Phocid sedation worksheet). Final sedative selection is at the discretion of the veterinarian within the confines of the approved protocol, or with special permission from NOAA.
9. **Approach:** The target animal should be approached either from land, or from a vessel in front of the haul-out. If by vessel, it should be positioned close to the haul-out, taking care to not flush the animals.
  - **Distance** - Using a range finder, the spotter calls out the distance from the target so that the marksman can select the ideal distance and correctly set the projector pressure. A distance of 20 meters is ideal for an accurate shot, a shot should not be attempted if more than 30 meters from the animal.
  - **Land shot** - If darting from shore, only the marksman and spotter should go ashore. They will stalk carefully, go slow, wear camouflage gear and use natural cover, remain quiet, and approach from downwind. With skill and patience, marksman and spotter can get within feet of the entangled animal.
  - **Water shot** – If darting from the boat, ensure all personnel on the vessel are quiet, and stay low in the boat. Spend time driving the boat parallel to shore getting closer each time so that the animals become accustomed to the boat. Try to determine where the animal might go once hit by the dart.
10. **Practice trials:** Vessels transit away from haulout and practice seine net capture procedure.
11. **Positioning:** Boat #1 positions ~ two boat length from the animal at a 90° angle to the animal.
12. **Darting:**
  - **Wind** - Wind can have a significant effect on the success of darting. With appropriate projector pressure, darting with less than 15 knot head- and cross- winds is successful. Tail winds are to be avoided as they significantly alter the accuracy and precision of the shot.
  - **Currents** – Currents can present an additional challenge when darting from a boat. Make practice approaches prior to taking the actual shot to determine the best angle of attack, speed, etc. to allow the marksman a reasonable chance of success.
  - **Dart preparation** - Use a dart with a drug plunger that moves smoothly and easily to ensure all sedative is released upon impact. Add a drop of lubricant if needed. To ensure maximum safety, the projector should not be pressurized until the marksman is ready to take the shot. If pressurized too soon, there is a chance that the projector could lose pressure.
  - **Angle of shot** – The angle of the shot is important to take into consideration. The only way to know how the dart will react to an upward or downward angle is to practice and record the shot (*i.e.*, if shooting upward from 10 m away, determine where you should aim to make the correct shot).

- **Taking the shot** – Ensure the marksman is within 20 m of the target animal. It is best to get as close as possible to minimize the pressure of the dart, thus minimizing the startle response of the animal. If other animals are in the vicinity, there is a greater chance that the target animal will remain on shore. The marksman warns the team “darting” and fires the projector. Aim for the shoulder or flank. Stay away from the head, thorax or abdomen.

### 13. Surveillance

- **Land** – As soon as the animal is darted, have all personnel keep their eyes on the target animal. Vessels should remain a good distance away (50 - 100 m or more), ensuring the boat’s presence does not cause the animal to jump in the water, but close enough that personnel with binoculars can keep eyes on the animal. Continue monitoring the animal until it has been asleep for a couple of minutes and the veterinarian informs personnel that it is safe to approach the animal.
- **Water** – Keep an eye on the animal prior to and after darting. If the animal goes into the water, use the “man overboard” method of always having someone with eyes on the animal and pointing to the location it was last observed prior to going under water. It is ideal to have three vessels spread out, one at either end of the haul-out and one in the middle, to have the best chance of watching for the animal as it comes up to the surface. The animal is immediately assessed for any signs of respiratory or circulatory distress and if found treated accordingly. The respiration rate, heart rate, and body temperature should be continually monitored.

### 14. Retrieval:

- **At surface:** A sedated seal at the surface is retrieved using one or two hoop nets and/or a shepherd crook. Evasive seals at the surface may be captured using a seine net if conditions are appropriate for its use.
- **Below surface:** A sedated seal below the surface is located with the transmitter dart if used. In addition, a fish finder, live-feed underwater camera and avalanche poles may be utilized. Animals should be retrieved from the bottom using either a long-poled hoop net or lifeguard rescue hook. If conditions are appropriate and it is deemed useful, a seine net may be employed as well.

### 15. Net deployment (if necessary):

- Once in proper position to the target animal, the boat operator should then instruct the Netter to start deploying the net. The Netter then tosses the sea anchor and buoy over the stern and then quickly pays out the net, being cautious not to get tangled up in the net. As the net starts deploying, the boat operator swiftly drives the boat in a large arc around the target animal maintaining the same approximate distance from the animal throughout the encircling process. All other team members should be positioned toward the middle of the bow of the boat, seated on the deck so as not to obstruct Netter or Boat Operator.
- Once the Netter has deployed all of the net and the circle is completed, one designated team member on the primary boat uses a boat hook to retrieve the buoy and hands it to the netter to close the gap between the two ends of the net. The boat operator then sets two anchors on the opposite side of where the net is deployed to stabilize the vessel and prevent it from getting pulled into the net.
- During the encirclement, the secondary boat should be positioned at what should be

approximately the six o'clock position once the net is fully deployed. The role of the secondary boat is to monitor/spot animals in the net, check the net for animals entangled in it, and disentangle and release any non-targeted animals. Should the target animal become entangled and the support boat is closest, they should reel in the net to bring the animal close to the boat and keep its head above water. Depending on circumstances and size of the animal, they should either: disentangle from the side of the secondary boat, transfer to the primary boat for disentanglement, or ferry the animal to a nearby shore for disentanglement.

16. **Post retrieval:** Once retrieved, the animal should be brought onto the capture vessel or assessed whether it can be held along-side the vessel and brought to a nearby beach or sand-bar.
17. **Monitoring and assessment:** If adequately sedated, the animal is immediately assessed visually for any signs of respiratory or circulatory distress and if found treated accordingly. The respiration rate, heart rate (stethoscope), and body temperature (rectal thermometer) are continually monitored. If a transmitter dart was used, the dart body is removed from the needle to prevent further tissue damage.
18. **Data collection:** Morphometrics, sex, samples, and documenting photos should be taken and all data recorded completely.
19. **Disentanglement:** Using an appropriate cutting tool (e.g., knife, scissors, wire cutters, etc.), the entangling material should be cut away from the animal and handler and removed by peeling the entangling material out of the wound rather than dragging it out from one side to minimize pain and prevent further injury. Double check to ensure all entangling material has been removed. All entangling gear should be retained (if possible), documented under [Level A and Human Interaction Forms](#) (Appendix B – Level A and Human Interaction Form), and archived or sent to a NMFS gear repository.
20. **Wound care:** The wound (if any) should be cleaned with antiseptic and treated topically. If needed, the veterinarian may conduct wound debridement.
21. **Antibiotics and fluids:** At the discretion of the veterinarian, antibiotics and/or fluids and pain medications may be given.
22. **Marking and tagging:** A flipper tag and paint stick (for applicable species) should be applied. If available, a satellite-linked tag should be attached. Hair dye may also be used for more visible and longer-term identification.
23. **Sedative reversals:** Reversal administration dependent on the animal's condition. If indicated

sedation reversals should be given at the prescribed dosage (see Appendix K – Phocid sedation worksheet). Darts and or syringes pre-loaded with appropriate reversals should be kept readily available should an emergency situation occur in which reversal would increase the likelihood of the survival of the animal or should a non-target animal be hit with a dart.

24. **Post-recovery:** After recovery, the animal should either be released or if additional monitoring or rehabilitation is required it should be transported to a rehabilitation facility.
25. **Dart retrieval:** wearing gloves, if using a static dart, retrieve and secure inside a protective case until dart can be cleaned.
26. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.
27. **Disinfecting/disposal:** If protective reusable clothing (raingear, footwear, kneepads, cloth gloves) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including retraining nets, measuring gear (tape measures and scales), tagging supplies (tagging pliers/hole punches), specimen supplies (specimen cooler, ice packs), and other miscellaneous items (buckets, clipboards, writing implements, etc.). Dispose of used nitrile gloves in the trash. Place used needles/scalpels in a “SHARPS” container (do not recap needles).
28. **Submit reports:** Ensure all datasheets and report are complete and submitted where appropriate. Appropriate “take” (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals also should be completed.
29. **Prepare again:** Clean and organize gear so it is ready for the next response.

## 7. Gaps and Future Research Needs

### 7.1. Training and sharing of protocols

One of the biggest gaps in the ability to respond to entangled pinnipeds is the lack of quick access to entangled animals. In many regions, lack of personnel in remote areas prevents a response to entangled individuals. Many groups are now identifying “hot spots” for entangled animals and targeting these areas at certain times of the year (twice a year or quarterly) and opportunistically disentangling the animals that are present. There also is a need to increase the number of veterinarians that are able to access controlled drugs used in remote sedation of pinnipeds as well as train more personnel in appropriate darting techniques.

Training, specifically remote sedation hands-on training and cross-training of responders should be implemented and continued to ensure responders are fully qualified and experienced to respond. If possible, annual or biennial darting and sedation classes, including the proper methods to load darts, the best sedation methods, and lessons learned would be beneficial to all responders. For groups that may not typically use in-water, vessel based capture techniques, or seine nets, these activities should also be part of regular training exercises. Responders that have developed effective protocols should share with those that are just starting out.

### 7.2. Equipment needs/tool & technique development

As techniques and protocols improve, these should be shared with network members via the MMHSRP. NOAA should encourage formal training in remote sedation and capture techniques. Better methods should be developed for floating a large pinniped alongside a boat efficiently and safely. Continued improvements in refining remote sedation drug combinations for phocids should be encouraged to find a combination that does not result in sinking.

Continued research into effective sedation protocols for different species and methods for best practice should be encouraged including collaborating with the global pinniped community.

### 7.3. Lessons learned

- Included below are lessons learned from entanglement response personnel:
- Safety should always be the top priority.
- Be prepared, PRACTICE regularly to be ready for a response, and have an experienced team that works well together.
- Establish methods for clear communication prior to a capture event. Ensure all participants understand how communications will be conducted.

- When using remote sedation, the most important shot is the one not taken. Only dart after consulting the decision matrix, ensuring there is a safety plan in place, and never let the pressure of others cause you to dart before you are ready or when the risks outweigh the benefits.
- The best response is always to stand down if conditions for animals or humans are not safe.
- Darting pinnipeds in the water increases the risk to both animal and human safety and is not recommended. Darts can bounce off of the water in random directions and increase the risk to responders.
- Always conduct a team debrief shortly after each capture to discuss what went well and where improvements could be made.
- Never stop striving to improve safety and handling protocols. Share lessons learned with other teams nationally and internationally.

## 7.4. Outreach and education

All NOAA stranding networks in the United States provide stranding hotline numbers to report entangled or injured marine mammals (see <https://www.fisheries.noaa.gov/report>). It is important to get this information out to all regions of the country so entangled pinnipeds can be documented and possibly helped. For more information about how we can all help reduce the amount of marine debris that enters the environment, see <https://marinedebris.noaa.gov/>.

NOAA and network members should continue outreach and education and work together with the public, industry, and stakeholders to mitigate the problem of entangling debris in the ocean. Those working in the pinniped entanglement field should consider becoming members of the global multi-stakeholder [Pinniped Entanglement Group \(PEG\)](#) to stay informed about the latest updates regarding pinniped entanglement response, tools, successes, innovation, deterrents, protocols, outreach, and education.

There are many opportunities to get involved with youth in the schools. NOAA has a very successful [Ocean Guardian School Program](#). An Ocean Guardian School makes a commitment to the protection and conservation of its local watersheds, the world's ocean, and special ocean areas, such as national marine sanctuaries. The school makes this commitment by proposing and then implementing a school- or community-based conservation project. Project pathways include: 1) Restoration; 2) Rethink/Refuse/Reduce/Reuse/Rot/Recycle; 3) Reducing marine debris and single-use plastics; 4) Creating schoolyard habitats or gardens using native plants and reducing water use; 5) Energy and ocean health. As part of this program, the schools produce measurable data so progress can be tracked. Entanglement response personnel should consider partnering with the Ocean Guardian School Program to expand outreach and education related to the impacts of marine debris and plastics on marine mammals.

## 8. Conclusion

There have been many advances in pinniped entanglement response in the last several years; notably, remote sedation now allows responders to safely capture and disentangle large pinnipeds that previously were inaccessible. However, our ability to disentangle animals is a small response to the much larger problem of plastics and marine debris in the oceans that threaten all marine life. It is important to collectively work together to proactively find solutions to prevent marine debris from entering our waterways. By working together on outreach and prevention, we can help to mitigate the impacts of marine debris on pinnipeds and all marine species. **Prevention is the key to solving this global problem.**

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## 10. References

Baylis, A. M., B. Page, I. Staniland, J. P. Arnould, and J. McKenzie. 2015. Taking the sting out of darting: Risks, restraint drugs and procedures for the chemical restraint of Southern Hemisphere otariids. *Marine Mammal Science* **31**:322-344. <https://doi.org/10.1111/mms.12148>

Champagne, C. D., D. S. Houser, D. P. Costa, and D. E. Crocker. 2012. The Effects of handling and anesthetic agents on the stress response and carbohydrate metabolism in Northern elephant seals. *PLoS ONE*, **7**(5), E38442. <https://doi.org/10.1371/journal.pone.0038442>

Franco-Trecu, V., M. Drago, H. Katz, E. Machín, and Y. Marín. 2017. With the noose around the neck: Marine debris entangling otariid species. *Environmental Pollution* **220**:985-989. <https://doi.org/10.1016/j.envpol.2016.11.057>

Frankfurter, G., E. DeRango, and S. Johnson. 2016. Use of acoustic transmitter-equipped remote sedation to aid in tracking and capture of entangled California sea lions (*Zalophus californianus*). *Journal of Wildlife Diseases* **52**:730-733. <https://doi.org/10.7589/2015-10-274>

Gall, S. C., and R. C. Thompson. 2015. The impact of debris on marine life. *Marine Pollution Bulletin* **92**:170-179. <https://doi.org/10.1016/j.marpolbul.2014.12.041>

Geraci, J. R., and V. J. Lounsbury. 2005. Marine mammals ashore: a field guide for strandings. National Aquarium in Baltimore.

Gobush, K. S., Wurth, T. A., Henderson, J. R., Becker, B. L., & Littnan, C. L. 2016. Prevalence of interactions between Hawaiian monk seals (*Nemonachus schauinslandi*) and nearshore fisheries in the main Hawaiian Islands. *Pacific Conservation Biology*, **23**(1): 25-31.

Götz, T., and V. A. Janik. 2010. Aversiveness of sounds in phocid seals: psycho-physiological factors, learning processes and motivation. *The Journal of Experimental Biology* **213**:1536-1548. doi: 10.1242/jeb.035535

Götz, T., and V. A. Janik. 2011. Repeated elicitation of the acoustic startle reflex leads to sensitisation in subsequent avoidance behaviour and induces fear conditioning. *BioMed Central Neuroscience* **12**:30.

Götz, T., and V. A. Janik. 2013. Acoustic deterrent devices to prevent pinniped depredation: efficiency, conservation concerns and possible solutions. *Marine Ecology Progress Series* **492**:285-302. doi: 10.3354/meps10482

Götz, T., and V. A. Janik. 2015. Target-specific acoustic predator deterrence in the marine environment. *Animal Conservation* **18**:102-111.

Götz, T., and V. A. Janik. 2016. Non-lethal management of carnivore predation: long-term tests with a startle reflex-based deterrence system on a fish farm. *Animal Conservation* **19**:212-221

Gulland, F. M., L. A. Dierauf, and K. L. Whitman. 2018. CRC handbook of marine mammal medicine. CRC Press.

Hamer, D. J., Goldsworthy, S. D., Costa, D. P., Fowler, S. L., B. Page, and M.D. Sumner. 2013. The endangered Australian sea lion extensively overlaps with and regularly becomes by-catch in demersal shark gill-nets in South Australian shelf waters. *Biological Conservation*, **157**:386-400.

Hamer, D. J., and S. D. Goldsworthy. 2006. Seal–fishery operational interactions: Identifying the environmental and operational aspects of a trawl fishery that contribute to by-catch and mortality of Australian fur seals (*Arctocephalus pusillus doriferus*). *Biological Conservation* **130**(4):517-529. <https://doi.org/10.1016/j.biocon.2006.01.014>

Hamilton S. and G. B. Baker. 2015. Review of research and assessments on the efficacy of sea lion exclusion devices in reducing the incidental mortality of New Zealand sea lions *Phocarcinos hookeri*

in the Auckland Islands squid trawl fishery. *Fisheries Research* **161**:200–206.

Hamilton, S., and G. B. Baker. 2019. Technical mitigation to reduce marine mammal bycatch and entanglement in commercial fishing gear: lessons learnt and future directions. *Reviews in Fish Biology and Fisheries*. **29**:223–247. <https://doi.org/10.1007/s11160-019-09550-6>

Hanni, K. D., and P. Pyle. 2000. Entanglement of pinnipeds in synthetic materials at South-east Farallon Island, California, 1976–1998. *Marine Pollution Bulletin* **40**:1076–1081.

Harcourt, R., D. Auriolles, and J. Sanchez. 1994. Entanglement of California sea lions at los islotes, Baja California Sur, México. *Marine Mammal Science* **10**:122–125.

Haulena, M. 2014. Otariid seals. In: *Zoo animal and wildlife immobilization and anesthesia*, West G, Heard D, Caulkett N, editors. Wiley Blackwell Publishing Ltd., Ames, Iowa, pp. 661–672.

Heath, R. B., D. Calkins, D. McAllister, W. Taylor, and T. Spraker. 1996. Telazol and isoflurane field anesthesia in free-ranging Steller's sea lions (*Eumetopias jubatus*). *Journal of Zoo and Wildlife Medicine* **27**:35–43.

Jeffries, S. J., R. F. Brown, and J. T. Harvey. 1993. Techniques for capturing, handling and marking harbor seals. *Aquatic Mammals* **19**:21–21.

Kemper C. M., D. Pemberton, M. Cawthorn, S. Heinrich, J. Mann, B. Würsig, P. Shaughnessy, and R. Gales. 2003. Aquaculture and marine mammals: coexistence or conflict? In: Gales N., Hindell M., Kirkwood R. (eds.) *Marine mammals: fisheries, tourism, and management issues*. CSIRO, Collingwood, p 208–225.

Königson, S., J. Lövgren, J. Hjelm, M. Ovegård, F. Ljunghager, and S. G. Lunneryd. 2015. Seal exclusion devices in cod pots prevent seal bycatch and affect their catchability of cod. *Fisheries Research*, **167**:114–122. <https://doi.org/10.1016/j.fishres.2015.01.013>

Kühn, S., and J. A. Van Franeker. 2020. Quantitative overview of marine debris ingested by marine megafauna. *Marine Pollution Bulletin*, **151**.110858. <https://doi.org/10.1016/j.marpolbul.2019.110858>

Laist, D. W. 1997. Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. Pages 99–139 *Marine Debris*. Springer.

Lithner, D., Å. Larsson, and G. Dave. 2011. Environmental and health hazard ranking and assessment of plastic polymers based on chemical composition. *Science of the Total Environment* **409**:3309–3324.

Lynch, M., M. Tahmindjis, and H. Gardner. 1999. Immobilisation of pinniped species. *Australian Veterinary Journal*, **77**: 181–185. doi:10.1111/j.1751-0813.1999.tb11231.x

Melin, S. R., M. Haulena, W. Van Bonn, M. J. Tennis, R. F. Brown, and J. Harrison. 2013. Reversible immobilization of free-ranging adult male California sea lions (*Zalophus californianus*). *Marine Mammal Science* **29**:E529–E536.

Page, B., J. McKenzie, R. McIntosh, A. Baylis, A. Morrissey, N. Calvert, T. Haase, M. Berris, D. Dowie, and P. D. Shaughnessy. 2004. Entanglement of Australian sea lions and New Zealand fur seals in lost fishing gear and other marine debris before and after Government and industry attempts to reduce the problem. *Marine Pollution Bulletin* **49**:33–42.

Price, C. S., J. A. Morris, E. Keane, D. Morin, C. Vaccaro, and D. Bean. 2017. Protected species and marine aquaculture interactions. NOAA Technical Memorandum, NOS NCCOS 211.

Raum-Suryan, K. L., L. A. Jemison, and K. W. Pitcher. 2009. Entanglement of Steller sea lions (*Eumetopias jubatus*) in marine debris: Identifying causes and finding solutions. *Marine Pollution Bulletin* **58**:1487–1495. <https://doi.org/10.1016/j.marpolbul.2009.06.004>

Read, A. J. 2008. The looming crisis: Interactions between marine mammals and fisheries. *Journal of*

Mammalogy 89(3):541-548. <https://doi.org/10.1644/07-MAMM-S-315R1.1>

Reeves, R. R., K. McClellan, and T. B. Werner. 2013. Marine mammal bycatch in gillnet and other entangling net fisheries, 1990 to 2011. *Endangered Species Research*, **20**(1):71-97. doi: 10.3354/esr00481

Rochman, C. M., E. Hoh, B. T. Hentschel, and S. Kaye. 2013a. Long-Term Field Measurement of Sorption of Organic Contaminants to Five Types of Plastic Pellets: Implications for Plastic Marine Debris. *Environmental Science & Technology* **47**:1646-1654.

Rochman, C. M., M. A. Browne, B. S. Halpern, B. T. Hentschel, E. Hoh, H. K. Karapanagioti, L. M. Rios-Mendoza, H. Takada, S. Teh, and R. C. Thompson. 2013b. Policy: Classify plastic waste as hazardous. *Nature* **494**:169

Sharp, S. M., S. P. Johnson, M. J. Moore, C. T. Harry, J. M. Hoppe, K. M. Moore, M. E. Niemeyer, K. M. Patchett, K. Rose, and D. Zahniser. 2016. Successful Remote Sedation, Capture, and Treatment of Entangled Gray Seals (*Halichoerus grypus*) on Cape Cod, MA, USA.

Teuten, E. L., J. M. Saquing, D. R. Knappe, M. A. Barlaz, S. Jonsson, A. Björn, S. J. Rowland, R. C. Thompson, T. S. Galloway, and R. Yamashita. 2009. Transport and release of chemicals from plastics to the environment and to wildlife. *Philosophical Transactions of the Royal Society B: Biological Sciences* **364**:2027-2045.

Wright, B. E., M. J. Tennis, and R. F. Brown. 2010. Movements of male California sea lions captured in the Columbia River. *Northwest Science* **84**:60-73.

## 11. Appendices

### Appendix A - Pinniped Entanglement Response – Frequently Asked Questions

#### Q: What are pinnipeds?

**A:** Pinnipeds are seals, sea lions, and walruses. The word *Pinnipedia* translates from Latin as “winged foot,” referring to the animals’ fin-like flippers. Three families of living pinnipeds are recognized: the *Phocidae* (earless or true seals); the *Otariidae* (eared seals), and the *Odobenidae* (walrus). Some pinnipeds must come ashore to breed while other phocids (e.g., harbor seals) breed in the water; however, all give birth and nurse their young on land or on ice. Some species are at sea for several months at a time, while others return to the shore every day. Phocid seals found commonly in the United States include elephant, gray, and harbor seals as well as ice seals (bearded, harp, hooded, ribbon, ringed, and spotted seals). The otariids – which include fur seals (e.g., Northern and Guadalupe fur seals) and sea lions (e.g., Steller and California sea lions) have external ear flaps. Under the Marine Mammal Protection Act, NOAA Fisheries has jurisdiction over seals and sea lions while the United States Fish and Wildlife Service has jurisdiction over walrus.

#### Q: What is a pinniped entanglement?

**A:** Seals and sea lions most commonly become entangled in marine debris or active fishing gear around their head and/or neck and flippers. They can also ingest debris and gear. Marine debris encompasses a wide variety of manufactured materials that are abandoned or disposed of in the marine environment. Common examples of marine debris that harm pinnipeds include plastic packing bands/straps, abandoned fishing gear, rope, and large rubber bands often used on crab and other fishery pots (Harcourt *et al.* 1994, Hanni and Pyle 2000, Page *et al.* 2004, Raum- Suryan *et al.* 2009, Franco-Trecu *et al.* 2017). Additionally, animals can become entangled in actively fished commercial and recreational fishing gear including line, nets, hooks, flashers, etc. Entanglement and ingestion of marine debris and fishing gear can cause decreased swimming ability, disruption in feeding, life-threatening injuries, infection, and death. For more detailed information about pinniped entanglement, visit the [Pinniped Entanglement Group website](#).

## **Q: How do pinnipeds become entangled?**

**A:** Seals, and especially sea lions, are very playful, especially when they are young. They are often curious about floating materials such as plastic packing bands, net fragments, and other lost and abandoned fishing gear and trash. While investigating these materials, they often get them looped around their necks and bodies and don't have hands like us to remove them.

## **Q: Can pinnipeds become seriously injured when entangled?**

**A:** Entanglements have been identified as a significant cause of injury or mortality to pinnipeds (*i.e.*, seals and sea lions) throughout the world. Entangling materials may cause lacerations, amputation of appendages, infection, may impact the ability to catch their food, and may result in death (*e.g.*, drowning, strangulation, etc.) and/or death of dependent young. Additionally, ingestion of marine debris or fishing gear can lead to perforations or impactions of the esophagus, stomach and intestines (Gobush *et al.* 2016).

## **Q: What is a life-threatening entanglement?**

**A:** A life-threatening entanglement includes any material that impacts the ability of the pinniped to swim, breath, or feed, or that may cause severe internal injury (*e.g.*, swallowed hooks still connected to line and/or lure protruding from the mouth; *e.g.*, see pp 34-35 [NMFS Serious Injury Procedure](#) for details).

## **Q: How does NOAA Fisheries respond to entanglements?**

**A:** NOAA Fisheries works with highly skilled experts nationally to establish a Stranding Network of trained response teams. NOAA Fisheries also maintains regional marine mammal stranding reporting hotlines that allow reports of entangled and injured pinnipeds to quickly be relayed to the appropriate responders. Responding to entanglements is extremely difficult, dangerous, and should only be attempted by professionally trained teams. Responders can only reach a small fraction of the number of entangled pinnipeds, so we should always focus on PREVENTION of marine debris.

## **Q: Who do people contact if they encounter an entangled pinniped and what should they do? Who is responsible for the disentangling the pinniped?**

**A:** Immediately contact your local Stranding Network, local authorities or the NOAA Fisheries 24-hour Stranding Hotline to report a live or dead-stranded marine mammal:

- For the Southeast Region, call 877-WHALE HELP (877-942-5343)
- For the Northeast Region, call (866) 755-6622
- For the West Coast Region, call (866) 767-6114
- For the Alaska Region, call (877) 925-7773
- For the Pacific Islands Region, call (888) 256-9840

**Members of the public should NOT attempt to disentangle pinnipeds themselves and should instead immediately call authorized professional responders.** Only responders who have been authorized by NOAA Fisheries and who have the training, experience, equipment, and support needed should attempt to disentangle marine mammals. Entanglement response efforts also rely on the support of many state and federal agencies (including law enforcement agencies and the United States Coast Guard), non-governmental organizations, and others working together to respond to, and ultimately prevent, entanglements.

The NOAA Fisheries [Office of Protected Resources](#) coordinates marine mammal entanglement response efforts around the country through the [National Marine Mammal Health and Stranding Response Program](#).

Regardless of the species, disentangling marine mammals is dangerous, and should only be performed by trained professionals. **Only trained and authorized responders should attempt to disentangle or closely approach an entangled pinniped.** Pinnipeds are unpredictable and attempting to remove an entanglement can be dangerous.

Here are the steps to follow:

- Stay in the boat—***never get in the water*** to attempt to help an entangled seal or sea lion.
- Note the GPS coordinates of the location of the entangled animal and direction of travel.
- [Call your local responder](#) via the national entanglement response and Stranding Network.
- Wait for trained, authorized personnel—do not attempt to free an animal on your own.
- Monitor the situation—if a response is possible, authorities may ask that you stand by and watch the animal from a safe distance (greater than 100 yards and not directly behind the animal).

- Document the entanglement—if possible take photos and video of the animal from a safe and legal distance (e.g., 100 yards). This can provide valuable information to Stranding Network responders. Only trained and permitted responders should approach or pick up a stranded marine mammal.
- Do not touch the marine mammal.
- Don’t allow pets to approach the pinniped.

## **Q: How does bycatch affect pinnipeds?**

**A:** Bycatch in active fishing gear (e.g., commercial trawl, purse seine, longline, gillnet, troll) is one of the largest threats to marine mammal populations (including pinnipeds) worldwide (Woodley and Lavigne 1991, Read 2008, Reeves *et al.* 2013, Hamilton and Baker 2019). Pinnipeds may interact with fisheries while pursuing the same fishery target species, while being attracted to fishery discards, by being fed intentionally or unintentionally, or when encountering fishing gear and bait in the water (Hamer and Goldsworthy 2006, Raum-Suryan *et al.* 2009, Hamer *et al.* 2013, Reeves *et al.* 2013, Hamilton and Baker 2019). These interactions may result in the animal being caught in active fishing gear (e.g., hooks), or entangled in nets and lines (Hamilton and Baker 2019). Pinniped depredation at aquaculture facilities also can result in fatal entanglements (Kemper *et al.* 2003, Price *et al.* 2016).

## **Q: How do you respond to an entangled pinniped on land?**

**A:** Only trained authorized responders should respond to an entangled pinniped on land. For physical on-land responses, factors that should be considered include environmental conditions, team selection and training, the animal’s condition, type of entanglement and location on the body, resources, and mission complexity. Response to an entanglement pinniped on land may include disentanglement in the field or capture and transport to a rehabilitation facility for disentanglement. Determining whether disentanglement will occur in the field or at a rehabilitation facility will depend on multiple factors, including the type and severity of the entanglement, location of the animal, size, species, and condition, and team and equipment available. In a field disentanglement, techniques may include removal with disentanglement tools at a distance or through restraint of the animal. If disentanglement is determined to be more appropriately conducted at a rehabilitation facility, the animal will be captured and transported to the appropriate facility.

## **Q: How do you respond to an entangled pinniped on land using sedation administered by hand or pole syringe?**

**A:** Only trained authorized responders should respond to an entangled pinniped on land using sedation. For a hand/pole syringe sedation response, factors that should be considered include environmental conditions, team training and qualifications, selection including the availability of veterinarian and drugs, the type of entanglement, species and condition of the animal, resources, and mission complexity. The veterinarian (on-site or via phone consultation) will select the appropriate drug combination and dosage. The two main methods of drug administration are hand injection and pole syringe injection. Hand injecting a medication requires capture and restraint. The pole injecting requires approaching the animal quietly, reaching out the pole onto the animal's flank and the injection is triggered when pressure is applied to the tip.

**Q: How do you respond to an entangled pinniped in the water?**

**A:** Only trained authorized responders should respond to an entangled pinniped in water. For in-water responses, factors that should be considered include environmental conditions, team training and qualifications, selection including the availability of veterinarian and drugs, the type of entanglement, species and condition of the animal, pinniped selection and condition, permission, resources, and mission complexity. To capture the entangled pinniped in water, different types of nets and barriers can be used to herd or encircle and capture the seal or sea lion. In-water captures are difficult, complicated, and can lead to both injury and death of the pinniped as well as injury to responders.

**Q: How do you respond to an entangled pinniped using remote sedation?**

**A:** Only trained authorized responders should respond to an entangled pinniped using remote sedation. For remote sedation response, factors that should be considered include environmental conditions, team training and qualifications, selection including the availability of veterinarian and drugs, the type of entanglement, species and condition of the animal, pinniped selection and condition, permission, resources, and mission complexity. The veterinarian will select the appropriate drug combination and dosage. Remote sedation can be administered using a dart gun from land or boat. A remote sedation response may include a primary darting/capture vessel, along with other watercraft nearby for roles including safety and support/monitoring should the animal flee into the water. Remote sedation responses are difficult, complicated, and can lead to both injury and death of the pinniped and potential injury to responders. A dart gun should never be used to dart a pinniped in the water.

**Q: What are the risks to the Stranding Network members during a disentanglement?**

**A:** Pinnipeds are powerful wild animals that can pose risks to human health and safety. Stranding Network members may be exposed to diseases that can be transmitted from pinnipeds to humans, may sustain injuries or bite wounds, and usually conduct work on dangerous terrain. There are different techniques to capture pinnipeds to reduce these risks including manually restraining smaller animals, capturing animals using equipment such as nets and/or boards and a stationary cage, or darting larger animals with sedatives so that they can be safely approached and disentangled.

**Q: Do the marine animals know that you are trying to help them?**

**A:** Certainly, they are aware of a rescue team's presence but just what they think of response activities is unclear. As with any wild animal, they may be very dangerous when injured and under stress. While working closely with a marine mammal, Stranding Network members make every effort to keep themselves safe. Animals may react with fight or flight responses and may use their teeth and body to defend themselves or escape.

**Q: What is NOAA Fisheries doing to prevent future entanglements?**

**A:** NOAA Fisheries continues to work with numerous partners to reduce marine debris and to minimize or prevent entanglements. Each successful disentanglement provides information to guide gear modifications and management strategies to further reduce threats.

**Q: What can people do to help prevent entanglement of marine animals?**

**A:** When fishing or boating, do not leave fishing gear or trash behind. Also, consider participating in community clean-up efforts. Whether at the beach, river, or local park, trash can often find its way into the ocean and present an entanglement risk. And always remember to "lose the loop" - cut any loop before properly discarding it in the trash so that it does not become an entanglement hazard.

**Q: Why is documentation of pinniped entanglements important?**

**A:** Without documentation, little can be learned about entanglements and how to prevent them. By understanding how, where, when, and which pinnipeds get entangled, we may be able to make better decisions regarding prevention, which is the ultimate solution to the problem. The primary focus of

entanglements should be in prevention and it is difficult to prevent the problem if we do not fully understand it. Documentation helps quantify entanglement incidence and prevalence, which helps us understand the overall impact on pinniped populations. When we know the main sources of entanglement, we can prioritize the best methods to solve the problem. For pinnipeds entangled in active fishing gear, we need to find effective deterrents to reduce interactions. For pinnipeds entangled in marine debris and lost and abandoned fishing gear, we need to provide more outreach and education while encouraging prevention. Documentation also can help show if the disentanglement has been successful or not and creates an understanding of the healing process.

**Q: Do you analyze the gear collected from a disentanglement?**

**A:** When disentangling, a secondary goal for the Stranding Network is to document and recover the entangling gear. Recovered entangling gear may be sent to NOAA Fisheries gear experts for identifying type of material, configurations, and specific fishery if possible. It may be provided to the NOAA Office of Law Enforcement if the gear is considered non-compliant with regional or seasonal fishery restrictions.

## **Appendix B – Level A and Human Interaction Form**

Level A forms, Human Interaction forms, and a complete and detailed examiners guide can be found online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/level-data-collection-marine-mammal-stranding-events>

# MARINE MAMMAL STRANDING REPORT - LEVEL A DATA

FIELD #: \_\_\_\_\_ NMFS REGIONAL #: \_\_\_\_\_ NATIONAL DATABASE#: \_\_\_\_\_  
(NMFS USE) (NMFS USE)

COMMON NAME: \_\_\_\_\_ GENUS: \_\_\_\_\_ SPECIES: \_\_\_\_\_

EXAMINER Name: \_\_\_\_\_ Affiliation: \_\_\_\_\_

Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Stranding Agreement or Authority: \_\_\_\_\_

Report Type:  Stranded  Live entangled, in-water CONFIDENCE CODE (Check ONE):  Unconfirmed Public Report  Confirmed Public Report  Confirmed by Network

<p><b>INITIAL OBSERVATION</b> <input type="checkbox"/> Same Information for Level A Examination</p> <p><b>DATE:</b> Year: _____ Month: _____ Day: _____</p> <p>First Observed: <input type="checkbox"/> On Beach/Land/Ice <input type="checkbox"/> Floating <input type="checkbox"/> Swimming <input type="checkbox"/> Anchored</p> <p><b>LOCATION:</b> State: _____ County: _____ City: _____ Body of Water: _____ Locality Details: _____ Lat (DD): _____ N Long (DD): _____ W <input type="checkbox"/> Actual <input type="checkbox"/> Estimated</p> <p>How Determined: (check ONE) <input type="checkbox"/> GPS <input type="checkbox"/> Map <input type="checkbox"/> Internet/Software <input type="checkbox"/> Other _____</p> <p><b>CONDITION AT INITIAL OBSERVATION</b> (Check ONE)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><input type="checkbox"/> 1. Alive</td> <td style="width: 50%;"><input type="checkbox"/> 4. Advanced Decomposition</td> </tr> <tr> <td><input type="checkbox"/> 2. Fresh Dead</td> <td><input type="checkbox"/> 5. Mummified/Skeletal</td> </tr> <tr> <td><input type="checkbox"/> 3. Moderate Decomposition</td> <td><input type="checkbox"/> 6. Condition Unknown</td> </tr> </table>	<input type="checkbox"/> 1. Alive	<input type="checkbox"/> 4. Advanced Decomposition	<input type="checkbox"/> 2. Fresh Dead	<input type="checkbox"/> 5. Mummified/Skeletal	<input type="checkbox"/> 3. Moderate Decomposition	<input type="checkbox"/> 6. Condition Unknown	<p><b>LEVEL A EXAMINATION</b> <input type="checkbox"/> Restrand <input type="checkbox"/> Examined? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p><b>DATE:</b> Year: _____ Month: _____ Day: _____</p> <p>First Examined: <input type="checkbox"/> On Beach/Land/Ice <input type="checkbox"/> Floating <input type="checkbox"/> Swimming <input type="checkbox"/> Anchored</p> <p><b>LOCATION:</b> State: _____ County: _____ City: _____ Body of Water: _____ Locality Details: _____ Lat (DD): _____ N Long (DD): _____ W <input type="checkbox"/> Actual <input type="checkbox"/> Estimated</p> <p>How Determined: (check ONE) <input type="checkbox"/> GPS <input type="checkbox"/> Map <input type="checkbox"/> Internet/Software <input type="checkbox"/> Other _____</p> <p><b>CONDITION AT EXAMINATION</b> (Check ONE)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><input type="checkbox"/> 1. Alive</td> <td style="width: 50%;"><input type="checkbox"/> 4. Advanced Decomposition</td> </tr> <tr> <td><input type="checkbox"/> 2. Fresh Dead</td> <td><input type="checkbox"/> 5. Mummified/Skeletal</td> </tr> <tr> <td><input type="checkbox"/> 3. Moderate Decomposition</td> <td></td> </tr> </table>	<input type="checkbox"/> 1. Alive	<input type="checkbox"/> 4. Advanced Decomposition	<input type="checkbox"/> 2. Fresh Dead	<input type="checkbox"/> 5. Mummified/Skeletal	<input type="checkbox"/> 3. Moderate Decomposition	
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<p><b>LIVE ANIMAL INFORMATION</b></p> <p><b>INITIAL LIVE ANIMAL DISPOSITION</b> (Check one or more)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><input type="checkbox"/> 1. Left at Site</td> <td style="width: 50%;"><input type="checkbox"/> 5. Died at Site</td> </tr> <tr> <td><input type="checkbox"/> 2. Immediate Release at Site</td> <td><input type="checkbox"/> 6. Died during Transport</td> </tr> <tr> <td><input type="checkbox"/> 3. Relocated and Released</td> <td><input type="checkbox"/> 7. Euthanized</td> </tr> <tr> <td>4. Disentangled</td> <td><input type="checkbox"/> 8. Transferred to Rehabilitation:</td> </tr> <tr> <td><input type="checkbox"/> a. Partially</td> <td>Date: Year: _____ Month: _____ Day: _____</td> </tr> <tr> <td><input type="checkbox"/> b. Completely</td> <td>Facility: _____</td> </tr> </table> <p><input type="checkbox"/> 9. Other: _____</p> <p><b>CONDITION/DETERMINATION</b> (Check one or more)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><input type="checkbox"/> 1. Sick</td> <td style="width: 50%;"><input type="checkbox"/> 7. Location Hazardous</td> </tr> <tr> <td><input type="checkbox"/> 2. Injured</td> <td><input type="checkbox"/> a. To animal</td> </tr> <tr> <td><input type="checkbox"/> 3. Out of Habitat</td> <td><input type="checkbox"/> b. To public</td> </tr> <tr> <td><input type="checkbox"/> 4. Deemed Releasable</td> <td><input type="checkbox"/> 8. Unknown/CBD</td> </tr> <tr> <td><input type="checkbox"/> 5. Abandoned/Orphaned</td> <td><input type="checkbox"/> 9. No Rehabilitation Options</td> </tr> <tr> <td><input type="checkbox"/> 6. Inaccessible</td> <td><input type="checkbox"/> 10. Other: _____</td> </tr> </table>	<input type="checkbox"/> 1. Left at Site	<input type="checkbox"/> 5. Died at Site	<input type="checkbox"/> 2. 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Other: _____	<p><b>DEAD ANIMAL INFORMATION</b></p> <p><b>CARCASS STATUS</b> (Check one or more)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><input type="checkbox"/> 1. Frozen for Later Examination/Necropsy Pending</td> <td style="width: 50%;"><input type="checkbox"/> 8. Towed:</td> </tr> <tr> <td><input type="checkbox"/> 2. Left at Site</td> <td><input type="checkbox"/> 5. Landfill</td> </tr> <tr> <td>Lat: _____</td> <td>Long: _____</td> </tr> <tr> <td><input type="checkbox"/> 3. Buried</td> <td><input type="checkbox"/> 6. Incinerated</td> </tr> <tr> <td><input type="checkbox"/> 4. Rendered</td> <td><input type="checkbox"/> 7. Composted</td> </tr> <tr> <td colspan="2"><input type="checkbox"/> 9. Sunk: Lat: _____ Long: _____</td> </tr> <tr> <td colspan="2"><input type="checkbox"/> 10. Unknown/Other: _____</td> </tr> </table> <p><b>DEAD ANIMAL EXAM</b> <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><input type="checkbox"/> Photos Only</td> <td style="width: 50%;"><input type="checkbox"/> External Exam</td> </tr> <tr> <td><input type="checkbox"/> Carcass Fresh</td> <td><input type="checkbox"/> Partial Internal Exam</td> </tr> <tr> <td colspan="2"><input type="checkbox"/> Complete Internal Exam</td> </tr> <tr> <td colspan="2"><input type="checkbox"/> Carcass Frozen/Thawed</td> </tr> </table> <p><b>CARCASS CODE AT EXAM</b> <input type="checkbox"/> Code 2 <input type="checkbox"/> Code 3 <input type="checkbox"/> Code 4</p> <p><b>EXAMINED BY:</b> _____ Date: Year: _____ Month: _____ Day: _____</p> <p><b>PHOTOS/VIDEOS TAKEN:</b> <input type="checkbox"/> YES <input type="checkbox"/> NO Photo/Video Disposition: _____</p>	<input type="checkbox"/> 1. Frozen for Later Examination/Necropsy Pending	<input type="checkbox"/> 8. Towed:	<input type="checkbox"/> 2. Left at Site	<input type="checkbox"/> 5. Landfill	Lat: _____	Long: _____	<input type="checkbox"/> 3. Buried	<input type="checkbox"/> 6. Incinerated	<input type="checkbox"/> 4. Rendered	<input type="checkbox"/> 7. Composted	<input type="checkbox"/> 9. Sunk: Lat: _____ Long: _____		<input type="checkbox"/> 10. Unknown/Other: _____		<input type="checkbox"/> Photos Only	<input type="checkbox"/> External Exam	<input type="checkbox"/> Carcass Fresh	<input type="checkbox"/> Partial Internal Exam	<input type="checkbox"/> Complete Internal Exam		<input type="checkbox"/> Carcass Frozen/Thawed	
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<p><b>MORPHOLOGICAL INFORMATION</b></p> <p><b>SEX</b> (Check ONE) <b>ESTIMATED AGE CLASS</b> (Check ONE)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><input type="checkbox"/> 1. Male</td> <td style="width: 50%;"><input type="checkbox"/> 1. Adult</td> </tr> <tr> <td><input type="checkbox"/> 2. Female</td> <td><input type="checkbox"/> 2. Subadult</td> </tr> <tr> <td><input type="checkbox"/> 3. Unknown</td> <td><input type="checkbox"/> 3. Yearling</td> </tr> </table> <p><input type="checkbox"/> Whole Animal <input type="checkbox"/> Partial Animal</p> <p>Straight Length: _____ cm _____ in</p> <p><input type="checkbox"/> Actual <input type="checkbox"/> Estimated <input type="checkbox"/> Not Measured</p> <p>Weight: _____ kg _____ lb</p> <p><input type="checkbox"/> Actual <input type="checkbox"/> Estimated <input type="checkbox"/> Not Weighed</p> <p><b>SAMPLES COLLECTED</b> (Check one or more)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><input type="checkbox"/> 1. Histology</td> <td style="width: 50%;"><input type="checkbox"/> 2. Other Diagnostics</td> </tr> <tr> <td><input type="checkbox"/> 3. Life History</td> <td><input type="checkbox"/> 4. Skeletal</td> </tr> <tr> <td colspan="2"><input type="checkbox"/> 5. Other: _____</td> </tr> </table> <p><b>PARTS TRACKING</b> (Check one or more)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><input type="checkbox"/> 1. Scientific Collection</td> <td style="width: 50%;"><input type="checkbox"/> 2. Educational Collection</td> </tr> <tr> <td colspan="2"><input type="checkbox"/> 3. Other: _____</td> </tr> </table>	<input type="checkbox"/> 1. Male	<input type="checkbox"/> 1. Adult	<input type="checkbox"/> 2. Female	<input type="checkbox"/> 2. Subadult	<input type="checkbox"/> 3. Unknown	<input type="checkbox"/> 3. Yearling	<input type="checkbox"/> 1. Histology	<input type="checkbox"/> 2. Other Diagnostics	<input type="checkbox"/> 3. Life History	<input type="checkbox"/> 4. Skeletal	<input type="checkbox"/> 5. Other: _____		<input type="checkbox"/> 1. Scientific Collection	<input type="checkbox"/> 2. Educational Collection	<input type="checkbox"/> 3. Other: _____		<p><b>OCCURRENCE DETAILS</b></p> <p>Was the Marine Mammal Human Interaction Report completed? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p><b>Findings of Human Interaction:</b> <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> Could Not Be Determined (CBD)</p> <p>Evidence of:</p> <ol style="list-style-type: none"> <li>1. Vessel Interaction <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> CBD</li> <li>2. Shot <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> CBD</li> <li>3. Fishery Interaction <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> CBD</li> <li>4. Entangled <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> CBD</li> <li>5. Ingestion <input type="checkbox"/> GEAR <input type="checkbox"/> DEBRIS <input type="checkbox"/> NO <input type="checkbox"/> CBD</li> <li>6. Other Human Interaction: _____</li> </ol> <p>If YES, what was the likelihood that the human interaction contributed to the stranding event?</p> <p><input type="checkbox"/> Uncertain (CBD) <input type="checkbox"/> Improbable <input type="checkbox"/> Suspect <input type="checkbox"/> Probable</p> <p><b>Gear/HI Items Collected?</b> <input type="checkbox"/> YES <input type="checkbox"/> NO Gear Disposition: _____</p> <p><b>Other Findings Upon Level A:</b> <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> Could Not Be Determined (CBD)</p> <p>If Yes, Choose one or more: <input type="checkbox"/> 1. Illness <input type="checkbox"/> 2. Injury <input type="checkbox"/> 3. Pregnant <input type="checkbox"/> 4. Other: _____</p> <p>How Determined (Check one or more): <input type="checkbox"/> Photos Only <input type="checkbox"/> External Exam <input type="checkbox"/> Partial Internal Exam</p> <p><input type="checkbox"/> Complete Internal Exam (Necropsy) <input type="checkbox"/> Other: _____</p>
<input type="checkbox"/> 1. Male	<input type="checkbox"/> 1. Adult																
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<input type="checkbox"/> 3. Other: _____																	

GE# \_\_\_\_\_

(NMFS Use)

Group Event:  YES  NOIf Yes, Type:  Cow/Calf Pair  Mass Stranding  UME # Animals: \_\_\_\_\_  Actual  Estimated

TAG DATA		ID#	Color	Type	Placement*	Applied	Present	Removed
Tags Were:					(Circle ONE)			
Present at Time of Stranding (Pre-existing):	<input type="checkbox"/> YES <input type="checkbox"/> NO			D DF L R LF LR RF RR V	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Applied during Stranding Response/Release:	<input type="checkbox"/> YES <input type="checkbox"/> NO			D DF L R LF LR RF RR V	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Applied during Rehabilitation/Release:	<input type="checkbox"/> YES <input type="checkbox"/> NO			D DF L R LF LR RF RR V	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Absent but Suspect Prior Tag:	<input type="checkbox"/> YES <input type="checkbox"/> NO			D DF L R LF LR RF RR V	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
				D DF L R LF LR RF RR V	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
				D DF L R LF LR RF RR V	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

\* D= Dorsal; DF= Dorsal Fin; L= Left Lateral Body R= Right Lateral Body LF= Left Front; LR= Left Rear; RF= Right Front; RR= Right Rear; V= Ventrum

ADDITIONAL IDENTIFIER: \_\_\_\_\_ (If animal is restrained, please indicate any previous field numbers here)

ADDITIONAL REMARKS:

DISCLAIMER

THESE DATA SHOULD NOT BE USED OUT OF CONTEXT OR WITHOUT VERIFICATION. THIS SHOULD BE STRICTLY ENFORCED WHEN REPORTING SIGNS OF HUMAN INTERACTION DATA.

DATA ACCESS FOR LEVEL A DATA

UPON WRITTEN REQUEST, CERTAIN FIELDS OF THE LEVEL A DATA SHEET WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR CREDIT THE STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE. THE NATIONAL MARINE FISHERIES SERVICE WILL NOTIFY THE CONTRIBUTING STRANDING NETWORK MEMBERS THAT THESE DATA HAVE BEEN REQUESTED AND THE INTENT OF USE. ALL OTHER DATA WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR OBTAIN PERMISSION FROM THE CONTRIBUTING STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE.

PAPERWORK REDUCTION ACT INFORMATION

PUBLIC REPORTING BURDEN FOR THE COLLECTION OF INFORMATION IS ESTIMATED TO AVERAGE 30 MINUTES PER RESPONSE, INCLUDING THE TIME FOR REVIEWING INSTRUCTIONS, SEARCHING EXISTING DATA SOURCES, GATHERING AND MAINTAINING THE DATA NEEDED, AND COMPLETING AND REVIEWING THE COLLECTION OF INFORMATION. SEND COMMENTS REGARDING THIS BURDEN ESTIMATE OR ANY OTHER ASPECT OF THE COLLECTION INFORMATION, INCLUDING SUGGESTIONS FOR REDUCING THE BURDEN TO: CHIEF, MARINE MAMMAL AND SEA TURTLE CONSERVATION DIVISION, OFFICE OF PROTECTED RESOURCES, NOAA FISHERIES, 1315 EAST-WEST HIGHWAY, SILVER SPRING, MARYLAND 20910. NOT WITHSTANDING ANY OTHER PROVISION OF THE LAW, NO PERSON IS REQUIRED TO RESPOND, NOR SHALL ANY PERSON BE SUBJECT TO A PENALTY FOR FAILURE TO COMPLY WITH, A COLLECTION OF INFORMATION SUBJECT TO THE REQUIREMENTS OF THE PAPERWORK REDUCTION ACT, UNLESS THE COLLECTION OF INFORMATION DISPLAYS A CURRENTLY VALID OFFICE OF MANAGEMENT AND BUDGET (OMB) CONTROL NUMBER.



## MARINE MAMMAL HUMAN INTERACTION REPORT

## Exam Information (fill in or circle most appropriate)

1 Field #: \_\_\_\_\_ Species: \_\_\_\_\_  
 2 Examiner: \_\_\_\_\_ Recorder: \_\_\_\_\_  
 3 Date of exam: \_\_\_\_\_ Condition code (at exam): 1 2 3 CBD  
 4 Preservation: alive fresh frozen frozen/thawed Body condition: emaciated not emaciated CBD  
 5 Documentation: digital print slide video Image disposition: \_\_\_\_\_  
 6 Integument: normal abnormal decomposed % Skin missing: <10% 10-25% 25-50% >50%  
 7 Explanation of terms:  
 YES = I have examined the area and/or found signs of this pathology, natural marking, or human interaction  
 NO = I have examined the area and/or did not find signs of this pathology, natural marking, or human interaction  
 CBD = I have examined the area and could not determine whether there were signs of human interaction (i.e. the part was missing, degraded, or signs were ambiguous)  
 NE = I did not examine the area  
 NA = this animal doesn't normally have that part (i.e. seals have no peduncle, dolphins have no rear flippers)

WHOLE BODY EXAM		YES	NO	CBD	NE	NA	Image taken
8	External pathology (pox, tattoo lesion, abscess, fungal patches)						
9	Natural markings (scars, tooth rakes, unusual pigmentation)						
10	Appendage(s) removed / Mutilation (with instrument)						
11	Pelt removed / Mutilation (with instrument)						
12	Body sliced / Mutilation (with instrument)						
13	Gear / Debris present on animal (including tags)						
14	Gear / Debris retained (name & contact info in Comments)						
15	HI lesions (fishery, gunshot, propeller, healed HI scar, brand)						

16 Predation / scavenger damage (circle all anatomical areas where damage hinders evaluation; numbers coincide with anatomical areas below): 17 18 19 20 21 22 23 24 25 26 27 28 29 NONE

## FILL IN TABLE FOR ALL POSSIBLE FINDINGS OF HI

Do not use for natural markings/pathology.

DETAILED EXAM OF ANATOMICAL AREAS	YES	Type of Lesion										Origin of Lesion						
		NO	CBD	NE/NA	Impression/ Laceration	Penetrating wound	Healed HI scar	Abrasion	Other / CBD	Twine / line	Net	MO/MU/CBD*	Hook	Packing Band	Other / CBD	Propeller	Gunshot	Other / CBD
17	Rostrum/snout																	
18	Mandible																	
19	Head and/or neck																	
20	L Front appendage																	
21	R Front appendage																	
22	L Body																	
23	R Body																	
24	Dorsum/dorsal fin																	
25	Ventrum																	
26	Peduncle																	
27	L Rear appendage																	
28	R Rear appendage																	
29	Flukes/tail																	

\* If Gear-Line is the lesion origin, mark the MO/MU/CBD column: "MO" for monofilament, "MU" for multifilament, and "CBD" if the type of line cannot be determined

Field #: \_\_\_\_\_

INTERNAL EXAM	Date _____	YES	NO	Partial	CBD	Image taken	Detailed Info (circle all that apply)			
							Associated tissue reaction:	YES	NO	CBD
30 Internal exam conducted							Details in Comments section -use line number			
31 Bruising/blunt trauma							Details in Comments section -use line number			
32 Skeleton examined							Details in Comments section -use line number			
33 Broken bones present							Associated tissue reaction:	YES	NO	CBD
34 Mouth/GI tract examined (circle contents)							intact prey	partially digested	hard parts only	
							debris/gear	empty	other	
35 Lungs/bronchi examined							Details in Comments section -use line number			
36 Lung/bronchi contents							froth	fluid	air	(color: )
37 Bullet/projectile found							found using:	CT	X-ray	dissection (collected? Y N )
38 Other lesions noted							Details in Comments section -use line number			

39 **Comments** (note line number from left margin before each comment):

40 **Findings of Human Interaction:**  YES  NO  CBD

(Exam Type:  Photos Only  External Exam  Partial Internal Exam  Complete Internal Exam (necropsy))

41  Entanglement (gear\_\_ debris\_\_ CBD\_\_ )  Vessel trauma (sharp\_\_ blunt\_\_ both\_\_ )  
 Hooking (recreational\_\_ commercial\_\_ CBD\_\_ ) Gunshot  Mutilation  
 Ingestion (gear\_\_ debris\_\_ CBD\_\_ )  Harassment  CBD/Other \_\_\_\_\_

42 **Stranding Event History/Circumstances:**

43 **INITIAL HUMAN INTERACTION EVALUATION:** If you marked YES above (line 40) evaluate the external exam, necropsy, carcass condition and circumstances surrounding the stranding event to answer the question below. Remember to be conservative in your subjective evaluation.

**What is the likelihood that the finding of human interaction (line 40), contributed to the stranding event?**

0: Uncertain (CBD)

1: Improbable

2: Suspect

3: Probable

44 **Justification:**

Final human interaction evaluation requires additional data from level B and C analyses as well as review by experts (e.g. a veterinary pathologist)

#### PAPERWORK REDUCTION ACT INFORMATION

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## **Appendix C – Draft Pinniped Entanglement Assessment Guide**

Draft Pinniped Entanglement Assessment Guide developed by The Marine Mammal Center as part of Prescott Grant NA19NMF4390136 and in cooperation with National Marine Fisheries Service (NMFS) Alaska Fisheries Science Center, Marine Mammal Laboratory. Wound entanglement example photographs were collected under NMFS Permit 16087-02 issued to NMFS Alaska Fisheries Science Center, Marine Mammal Laboratory.

### **Pinniped Entanglement Assessment Guide - DRAFT**

This guide is for findings related to confirmed, probable, and suspect anthropogenic entanglements and wounds/scars resulting from these entanglements in live animals and fresh dead and moderately decomposed carcasses (stranded and free-ranging/at rookeries). Complete this form (or short-hand/printable version for the field) when there is evidence of active or previous entanglement, includes gear/material present, lesion (impression/laceration/scar) without gear/material. We are considering other formats as well, such as an online application or fillable/printable PDF form.

Target groups completing this form

- Any trained individual that encounters, or receives a report of, an entangled pinniped (stranding network, permitted researchers, etc.). Not intended to be filled out by members of the public.

Target audience

- Managers, regulatory agencies, and researchers. Not for clinical purposes where more detailed description likely is needed.

**Field ID:** \_\_\_\_\_

**Date:** \_\_\_\_\_ **Time:** \_\_\_\_\_ **Assessor's name:** \_\_\_\_\_

**Stranded animal:** Yes No

**If no, complete this section:**

Tag/brand/other identifying marks (location, type, color, number): \_\_\_\_\_

---

Sex: Male Female Unknown

Age class: Adult Subadult Juvenile Yearling Pup Unknown

Age/Age Range (if known/estimated): \_\_\_\_\_

Body condition: Emaciated (very thin, severely underweight)

Thin (mildly/moderately underweight)

Normal-Robust (good body condition)

**How was the entanglement assessed? (select one):**

- Physical handling (chemical restraint)
- Physical handling (no chemical restraint; includes manual restraint, entanglement removal without restraint)
- Visual assessment (in-person, but not handled)
- Photograph/video only (no in-person assessment by trained individual)
- Gross necropsy

**Gear Present (select one):**

- Yes (confirmed gear present)
- Probable/Suspect (likely gear present, but unable to confirm)
- No (confirmed gear not present)
- Unknown/CBD (could not assess or unknown if gear present)

**Animal disentangled:** Yes No

**Number of distinct wounds by location on body:**

A distinct wound is defined as those with any non-affected tissue between wounds (not # of foreign material wraps within 1 wound). Put NE for not examined (or not visible).

Muzzle/Head/Neck \_\_\_\_\_

Shoulder/Fore-flipper \_\_\_\_\_ base of neck to armpit/axilla

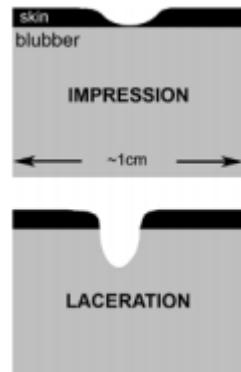
Body/Hind-flipper \_\_\_\_\_ behind the armpit/axilla

**Movement Constrained (select all that apply):**

- None
- Mouth/Mandible/Jaw – can't open/close mouth fully, entangling material does not travel past the mouth and into the throat (or further down the GI tract), which puts it in the “ingestion” category instead of “entanglement”
- Head/Neck – can't move head fully side-to-side or up-down
- Fore-flipper
- Hind-flipper

**Wound Characterization (select all that apply; different regions affected by the entanglement may have different wound characterization):**

- No wound/mark/indentation
- Superficial
  - Not cutting into the dermis, includes indentation, impression, or abrasion
  - NDB definition: An *impression* is a compression wound that occurs when an object leaves an indentation but does not lacerate or abrade the skin/pelt.
  - NDB definition: An *abrasion* occurs when gear or debris rubs an area and scrapes the skin/pelt without forming an obvious laceration or distinct impression.
- Laceration
  - Full thickness through the dermis in at least 1 region but no tissue overlying the entangling material. Granulation tissue (wound healing) may be present or absent.
  - NDB definition: A *laceration* occurs when the skin/pelt is penetrated from tight constriction or prolonged compression. The skin tears resulting in a lesion.
- Laceration with healing
  - Regions with tissue overlying the entangling material. Haired or unhaired skin/scar tissue present over regions of the entanglement wound.
- Healed laceration
  - Fully scarred, haired or unhaired skin completely covering entire circumference of wound, no regions of active discharge or open/interrupted skin.
  - NDB definition: A *healed scar* is similar to a natural scar in pigmentation but exhibits similar characteristics to the other types of lesions described here (e.g., linear scars on leading edges of appendages consistent with entanglement). Lesion is completely healed with no open tissue. Healed scars may be pigmented and may feel different than surrounding tissue, but there should be no exposed flesh, discharge, or soft swelling if the wound is healed.



Source: NOAA MMHSRP  
Examiners Guide

**Tissues Involved (select 1 for each tissue listed):**

Include those that are compromised/affected, not just cut, by the entanglement

Sinus            Yes    Probable/suspect    No    Unknown/CBD/NE

Trachea	Yes	Probable/suspect	No	Unknown/CBD/NE
Bone	Yes	Probable/suspect	No	Unknown/CBD/NE
Joint	Yes	Probable/suspect	No	Unknown/CBD/NE
Eye	Yes	Probable/suspect	No	Unknown/CBD/NE

**Entanglement Material Collected:** Yes No

**Photographs (check all that apply):**

Pre-disentanglement  whole body  zoomed in (on wound/entanglement)  
 Post-disentanglement  whole body  zoomed in (on wound/entanglement)  
 Entanglement material

**Notes** (explain any fields marked Unknown/CBD/NE and describe lesions without including interpretation of gear type):

---



---

**Entanglement Material:**

Net – same knot type and at least 1 full mesh

Monofilament

Multifilament

Collect from mono- and multi-filament net:

Stretch mesh length \_\_\_\_\_ cm

# knots/knotless intersects

<50 (small) 50-100 (medium) >100 (large)

Collect from multifilament net only

Color \_\_\_\_\_

Twine size/diameter \_\_\_\_\_ mm (rounded to nearest mm)

Braided Twisted

# twines \_\_\_\_\_ # strands/twine \_\_\_\_\_

Knotted Knotless

Total net mass \_\_\_\_\_ g

Line – includes twine and rope, might have irregular knots

Monofilament

Multifilament

Collect from mono- and multi-filament net:

Length \_\_\_\_\_ cm

# knots \_\_\_\_\_

Collect from multifilament net only

Color \_\_\_\_\_

Twine size/diameter \_\_\_\_\_ mm (rounded to nearest mm)

Braided Twisted

# twines \_\_\_\_\_ # strands/twine \_\_\_\_\_

Other (not line/net), describe: \_\_\_\_\_  
 (e.g., packing band/strap, rubber band, toilet seat, snorkel mask)

**Measuring twine size:** To measure the twine's thickness, pull a section of the twine straight and lay it across a ruler or the gauge on the back page of this guide to find the closest measurement.

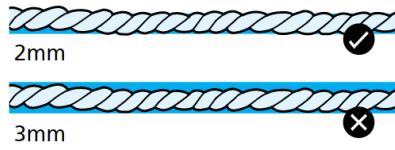


Figure 5: Match twine to closest millimetre.

**What type of twine:** How is the twine constructed? Is it twisted, braided like a shoe lace or monofilament like fishing line?

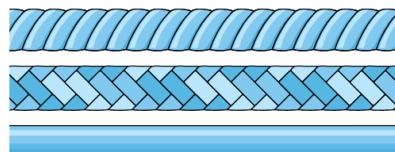


Figure 6: The types of twine construction from top to bottom: twisted; braided and monofilament

Source: Gunn, R. 2015. Ghost Net ID Guide. Ghostnets Australia.

<https://www.ghostnets.com.au/resources/net-id-guide/>

**Other net details:** Whether the mesh is constructed of single twine or twine that has been doubled up (Figure 7) and whether or not there are knots in the material (Figure 8).

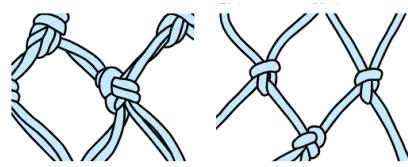


Figure 7: Double and single twine.



Figure 8: Knotless and knotted netting.



## Entanglement Wound Examples

### Superficial

NMFS Permit 16087-02



NMFS Permit 16087-02



### Superficial

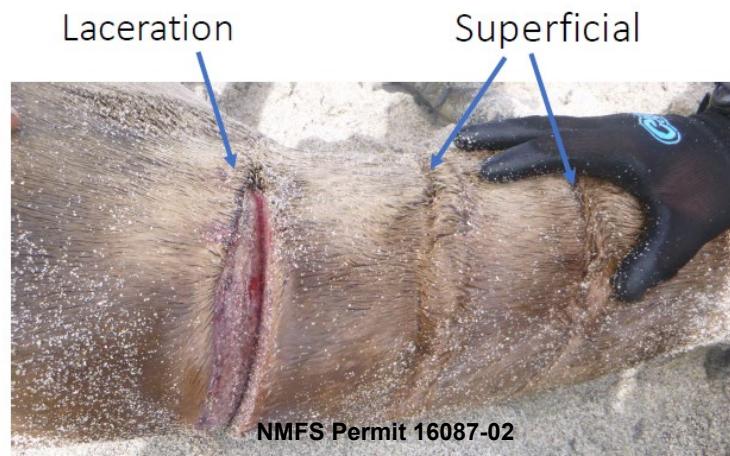
NMFS Permit 16087-02



### Laceration

NMFS Permit 16087-02





Laceration  
with healing

Entanglement material was  
wrapped around the neck  
Skin had healed up over the  
top of the foreign material



Laceration  
with healing

Entanglement material was  
wrapped around the neck  
Skin had healed up over the  
top of the foreign material



Laceration with healing  
entanglement material was present circumferentially around neck



Healed  
2 months after disentanglement



### Entanglement Wraps/Wounds Count Examples

1 Wrap



2 Wraps



3 Wraps



## Wound Scoring Example

### Example Wound Score

- Observed walking backward only, unable to walk forward
- Observed unable to move neck side to side through normal range of motion
- Wounds evaluated after capture and chemical restraint (anesthetized)



### Example Wound Score



How was the entanglement assessed? (select one):

Physical handling (chemical restraint)  
 Physical handling (no chemical restraint)  
 Visual assessment  
 Photograph/video only  
 Gross necropsy

Gear Present (select one):

Yes  
 Probable/Suspect  
 No  
 Unknown/CBD

Animal disentangled: Yes No

Number of distinct wounds by location on body:

Muzzle/Head/Neck 3  
Shoulder/Fore-flipper 0  
Body/Hind-flipper 0

Movement Constrained (select all that apply):

None  
 Mouth/Mandible/Jaw  
 Head/Neck  
 Fore-flipper  
 Hind-flipper

Wound Characterization (select all that apply):

No wound/mark/impression  
 Superficial  
 Laceration  
 Laceration with healing  
 Healed laceration

Tissues Involved (select 1 for each tissue listed):

Sinus.	Yes	Probable/suspect	No	Unknown/CBD/NE
Trachea	Yes	Probable/suspect	No	Unknown/CBD/NE
Bone.	Yes	Probable/suspect	No	Unknown/CBD/NE
Joint	Yes	Probable/suspect	No	Unknown/CBD/NE
Eye.	Yes	Probable/suspect	No	Unknown/CBD/NE

## Appendix D – Risk Factor Table

Risk factor table based on table provided by [The Hawaiian monk seal research program, NMFS](#).

Risk Factor	Risk Factor Category						Risk Level		
	Very Low - 1	Low - 2	Medium - 3	Medium High - 4	High - 5	Very High - 6			
Environment	Very Acceptable	Acceptable	Moderately Acceptable	Moderately Dangerous	Dangerous	Very Dangerous			
Team Selection and Fitness	Excellent Team	Good Team	Appropriate Team	Marginal Team	Poor Team	Very Poor Team			
Animal selection and condition	Healthy	Healthy	Injured/Compromised		Highly Compromised				
Permits & Authorization	Excellent		Good		Poor				
Resources: Equipment, PPE, communication, etc.	Excellent		Good		Not Prepared				
Mission Complexity: New or experimental, time sensitive, etc.	Simple	Standard	Moderately Complex		Very Complex	Extremely Complex			
If any risk level equals:	Any medium-high	Contact project lead or immediate supervisor before proceeding.							
	Any High – Very High	Contact veterinarian							

**Key considerations or questions to be asked in the Risk factor analyses (Green-Amber-Red; GAR):**

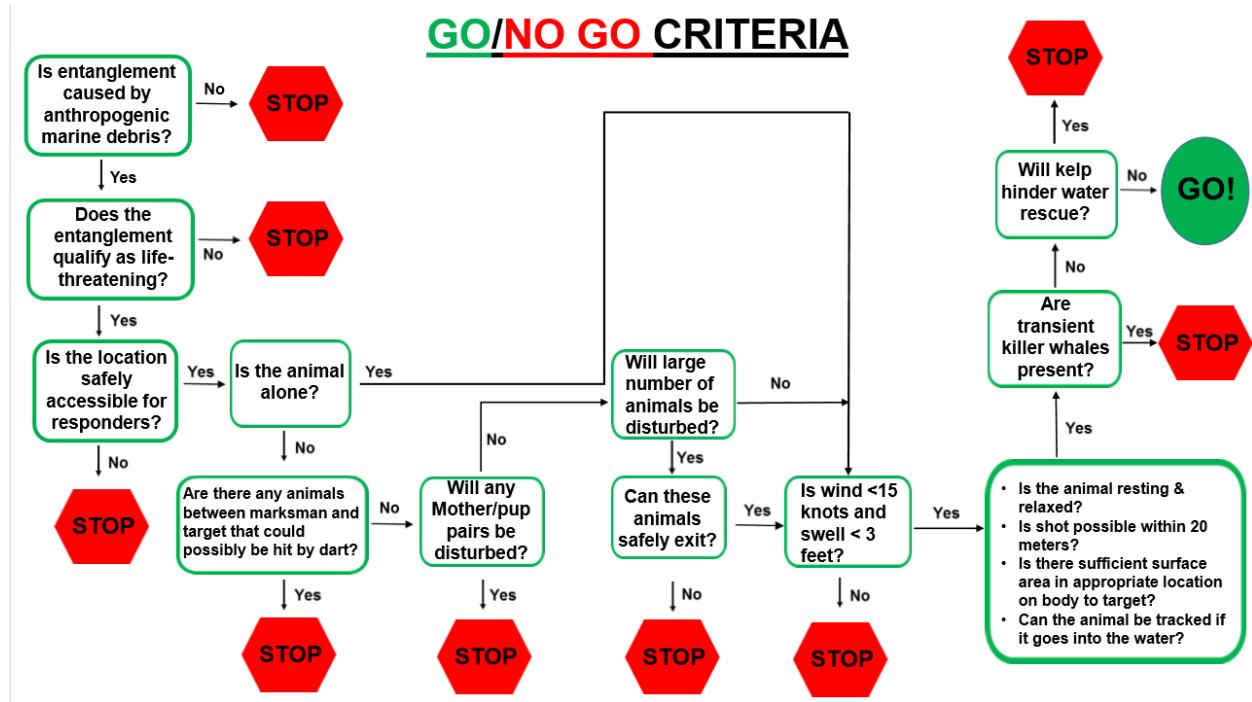
- **Molt:** Molt stage should be considered for some species, as it is highly energetically costly and may make individuals less capable of withstanding the stress of capture.
- **Pregnancy:** Adult females require additional consideration. Adult females are likely to be pregnant during part of the year and some drugs (or stress) could lead to late term abortions. Pregnant females should only be captured if their survival, and the survival of their unborn pup, is in eminent danger due to the entanglement.
- **Health and behavior assessment:** Observe body condition, responsiveness (responds normally to natural stimuli), or if there are any external or behavioral abnormalities.
- **Weather and tide concerns:** Does weather pose a threat to the animal or responders (*i.e.*, heat stress or hypothermia or threatening storms)? If so, is there a way to mitigate it? Depending upon climate/season, captures during the middle of the day should be avoided unless overcast/cool. Consider the animal's body temperature before, during, and after handling. Is the tide coming in or going out, how high/low is it and how can it impact the event?
- **Habitat concerns:** Habitat (*i.e.*, geographic location, substrate type, navigation hazards, water depth, currents, etc.) should be assessed for hazards to animals and responders.
- **Equipment:** Is all necessary gear functional, available, and ready? This includes, but is not limited to, crowding, capture, tagging, sampling, instrumentation, disentanglement, emergency equipment, temperature mitigation gear (*e.g.*, shade, bucket for water), and transport gear (*e.g.*, cage, truck, boat).
- **Presence of other animals:** Are there other pinnipeds, pups, or other wildlife in the area that may be disturbed by the handling? Is there a potential for other pinnipeds to approach and disrupt the target animal or responders during capture? Consider other natural and cultural resources nearby.
- **Egress:** Has the team assessed all possible hazards in the capture zone? Is there a safe place for the non-entangled animals to egress? Is the entangled animal in a safe location if remotely sedated? What hazards are in the capture zone that could potentially cause injury to the entangled and surrounding animals?
- **Team composition:** Are there adequate responders with the appropriate level of expertise and experience to safely complete the mission and address unforeseen situations? If a veterinarian or veterinary technician is necessary, there should be sufficient personnel to assist the entanglement response so the veterinarian can monitor the animal. Ensure that all involved fully understand their roles and everyone understands warning signs to look for. Designate a

safety officer to monitor fatigue, injury, the animal, and personnel throughout the response.

- ***Public presence:*** Is the capture going to be in a public area? Ensure adequate crowd control and outreach. If in a crowded public area, consider a public briefing before and after the event. Expect to be recorded or live streamed and ensure that all involved behave appropriately. Carefully consider clothing/logos that will be seen by the public, to help the public recognize the professionalism of the team.

## Appendix E – Decision Matrix (Go/No Go)

Example of a *Go/No Go* decision matrix (based on information provided by [Alaska Department of Fish and Game Steller sea lion program](#)).



## Appendix F - Gear Checklist

Example of a *Field Response Checklist* (provided by [The Marine Mammal Center](#)).

## Field Response Checklist

Latest Edit: Dave Zahniser Mar 23, 2019

<u>Other Supplies</u>	<u>Medical Kit</u>	<u>Medical Kit</u>	<u>Darting Supplies</u>
<b>Tracking:</b> <input type="checkbox"/> Hydrophone - VR100 <input type="checkbox"/> Hydrophone Mic <input type="checkbox"/> Hydrophone pole <input type="checkbox"/> Hydrophone Charger <input type="checkbox"/> Pingers - Asst. Frequencies	<b>Needles:</b> <input type="checkbox"/> 16G x 1.5" <input type="checkbox"/> 18G x 3.5" <input type="checkbox"/> 18G x 1.5" <input type="checkbox"/> 18G x 1.0" <input type="checkbox"/> 20G x 3.5" <input type="checkbox"/> 20G x 1.5" <input type="checkbox"/> 20G x 1.0"	<b>Misc:</b> <input type="checkbox"/> Stethoscope <input type="checkbox"/> Safety Glasses (2) <input type="checkbox"/> Exam Gloves <input type="checkbox"/> Darting Worksheet <input type="checkbox"/> Field Logs <input type="checkbox"/> Pens, Sharpies <input type="checkbox"/> Clipboard <input type="checkbox"/> Tape Measure (cm) <input type="checkbox"/> Flipper Tags <input type="checkbox"/> Flipper Tag Gun <input type="checkbox"/> Labeling Tapes <input type="checkbox"/> Duck Tape <input type="checkbox"/> Zip Lock Bags <input type="checkbox"/> Grease Markers <input type="checkbox"/> Calculator <input type="checkbox"/> Long Nose Pliers <input type="checkbox"/> Pelican Cases (3)	<b>Projector:</b> <input type="checkbox"/> Dart Projector <input type="checkbox"/> CO <sub>2</sub> Cartridges <input type="checkbox"/> CO <sub>2</sub> Adapter <input type="checkbox"/> Range Finder <input type="checkbox"/> Extra Battery (RF) <input type="checkbox"/> Pressure Reference <input type="checkbox"/> Extra Breach Pin <input type="checkbox"/> Bore Cleaner <input type="checkbox"/> Anemometer
<b>Misc:</b> <input type="checkbox"/> Leather Gloves <input type="checkbox"/> Duck Tape <input type="checkbox"/> Multi-tool <input type="checkbox"/> Helmets <input type="checkbox"/> PFDs <input type="checkbox"/> Binoculars	<b>Syringes:</b> <input type="checkbox"/> 1.0 mL (40) <input type="checkbox"/> 3.0 mL (20) <input type="checkbox"/> 6.0 mL (10) <input type="checkbox"/> 12.0 mL (10) <input type="checkbox"/> 20.0 mL (10)		<b>Darts:</b> <input type="checkbox"/> Dart Bodies <input type="checkbox"/> Dart Tailpieces <input type="checkbox"/> Stabilizers <input type="checkbox"/> Caps <input type="checkbox"/> Red Sleeves <input type="checkbox"/> Green Sleeves <input type="checkbox"/> Pin <input type="checkbox"/> Coupler <input type="checkbox"/> 20mL Syringes <input type="checkbox"/> Long Paperclips <input type="checkbox"/> Dart Needle Covers <input type="checkbox"/> Silicone Dart Lube <input type="checkbox"/> Hemostats
<b>Video/Photography</b>	<b>Ventilation:</b> <input type="checkbox"/> Ambu Bag <input type="checkbox"/> ET Tubes: 6,7,8,9,10,12,14 <input type="checkbox"/> ET Tube Stylet <input type="checkbox"/> Laryngoscope <input type="checkbox"/> Scope Batteries <input type="checkbox"/> Jaw Ropes <input type="checkbox"/> ET tube ties <input type="checkbox"/> Sterile Lube	<b>Drugs</b>	
<b>GoPro:</b> <input type="checkbox"/> Cams <input type="checkbox"/> Batteries <input type="checkbox"/> Chargers <input type="checkbox"/> Flash Memory <input type="checkbox"/> Mounts	<b>Instruments &amp; Supplies:</b> <input type="checkbox"/> Eye Lube <input type="checkbox"/> Sterile H <sub>2</sub> O (5) <input type="checkbox"/> Saline <input type="checkbox"/> Chlorhexidine Scrub <input type="checkbox"/> Small Surgery Pack <input type="checkbox"/> Scalpels (10 and 11) <input type="checkbox"/> Disentanglement Scissors <input type="checkbox"/> Hemostats (2) <input type="checkbox"/> Sharps Container <input type="checkbox"/> Blood Tubes <input type="checkbox"/> Vacutainer & Adapter	<b>Sedatives:</b> <input type="checkbox"/> Medetomidine (20 mg/mL) <input type="checkbox"/> Butorphanol (10 mg/mL) <input type="checkbox"/> Butorphanol (50 mg/mL) <input type="checkbox"/> Midazolam (5 mg/mL) <input type="checkbox"/> Midazolam (50 mg/mL)	<b>Needles - Barbed:</b> <input type="checkbox"/> 25 mm <input type="checkbox"/> 30 mm <input type="checkbox"/> 40 mm <input type="checkbox"/> 60 mm
<b>Field Anesthesia</b>		<b>Reversals:</b> <input type="checkbox"/> Atipamezole (3 full bottles) <input type="checkbox"/> Naltrexone (1 full bottle) <input type="checkbox"/> Flumazenil (10 bottles)	<b>Needles - Plain:</b> <input type="checkbox"/> 25 mm <input type="checkbox"/> 30 mm <input type="checkbox"/> 40 mm <input type="checkbox"/> 60 mm <input type="checkbox"/> Practice
<input type="checkbox"/> Anesthesia Machine <input type="checkbox"/> O <sub>2</sub> Canister <input type="checkbox"/> Wrench for O <sub>2</sub> tank <input type="checkbox"/> Mask - Small <input type="checkbox"/> Mask - Large <input type="checkbox"/> Reservoir Bags: 3, 4, 5 Liter <input type="checkbox"/> Isoflurane (2 bottles) <input type="checkbox"/> Isoflurane Bottle Adapter <input type="checkbox"/> Tubing (2) <input type="checkbox"/> Sodasorb		<b>Emergency Drugs:</b> <input type="checkbox"/> Doxapram <input type="checkbox"/> Epinephrine <input type="checkbox"/> Atropine <input type="checkbox"/> Pentobarbital (Euthasol)	 The Marine Mammal Center.

Example of a *Capture Gear Checklist* (adapted from the [Alaska Department of Fish and Game Steller sea lion program](#)).



## DISENTANGLEMENT CAPTURE GEAR CHECKLIST

### Animal capture/restraint in skiff

#### Capture Skiff (boat #1)

- 1 short capture pole
- 1 long capture pole
- Flathead screwdriver
- 2 Shepherd's hooks
- Retractable boat pole
- Bent PVC pole
- 3-4 flipper loops
- dive slate/pencil

#### Assist Skiff (boat #2)

- 1 short capture pole
- 1 long capture pole
- Flathead screwdriver
- 2 Shepherd's hooks
- Retractable boat pole
- 2 flipper loops
- dive slate/pencil

### Sampling/Data recording

- Permit
- Rangefinder
- Data notebook
- 3 pencils/1 sharpie
- Waterproof camera; spare batteries
- GoPro; spare batteries
- 2 pair binoculars
- 2 watches – time synced

### Measure

- Flexible measuring tape
- Retractable measuring tape

### Tagging and Marking

- 2 pair tagging pliers
- 4 pair Allflex flipper tags
- 2 bottles hair dye
- 2 tubes cream developer
- Small pair scissors
- 4 pair latex gloves
- 2 paint sticks

### Head- mount satellite tagging

- Satellite tag
- 2-part 5-minute epoxy
- 2 epoxy dispensers
- 2 sturdy cups for mixing
- 3 tongue depressors (mix glue, apply tag)
- Small bottle acetone and rag
- 4 pair latex gloves

### Flipper satellite tagging

- SPOT satellite tags
- 2 leather punches
- Spare stainless screws
- Phillips screwdriver/Leatherman
- Spare magnet to turn tag on
- Q-tips & alcohol
- Tagging cheat sheet w/photos

### Cutting tools

#### Capture Skiff (boat #1)

- 1 pair dykes
- 1 pair sharp scissors
- 1 net knife and hook
- 1 "cat claw" twine cutter
- 2 Victorinox knives
- 1 fish hook remover

#### Assist Skiff (boat #2)

- 1 pair dykes
- 1 pair sharp scissors
- 1 net knife and hook
- 1 "cat claw" twine cutter
- 1 Victorinox knife

### Miscellaneous

- 2 clean towels to cover eyes
- Rubber wedge/mouth gag – if hooked
- Bucket to cool animal
- Emergency blankets
- Hot water bottles
- Hand warmers
- Knee pads
- Garbage bags
- Spare Ziplocks
- Spare reading glasses

## Appendix G – Disentanglement form

Example of a *Steller sea lion disentanglement form* (provided by [Protected Resources Division](#), [NMFS Alaska Region](#) and [Alaska Department of Fish and Game Steller sea lion program](#)).

STELLER SEA LION DISENTANGLEMENT FORM

Date: ADF&G No: NMFS No:

RESPONDERS:

1. Name of vessels and responders in each during darting:
2. Responders on shore:
3. Veterinarian:

CONDITIONS

1. Sea state: 2. Wind direction and speed: 3. Other:

ENTANGLEMENT

1. Location of haulout/rookery: 2. Location of animal: 3. Distance of animal to water: 4. Other:
5. Type of entanglement:  
- Description of entanglement:  
- Entangling material:

DARTING

1. Age and gender estimation:
2. Initial size estimate kg: lbs:

Drug	Dose range for size(mg)	mg given	ml given
Medetomidine			
Butorphanol			
Midazolam			
0.9 % NaCl			

3. Darter:
4. Time drugs mixed:
5. Size of dart:
6. Time dart pressurized and loaded into gun:
7. Distance to animal:
8. Location of darter (underline): on shore on water
9. Orientation of darter's line of sight to animal:
10. Time of shot:
11. Dart placement (underline): right side left side neck shoulder thorax abdomen flank hip
12. Other:
13. Reaction to dart (underline): startled looked moved none stayed on haulout went into water and tracked went into water and lost
14. Additional behaviors:
15. Number animals in immediate vicinity: Number animals alerted: Number animals flushed into water:
17. Time of capture: Behavior:

DISENTANGLEMENT PROCEDURES

1. Entanglement (underline): *flasher removed* neck entanglement removed
2. Description of event:
3. Other: A. Morphometrics: B. flipper tags applied/location/number: C. hair dye applied/location:  
D. sat tag applied/location: E. skin sample/location: F. hair sample/location:  
G. whisker/location: H. antibiotic/location/volume: I. hot branding:

MONITORING

1. Start time:
2. Beginning RR:
3. Beginning CRT:
4. Beginning temp:
5. Other:

Time	BPM	CRT (sec)

REVERSAL AND RECOVERY

1. Time of reversal:
2. Location of injection:
3. Reversal drug dosage:  
Atipamezole mg: ml:  
Nalrexone mg: ml:  
Flumazenil mg: ml:
4. Time to full recovery:
5. Behavior:
6. Dart (underline): *retrieved lost* Remaining volume of drugs in dart:
7. Other:

DOCUMENTATION:

FOLLOW UP:

## Appendix H - Remote Sedation Worksheet

Example of a *Remote Sedation Worksheet* (provided by [The Marine Mammal Center](#)).

Remote Sedation Worksheet				Date:			
Temp ID:		Field#		Previous ID			
Estimated Weight (kg):		Actual Weight (kg):					
Veterinarian:		Marksman:					
Dart Size (mL):		Needle Length (mm):		Barbed? Y / N			
Projector Pressure (BAR):		Dart Time:					
Transmitter Freq (kHz):		Disposition Time:					
Drug	Drug conc. mg/mL	Amount mg	Volume mL	Bottle #	Time of Admin.	Route	Time to Effect
Midazolam							
Medetomidine						Dart	
Butorphanol							
Atipamezole							
Flumazenil							
Naltrexone							
Dart Placement:		Distance to Animal:					
Level of Sedation: <u>None</u> <u>Mild</u> <u>Moderate</u> <u>Marked</u>   Obs:							
Capture Successful? <u>Yes</u> / <u>No</u>		Dart Disposition:					
Animal Disposition: <u>Recov'd Live</u> <u>Recov'd Dead</u> <u>Seen, Not Captured</u> <u>Not Seen</u>							
Flipper Tag Color:		Left #:			Right #:		
Time: _____	HR: _____	RR: _____	Notes: _____				
Time: _____	HR: _____	RR: _____					
Time: _____	HR: _____	RR: _____					
Time: _____	HR: _____	RR: _____					
Time: _____	HR: _____	RR: _____					
Time: _____	HR: _____	RR: _____					
Time: _____	HR: _____	RR: _____					
Time: _____	HR: _____	RR: _____					
Time: _____	HR: _____	RR: _____					
Time: _____	HR: _____	RR: _____					





## Appendix I – Drug interaction Form

Example of an *Accidental Drug Injection Form* (provided by [The Marine Mammal Center](#)).

**THIS PATIENT MAY HAVE BEEN INJECTED WITH THE FOLLOWING:**

Injected at _____ am/pm	
_____ mg	<b>Medetomidine</b> (20.0 mg/mL) or (50.0 mg/mL)
_____ mg	<b>Midazolam</b> (5.0 mg/mL) or (50.0 mg/mL)
_____ mg	<b>Butorphanol</b> (10.0 mg/mL)
_____ mg	(other) _____

**Patient Name:**

**Emergency Contact:**



The Marine  
Mammal Center

*Rescue & Response Dept.*

*rescue @ tmmc.org*

*(415)289-7350*

## Appendix J – Otariid sedation worksheets

Example of an *Otariid sedation worksheet* (provided by [The Marine Mammal Center](#)).

### Otariid Sedation Worksheet

Optimized for 3.0 mL Dart			Weight in kg											
Drug	Dose (mg/kg)	Conc. (mg/mL)	20 kg	25 kg	30 kg	35 kg	40 kg	45 kg	50 kg	60 kg	70 kg	80 kg	90 kg	100 kg
<b>Sedatives</b>														
Medetomidine	0.03	20.0	0.03 mL	0.04 mL	0.05 mL	0.05 mL	0.06 mL	0.07 mL	0.08 mL	0.09 mL	0.11 mL	0.12 mL	0.14 mL	0.15 mL
Midazolam	0.2	5.0	0.80 mL	1.00 mL	1.20 mL	1.40 mL	1.60 mL	1.80 mL	2.00 mL	2.40 mL	2.80 mL	3.20 mL	3.60 mL	4.00 mL
Butorphanol	0.2	10.0	0.40 mL	0.50 mL	0.60 mL	0.70 mL	0.80 mL	0.90 mL	1.00 mL	1.20 mL	1.40 mL	1.60 mL	1.80 mL	2.00 mL
Midazolam (Concentrated)	0.2	50.0	0.08 mL	0.10 mL	0.12 mL	0.14 mL	0.16 mL	0.18 mL	0.20 mL	0.24 mL	0.28 mL	0.32 mL	0.36 mL	0.40 mL
Butorphanol (Concentrated)	0.2	50.0	0.08 mL	0.10 mL	0.12 mL	0.14 mL	0.16 mL	0.18 mL	0.20 mL	0.24 mL	0.28 mL	0.32 mL	0.36 mL	0.40 mL
<b>Reversals</b>														
Atipamezole	0.15	5.0	0.60 mL	0.75 mL	0.90 mL	1.05 mL	1.20 mL	1.35 mL	1.50 mL	1.80 mL	2.10 mL	2.40 mL	2.70 mL	3.00 mL
Atipamezole (Concentrated)	0.15	25.0	0.12 mL	0.15 mL	0.18 mL	0.21 mL	0.24 mL	0.27 mL	0.30 mL	0.36 mL	0.42 mL	0.48 mL	0.54 mL	0.60 mL
Fiumazenil	0.015	0.1	3.00 mL	3.75 mL	4.50 mL	5.25 mL	6.00 mL	6.75 mL	7.50 mL	9.00 mL	10.50 mL	12.00 mL	13.50 mL	15.00 mL
Naltrexone	0.1	50.0	0.04 mL	0.05 mL	0.06 mL	0.07 mL	0.08 mL	0.09 mL	0.10 mL	0.12 mL	0.14 mL	0.16 mL	0.18 mL	0.20 mL
<b>Emergency Drugs</b>														
Doxapram	2.0	20.0	2.00 mL	2.50 mL	3.00 mL	3.50 mL	4.00 mL	4.50 mL	5.00 mL	6.00 mL	7.00 mL	8.00 mL	9.00 mL	10.00 mL
Epinephrine	0.1	1.0	2.00 mL	2.50 mL	3.00 mL	3.50 mL	4.00 mL	4.50 mL	5.00 mL	6.00 mL	7.00 mL	8.00 mL	9.00 mL	10.00 mL
Atropine	0.04	0.54	1.48 mL	1.85 mL	2.22 mL	2.59 mL	2.96 mL	3.33 mL	3.70 mL	4.44 mL	5.19 mL	5.93 mL	6.67 mL	7.41 mL



**Example of a *Steller sea lion sedation worksheet* (provided by [Protected Resources Division, NMFS Alaska Region](#)).**

Drug	Dose (mg/kg)	Dose range (mg/kg)	Conc. (mg/ml)	Weight															
				kg	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
				lbs	441	551	662	772	882	992	1103	1213	1323	1433	1544	1654	1764	1874	1985
<b>Sedatives</b>																			
Medetomidine	0.03	0.03 - 0.10	40	ml	0.15	0.19	0.23	0.26	0.30	0.34	0.38	0.41	0.45	0.49	0.53	0.56	0.60	0.64	0.68
Butorphanol	0.20	0.2 - 0.4	50	ml	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6
Midazolam	0.20	0.1 - 0.2	50	ml	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6
<b>Reversals</b>																			
Atipamezole	0.15	0.15 - 0.5 (5 x mg med)	25	ml	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4
Naltrexone	0.50	-	50	ml	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
Flumazenil	0.0002 - 0.002	0.1	ml	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	
<b>Emergency Drugs</b>																			
Doxapram	2.00		20	ml	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Epinephrine	0.10		1	ml	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Atropine	0.04		15	ml	0.5	0.7	0.8	0.9	1.1	1.2	1.3	1.5	1.6	1.7	1.9	2.0	2.1	2.3	2.4

## Appendix K – Phocid sedation worksheet

### Example of a *Gray seal sedation worksheet* provided by the [International Fund for Animal Welfare](#).

**Note:** Dosages listed below are starting and can be incrementally but cautiously increased should they not elicit an effective sedative plane. Based on response to previous dosage, (*i.e.*, not adequate sedation for capture), the dose should be increased by 25%. Other sedatives such as butorphanol may be used on animals in hand as determined by a veterinarian, but are unlikely to be used in a remote sedation cocktail due to previous adverse effects.

Sedatives - delivered by dart or pole syringe					
Midazolam		Medetomidine		Dexmedetomidine	
Conc. (mg/ml)	Dosage (mg/kg)	Conc. (mg/ml)	Dosage (mg/kg)	Conc. (mg/ml)	Dosage (mg/kg)
50	0.3	40	0.02	0.5	0.0075 - 0.015
Reversals - hand injected, if needed					
Flumazenil		Naltrexone		Atipamezole	
Conc. (mg/ml)	Dosage (mg/kg)	Conc. (mg/ml)	Dosage (mg/kg)	Conc. (mg/ml)	Dosage to reverse Medetomidine (mg/kg)
0.1	0.015	50	0.2	5	5x (Medetomidine dosage)
					Equal to volume of Dexmedetomidine

**Example of a *Hawaiian monk seal sedation worksheet* provided by The Hawaiian Monk Seal Research Program.**

Sedatives - delivered by pole syringe or hand inject		
Diazepam	Midazolam	Butorphanol (rarely used)
Dosage (mg/kg)	Dosage (mg/kg)	Dosage (mg/kg)
0.1 - 0.3	0.2-0.3	0.05-0.2

## Appendix L – Weight/dose card

Example of a *Steller sea lion weight/dose card* (provided by [Protected Resources Division, NMFS Alaska Region](#) and [Alaska Department of Fish and Game Steller sea lion program](#)). After each capture, a photo, summary of age, sex, estimated weight, drugs and dosages use, and darting distance and pressure are created, laminated, and added to a binder to have as reference for the next entanglement response.

Work conducted under NOAA Permit #18786



PEJ, Graves, June 30, 2018

Age/Sex: Subadult/Male (5 yr. old)

Estimated weight: ~ 400 kg/ 840 lbs

Meditomidine: 19.6 mg (.05 mg/kg) (.03-.05 mg/kg)

Midazolam: 85 mg (.2 mg/kg) (.1 - .3 mg/kg)

Butorphanol: 85 mg (.2 mg/kg) (.1 - .3 mg/kg)

Darting distance/pressure: 17 yds/5 bars

Atipamazole: 80 (.2 mg/kg)

Naltrexone: 200 (0.5 mg/kg)

## Appendix M – Capture Pole

**Example of a *capture pole* used for in-water Steller sea lion entanglement responses (provided by [Alaska Department of Fish and Game Steller sea lion program](#)).**

### SPECIFICATIONS:

- $\frac{3}{4}$ " Polyvinyl chloride (PVC) handle (length of your choice) with end cap to keep afloat
- $\frac{3}{4}$ " tee with 2 barbs attached to the opposite end for holding hose
- PVC primer & cement
- $\frac{3}{4}$ " sanitation hose- any hose that is quite rigid, but best avoid wire reinforced hose as it's difficult to cut
- $\frac{1}{4}$ " to  $\frac{5}{16}$ " rope (recommend the 3-strand polypropylene long-liner line that is greenish) for wrapping through device



- The tee and cap are glued to the main pole with the appropriate PVC cement; note that you may not find a PVC tee that has a female end (for fitting over the main handle) with two hose barbs. If you can't find one, use a threaded tee that attaches to another threaded fitting that is then glued to the handle.
- You then slice the hose (length of choice to form a good-sized loop) lengthwise down the middle-

LEAVE ABOUT 6" ON EITHER END SO YOU CAN ATTACH TO THE BARBED FITTING. Attach the hose to the barb fitting (*see note below about planned modification*) - you may want some to apply grease or dish soap to help get the hose on. You may need to heat the hose to reduce the rigidity. You then have to push the line into the cut you've made in the hose (until the hose becomes more pliable, using a flat-end screwdriver works well, to feed the line into the slit).

- The line (which is formed into a cinching loop by tying a bowline in one end, then running the other end through the bowline) is then run out along the handle so the operator can easily grab it. We recommend taping the rope to the handle in a few places - don't over tape as you want it to come off once you have rope around the animal.
- **New modifications:** We plan on sanding down one of the barbs (the right amount should take some experimenting so best to buy a few extra tees) to allow the hose to somewhat easily come off should the animal swim off. We may also add a corrodible link, by slicing the hose across the width and using the link to join the two ends – it could be tied on.

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