

Agenda Item 3.1

Follow-up from AC24 on Threats to Small
Cetaceans

Bycatch

Information Document 3.1b

**Guidelines for the Safe and Humane
Handling and Release of Bycaught Small
Cetaceans from Fishing Gear (Draft
August 2019)**

Action Requested

Take note

Submitted by

WWF



Note:

Delegates are kindly reminded to bring their own document copies to the meeting, if needed.

Guidelines for the safe and humane handling and release of bycaught small cetaceans from fishing gear

Draft (August 2019)

Dr Derek J Hamer



DBMS Global Oceans: PR-046
Unpublished Report Series: 131 (DRAFT v9.2)
Report to: Worldwide Fund for Nature (WWF), project AK51

DRAFT – not to be cited until finalized.

Disclaimer:

The authors do not warrant that the information in this document is free from errors or omissions, nor do they accept any form of liability, be it contractual, promissory, tortuous or otherwise, for its content, or for any consequences arising from its use, or any reliance placed upon it. The information, opinions and advice contained in this report are for non-obligatory guidance purposes only and may not relate to, or be relevant to the particular circumstance of the reader or user. The authors do not take responsibility for the opinions or actions of others arising from the use of content within this document, before or after its production date.

Copyright:

© 2019 DBMS Global Oceans

This work is copyright. Apart from permitted use under the Australian Government Copyright Act 1968 and its subsequent amendments, no part of this report may be reproduced by any process without prior written permission from DBMS Global Oceans and the first author. Beyond Australian territorial jurisdiction, the Australian Government, in relation to copyright, extends its copyright limitations through bilateral agreements with other nations and through membership to international conventions.

Development:

Author__ Dr Derek J Hamer

Editor__ Gianna Minton (Consultant-Coordinator, WWF Cetacean Initiative)

Reviewers__ Aimee Leslie (WWF – Peru), Leigh Henry (WWF – US) and experts consulted by the IWC, CMS and ASCOBANS

Approved__ TBA

Distribution: ‘DRAFT for IOTC Submission’ for consideration by the IOTC Working Party on Ecosystems and Bycatch (WPEB)

Contact:

Dr Derek J Hamer

DBMS Global Oceans, GPO Box 175, Hobart, Tasmania, Australia, 7001.

derek@dbms-global.com

+61 (0)428 104 493

www.dbms-global.com

Front page photo credits (left to right):

- Striped dolphin bycaught in gill-net: Greenpeace Turkey
- Dolphins encircled in purse-seine net, eastern tropical Pacific Ocean: M.L. Gosliner
- False killer whale caught on longline hook (NOAA/NMFS)

Table of Contents

SUMMARY	4
DRAFTING AND REVIEW PROCESS TO DATE	6
PURPOSE, SCOPE AND LIMITATIONS	7
GLOSSARY OF TERMS	9
1. BACKGROUND AND CONTEXT	11
• 1.1 Overview	11
Drivers of bycatch	11
Efforts to mitigate bycatch	12
Lessons learned from stranding events	12
• 1.2 Welfare, anatomy and stress management	14
Delicate appendages	16
Blowhole and breathing	17
Jaws and teeth	18
Skin and touch	18
Eyes and seeing	19
Ears and hearing	19
Stress, internal organs and body function	19
2. AT SEA OPERATIONAL PRACTICE	20
• 2.1 Training for preparedness and competency	21
Step 1: Industry workshop – improving awareness and developing documents, and processes	21
Step 2: Portside workshops – animal handling and release protocols, and data collection	22
Step 3: Crew induction, refresher training and competency assessment	23
• 2.2 Equipment list	23
• 2.3 Release of small cetaceans brought alongside	26
Hooked – longline and drop line	27
Encircled – purse-seine net	29
Tangled – gill-net	31
Trapped – trawl net	33
• 2.4 Handling and release of small cetaceans brought aboard	35
Bringing the animal aboard	35
Initial assessment of animal condition	37
Temporarily holding the animal on board	38
Moving and releasing the animal	40
• 2.5 Record keeping	45
ACKNOWLEDGEMENTS	45

REFERENCES.....	46
ANNEX 1: Response to the first round of stakeholder reviews	52

SUMMARY

These guidelines, in their full text format, are intended to provide fisheries managers at any level, as well as those who work with fisheries to improve their sustainability, with best-practice methodology on the safe and humane handling and release of small cetaceans accidentally bycaught in fishing gear. They are intended to enable managers and ‘trainers’, as well as anyone involved with fisheries policy or management to understand the rationale and need for ‘best practice’, as well as the science that supports the recommended practices. The illustrations provided with these guidelines, as well as the bullet-pointed handling notes, can be used to develop 2-page laminated fisher-friendly ‘Flips’ (ready reckoners) that contain clear, concise, bullet-pointed instructions pertinent to each specific fishery.

Fishing is now widespread across all oceans and seas, and most large rivers, with extensive spatial, temporal and trophic overlap occurring with cetaceans in many areas. A 2006 global synthesis estimated that 300,000 cetaceans are killed incidentally in commercial fisheries each year. As air-breathers, small cetaceans – dolphins and porpoises, which are the focus of these Guidelines – are unlikely to survive these events, typically succumbing to asphyxiation, injury or stress. **Preventing fisheries bycatch should be a top priority to ensure the conservation of species or populations**, and most efforts to date have rightly centred on the principle. However, when these efforts fail and small cetaceans are found alive in or on the fishing gear, a clear and comprehensive set of Guidelines for the fishers involved would be of great benefit.

These Guidelines address a gap in currently existing resources available to relevant government fishery management agencies and fishing industry associations or organisations. They draw upon the evolving literature on how beach-stranded cetaceans are humanely handled and released back into the water. These practices, which reflect changing values in society towards animal welfare and conservation, have taught us much about the physiological characteristics and responses of the individual animals involved, highlighting their needs and vulnerabilities. Stranded and entangled cetaceans are likely to feel pain, suffer from exposure, and experience fear and stress as humans do. For this reason, these **Guidelines focus on humane handling and release methods that are likely to improve the chances of survival for the animal involved**.

The guidelines provide the rationale and instructions for best practice for (i) releasing small cetaceans that are brought alongside the vessel, bycaught in or on fishing gear, and (ii) handling a bycaught animal that is accidentally or intentionally brought aboard. In each case, the aim is to decrease the risk of further injury or stress, thus increasing the chances of post release survival. Experience gained from beach stranding events shows that a high level of competence and preparedness (which includes having the right equipment on hand) has a significant positive impact on post-release survival. In the fishery context, formal, regular and structured training is recommended, which involves all

participants, from deck hands and skippers, to licence holders and fishery managers. Broader relationships with stranding experts and marine mammal biologists are also encouraged, so the most effective fishery specific protocols can be developed. From these efforts, the concept of safely and humanely handling and releasing small cetaceans will be normalised.

Bycaught animals should be released while still in the water where possible, because bringing them aboard will increase psychological and physical stress, both of which are difficult to detect and measure. Consequently, the underlying goal should always be to release the animal as soon as possible and to minimise handling, thus giving it the best chance of survival. Detail is given, on a fishery specific basis, on how to release a hooked (longline or drop line), encircled (purse-seine), trapped (trawl), or tangled (gill-net) animal from the fishing gear, while still in the water. The circumstances will vary by fishery and vessel, and under different weather conditions. Other fisheries could be addressed in future versions of these Guidelines as the need arises.

In these guidelines, **crew safety is prioritised; crew members should never enter the water with entangled animals, as this poses an unnecessary injury or drowning risk.** Some fisheries may develop gear modifications (e.g. a removable section of cork line in a purse-seine fishery) or carry equipment (e.g. a line cutter on an extended pole for a longline fishery) to facilitate access to the animal without entering the water.

On occasion, bycaught animals will be brought aboard the vessel, either accidentally because they were not detected beforehand, or intentionally because it was deemed safer for the animal or crew to do so. Detail is provided on how to safely and humanely bring the animal aboard; make a basic assessment about its condition; hold it aboard for a short period; and then how to move and release it back to the water. Instructions are also included for the use of specific and custom-made equipment to facilitate these actions (e.g. slings, stretchers and towels).

Entanglement events provide opportunities to learn about the gear and nature of entanglements as well as their impacts on cetaceans. This information can be used to guide mitigation efforts as well as improve handling and release practices. As such, comprehensive record keeping is recommended, using standardised log sheets that are collected by a central agency for collation and analyses.

These Guidelines and the practical and robustly laminated 'Flips' that are developed for crew members should be viewed as a starting point for capacity building when the need to address small cetacean bycatch becomes apparent. They are 'living documents' that should be updated through regular consultation and review. Ultimately, it is hoped that they will contribute to a wider culture of 'best practice', in the global effort to minimise the impact of fishing activities on the welfare and conservation of small cetaceans that interact with fisheries.

NOTE: These Guidelines do not replace existing agreements, laws, regulations or licence conditions. They must function within the legal framework established by the relevant authorities. Additionally, they do not in any way encourage or endorse behaviours that are unsafe to fishers or others involved.

DRAFTING AND REVIEW PROCESS TO DATE

The best practice guidelines have been commissioned by WWF, with funding from WWF US, and technical support and overview by WWF International, WWF Peru, and the WWF Marine Cetacean Initiative. After an open tender with detailed terms of reference that elicited applications from 10 highly qualified individuals, Derek Hamer, was selected based on his practical experience with marine mammal bycatch in a range of fisheries, and particularly his hands-on experience and familiarity with fishing operations, crews and gears.

A first draft was completed in July 2019 and circulated to a range of partners and stakeholders for their feedback and input. These included:

- **The International Whaling Commission (IWC):** The coordinators of the [Bycatch Mitigation Initiative](#), [Stranding Initiative](#) and [Large Whale Entanglement Response Network](#) each circulated the guidelines to their expert panels, resulting in detailed feedback and valuable suggestions from at least 12 different individuals with recognized expertise in cetacean health and pathology, cetacean anatomy, stranding response, and entanglement response.
- **The Convention on Migratory Species (CMS):** The CMS focal point for aquatic animals shared the draft guidelines with the CMS Scientific Council, and received detailed feedback from three members of the CMS Aquatic Mammals Working Group, as well as the CMS focal point for Australia.
- **Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS):** The ASCOBANS coordinator shared the guidelines with ASCOBANS Parties and members of joint ASCOBANS-ACCOBAMS bycatch Working Group, and received comments from at least three individual experts.
- **Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area (ACCOBAMS):** The guidelines were sent to the ACCOBAMS coordinator, who had provided a 'blessing' to build on the shorter [illustrated best practice guide](#) they produced in 2018. Members of the joint ASCOBANS-ACCOBAMS bycatch working group provided feedback through the ASCOBANS coordinator.
- **WWF:** The document was reviewed and edited by WWF's Marine Cetacean Initiative Coordinator in close consultation with the consultant, and shared with WWF's Marine Cetacean Team, comprising practitioners working with cetaceans around the globe.
- **The IUCN Cetacean Specialist Group (CSG):** The chair and a few members of the IUCN CSG were invited to review the document and provided comments and feedback.

Further review and endorsement

A summary report of how feedback from all of the parties above was incorporated into this draft is available as an Annex to this document. This latest draft will be shared with the IOTC Working Party on Ecosystems and Bycatch, which will meet on September 3-7 in La Reunion, as well as a stakeholder engagement meeting hosted in mid-September by the FAO to work on the development of technical guidelines for the mitigation of marine mammal bycatch. In each case, participants will be invited to: Discuss the document during their meeting, with suggestions and feedback to be captured in the meeting report;

Provide written feedback in bullet-point format (rather than tracked changes), citing page and section numbers where appropriate.

Feedback from these two fora will be incorporated into a revised draft by December 2019. At the same time, a professional designer/illustrator will be contracted to reformat the document and its illustrations, and create at least one template for the laminated 'Flip' to be used for on-deck consultation. It is hoped that the FAO and the IOTC will be able to incorporate these into their official documentation after that point.

The reformatted draft will be shared with the IWC Scientific Committee in May 2020, with the hope/expectation that the Scientific Committee can provide a recommendation for endorsement of the Guidelines at the next IWC Commission meeting in October 2020.

Testing and dissemination

- WWF Peru has already started to work with draft versions of these guidelines in their engagement with both industrial and small scale artisanal fisheries in Peru.
- As a 'living document' it is hoped that these guidelines can be updated and adapted for use in different fisheries around the globe.
- A 2-page PDF brochure or leaflet can also be produced to advertise/promote the guidelines with other stakeholder groups.

PURPOSE, SCOPE AND LIMITATIONS

These guidelines, in their full text format, are intended to provide fisheries managers at any level, as well as those who work with fisheries to improve their sustainability, with best-practice methodology on the safe and humane handling and release of small cetaceans accidentally bycaught in fishing gear. They are intended to enable managers and 'trainers', as well as anyone involved with fisheries policy or management to understand the rationale and need for 'best practice', as well as the science that supports the recommended practices. The illustrations provided with these guidelines, as well as the bullet-pointed handling notes, can be used to develop 2-page laminated fisher-friendly 'Flips' (ready reckoners) that contain clear, concise, bullet-pointed instructions pertinent to each specific fishery.

Bycatch of small cetaceans (dolphins and porpoises) in fishing gear is recognized as the most significant human-induced threat to their welfare and conservation around the globe (e.g. Lewison et al. 2004). As air-breathers, small cetaceans are unlikely to survive entanglement events, resulting in thousands of bycatch-induced mortalities each year, suggesting that avoiding their interaction with fishing gear should be of the highest priority. However, when these attempts fail and fishers find small cetaceans alive in their gear, a clear and comprehensive set of Guidelines for the fishery involved would be of great benefit. Specifically, fishers would be able to develop 'best practice' around how to handle and release animals in a manner that is humane, prevents further injury, and increases its chances of survival.

In the context of these Guidelines, a small cetacean comprises a weight and size that can be lifted by available crew, or by existing cranes or winches, in a way that does not compromise the safety of the crew, nor the operational capacity of the vessel. Small cetaceans may be up to 7 metres long (DPIPWE

2019) and include (but may not be confined to) all the dolphins (36 species), porpoises (six species) and river dolphins (four species) that are of the suborder Odontoceti, or toothed whales (Hooker 2002). In situations where larger cetaceans are brought alongside and there is crew and vessel capacity, these Guidelines may also assist with their release in the water, although handling a larger animal on the deck is not advised.

These Guidelines will equip the fisher, and those responsible for managing fisheries with a better understanding of the needs of entangled dolphins and porpoises, and with greater operational ability around handling and release procedure, reducing the risk of further stress or injury in the gear, or aboard the vessel. Note that these Guidelines are not aimed at addressing large whale disentanglement from fishing gear, which is typically more dangerous and operationally difficult. The International Whaling Commission's Global Large Whale Entanglement Response Network provides training and documentation for such instances (see <https://iwc.int/entanglement-response-network>). Additionally, these Guidelines do not address situations where fishers, typically in artisanal contexts, view small cetacean bycatch as food for subsistence purposes. Other educational pathways and incentives are needed to address this activity. Similarly, while the sections providing instructions for specific categories of fisheries do not include all possible gears or gear configurations, the basic principles explained in the document apply to all fisheries and can be adapted as necessary. Future iterations and updates could include more detailed instructions for fisheries not yet included (e.g. trap and pot fisheries, where entanglement in lines can be an issue for small, as well as large cetaceans).

Finally, these Guidelines do not replace existing agreements, laws, regulations or licence conditions. They must function within the legal framework established by the relevant authorities. Nor do they act as an alternative to making all efforts to avoid small cetaceans from becoming bycaught in the first place. Additionally, they do not in any way encourage or endorse behaviours that are unsafe to fishers or others involved.

GLOSSARY OF TERMS

Appendage: A body part that projects or extends from the core or trunk, which in small cetaceans includes the rostrum, pectoral and dorsal fins and the fluke.

Blowhole: The nostril located on the top of the head. During dives the blowhole is sealed by a nasal plug which opened upon surfacing for breathing. Baleen whales have two openings in their blowhole, while toothed whales have only one.

Bycatch: Any unwanted or non-target animal that is caught during fishing operations. In the context of these guidelines, small cetaceans are incidentally caught by fishing gear that has been set to catch other species of commercial value.

Calf: A dependent young whale or dolphin, sometimes referring only to those born in the past year.

Cervical vertebrae: The individual bones of the spine, or backbone, located in the 'neck' or just behind the skull.

Cetacean: Whale, dolphin or porpoise. In the context of these Guidelines, small cetaceans generally refer to dolphins and porpoises, both of which belong to the Odontocete sub-order, which have teeth for feeding on squid and fish, and in some cases other marine mammals. In contrast, large cetaceans, belonging to the mysticete sub-order, use baleen plates to forage on plankton and krill.

Dolphin: Refer to Cetacean above. Dolphins can have a pronounced rostrum (beak) and/or a blunt head, and always have conical teeth for grasping fish or squid prey. See Porpoise for comparison.

Dorsal fin: The fin along the midline of the back of most whales, dolphins and porpoises, with its rigidity facilitated by a cartilaginous core.

Echolocation: The process by which most odontocetes, to which the small cetaceans belong, use vocalizations to obtain information about their surroundings. Similar to SONAR, echolocation involves the production of rapid, high-frequency clicks that bounce off objects in the animal's path, with those that return to it aiding in the creation of an 'auditory picture' of the surroundings.

Entanglement: Instances where a marine mammal becomes caught in or on fishing gear, either when foraging naturally, or when depredating bait or target fish from the gear. In the context of these Guidelines and of operational interactions of small cetaceans with fishing gear, this is an overarching term for when the animal becomes hooked, encircled, trapped, or tangled.

Flukes: The flat horizontal lobes that form the tail of all whale and dolphin species, which typically has a cartilaginous core.

Foraging: Feeding or searching for food.

Odontocetes: All whales and dolphins that have teeth; includes Sperm whales, Killer whales (Orca) and all dolphins and porpoises.

Pectoral fins: Sometimes referred to as flippers, although most often as fins. They are modified limbs with bone structures, which are the equivalent of human arm and hand. They are used for stability and steering, with some movement possible to facilitate this.

Porpoise: Although this term is sometimes used to refer to any small dolphin, porpoises are distinguished from dolphins by always having blunt snouts/heads (i.e. no pronounced beak) and spade-shaped teeth.

Rostrum: The 'snout' or beak' of a dolphin or whale, comprising the upper and lower mandible or jaw.

Stranding: Occurs when a live or dead whale or dolphin comes ashore, partially or wholly out of the water. In live animal situations, they are generally unable to return to open water without assistance.

Tailstock: Also called caudal peduncle, the tapered rear part of the body, from just behind the dorsal fin to just in front of the flukes.

Trophic competition: The **trophic level** of an animal is the position it occupies in a food chain; animals in trophic competition are competing for the same food source.

Vascularised: Containing blood vessels/veins.

Vertebrae: The individual bones of the spine or 'back bone'.

Whale: This term is used to refer to any large cetacean, but technically scientists distinguish between toothed cetaceans (*odontocetes*) and those with baleen plates instead of teeth (*mysticetes*);

1. BACKGROUND AND CONTEXT

1.1 Overview

Drivers of bycatch

Commercial and industrial scale fisheries are now widespread across all oceans and seas, and in most large rivers, with many being poorly regulated, overfished, or depleted (Pauly 2008; Cullis-Suzuki and Pauly 2010; Teh et al. 2017). Small scale artisanal fisheries are also widespread, being important to local economies of coastal communities, although largely unregulated. The spatial, temporal and trophic overlap between fisheries and marine mammals, including small cetaceans, is extensive and possibly increasing in some areas. One global synthesis of available commercial fishing records during the 2000s suggested an estimated 300,000 cetaceans were bycaught annually (Read 2006). Then and now, such estimates are likely minima due to underreporting, the difficulty of monitoring bycatch in small scale artisanal fisheries in remote areas, or ‘cryptic catch’ (Wade et al. 2007), as indicated by animals that wash up on shores (known as ‘stranded’ animals, alive or dead) exhibiting injuries attributable to being bycaught in fishing gear (e.g. Kuiken 1996; de Quiros et al. 2018; Lusher et al. 2018). This situation highlights the pressing need to mitigate the negative impacts to non-target species, including small cetaceans.

The principal driving cause of small cetacean bycatch in fishing gear is either competition for the same resource, or opportunism around increased access created by the fishing gear, or both (FAO, 2018). Fish stocks are finite and are often unable to respond adequately to the unprecedented extraction capacity of today’s fisheries (Norse et al. 2012). Fisheries and cetaceans are now much more likely to be in the same place at the same time, focusing their efforts where prey, which are also fisheries resources are distributed (Lewison et al. 2014). Consequently, ‘operational interactions’ (where hooking, encirclement, entrapment, or entanglement) typically occur when small cetaceans ‘depredate’ from active (e.g. purse-seine, or trawl) passive (e.g. longline, demersal traps) gear, to increase their foraging success (Gilman et al. 2006; Hamer et al. 2012), or when foraging or other activities lead cetaceans into the path of stationary gear such as gill nets of any description (e.g. Northridge et al. 2017).

In the majority of cases, dexterity and echolocating capacity (Whitlow 2002) aid small cetaceans to avoid interactions with fisheries, in the same way they avoid predators or other risky situations when foraging naturally. Unfortunately, this is not always the case, with bycatch events occurring when an animal misjudges and becomes hooked, encircled, trapped, or tangled, which often leads to physical trauma or asphyxiation (Gosliner 1999; Hamer et al. 2008). Naturally foraging animals may also become bycaught on, in or by fishing gear they do not detect. Small cetaceans typically focus their foraging efforts in the upper 100 metres of the water column (Stewart 2002), suggesting they are likely to interact with fisheries operating in coastal (e.g. demersal gill-nets for shark), shelf (e.g. pair trawls for bass) and the epi-pelagic zone of oceanic and international waters (e.g. shallow set pelagic longlines and pelagic purse-seines for tuna).

Efforts to mitigate bycatch

Concerns about the impact of fishing activities on small cetaceans were first raised during the 1960s, when large numbers of dolphins were bycaught and killed in the eastern tropical Pacific purse-seine fishery for yellowfin tuna (Hall, 1998). Collaboration between researchers and the fishery resulted in the development of an effective means to release dolphins before the net was hauled aboard, thus heralding a change in attitude towards the impacts of fishing on cetacean conservation (NRC 1992; Gosliner 1999). Fishery bycatch across a range of fishing gear types is now widely understood to be one of the primary causes of population decline among many small cetacean populations (and marine mammal populations generally; e.g. Northridge 2002; Read 2008). This highlights the need to integrate well-developed marine mammal bycatch mitigation strategies into modern, sustainable fisheries management, and for 'in country' capacity building and education in less regulated environments.

There are three ways for fishing operations to avoid bycatch, being (i) behaviour or practice change on fishing vessels (e.g. mandatory licence conditions and voluntary codes of practice, around increased monitoring of presence prior to commencing fishing and moving on or delaying if animals are seen, e.g. Hamer and Goldsworthy 2006 involving pinnipeds; Hamer et al. 2008), (ii) fishing gear modification or augmentation (e.g. escape hatches in trawl nets, Hamilton and Baker 2019; physical deterrent devices on longlines, Hamer et al. 2015) and (iii) spatial and temporal restrictions to fishing effort (e.g. seasonal and bycatch limit triggered closures, Beest et al 2017). The full suite of mitigation measures are reviewed in Leaper and Calderan 2018. In contrast, these guidelines focus on what must be done when attempts to avoid small cetaceans have failed. In practice, the situation typically presents an immediate need to safely and humanely handle and release a small mammal, because it has become hooked, encircled, entrapped, or entangled. Nonetheless, these measures should be viewed as a last resort, rather than an alternative to more appropriate avoidance strategies.

Lessons learned from stranding events

To date, minimal effort has been committed to developing strategies for the safe handling and effective release of small cetaceans from fishing gear. In contrast, the number of guidelines developed for the rescue of cetaceans stranded on beaches or coastlines is numerous and growing. As public interest in the welfare and conservation of marine mammals has grown, private organisations and government agencies have refined techniques to improve the care and thus chances of survival of live stranded cetaceans (e.g. Geraci and Lounsbury 2005; Wells et al. 2013). In practice, whether a small cetacean is stranded on a beach, or brought aboard after being bycaught in fishing gear, managing its welfare and survival involves similar techniques. As such, stranding response guidelines and manuals can serve as good tools to help guide 'best practice' for managing small cetacean bycatch in fishing operations.

A recent European Cetacean Society (ECS) workshop highlighted the need to improve the welfare and survival prospects of stranded marine mammals and the safety of rescuers (Barnett et al. 2014). The

three following examples, compiled by independent experts, a private organisation and a government agency, adhered to that philosophy in the development of their guidelines:

- Geraci and Lounsbury (2005) *Marine mammals ashore: a field guide for strandings*
https://books.google.com.au/books/about/Marine_Mammals_Ashore.html?id=AlwWScWoP6MC&redir_esc=y
- British Divers Marine Life Rescue (BDMLR 2019). *Marine mammal medic handbook*
<http://wildpro.twycrosszoo.org/s/00ref/miscellaneouscontents/bdmlr-marinehandbook/4.Management.htm>
- Department of Primary Industries, Parks, Water and Environment, Tasmanian Government (DPIPWE 2019). *Cetacean incident manual: a guideline to departmental response protocols to cetacean stranding and entanglement events in Tasmania*
<https://dipwe.tas.gov.au/wildlife-management/marine-conservation-program/marine-mammal-incident-response> (updated version in review)

These and other cetacean stranding guidelines identify six key elements for improving the safety of the rescuers involved and the survival prospects of the animals involved:

- **Training and safety:** Being prepared and competent in the necessary tasks is critical for ensuring the safety of rescuers are maintained and welfare and survival prospects of the stranded animal are increased.
- **Incident management and task designation:** Desirable outcomes are more likely if there is a designated incident manager and if rescuers have specific roles.
- **Rapid assessment and prioritisation:** Effective initial assessment will lead to correct prioritisation, and appropriate and timely responses, thus desirable outcomes.
- **Stabilisation and first aid:** By using specialist equipment, specific techniques and expert advice, the animal's welfare and survival prospects will be improved.
- **Handling and release actions:** The safest and most appropriate methods for moving, transporting, or euthanising an animal or animals.
- **Record keeping:** For improving our understanding of the biology and ecology of the species involved and for learning how to improve the response to future bycatch/entanglement events.

Given the similarities between beach strandings and some bycatch events, the six abovementioned elements will be used to inform the development of best practice standards for the safe and humane handling and release of small cetaceans from fishing gear.

1.2 Welfare, anatomy and stress management

Small cetaceans are cognitive (exhibiting awareness and insight) and intelligent (able to respond rapidly and accurately) creatures (Würsig 2002). They are highly social and use sounds (or language that may also involve visual cues) to coordinate activities around foraging, breeding, care for young and play (Didzinski et al. 2002; Würsig 2002). These complex behavioural attributes are now widely acknowledged, along with the understanding that individuals feel pain and experience stress in much the same way that humans do (Curry 1999; Atkinson and Dierauf 2018). The needs of non-human, higher order vertebrates, were formally recognised during the 1997 Treaty of Amsterdam, with the creation of a protocol on animal welfare (ToA 1997).

Despite this contemporary understanding, many thousands of small cetaceans continue to die annually in what are likely to be stressful and painful circumstances, due to fatal injuries caused by the gear, or by asphyxiation (Dolman and Moore, 2017). Like all mammals, they breath air, and are unable to do so if they become bycaught under the surface of the water. Only a very small proportion will be found alive in the fishing gear (for example, if the gear was light enough to allow bycaught animals to reach the surface, or if they were caught just before the gear was brought to the surface) and even then may have significant injuries that may compromise their chances of survival in the long term. It is for this reason that **mitigating operational interactions of cetaceans with fishing gear should always be the first priority in any fishery.**

Although most small cetaceans have become bycaught unintentionally, they were deliberately and intensely targeted by purse-seiners in the eastern tropical Pacific during the 1960s, who sought to catch the valuable yellowfin tunas associating with them (Gosliner 1999; NRC 2002; Wells et al. 2008). After more than a decade of unprecedented levels of bycatch mortality, the ‘backdown’ procedure was developed to allow dolphins to exit the net before hauling commenced, followed by a ban on US vessels using ‘dolphin targeted’ sets. Despite this, the affected populations have not recovered (Gerrodette and Forcada 2005; Wade et al. 2007). This may be attributable to undetected but ongoing mortality caused by the continued stress and potential injury induced by (potentially repeated) exposure to chase and encirclement, or to separation of mothers and calves during this process (Wade et al 2007, Noren et al 2013). The animals involved are likely to experience considerable stress, whether they are bycaught or not (Forney et al. 2002), which is typically difficult to detect (St Aubin and Dierauf 2001). Encircled animals often exhibit ‘passive behaviour’ inside the net (where they hang motionless in the water, laying slightly backwards with the tail fluke pointing down), indicating that death is imminent if they are not released quickly (Coe and Stuntz 1980, Fernandez et al. 2017). Animals that are released alive may still succumb later to ‘capture myopathy’, where overexertion (thus exhaustion) and stress related hormones (and associated by-products) lead to delayed but catastrophic ‘muscle melt’ and systems failures (St Aubin et al. 1979; Coe and Stuntz 1980; Marsh and Anderson 1983, Fernandez et al. 2017). Although the bycatch of small cetaceans in most other fisheries is unintended, the outcomes are likely to be similar if the animal can still manage to breath air, because it will expend considerable energy attempting to escape and will become highly stressed in the process.

Animal welfare legislation has been developed in some countries to protect the welfare of domestic animals. In the USA, the Animal Welfare Act requires minimum standards of treatment and care be provided to domesticated and wild animals in domestic situations (e.g. zoos), although its extension to wild animals in wild settings is unclear (Young and Shapiro 2001). In Australia, there are several model codes of conduct for the treatment of specific domesticated animals (DAFF 2017), although almost completely fails to recognise the needs of wild animals (RSPCA 2018). While these countries, along with many others, have some of the most developed fishery management strategies intended to improve the conservation outcomes at population level for marine mammal populations involved in bycatch, they do not address the welfare of individual animals. This inequity highlights the need to develop welfare strategies around the humane treatment of marine mammals bycaught in fisheries (Dolman and Brakes 2018).

Below, the key elements of small cetacean anatomy are described, so the fisher understands the vulnerabilities of cetaceans when interacting with fisheries. With this knowledge, the fishers can adjust their behaviour and actions to avoid compromising the welfare of each bycaught individual. The specific precautions a fisher should take when handling and releasing a bycaught animal are also described, so that injury and stress levels are minimised, and crew safety and animal welfare are maximised. At its core, improving the welfare of a bycaught animal is about considering its needs, from the moment it is first detected to when it is released (whether in the water or on the deck). An increased understanding of small cetacean anatomy is likely to result in more appropriate management and actions, translating into gentler handling techniques (less physical stress) and a quieter environment (less situational stress). Adopting this approach and attitude will increase the likelihood of survival for the bycaught animal.

NOTE ON ILLUSTRATIONS: THESE ARE IN DRAFT FORMAT ONLY, AND INTENDED TO PROVIDE THE GRAPHIC DESIGNERS (WHO WILL PRODUCE THE FINAL LAYOUT AND FORMAT OF THESE GUIDELINES) WITH THE TOOLS/IDEAS THEY NEED TO PRODUCE PROFESSIONAL ILLUSTRATIONS FOR THIS DOCUMENT.

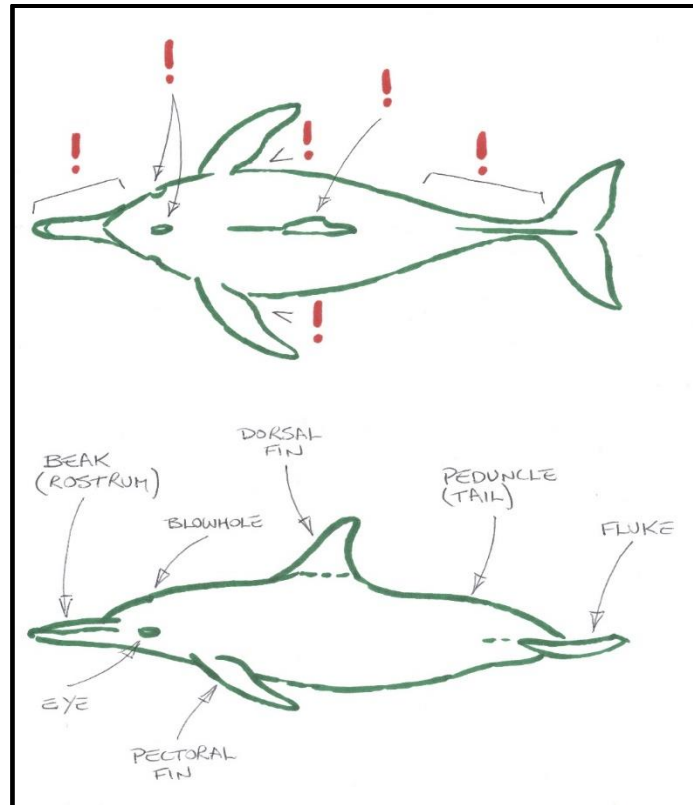


Figure 1. *Basic detail of a small cetacean, showing the anatomical features of interest (side view) and the delicate and fragile areas (plan view). There are many points where even gentle handling may injure the animal. These will become important in actioning 'best practice' handling and release procedures on the vessel when an animal is bycaught and landed, so as to improve its welfare situation and survival prospects.*

Delicate appendages

Despite the visual differences, the structure of small cetacean appendages is similar to those of a human, having a complex bony skeleton that is controlled by an intricate network of ligaments, tendons and muscles, with cartilage providing rigidity at the extremities (Geraci and Lounsbury, 2005; Figure 1). All are vascularised, with arteries and veins that carry blood from and to the heart and lungs. The highly developed nervous structure throughout transmit information about temperature and pain.

The rostrum (or beak) is a long, toothed upper jaw attached to the skull or head, with the lower jaw articulating beneath. The head is in turn connected to the skeleton of the torso (by cartilaginous tissue) via the cervical vertebrae of the neck. Similarly, the pectoral flippers (on either side of the body just behind the head) have a skeletal structure that is equivalent to a human hand, arm and shoulder. The tailfin (or fluke, at the hind or posterior end of the vertebrae) and the dorsal fin (on the top side of the body), are composed of soft and cartilaginous materials.

Small cetaceans are unable to move these appendages to the extent that a human can move equivalent appendages. Consequently, inappropriate pushing, pulling or twisting appendages in attempts to move an animal can easily cause injury. Although there may not be immediate or visible signs, the resulting pain will induce stress, which ultimately compromises their welfare and reduces the chance of survival. At the same time, it is important to stay clear of the tail fluke and the rostrum, on the deck or in the water. These animals have strong musculature and can move suddenly and with power. Their behaviour may be difficult to predict and thus cause injuries to crewmembers who do not exercise caution (Walsh et al. 2001).

Handling notes

- *Handle the animal in a way that avoids pushing, pulling or twisting its appendages, as this may cause painful injuries that can decrease the chances of survival.*
- *Stay clear of the tail fluke and rostrum to avoid injury to crew.*
- *Whenever possible, use lifting 'stretchers', which are safer for the animals and the crew (this is described in Section 2.2)*
- *Make all efforts to keep the animal in the upright position at all times, including when moving, or when returning to the water.*
- *Use props, such as sand bags or rolled towels placed on either side of the animal, to gently hold it upright and in a 'natural' position (see figure 8).*

Blowhole and breathing

As mentioned earlier, small cetaceans breath air just like all other marine and land mammals. Unlike most other mammals though, breathing occurs through the blowhole located at the top and towards the back of the head. For this reason, it is critical that the passage of air is not obstructed under any circumstances. Fishers should also pay particular attention ensuring an animal that is bycaught and still in the water is able to remain at the surface, until it is brought aboard or released. Although unlikely, it is advisable to remain clear to avoid the transfer of air or droplet borne diseases (DPIPWE 2019).

Handling notes

- *Do not cover or block the blowhole, or spray water in or near it, to allow uninterrupted breathing.*
- *If the animal is held aboard a vessel for an extended period, apply Vaseline around the exterior surface of the blowhole to maintain skin condition (using gloves), although this should be done carefully to ensure none comes into contact with the interior surfaces of the nasal passage (DPIPWE 2019).*
- *Avoid placing the animal downwind of exhaust fumes and where possible, the crew should avoid being downwind of the blowhole.*

Jaws and teeth

Small cetaceans perceive sound through the jaws and teeth, and the fatty deposits around the inner ears. Any damage not only compromises feeding, but can also affect survival due to interference with echolocation, navigation and object detection, and with hearing predators and prey. Net or line may entangle the teeth, tongue or jaws, and damage can be furthered to these structures during handling. Rough handling may damage these delicate structures, despite their robust appearance. Additionally, crew members may be injured by the teeth, so should avoid placing their hands or feet inside the mouth.

Handling notes

- *Under no circumstances should the jaw be used to move or hold the animal, despite looking robust.*
- *Fishers should avoid placing their hands or feet inside the mouth, as they may be easily injured.*

Skin and touch

Although the skin of small cetaceans appears to be tough, it is highly sensitive to touch, sun, heat and pain, and is easily cut and abraded. The skin is typically used to transfer touch sensations through an extensive nerve network just beneath the surface. For this reason, particular care should be taken to ensure the animal is not placed on sharp or abrasive objects (of a physical or chemical nature), nor on particularly hot or cold surfaces, because the sensation of pain and discomfort will be heightened, thus increasing stress levels.

Handling notes

- *Avoid sharp and abrasive objects, and hot or cold surfaces.*
- *For animals being held aboard the vessel for extended periods (e.g. for more than 10 minutes), wet towels should be carefully placed over the animal to ensure they are kept moist, using water collected from overboard that is of ambient temperature. This is particularly important to avoid hypo- or hyperthermia, and to prevent the particularly sensitive skin from windburn or sunburn (Walsh et al. 2001).*
- *Deck hoses should be avoided, as the water is often partially heated as it travels through a pump in the engine room, so that temperature shock is avoided when the animal is released.*

Eyes and seeing

The eyes and immediate surrounds of the eye of small cetaceans are similar to those of a human. As such, their perception of pain in relation to eye and socket damage will be acute. Also, small cetaceans have very good eyesight, both in and out of the water, so will be able to see all movements and will be sensitive to bright light and changes in light, in much the same way that humans are. Sudden movements may also frighten animals, so should be avoided to minimise stress.

Handling notes

- *Avoid any kind of physical contact with the eyes, unless attempting to gently and carefully remove foreign bodies that are relatively superficial. Using water to 'flood-irrigate' the eyes is the best approach, although a clean cotton cloth may assist in removing small objects.*
- *If the animal is kept aboard for an extended period, then regularly and gently drizzling small amounts of ambient temperature water over the face and eyes will be necessary to maintain eye hydration and overall condition.*
- *High pressure deck hoses should not be directed toward or near the eyes at any time.*
- *Refrain from making sudden movements within view of a bycaught animal and from shining bright lights in their direction, as both may frighten the animal.*

Ears and hearing

There is minimal visible evidence of the ear on the external surfaces of a small cetacean, being at best an inconspicuous hole behind the eye. The ability to hear is well developed, although exposure to very loud noises can temporarily or permanently impair cetacean hearing (Würsig and Richardson 2002). Hearing is critically important to its survival because in a world where vision is largely impaired, sound is used to locate prey and avoid predators (Thewissen 2002).

Handling notes

- *Although there is typically a lot of noise on or near fishing vessels, attempt to minimise noise as much as possible. The main engine may need to continue running for safety reasons, but if at all possible auxiliary engines should be shut down temporarily.*
- *Avoid dropping objects on the deck, as high intensity low pitch noises can be most damaging (Teilmann et al. 2006).*
- *Avoid shouting if possible: oscillating noise is likely to cause confusion and added stress for the animal.*

Stress, internal organs and body function

Despite the external differences, the internal organs and physiology of a small cetacean are similar to that of a human, with stress having similar results on system function. Any bycatch situation, whether or not it involves physical trauma, is likely to lead to considerable stress for the affected individual.

Stress hormones (e.g. the corticosteroids and catecholamines) are produced in response to frightening or stressful events (e.g. chase by tuna purse-seiners), environmental conditions, or physical injury. These stress hormones may compromise organ function if they reach high levels, which may serve to further increase stress levels (Cowan and Curry 2008, Fernandez et al 2017).

A typical small cetacean live bycatch scenario might include: (i) broken teeth, bones or damaged tissues (the jaws and the vertebrae close to the tail fluke, and the shoulder bones beneath the pectoral fin are likely to be particularly vulnerable to physical trauma in the fishing gear), (ii) hypothermia and wind chill, or hyperthermia and wind burn (animals in stranding situations either become too cold due to the wind chill, or are burnt by sun and wind), and (iii) bulging eyes and rhabdomyolysis or ‘muscle melt’ (caused by stress hormone overload or toxicity, and muscle overexertion). Individually or collectively, these may result in death (Dolman and Moore, 2017; de Quiros et al. 2018). After a bycatch event has occurred and despite the injuries, fishers have the opportunity to prevent exposure and to directly reduce factors that may cause stress.

However, there may be times when a stressed or injured animal, whether in the water or on the vessel, enters a non-responsive state. Such animals may appear to be dead, although they may instead be still and holding their breath. In cases where there is any doubt, it is best to assume that all animals that are caught are alive and that handling and release procedures should still be humane and that its return to the water is expedited, to ensure it has the best chances of survival.

Handling notes

- *Adopt an overarching approach to the care of a bycaught small cetacean at all times, especially when attempting to handle and release an animal, approaching the animal as if a small child, or elderly person, in need.*
- *Gentler, quieter and more thoughtful actions create a more humane and safer situation, for the small cetacean and for the crewmembers involved.*
- *If there is any doubt as to whether an animal is (freshly) dead or in an unresponsive state, it should be treated as live, with all the same care applied and the same motivation to humanely handle the animal and to release it back into the water as soon as possible.*

2. AT SEA OPERATIONAL PRACTICE

To date, most efforts to mitigate operational interactions with marine mammals have evolved around the principal of avoidance (e.g. Hamer et al. 2008, 2015). These guidelines focus on what must be done when all reasonable efforts to avoid a small cetacean becoming bycaught have failed. Releasing bycaught animals from fishing gear while they are still in the water may be quick and involve swift decision making by prepared and competent fishers. However, animals may be brought aboard the vessel, either because they are not detected until the gear is landed on the deck, or because the nature of the operation (including the configuration of the fishing gear, or the vessel) necessitates it. Identical actions around the release from the fishing gear for an animal brought aboard will still apply, although

there will be the added elements of appropriate handling of the animal while aboard, and appropriate and timely release from the vessel when the right opportunity arises.

The remainder of this section describes in detail how to achieve a best practice standard around the safe and humane handling and release of small cetaceans bycaught in fishing gear. It aims to decrease the risk of further injury or stress, thus increasing the chances of post release survival. Whether releasing an animal in the water, or handling it on board and then releasing, the aims are guided by the principal objectives outlined by developed beach stranding guidelines, which are best detailed in Geraci and Lounsbury (2005). The guide outlines a framework for training the relevant stakeholders to a high level of preparedness and competency, and identifies equipment important for carrying out the necessary actions. It then goes on to detail the methods used for the safe and humane release of bycaught animals that are brought alongside from the various gear types in use, then the methods used to handle a bycaught animal that is brought aboard the vessel. Each fishery and each vessel within a fishery will need to adapt the practices and methods to suit the configuration and nuances of their particular vessel and gear. Nonetheless, the one common theme across all should be a willingness to adopt the practices in the best interests of the small mammals that become bycaught in their fishing gear.

2.1 Training for preparedness and competency

Being prepared for a bycatch event and competent in the required handling and release procedures are critical factors for ensuring all is done to decrease the risk of further injury or stress to a bycaught cetacean, and to increasing its chances of post release survival. Underpinning this should be a positive attitude towards the welfare of the animal and a desire to act humanely on its behalf. Achieving these elements underpin the best practice standard, because it is likely to increase the safety of the crewmembers involved and increase the survival prospects of the bycaught animal.

All participants, including fishery managers, licence holders, researchers and observers, plus (most importantly) skippers and crewmembers will need training appropriate to the nature and level of their involvement, and to the fishery, fishing gear and vessel type involved. It is suggested that the managers of a fishery facilitate a three-step approach to training, thus ensuring the most effective implementation of vessel-based protocols:

Step 1: Industry workshop – improving awareness and developing documents, and processes

The purpose of the industry workshop is to bring all relevant stakeholders together to understand the issue and the need to develop fishery-specific protocols for the safe and humane handling and release of small cetaceans. Stakeholders and contributors would include fishery licence holders and managers, marine mammal scientists and stranding experts, regional observer coordinators, and representatives from relevant NGOs and IGOs. Beneficiaries from the workshop would be fishery licence holders and

fishery managers. Suggested elements for discussion and chronology of proceedings (estimated 1-2-day duration):

- Presentation on the impacts of fishing activities on marine mammal and welfare, particularly relating to the species encountered by the fishery.
- Presentation of small cetaceans as sentient beings, referring to their complex communication and social structure, and pain perception and stress, plus current societal expectations around their welfare and humane treatment.
- Broader legal aspects relating to marine mammal welfare and conservation, including obligations to, or limitations of, relevant domestic legislation and regulations and international conventions.
- Clarification of minimum welfare and conservation needs for the small cetaceans bycaught in the fishery.
- Agreement on a list of minimum welfare standards for the fishery around best practice safe and humane handling and release protocols.
- Development of a vessel-based Implementation Plan that (i) outlines a crew-wide response plan at the vessel for when bycatch events occur (outlines roles, expected actions, and responsibilities for each crewmember involved), (ii) details the handling and release procedures, and the decision rules around when an animal should be brought aboard and how it should be released, either in the water or from the vessel, (iii) outlines the reporting and data collection process, and (iv) puts in place a schedule for induction, competency training and review.
- Note that in the plan above, it could be beneficial to establish relationships with local wildlife veterinarians, veterinary pathologists, and/or research organizations that could provide (remote) support to fishing crews as and when practical and appropriate.
- Develop or adapt a 2-page laminated 'Flip' (or other appropriate format) for use on the vessel that provides simplified and pictorially focused steps for the protocol.
- Development of content for the portside training workshop, aimed at developing preparedness and improving competency around the defined protocols.
- Establishing a register of fishery participants who have demonstrated competency.
- Establishing a database for holding information collected about each bycatch event, to inform periodic reviews and avenues for improvement.

Step 2: Portside workshops – animal handling and release protocols, and data collection

The purpose of the portside workshop is to build on-vessel capacity in the safe and humane handling and release of small cetaceans from fishing vessels. This would be facilitated through the Response Plan and the 'Flip' developed or adapted at the Industry workshop. Contributors would include fishery managers, stranding experts, observers and participants in other fisheries where similar protocols are already in place. Beneficiaries from the workshop would be skippers and crewmembers. Suggested elements for discussion and chronology of proceedings (estimated half day duration):

- Presentation on the impacts of fishing activities on marine mammal and welfare, particularly relating to the species encountered by the fishery.

- Presentation on small cetaceans as sentient beings, referring to their complex communication and social structure, and pain perception and stress, plus current societal expectations around their welfare and humane treatment.
- Briefing from the fishery manager on the legal obligations under the relevant legislation and fishery regulations, and the fishery arrangements that accommodate the protocols. This may also include information about legislated obligations around sustainable fishery practices, including the lessening of impacts on the welfare and conservation of non-target and bycatch species, and on observer programs for monitoring compliance.
- Hands-on practical demonstrations that closely follow the protocols set out in the following sections on releasing bycaught animals that are brought alongside, and on handling and releasing bycaught animals that are brought aboard. These demonstrations also focus on the need for leadership and defined roles, solid lines of communication, and regular drills and training. These demonstrations recognise the very specific nature of the fishery and in some cases of the vessels within the fishery.
- Training is also given on how to complete relevant forms and log sheets that are developed or endorsed by the fishery management authority.
- Each crewmember is assessed on their competency and this is recorded in a register held by the fishery management authority.

Step 3: Crew induction, refresher training and competency assessment

The purpose of the crew induction is to ensure that all new crewmembers are adequately trained, with their information needing to be passed to the relevant fishery management authority within a specified period for inclusion in the register. Refresher training and drills should be organised by the skipper (or other designate crewmember), so all can remain competent and prepared. Suggested elements for inclusion in inductions, training and competency assessment:

- Simulation of handling and release protocols, with informal assessment and signoff by the skipper (or other designated person), who is responsible for keeping training and assessments up to date.
- Periodic crew refresher training, at a frequency that is decided by the fishery managers. This allows new crewmembers to understand the effectiveness of group participation, especially the benefits of a designating the incident manager and other roles.
- In countries where monitoring and compliance is effective, it may be appropriate for adequately trained officers to conduct 'spot checks' on crew preparedness.

2.2 Equipment list

It is important to note that, while crew are often resourceful and innovative in the moment, there is considerable benefit in having a cache of equipment that is specifically set aside for use when a small cetacean is bycaught. Some items will already be on the vessel, or pre-exist and can be easily sourced from local stores and shops. Other items will need to be made specifically for the purpose, either from

materials on the vessel, or by other manufacturers. The following list aims to strike a balance between keeping the costs of obtaining and maintaining the necessary items to a minimum, while ensuring they allow the best practice protocols to be carried out unencumbered.

Pre-existing items

- *Deck hoses and buckets* Most larger vessels have deck hoses that can be used at low pressure to keep animals cool and wet. Buckets should be used as an alternative where hoses are not available, or where hose pressure is too high and cannot be adjusted, or where the water coming from the hose is contaminated or temperature modified. Having two or three buckets can be handy. The water used should be directly from the water body from which the animal came.
- *Flat straps and ropes*. Although the vessel is likely to contain many ropes, it is a good idea to have some set aside specifically for use when handling and moving bycaught small cetaceans, which are soft and contain sheaths to minimise abrasion.
- *Cloth bags, sheets and towels*. Both items can be wet down and draped over the animal, to keep it cool or warm, depending on the weather situation. Cloth bags can be used for the same purpose, but may also be filled with sand prior to the commencement of the trip, then used for stabilising a bycaught animal in an upright position if it is brought aboard the vessel. Rolled up towels could be used for the same purpose.
- *Knives and pliers*. These items will be useful in cutting away fishing gear that is hooked in or entangled around a small cetacean. A standard fish knife will be useful for on-deck purposes, while a curved, custom-made blade (ideally curved with the cutting edge on the inside, to minimise injury) on an extension pole will be useful for reaching overboard to cut net and line away from an animal in the water (e.g. Moore et al. 2018; figure xx). Great care should be taken when using knives to prevent injuring the animal. These items must be kept in good working condition, stored correctly, and used safely and appropriately.
- *Cranes or boom winches*. The presence of either item and its location on the vessel will influence the design of a stretcher (described below) and the way the bycaught animal is handled and moved on the deck.

Purpose made items

- *Animal stretcher*. A stretcher (Figure 2a and 2b) will be the most specialised and important item for ensuring the safe and humane handling and release of a bycaught small cetacean. Ideally, it will be custom made, taking into account the number of crewmembers available to lift and handle the animal, the configuration of the deck and of other mechanised lifting options, and the size, shape and behaviour of the species encountered. Its effective placement and use will be described in Section 4.

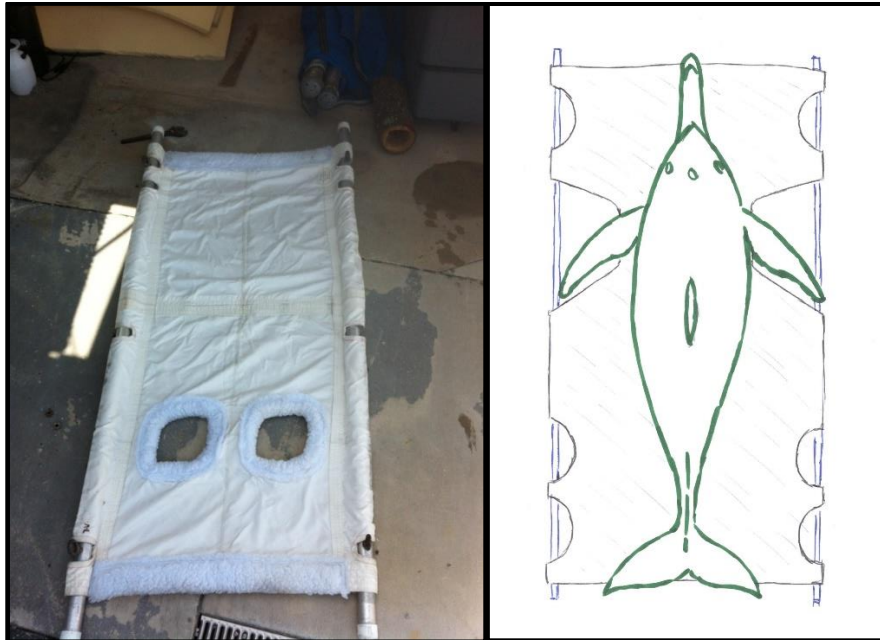


Figure 2. Left: Example of a specialised stretcher for the effective and safe handling and moving of small cetaceans (Courtesy: Francis Gulland). Right: *A suggested stretcher configuration for carrying a small cetacean*. It should be purpose built for use in your fishery, based on the suite of species (thus size range) you are likely to encounter. Note the double hand holds present, which allow four people to do the lift. Two are modified to accommodate the pectoral fins during the lift. Strong canvas is recommended, with reinforcing (double layered) along all edges. Thick walled aluminium poles provide structure and are slid into place after the stretcher is positioned under the animal.

- *Flat straps and ropes*. In addition to having ready access to pre-existing straps and ropes, it is a good idea to have specific items that can be used for slinging the stretcher onto a crane or boom winch, or for lifting a section of net within which a small cetacean is bycaught. Additionally, ropes for controlling the lifted sling from the deck or from a skiff (or dinghy) will be needed (see figure 7a or Figure 10 for an example of how these could be used).
- *Soft mats*. It is recommended that a selection of durable and soft mats are kept on board, so that bycaught animals can be rested on them, instead of directly on a deck that may have sharp edges, surfaces that are hot or cold, and finishes that are abrasive or irritating.
- *Specialised cutters and poles*. Some specialised response teams use 'goose-beak' cutter to cut away fishing gear entangled on whales, where the opposing blades are on the inside of the curve, which look much like a half-shut pocket knife in shape. These cannot cut the animal and have blunt/soft leading edges to easily slide under the material without causing any further injury. Purpose built poles can be used to reach the animal from the main vessel or skiff, if it is impractical or unsafe to be close.

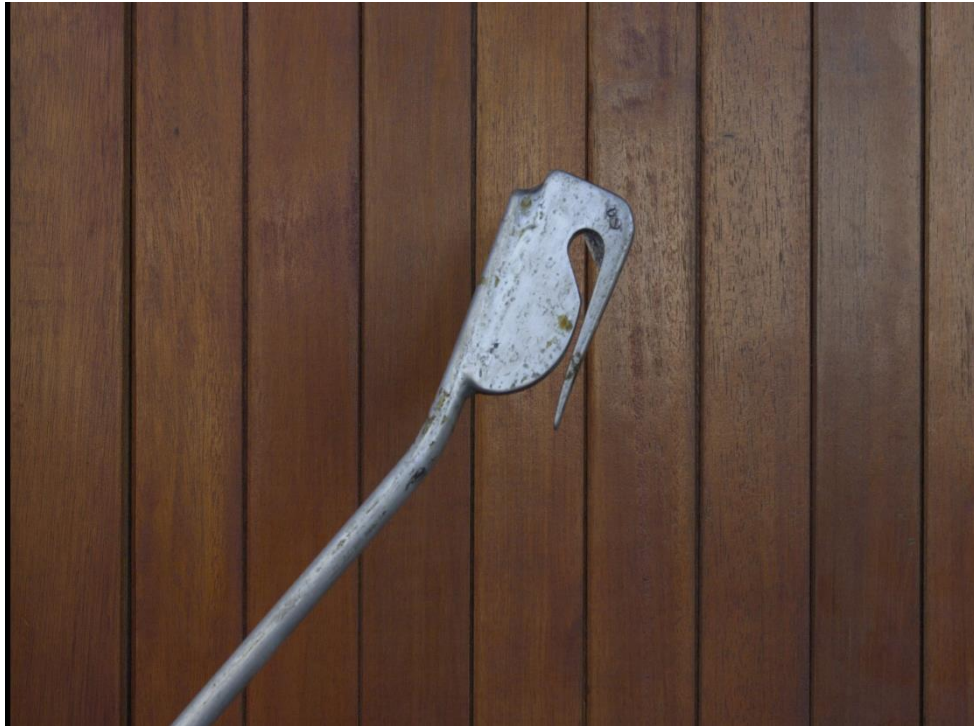


Figure 3. Example of a 'goose-beak' blade, developed specifically for disentangling. This equipment is used to disentangle seals but it has also been used successfully to cut the snoods on tuna longlines after tagging billfish or tuna. The angle of the bend on the pole at the head may to be altered depending on the gear and the fishery to allow the correct angle of attack. The advantage of this cutter is that it guides the nylon line to the carpet cutter which can be easily replaced. (Courtesy of the South African Department of Environmental Affairs).

2.3 Release of small cetaceans brought alongside

Fishing operations that geographically overlap with small cetacean populations should take all steps to avoid operational interactions, because they increase the risk that the animals involved will become bycaught in their gear (see Leaper and Calderan 2018 and Hamilton and Baker 2019 for reviews of ways to mitigate interactions). It is acknowledged that, despite all efforts, some animals will inevitably become bycaught. This may be because the avoidance measures have been less effective (e.g. night purse-seining, when nearby dolphins are less visible), or because the gear is very long and without effective deterrent structures in place (e.g. gill-nets or longline gear that are up to 70 nautical miles long and are set without pingers or other deterrent devices).

Wherever possible, a by-caught animal should be safely and humanely released in the water, before the fishing gear is brought aboard. Small cetaceans that are released in the water will typically be at lower risk of further stress or injury when compared with animals that are lifted out of the water and retained aboard for an extended period. Marine mammals are adapted to living in water, where the buoyant environment supports the weight and structure of the animal as a whole and its individual

organs, and keeps the skin moist. An animal that has been lifted out of the water and onto the deck for release will need to work harder to breathe, while structures such as the heart, lungs and arteries may collapse under added weight. This situation should be avoided where possible, as the resulting stress, fatigue and systems failures will become more likely as time passes (See section 1.2), thus highlighting the preference to releasing animal in the water where possible. Physical injury and stress can be very difficult to detect and measure, so the underlying goal should always be to release the animal as soon as possible and to minimise handling, thus giving it the best chance of survival.

This section provides advice on how to effectively and efficiently release animals from each gear type while still in the water, in a way that promotes best practice procedures and protocols that are both safe for the crewmembers involved and humane for the bycaught animals involved. In all cases where an animal is bycaught and released in the water, it is strongly encouraged that the nature and location of the even be recorded, then reported to the appropriate authorities. Section 4.5 includes details on reporting protocols and formats.

SAFETY NOTE: while it will always be better for the bycaught animal to remain in the water and to be released there; **crew members attempting the release the animal should never enter the water** to do so. Such activity puts the crewmember at an unnecessarily high risk of injury and death, if they also become caught in the gear, or if they are exposed to cold temperatures or are physically injured by the struggling bycaught animal, or by other animals in the vicinity. The relevant legislative guidelines and company policies around personal safety should be adhered to at all times.

Hooked – longline and drop line

Fishing vessels that deploy hooks operate during the day and night, depending on the species they target and the region they fish in. For this reason, the point at which the crew detect a bycaught small cetacean will differ, with those bycaught during the day being seen from up to 1 nautical mile away, while those bycaught at night being seen only when very close to the vessel. For the latter, some suggestion that a small cetacean has been bycaught may be evident in the nature of the pull on the line and the direction in which it comes from, plus the exhalation sounds as the animal surfaces and breathes. The management of a small cetacean bycaught on a longline or dropline hook will depend on the size and configuration of the vessel, the height of the deck from the waterline, and the size and behaviour of the bycaught species (Figure 4).

The presence of a bycaught small cetacean should be immediately communicated to the skipper or helmsman and actions to ensure its safe and humane release should commence as soon as possible. Next, the vessel should be moved towards the bycaught animal, rather than attempting to bring the animal towards the vessel by further hauling the gear. Continued hauling may further embed the hook in the animal, which may further injure the lodgement site (which could be the lip, throat, or stomach). The skipper should be adept at moving the vessel sideways, especially if side thrusters are fitted. Where possible, the vessel should be kept with the bow facing into the swell, to avoid rolling that would otherwise occur if it were broadside. This prevents the line from pulling on the bycaught animal as the vessel rolls away.

It may take some time to move the vessel towards the bycaught animal. While it is acknowledged that the skipper will want to avoid having the gear tangling around the propeller, or on other parts of the hull, considerable patience will be needed to successfully manoeuvre alongside the bycaught animal. In situations where the working platforms of the vessel are well above the waterline, deploying a skiff will allow appropriately trained crewmembers to position themselves alongside the bycaught animal. Once this has been achieved, at no time should crewmembers use hooks to bring the animal closer (ACCOBAMS 2018), as this will further injure the animal. Once as close as practicable to the, an appropriate cutting implement (e.g. a pair of pliers, a sharp knife, of a goose-beak cutter if present) should be used to cut the line, leaving the shortest length possible attached to the hook that is embedded in the animal. In the absence of a smaller skiff/dinghy that could be used to approach the animal and reach it at the waterline, crew members could consider using a cutting implement on a long pole to cut the line as close to the hook as possible. Only under exceptional circumstances (e.g. if the animal is calm and very close) should any attempt be made to remove the hook, bearing in mind the hook will be barbed and thus difficult to remove.

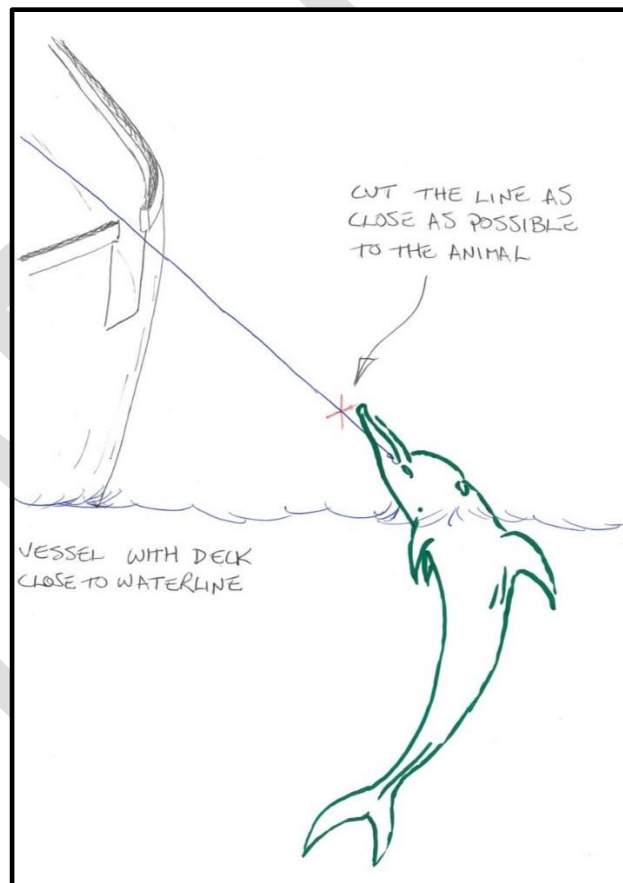


Figure 4. *Releasing small cetacean from hook and line.* When detected, hauling should cease immediately and the vessel manoeuvred towards the bycaught animal. Further hauling of the line will cause more injury and stress. The line should be cut as close as possible to the animal.

Key actions:

- Immediately inform the skipper when a bycaught small cetacean is detected.
- Do not continue to haul or pull on the line.
- Make all attempts to manoeuvre the vessel towards the animal, preventing vessel roll by keeping the bow into the swell.
- Do not use any kind of hook to bring the animal closer, as this will further injure it.
- Cut the line using an appropriate implement, as close as possible to the animal.
- Only under exceptional circumstances should any attempt be made to remove the hook.

Encircled – purse-seine net

Purse-seiners also operate during the day and night, depending on the fish species they target and the region they fish in, although their surface operations (and the use of powerful lights at night) mean that encircled small cetaceans are usually detected soon after the net has been pursed, early in the fishing operation (Hamer et al. 2008). Typically, encircled animals initially swim back and forth inside the cork line, at the surface and at the furthest point from the vessel. Oddly, despite the jumping behaviour that small cetaceans are often known for (especially the dolphins), they almost never use this ability to escape (NRC 1992). It is at this time that efforts should be prioritised to remove the animals from the net. If delays occur, then the risk of stress related ‘passive behaviour’ (Coe and Stuntz 1980) developing will increase, which is known to lead to death soon after (Hamer et al. 2008).

Three methods are known to be in use that create an escape route for encircled small cetaceans. The first was developed in the eastern tropical Pacific where large purse-seine nets are used and is known as the ‘backdown’ procedure. It involves the main vessel going astern and pulling the otherwise circular shape of the cork line into an ellipse, with the movement through the water causing the most forward end to be pulled below the surface, thus allowing the encircled animals to escape over the top (Gosliner 1999). A skiff is used to keep the main area of the net open and to prevent net folds from occurring, which are often evident in the ‘spaghetti’ folds in the cork line (Figure 5a). This phenomenon is more likely to occur when hauling stops, which is often necessary to initiate release procedures.

The second method was developed in Australia where medium to large vessels are used, which involves temporarily separating the cork line from the seine net using a quick release rope, known as the ‘dolphin gate’. The heavier seine net material tends to sink, creating a hole that the encircled animals can swim through (Hamer et al. 2008). It is best to place the gate in the cork line at a point where it will be furthest from the vessel soon after net hauling commences (Figure 5b). Again, a skiff will be needed to open the gate and may also be useful for pulling on the net to maintain its shape and prevent folds from forming. A third method developed in the Mediterranean is similar, involving a skiff pulling on a rope to cause a slack area in the cork line, which is then held down using a removable weight (ACCOBAMS 2018).

For all three methods, the placement of the skiff needs to be carefully considered, so its presence (i.e. the noise caused by the motor and the bubbles caused by propeller wash) does not deter the encircled dolphins from approaching the escape route. It may also be useful to use the skiff to shepherd the animals towards the opening, although it should be moved slowly and carefully to avoid further stress and strike injuries. On vessels with high lookout points (e.g. the wheelhouse roof, or a crow's nest) one or more crewmembers should keep watch to ensure (i) the seine net remains open and net folds do not form, (ii) all animals observed encircled are accounted for during the release operation and (iii) skiff operations remain safe for the operator and for the encircled animals.

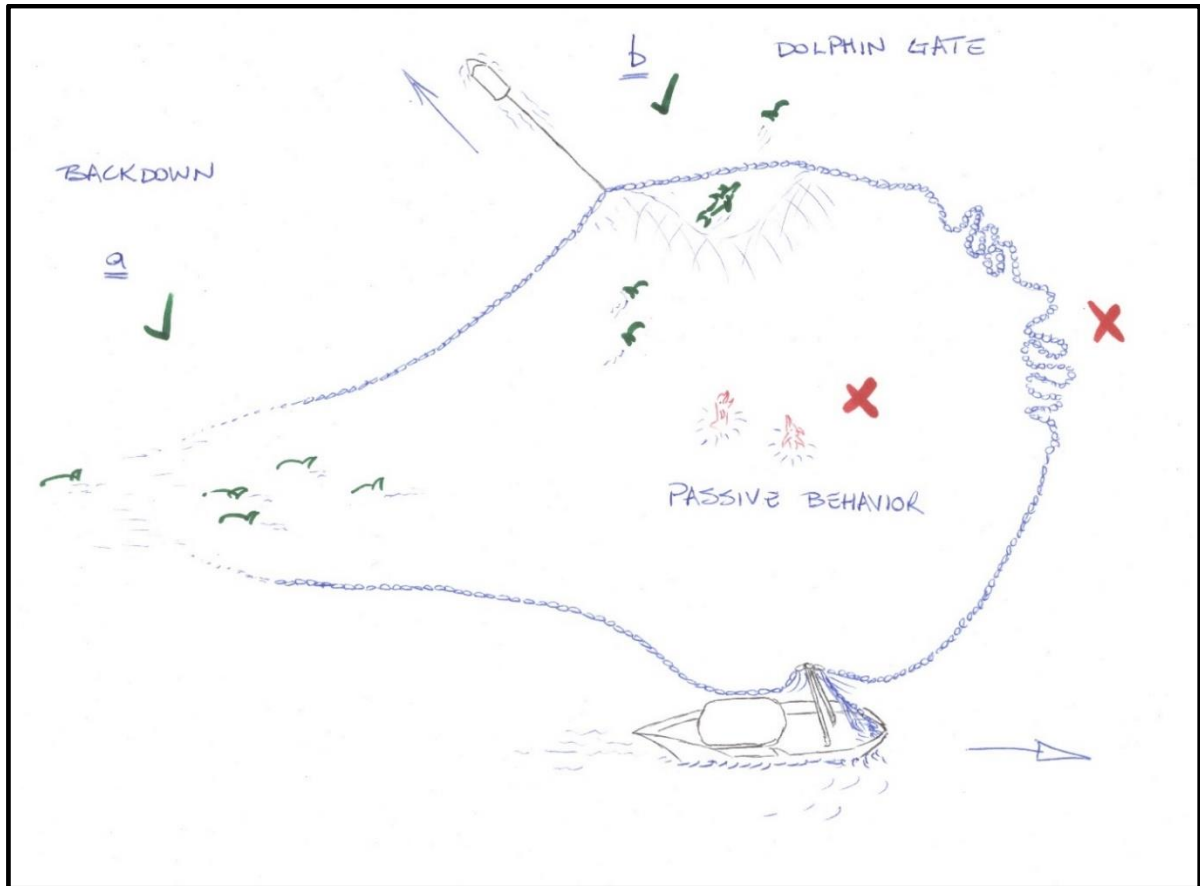


Figure 5. (a) *Backdown*. The vessel goes astern, so the corkline becomes elliptical and the most forward end is pulled below the surface, thus facilitating escape. (b) *Dolphin gate*. A prefabricated quick release rope detaches the corkline from the seine net, which sinks and creates an opening for escape.

In both cases, a skiff will be needed to keep the net open (i.e. generally round in shape) and to prevent the formation of 'spaghetti' like net folds that typically form when hauling is stopped, which are an entanglement risk for bycaught animals. If release attempts are delayed for too long, bycaught animals will become stressed and develop passive behaviour, indicating that death is imminent.

Key actions:

- Crew members, using high points such as the wheelhouse roof or a crow's nest, should be on the lookout for encircled small cetaceans during pursuing operations (early in the fishing event).
- Removal operations should commence as soon as encircled animals are detected, to avoid 'passive' behaviour form developing, which is an indicator of imminent stress-related death.
- One of three release methods should be used (depending on its suitability to the vessel), utilising a combination of changed fishing practice and modified net (see above).
- The skiff should be used to maintain the shape of the net (and prevent net folds from forming) and to shepherd encircled animals towards the exit point, although slow and careful manoeuvring is required to avoid further stress and injury to the animals and to ensure the safety of the operator.

Tangled – gill-net

Like longlines, a small cetacean tangled in a gill-net is unlikely to be detected until hauling and until it is close to the vessel. If the animal is alive, it likely only became bycaught in a demersal net during the haul, or may have been tangled for some time in a pelagic net and able to continue breathing at the surface. Hauling should cease when an animal is detected and procedures should commence as soon as possible to facilitate its release. The vessel should be manoeuvred to bring the net and the tangled animal alongside. Once this has occurred, two ropes should be secured around the net; one in front and one behind the animal. The animal should then be gently lifted, partially out of the water, making sure not to injure any appendages (Figure 6). Winches or cranes should be used if available, especially if the animal is large. For small animals, two crewmembers may be able to lift on the two ropes and secure to rails, or hooks, on the gunwale. Using a sharp knife, or a goose-beak cutter, the meshes should be cut through on a line parallel to the length of the animal, so it can be rolled over and out of the net, gently landing back in the water. If a skiff is not available, or it is not possible to secure lifting ropes, then the curved blade with extension pole may allow the crewmember to reach the animal, to cut through enough net meshes to facilitate the release of the tangled animal. Great care needs to be taken under these circumstances, due the constant movement caused by the surge of the swell and roll of the vessel.

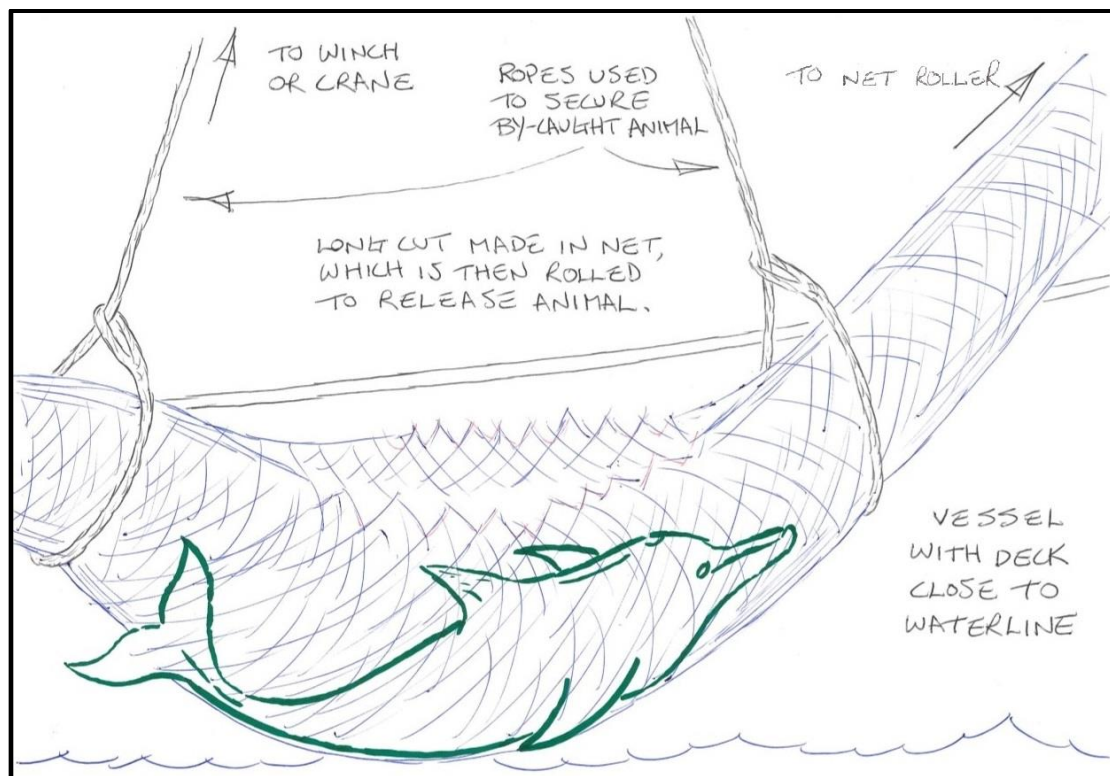


Figure 6. *Releasing small cetacean tangled in gill-net.* As soon as the animal is detected, hauling should be slowed to a minimum and the vessel manoeuvred, so that the animal is brought alongside. Two ropes should be slung around the net; one in front and one behind the animal. The animal should then be lifted just above the waterline, either using a winch or crane, or by hand and secured to gunwale rails, hooks, or bollards. The net should then be carefully cut using a knife, so the animal can fall gently back into the water.

Key actions:

- The crew member closest to the net roller, or in a position where the net can be seen ahead of the net roller (before it comes aboard), should be on the lookout for small cetaceans tangled in the gill-net during the haul.
- If one is detected, the skipper should be informed and release procedures should commence immediately.
- The portion of net in which the animal is bycaught should be brought alongside, by carefully manoeuvring the vessel.
- Securing ropes should be placed in front of and behind the animal, so it can be gently lifted just above the waterline, either using available cranes or winches, or by hand if the animal is sufficiently small and there are available tie off points.
- The net should be cut carefully along the axis of the animal, so it can then be rolled to facilitate its release and soft landing back into the water. If using the curved blade on an extension pole, take care not to injure the animal as the vessel is likely to roll in the swell.

Trapped – trawl net

Note that the principals described in these procedures can also be applied to entanglements in other static gear, such as crab or lobster pot float lines. Future iterations of these guidelines may include more specific instructions for these instances. Unlike purse-seine operations, animals trapped in a trawl net will only be detected when it is close to being hauled aboard, at the end of the fishing event. If a by-caught small cetacean is alive when it is detected, it would have become trapped during hauling, as the net was being brought to the surface and the trawl doors were still operating to keep the mouth of the net open. Broadly speaking, a trawl net is like a cone, with larger mesh 'sweep' (or 'wing') net at the front and smaller mesh net towards the rear of the net, or 'cod-end'. If a small cetacean becomes caught in the sweeps, it is typical for a pectoral fin or tail fluke to be caught in the meshes. If an animal is caught in this way, their presence may be detected soon after the net begins to come aboard, whereupon hauling should be slowed until the animal is within reach. Care should be taken to prevent surges caused by swell, as this may cause further injury, especially if the animal is caught and hanging by the tail fluke. If the latter is the case, all efforts should be taken to avoid lifting the animal out of the water, if the vessel configuration and weather conditions permit.

Releasing an animal caught this way may be easier from a smaller vessel, where the deck is close to the waterline and where the net is typically 'fleeted' aboard (i.e. lifted in sections, using a crane or winch). The vessel should be manoeuvred to bring the portion of net where the animal is caught alongside. Using ropes and cranes to hold the animal in place (using similar methodology to that used by gill-netters), the large meshes should be carefully cut away from the appendages to facilitate release (Figure 7a). On larger vessels that haul the entire net and catch aboard using the high-powered net roller, it may be best to gently bring the animal partially up the stern ramp, as close as possible to the main deck. This way, harnessed crewmembers can work safely and carefully to perform the same task, releasing the animal onto the stern ramp so it can slide back towards the water once released. Care should be taken to ensure the animal is released away from any fishing gear remaining in the water.

Where bycaught animals are detected in the cod-end and where few fish have been caught, the skipper may choose to forego the catch by using the drawstring to open the 'bag', over the side of the vessel on small vessels, or over the stern ramp on larger vessels (Figure 7b). If a bycaught animal is detected in the cod-end when many fish have been caught, the skipper may choose to bring the entire net or cod end aboard, so the fish can be retained. In these situations, handling procedures will need to be implemented, which are described in Section 2.4.



Figure 7a. *Releasing small cetacean trapped in the 'sweep' of a trawl net of a small trawler.* When a small cetacean is bycaught in the large meshes at the front of the net, hauling should slow so that the animal can be brought alongside. A combination of ropes and the crane should be used to hold it in place, so the meshes can be carefully cut to facilitate its release.

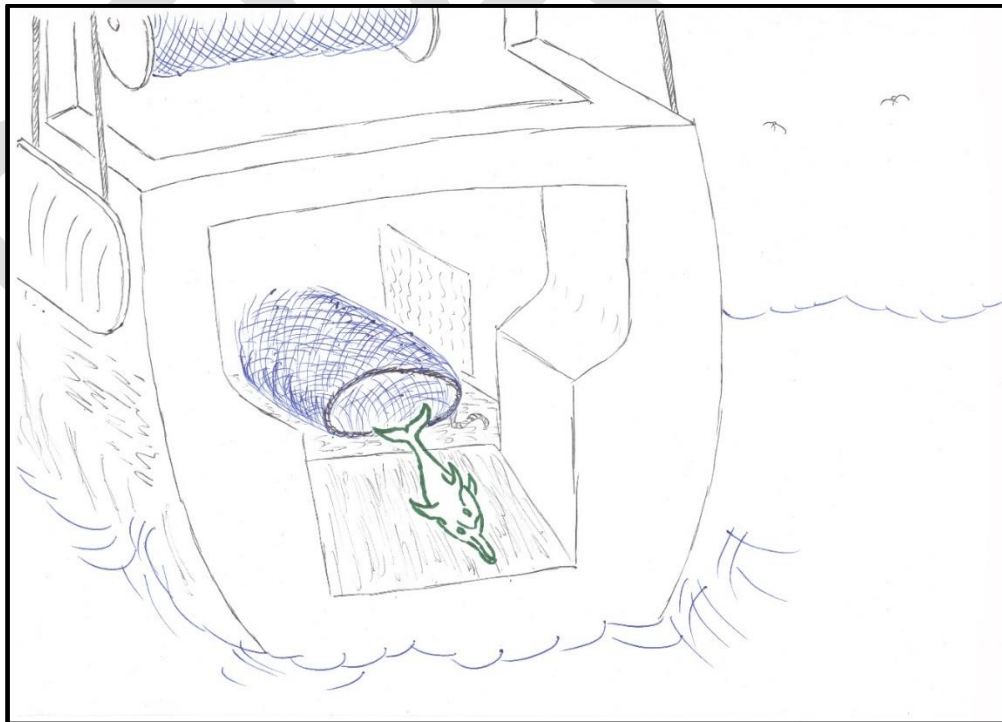


Figure 7b. *Releasing small cetacean trapped in the cod-end of a trawl net on a large stern trawler.* When a small cetacean is bycaught in the cod-end and where few fish have been caught, the skipper may choose to open the 'bag' using the drawstring and release the trapped animal gently down the stern ramp.

Key actions:

- Crewmembers should be on the lookout for trapped small cetaceans as the net as it comes to the surface during the haul.
- If a bycaught animal is detected in the sweeps of the trawl net, hauling should proceed slowly and the vessel should be manoeuvred to bring it alongside in the water. A combination of ropes and cranes should be used to gently hold the animal in place, just above the waterline, so it can be carefully cut out and released.
- If a bycaught animal is detected in the cod-end and few fish have been caught, the skipper may choose to forego the catch and use the drawstring to release it back into the water, either from alongside and close to the waterline on a small vessel, or at the top of the stern ramp for a 'slide release' on a large vessel.
- If the bycaught animal is in the cod-end along with a large quantity of fish, then the animal may need to be brought aboard and carefully handled on the deck – refer to Section 4.4.

2.4 Handling and release of small cetaceans brought aboard

There are a number of circumstances under which it may be necessary to bring the bycaught animal aboard the vessel. In most cases, this will occur because it is deemed unsafe to attempt releasing the animal alongside, either due to poor weather conditions, or the size of the vessel and lack of easy access to the animal, or because it is seemed safer for the animal to affect release aboard the vessel. In situations where animals must be brought aboard, these guidelines describe handling procedures that are associated with releasing the animal as soon as practicable, regardless of its condition, in a way that does not further compromise its welfare, nor the safety of the crew.

The following Guidelines outline how to best manage the handling of a bycaught small cetacean, from the time it is decided it should be brought aboard the vessel. It loosely follows the steps generally set out in manuals aimed at managing live stranded animals, such as those in Section 1.1. Broadly speaking, one person should manage the animal that is brought aboard and that person should know which other crewmembers will be called upon for assistance. Those crewmembers should also understand their roles. Collectively, they should all be trained and competent in the handling and release of small cetaceans. The 'incident manager' will be responsible for (i) managing the incident and delegating tasks, (ii) rapidly assessing and prioritising, (iii) physically stabilising the animal and providing first aid, (iv) all decisions around the handling and release of the animal, and (v) recording all relevant details about the incident.

Bringing the animal aboard

To ensure the welfare of the bycaught small mammal brought aboard is maintained, further stress and injury must be avoided from the time it is lifted from the water. It is likely that the animal will come

aboard in the net material in which it is tangled and lifted, either by the net hauling device directly, or by using a separate crane or winch. When the animal is lifted from the water, its full weight on the net will place the animal at risk of further injury if the body or appendages are twisted at irregular angles. As such, it may be necessary to gently lift and then lower the animal back into the water a few times to ensure it is in the most 'natural' position. In almost all cases, **an animal that is hook caught should not be lifted from the water, because to do so is likely to cause extensive further injury and stress;** attempts should be made to release these animals while still in the water.

Under instruction from the incident manager, the winch or crane operator will lift and bring the animal aboard the vessel. Where necessary, a second crewmember will operate a rope attached as close as possible to the animal (the 'rope handler'), primarily to minimise swing and rotation, especially when there is swell and wind. The incident manager will coordinate the operation, ensuring that movements are slow and careful, to prevent further injury or stress to the bycaught animal.

It may be necessary or ideal to cease fishing operations during this period, although vessel and crew safety will always take precedence. Where possible, the vessel should be oriented into the weather/swell to create the greatest stability for the lift, provided it does not increase the risk of fouling the propeller or hull with the fishing gear still in the water. It is also a good idea to keep unnecessary noise (such as dropping metal objects on the deck and shouting) and light (avoid shining powerful lights directly at the animal, mainly during night operations) to a minimum, so as to avoid unnecessary stress.

Prior to bringing the animal on the deck, the incident manager should already have selected the most appropriate place to place the animal, until the earliest and most convenient opportunity arises to release the animal back into the water. The best location would be a quiet area, away from activity, noise, light, excessively hot or cold surfaces and from fumes. Place the animal on a soft mat, in an upright and natural position, using sandbags (or equivalent, such as rolled up net material or towels, or fenders or buoys, though being sure that it does not become a tripping, entanglement, or abrasion hazard) to hold the animal in position. Ideally, a stretcher should also be placed under the animal at this time, so it can be moved at short notice and with minimal further disturbance (Figure 2). A towel can also be gently placed to cover the animal's eyes to reduce stress from visual stimulation and movement on deck. However, care should be taken not to cover the blowhole, to allow unobstructed breathing.

Key actions:

- When an animal is lifted from the water, its full weight will come to bear on the lifting apparatus, which is likely to be a portion of the net. All care should be taken to ensure the animal is not twisted or caught in a way that stretches or twists its flippers or tail, or bends its jaw, in an unnatural manner, thus causing further injury or stress. To achieve its most natural posture, it may be necessary to gently lift the animal just above the waterline, then lower into the water again (and repeat a few times) to ensure the animal comes to rest in the best possible position for the lift.
- The crane or winch operator should perform all movements as carefully as possible, ensuring the animal does not collide with objects. A rope should be attached to the net as close as possible to the animal, so that greater control over its movements through the air can be achieved. A third person, usually the skipper, first mate or deck boss, should coordinate the move, providing instructions to the crane operator and the rope handler.
- Decide beforehand where the animal will be placed, taking into account that a quiet and out-of-the-way place is preferable, on a temperature-neutral surface and away from fumes. A soft mat and stabilising sandbags (or equivalent) should be in place, or on hand for use.

Initial assessment of animal condition

Unlike a beach stranding situation, where there is likely to be access to vets or marine mammal medics (Geraci and Lounsbury 2005; DPIPWE 2019), the fishing vessel is likely to be remote and unsupported. For this reason, the extent of available expert assistance will be minimal, or non-existent (e.g. ACCOBAMS 2018). It is also likely that local regulations do not permit crewmembers to provide anything other than first aid care (Geraci and Lounsbury 2005). Nonetheless, some basic checks can be made as soon as the animal arrives on the deck of the vessel that will assist in making sound subsequent decisions that markedly improve the welfare for the animal and thus improve its chances of survival.

At first, the life state of the animal must be determined. The period between breaths can sometimes last up to several minutes (an adaptation for diving), so it may be necessary to monitor this for some time. The level of consciousness is also important and can be broadly classified as (i) alert (aware, very responsive to noise and movement; lightly stroking the top of the rostrum, close to its end, should illicit some movement), (ii) weakly responsive (responsive only after much stimulation), or (iii) non-responsive (no response to noise or touch; Geraci and Lounsbury 2005). At first, an animal may be weakly or non-responsive, simply because of the shock of the situation. Signs that are useful in this assessment are breathing (blowhole noise and torso expansion and contraction), general body movement (such as up and down tail fluke movements, which are attempts to swim), shivering and tremoring, and jaw and eye movement. Stunned and stressed animals may also appear limp, or may move erratically, or weakly. These signs may lead some crewmembers to incorrectly conclude that the animal is dying, or has just died. It is important that the person making this decision (most likely the incident manager) focuses their

attention on the animal for several minutes, as the animal may recover from the initial shock, once it becomes more used to its immediate surroundings.

During this time, those attending the animal should check for wounds and, if possible, humanely and carefully remove any fishing gear or other foreign objects that may be embedded in or caught on the animal. Special attention should be dedicated to ensuring that nothing is blocking the blowhole, or the mouth. If the vessel is operating close to the coast and it is possible to make radio or phone contact, it is recommended that an appropriate person be contacted for advice. This task should fall to the incident manager and ultimately to the skipper. It is advisable that prior arrangements are made with the relevant fishery management authority, before contacts or experts from local marine mammal stranding networks, or from local veterinary clinics, be allowed to attend. Nonetheless, their remote guidance may streamline the actions of crew member, resulting in a more favourable outcome.

Key actions:

- Due to limited or complete lack of support, the crew are not expected (or possibly not permitted) to provide more than basic first aid care to the bycaught animal, as outlined in the next point.
- Determine the life state of the animal, to assess its health and the extent of obvious injuries. Keep the animal in a physically stable position, cover with wet towels (although avoid covering the blowhole), carefully and humanely remove net or embedded objects, stop bleeding by applying pressure over the wound site, and make sure the blowhole and mouth are free from obstructions.
- If possible, seek advice from a pre-arranged source, such as a vet, or a stranding network. Informed advice may improve the survival prospects of the bycaught animal.

Temporarily holding the animal on board

The actions of crewmembers during this period are critical in ensuring the welfare and ultimately the survival of the bycaught animal. The four principal elements to humanely holding a bycaught marine mammal aboard the vessel focus on ensuring it is (i) released as soon as possible, (ii) kept in a temperature neutral environment by regularly dousing with water sourced directly from the surrounding ocean, (iii) protected from excessive noise, light and fumes, and (iv) held in a stable and natural position.

Marine mammals are adapted to living in water, which provides a buoyant effect that supports the weight and structure of the animal, and the systems and processes critical to maintaining life. The deck of a vessel is a very foreign environment and will almost certainly be a source of stress to the bycaught animal. There are also likely to be physiological complications if the animal is held on the deck for an extended period. The animal will need to work harder to breathe than it does in the water, while the circulation of blood to supply oxygen, cool organs and to remove toxins will be compromised in the

lower tissues that are pressing down on the deck (Geraci et al. 1987). As a result, fatigue and systems failures will become more likely as time passes. Therefore, it will be better to release the animal sooner, rather than later. It is acknowledged though that delays in releasing the animal may occur for practical reasons (e.g. the fishing operation cannot be stopped for safety reasons and is preventing access to a safe release point).

Ensuring the bycaught animal is in a temperature neutral environment that is protected from excessive heat, noise and vibrations, light and fumes, is critical for minimising additional stress and injury to the animal. The incident manager should already have chosen the most appropriate location on the deck to place the animal, prior to lifting it from the water. Placing the animal above a hot engine room in summer may cause heat stress, although may be appropriate in winter if it is excessively cold and windy. Conversely, it may be beneficial to place an animal over a chiller room or tank in summer. Whatever the case, it is best to avoid surfaces that are markedly different in temperature from the water that the animal came from, or will go back into, so temperature shock does not occur (RSPCA 1985). Soft mats can be used to prevent injury from sharp edges on the deck, although may also be useful for partially insulating the animal from deck temperature differences and vibration. Additionally, the structure of the vessel and the use of wet towels may be useful as a barrier against cold winds or direct sunlight (remembering to avoid placing towels over the blowhole). Consider also gently applying water from the sea to the body, taking care around the blowhole, to help cool the animal and keep skin moist.

It is also advisable that crewmembers avoid making unnecessary loud noises, or from shining powerful lights directly at the animal. Both may cause additional stress to the animal while aboard the vessel and may temporarily or permanently damage those senses, both of which are critical for foraging and for avoiding predators in the marine environment. Using sandbags, or wet rolled up towels, the animal should be held in position on the mat or stretcher. Ideally, they should be placed either side of the animal, immediately behind the pectoral fins, which is typically the widest part of the animal. It may also help to stabilise the animal by placing a wet rolled up towel under each pectoral fin, where it joins the body (analogous to an arm pit). This will also reduce the risk of injuring the joints (analogous to a shoulder joint) if the vessel rolls or pitches in a heavy sea.

Key actions:

- It is almost always better to release the bycaught animal sooner, rather than later, to avoid stress that is physiological (caused by increased physical demands on breathing, impaired blood circulation and temperature regulation, and abrading surfaces) and psychological (caused by being in an unfamiliar environment, where there is excessive noise, light and movement, and discomfort caused by heat or cold, or abrading surfaces) in nature. Nonetheless, it may be necessary to hold the animal on board if it is unsafe to release it.
- It is best to place the animal in a temperature neutral environment, where the deck surface and the air temperature are not dissimilar from the water that the animal came from, or will go back into. Excessively hot and cold surfaces should be avoided, although some surface cooling or warmth may be useful (after careful assessment of what is needed). The structure of the vessel and the use of wet towels may be useful as a barrier against cold winds or direct sunlight (remembering to avoid placing towels over the blowhole). Soft mats can be used to prevent injury from sharp edges on the deck, although may also be useful in insulating the animal from temperature differences and vibration.
- Excessive noise in the vicinity and powerful lights directed at bycaught animal should be avoided. Damaged hearing and/or sight will put the animal at risk when released, as it will reduce the effectiveness of foraging and of avoiding predators or other threats.
- Sandbags and wet rolled towels (or sheets or netting material) should be used to stabilise the animal in the upright position. Placing them immediately behind the pectoral fins, at the widest point, will be most effective. Additional wet rolled towels can be used under the pectoral fin where it joints the body, to provide further support and to avoid joint injury if the vessel pitches or rolls.

Moving and releasing the animal

If the bycaught animal needs to be moved and was placed directly on a mat when it was brought aboard, then the stretcher will need to be prepared for placement under the animal. For stretchers with specific head and tail ends (Figure 2), it is best to first identify the side of the animal from which you want to start placing the stretcher under the animal. Remove the pole that would be closest initially and place it somewhere secure, so it does not roll away and become a danger to the crew in doing so. Roll up the stretcher from the side the pole was removed, along its long axis, to the half way point. With the assistance of others (ideally, two as a minimum, although this will depend on the size of the animal) and under the instruction of the incident manager, partially and gently roll the animal away, so that the half-rolled stretcher can be gently pushed underneath (Figure 8). Move to the other side of the animal, again partially and gently rolling the animal away, so the rolled section of the stretcher can be unrolled. The spine of the animal should be directly above the centreline of the stretcher. The pole that was removed can now be slid back into the sleeves.

At no time should the animal be moved by twisting on or pulling the tail fluke, or by twisting the pectoral flippers, or by pulling on the jaw or beak. To do so will cause pain at best and permanent and possibly fatal injury at worst. Additionally, the rolling movement should be kept to a minimum, so that skeletal and tissue structures at the base of the outstretched pectoral flippers are not damaged. In some small cetacean species, it may be safer to tuck the flippers in and down the body before performing this task. However, the ability to articulate the flippers will vary between species, so this will need to be assessed on a species-by-species and fishery-by-fishery basis.

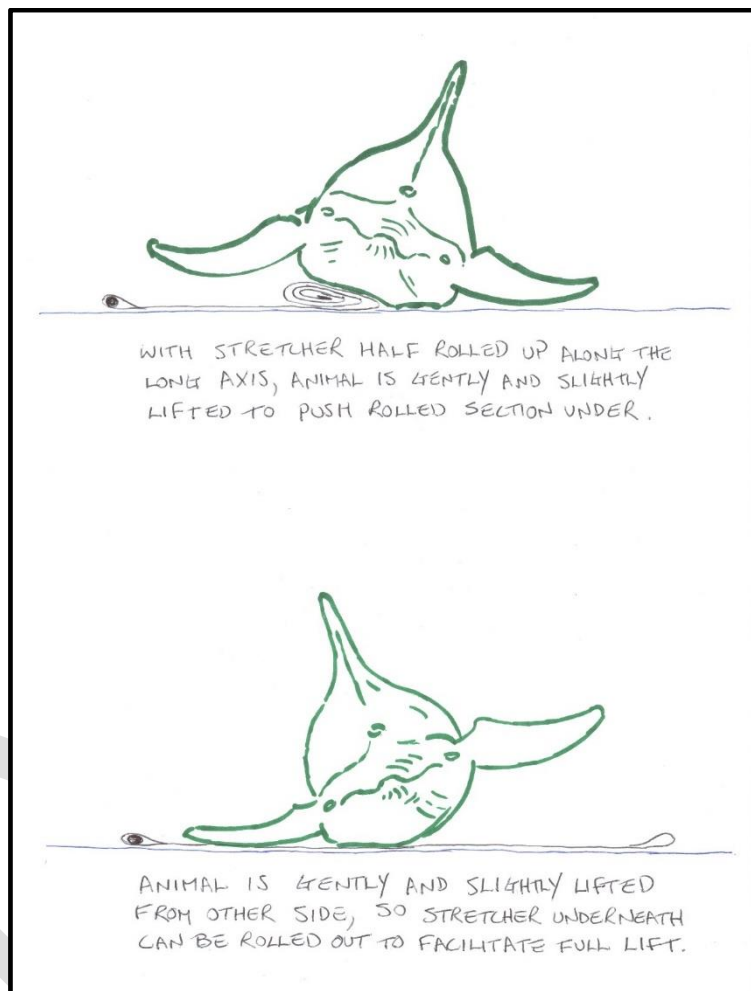


Figure 8. *Placing the stretcher under a small cetacean.* Do not lift the animal off the deck. The material should be rolled up to the half way mark along the long axis, then with two assistants gently and slightly rolling the animal away, the stretcher should be gently pushed underneath, to just over the halfway mark. Then, approaching the animal from the other side and again having two assistants, gently roll the animal away and unroll the stretcher. Lastly, insert the lifting poles through the sleeves on each side.

Immediately prior to moving the animal, the incident manager will inform all those involved about how the animal will be lifted and where it will be moved to. The way the animal is lifted will depend on the availability and type of stretcher available. If the vessel is not equipped with a stretcher, then net

material, or a tarpaulin if present, may need to be quickly fashioned to suit the purpose. The advantage of the stretcher is that its shape suits the animal most likely to be encountered by the fishery and has rigid poles and hand holds on each side that allow for lifting that is stable and thus safe for the crewmembers involved and for the animal being lifted. Once the lift has been planned and the assisting crewmembers are ready, the incident manager should notify the skipper and other crewmembers likely to be affected by the imminent activity.

If the animal is being moved into position for release, then the incident manager may need to liaise with the skipper and other crewmembers, to ensure the animal can be released away from fishing gear that may still be in the water. On vessels that are close to the waterline, it may simply be a matter of moving the animal to a sea door and releasing it directly from the stretcher. To do so, the animal should be oriented with its head towards the water and the crewmembers at that end should gently lower the stretcher, so the animal slides gently back into the water (Figure 9). Where possible, the head should be lowered to near or at the waterline, before it is slid into the water. The crew should then wait for the animal to breath, then release it immediately after.

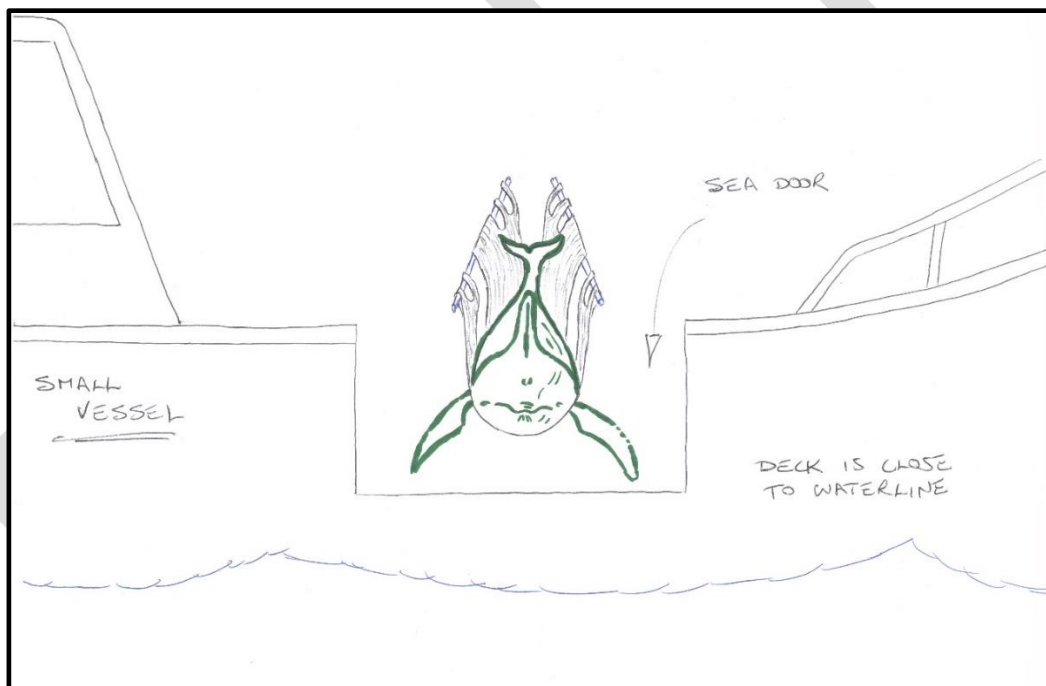


Figure 9. *Returning the small cetacean to the water from a small vessel, with a deck close to the waterline.* Ideally, there would be a sea door that provides good access to the surface of the water. The stretcher is manoeuvred to the sea door by the four crewmembers, where the two closest to the water drop their end slightly to close to deck and waterline level, thus allowing the animal to slide forward and out, into the water.

On vessels where the deck is high above the waterline, it may be necessary to use a crane or winch to lower the animal into the water. Once the animal is ready to be lifted, the purpose-built sling with four rope, wire or chain 'arms' that should be attached to the stretcher poles, at each of the four corners. A rope should be attached to one corner, so that a rope handler (as described earlier, when bringing a

bycaught small cetacean aboard) can prevent the animal from swinging or spinning when in the air, especially when there is swell or wind. Once the incident handler is happy that all elements are organised, he can instruct the crane driver to commence the lift. Larger vessels, especially purse-seiners tend to have a skiff on board that can be used to help guide the animal safely back into the water (trawlers and other larger fishing vessels may benefit from carrying an inflatable rubber dinghy that can be stored efficiently, then deployed when necessary). During these events, a second and longer rope, attached at the same location to the one used by the rope handler on the deck, should be lowered to the skiff operator, so that they can take over the role of rope handler once the animal is being lowered towards the water (Figure 10). Once the stretcher is lowered so the animal is partially in the water, the skiff should come alongside and release two of the four arms from one side, so the animal can roll gently sideways and into the water.

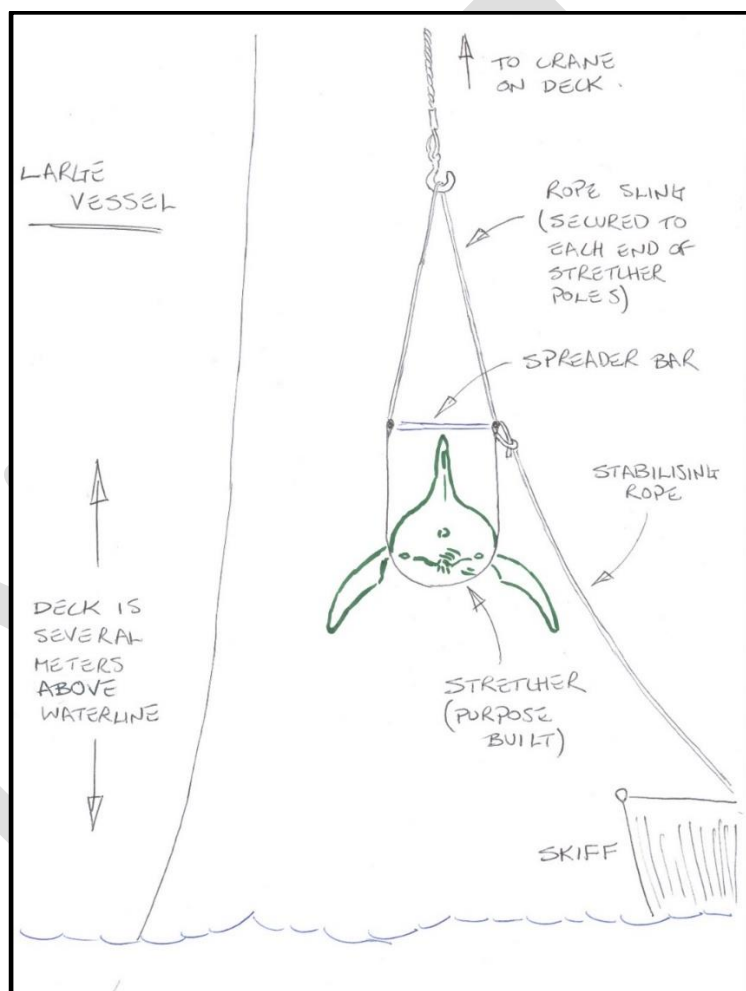


Figure 10. *Returning the small cetacean to the water from a large vessel, with a deck high above the waterline.* The stretcher is picked up by a boom winch, or gib crane, using a rope sling secured to each corner of the stretcher, through the hand grab holes, onto the aluminium poles. It is carefully manoeuvred over the side and lowered slowly towards the water. A rope handler on the skiff prevents the stretcher and animal from swinging or spinning, especially if there is swell and wind. Once the stretcher and animal are touching the water, the skiff should come alongside and

simultaneously activate the quick release latches that are on two of the sling ropes on the closest side, thus allowing the animal to role gently sideways, into the water.

Key actions:

- To move an animal, it will need to be placed on a stretcher. Half roll up the stretcher along its long axis, once the pole on that side has been removed from the sleeve and placed in a safe location. With the assistance of others and under the instruction of the incident manager, partially and gently roll the animal away, so the half-rolled stretcher can be placed underneath. Move to the other side, then partially and gently roll the animal in the other direction, so the portion of rolled up stretcher can be unrolled. Replace the pole in the sleeve. Do not twist on or pull any of the appendages, as this may cause injury. Carefully assess, based on the specie, if the dorsal fins should be tucked in and back before performing this task. If this is necessary, extra personnel will be needed to stabilise the animal.
- All crew members should follow the instructions of the incident manager, who will inform all involved how the animal will be lifted and where it will be lifted to. Although existing net or a tarpaulin can be used to make a makeshift stretcher, a purpose-built item will facilitate the most stable and safe lifts. Once the lift has been planned and is about to take place, the incident manager will inform the skipper and all affected crewmembers.
- The animal should be released away from any fishing gear in the water, although ideally after the fishing gear has been completely brought aboard. When releasing an animal from a vessel that is close to the waterline, it may be a simple matter of moving the animal on the stretcher to the most appropriate point, such as a sea door, then orienting its head towards the water, then allowing the animal to gently and slowly slide into the water immediately after it has completed a breath (there will be two sounds in quick succession, being an exhalation followed by an inhalation).
- On vessels with a deck high above the waterline, cranes or winches will need to be used to lower the animal on the stretcher. The four sling arms should be attached to each of the four corners of the stretcher. An additional free rope should be attached to one corner, so a 'rope handler' on the deck can guide and control the stretcher when it is lifted into the air. Once the animal is safely lifted over the side, the rope should be passed down to a rope handler on the deployed skiff, so the descent of the stretcher and animal can be controlled until it is brought to the waterline, where the animal should be partially submerged. Once the stretcher is lowered so the animal is partially in the water, the skiff should come alongside and release two of the four arms from one side, so the animal can role gently sideways and into the water.

2.5 Record keeping

It is important to keep a record of each bycaught animal and the events surrounding the incident, whether it was released in the water, or brought aboard in the fishing gear and then released later. This way, the relevant management authorities and research organisations can keep track of and learn about the nature and extent of such events, and the impacts they may have on the welfare of individuals and on the conservation of the population and species. The collected information will also help fishers, fishery associations and managers, and researchers gain insights into how to refine fishing practices in a way that reduces the impact of such events on bycaught small cetaceans and on the fishery involved. Each fishery will develop a data-sheet format that is in keeping with current fishery specific, national or regional documentation requirements, although it will be important to ensure the following data is recorded:

- Date and time the bycaught animal was initially detected;
- Location (if there are commercial in confidence concerns, then fishing area numbers, or the nearest degree, or tenth or a degree, may suffice);
- Small cetacean species (common name or species name; taking a photo is encouraged, so positive identification can be made);
- Gear type (e.g. purse-seine, or demersal longline) and where the animal was bycaught in the gear;
- The injuries sustained by the bycaught animal (both obvious external injuries, plus things like blood coming from the mouth, eyes, blowhole or anus);
- The time the animal was brought aboard, then released from the vessel or gear;
- A list of actions taken, whether it be to release the animal in the water, or to bring aboard, handled and then release (both successful and unsuccessful actions should be recorded).
- Accompanying reports with photos and/or video footage is strongly encouraged, as this will promote the greatest learning about the species and gear involved, injuries sustained, and measures taken. The widespread use of mobile/smart phones should make this possible.

ACKNOWLEDGEMENTS

Thanks are extended to: Rachael Alderman and Sam Thalman (Tasmanian Government Department of Primary Industries, Parks, Water and Environment; DPIPWE) for provision of their cetacean stranding response manual and the Australian Government national strategy; Aimee Leslie (Global Marine Turtle and Cetacean Bycatch Lead – Marine Programme Director, WWF Peru), Leigh Henry (Director Wildlife Policy – WWF US) and Gianna Minton (Coordinator - Global Cetacean Initiative; contracted to WWF) for their encouragement and comprehensive review of drafts. The development of these guidelines was funded by WWF.

REFERENCES

- ACCOBAMS and FAO, 2018. Good practice guide for the handling of cetaceans caught incidentally in Mediterranean fisheries. Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area, Monaco. Available online: http://www.accobams.org/new_accobams/wp-content/uploads/2018/12/Cetaceans-185x290.pdf
- Atkinson S and Dierauf L, 2018. Marine mammals and Stress. Ch. 19. In: Gulland FMD, Dierauf LA and Whitman KL, eds. CRC Handbook of Marine Mammal Medicine, 3rd edn., CRC Press, Boca Raton, Washington DC, USA.
- Barnett J, Dolman SJ, Simmonds MP and Wright AJ, (eds.) 2014. Best practice in rescue. Proceedings of the European Cetacean Society Workshop, Setubal, Portugal. ECS Special Publication Series 57.
- BDMLR, 2019. Management of the stranded cetacean. DBMLR marine mammal medic handbook, British Divers Marine Life Rescue
- Beest FM, Kindt-Larsen L, Bastardie F, Bartolino V and Nabe-Nielsen J, 2017. Predicting the population-level impact of mitigating harbor porpoise bycatch with pingers and time-area fishing closures. Ecosphere 8(4), e01785
- Bowles AE and Anderson RC, 2012. Behavioral responses and habituation of pinnipeds and small cetaceans to novel objects and simulated fishing gear with and without pingers. Aquatic Mammals 38, 161-188.
- Brownwell RL, 1989. Article of incorporation of the Society for Marine Mammalogy. Viewed at: <https://www.marinemammalscience.org/wp-content/uploads/2015/04/Society-for-Marine-Mammalogy-Articles-of-Incorporation.pdf>, on 24 April 2019.
- Carretta JV and Barlow J, 2011. Long-term effectiveness, failure rates, and “dinner bell” properties of acoustic pingers in a gillnet fishery. Marine Technology Society Journal 45, 7-19.
- Coe JM and Stuntz WE, 1980. Passive behaviour by the spotted dolphin, *Stenella attenuata*, in tuna purse seine nets. Fishery Bulletin 78, 535- 537.
- Cowan DF and Curry BE, 2008. Histopathology of the alarm reaction in small odontocetes. Journal of Comparative Pathology 139, 24-33.
- Cullis-Suzuki S and Pauly D, 2010. Failing the high seas: a global evaluation of regional fisheries management organizations. Marine Policy 34 1036-1042.
- Curry BE, 1999. Stress in mammals: the potential influence of fishery-induced stress in dolphins in the eastern tropical Pacific Ocean. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-260.

DAFF, 2017. Animal welfare in Australia. Department of Agriculture, Fisheries and Floristries. Australian Government, Canberra, Australia. Viewed at: <http://www.agriculture.gov.au/animal/welfare> , on 2 May 2019.

de Quiros YB, Hartwick M, Rotstein DS, Garner MM, Bogomolni A, Greer W, Niemeyer ME, Early G, Wenzel F and Moore M, 2018. Discriminating between bycatch and other causes of cetacean and pinniped stranding. *Diseases in Aquatic Sciences* 127, 83-95.

Dolman SJ and Brakes P, 2018 Sustainable fisheries management and the welfare of bycaught and entangled cetaceans. *Frontiers in Veterinary Science*, DOI: 10.3389/fvets.2018.0287.

Dolman SJ, Moore MJ. 2017. Welfare Implications of Cetacean Bycatch and Entanglements. In: Butterworth A editor. *Marine Mammal Welfare: Human Induced Change in the Marine Environment and its Impacts on Marine Mammal Welfare*. Cham: Springer International Publishing. p. 41-65.

DPIPWE, 2019. Stranding response. Cetacean incident manual: a guide to departmental response protocols for cetacean stranding and entanglement events in Tasmania. Wildlife Management Branch, Department of Primary Industries, Parks, Waters and Environment, Tasmanian Government, Hobart, Australia.

Dudzinski KM, Thomas JA and Douaze E, 2002. p. 248-268. In: Perrin WF, Würsig B and Thewissen JGM, eds. *Encyclopedia of marine mammals*, Academic Press, California, USA.

FAO, 2018. Report of the Expert Workshop on Means and Methods for Reducing Marine Mammal Mortality in Fishing and Aquaculture Operations, Food and Agriculture Organization of the United Nations, Rome, Italy.

FAO, 2019. The state of the world fisheries and aquaculture 2018. Meeting the sustainable development goals. Food and Agriculture Organisation of the United Nations. Rome, Italy.

Fernández A, de Quirós YB, Sacchini S, Sierra E. 2017. Pathology of Marine Mammals: What It Can Tell Us About Environment and Welfare. In: Butterworth A editor. *Marine Mammal Welfare: Human Induced Change in the Marine Environment and its Impacts on Marine Mammal Welfare*. Cham: Springer International Publishing. p. 585-608.

Forney KA, St Aubin DJ and Chivers SJ, 2002. Chase encirclement stress studies on dolphins involved in the eastern tropical Pacific Ocean purse-seine operations during 2001. Southwest Fisheries Science Centre, NMFS, NOAA. Administrative Report LJ-02-32.

Franco-Trecu V, Szephegyi MN, Dono F, Forselledo R, Reyes F, Passadore C, Crespo EA and Inchausti P, 2019. Marine mammal bycatch in the industrial bottom trawl fishery at the Rio de la Plata Estuary and the adjacent Atlantic Ocean. *Latin American Journal of Aquatic Research* 47, 89-101.

Geraci JR, Lounsbury VJ. 2005. *Marine Mammals Ashore: A Field Guide for Strandings. Second Edition.*: National Aquarium in Baltimore, Baltimore, MD.

Geraci JR, St Aubin DJ and Early GA, 1997. Cetacean mass strandings: the study of stress and shock. Abstracts of the 7th Biennial Conference on the Biology of Marine Mammals. Society for Marine Mammalogy. University of Miami, Florida, USA. 5-9 December 1987.

Gerrodette T and Forcada J, 2005. Non-recovery of two spotted and spinner dolphin populations in the eastern tropical Pacific Ocean. *Marine Ecology Progress Series* 291, 1-21.

Gosliner ML, 1999. The tuna-dolphin controversy. p. 120-155. In: Twiss JR and Reeves RR, eds. *Conservation and management of marine mammals*. Smithsonian Institution Press, Washington, USA.

Hall MA. 1998. An ecological view of the tuna-dolphin problem: impacts and trade-offs. *Reviews in Fish Biology and Fisheries* 8, 1-34.

Hamer DJ, Childerhouse SJ and Gales NJ, 2012. Odontocete bycatch and depredation in longline fisheries: a review of available literature and of potential solutions. *Marine Mammal Science* 28, 345-374.

Hamer DJ, Childerhouse SJ, McKinlay JP, Double MC and Gales NJ, 2015. Two devices for mitigating odontocete depredation and bycatch at the hook in tropical pelagic longline fisheries. *ICES Journal of Marine Science* 72, 1691-1705.

Hamer DJ and Goldsworthy SD, 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, 517-529.

Hamer DJ, Ward TM and McGarvey R, 2008. Measurement, management and mitigation of operational interactions between the South Australian Sardine Fishery and the short-beaked common dolphin (*Delphinus delphis*). *Biological Conservation* 141, 2865-2878.

Hamilton S and Baker GB, 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*, doi: 10.1007/s11160-019-09550-6

Hooker SK, 2002. Toothed whales, overview. p 1252-1259. In: Perrin WF, Würsig B and Thewissen JGM, eds. *Encyclopedia of marine mammals*, Academic Press, California, USA.

Kaplan IC, Koehn LE, Hodgson EE, Marshall KN and Essington TE, 2017. Modelling food web effects of low sardine and anchovy abundance in the California Current. *Ecological Modelling* 359, 1-24.

Kuiken T, 1996. Diagnosis of by-catch in cetaceans. Proceedings of the second European Cetacean Society Workshop on cetacean pathology, Montpellier, France. European Cetacean Society Newsletter No. 26, Special Issue. 2 March 1994.

Leaper R and Calderan S, 2018. Review of methods to reduce risks of cetacean bycatch and entanglements. CMS Technical Series No. 38. UNEP/CMS Secretariat, Bonn, Germany.

Lewison RL, Crowder LB, Wallace BP, Moore JE, Cox T, Zydelis R, McDonald S, DiMatteo A, Dunn DC, Kot CY, Bjorkland R, Kelez S, Soykan C, Stewart KR, Sims M, Boustany A, Read AJ, Halpin P and Nichols WJ, 2014. Global patterns of marine mammal, seabird, and sea turtle bycatch reveal taxa specific and cumulative megafauna hotspots. PNAS 111, 5271-5276.

Lusher AL, Hernandez-Milian G, Berrow S, Rogan E and O'Connor I, 2018. Incidence of marine debris in cetaceans stranded and bycaught in Ireland: recent findings and a review of historical knowledge. Environmental Pollution 232, 467-476.

Marsh H and Anderson PK, 1983. Probable susceptibility of dugongs to capture stress. Biological Conservation 25, 1-3.

Moore MJ, Mattila D, Landry S, Coughran D, Lyman E, Smith J, and Meyer M, 2018. Whale entanglement response and diagnosis. p. 37-45. In: Gulland FM, Dierauf LA and Whitman KL, eds., CRC handbook of marine mammal medicine, 3rd edn., CRC Press, Washington DC, USA.

Noren SR (2013) Altered swimming gait and performance of dolphin mothers: implications for interactions with tuna purse-seine fisheries. Mar Ecol Prog Ser 482:255–263

Norse EA, Brooke S, Cheung WWL, Clark MR, Ekeland L, Froese R, Gjerde KM, Headrich RL, Heppell SS, Morato T, Morgan LE, Pauly D, Sumaila R and Watson R, 2012. Sustainability of deep sea fisheries. Marine Policy 36, 307-320

Northridge S, 2002. Incidental catches. p 612-617. In: Perrin WF, Würsig B and Thewissen JGM, eds. Encyclopedia of marine mammals, Academic Press, California, USA.

Northridge S, Coram A, Kingston A, Crawford R. 2017. Disentangling the causes of protected-species bycatch in gillnet fisheries. *Conservation Biology*, 31: 686-695.

NRC, 1992. Dolphins and the tuna industry. National Research Council, National Academy of Sciences, USA. National Academy Press, Washington, USA.

Pauly D, 2008. Global fisheries: a brief review. Journal of Biological Research 9, 3-9.

Read AJ, 2008. The looming crisis: interactions between marine mammals and fisheries. Journal of Mammalogy, 541-548.

RSPCA, 1985. Report of the stranded whale workshop: a practical and humanitarian approach. Horsham, UK.

RSPCA, 2018. What is the Australian legislation governing animal welfare? Royal Society for the Protection of Cruelty to Animals, Australia. Viewed at: <https://kb.rspca.org.au/What-is-the-Australian-legislation-governing-animal-welfare-264.html> , on 2 May 2019.

St Aubin DJ, Austin TP and Geraci JR, 1979. Effects of handling stress on plasma enzymes in harp seals, *Phoca groenlandica*. Journal of Wildlife Diseases 15, 569-572.

St Aubin DJ and Dierauf LA, 2001. Stress and marine mammals. p. 253-269. In: Dierauf LA and Gulland FMD, eds. CRC handbook of marine mammal medicine, CRC Press, Washington DC, USA.

Stewart BS, 2002. Diving behavior. p. 333-339. In: Perrin WF, Würsig B and Thewissen JGM, eds. Encyclopedia of marine mammals, Academic Press, California, USA.

Teh LSL, Cheung WWL, Christensen V and Sumaila UR, 2017. Can we meet the target? Status and future trends for fisheries sustainability. Current Opinion in Environmental Sustainability 29, 118-130.

Teilmann J, Tougaard J, Miller LA, Kirketerp T, Hansen K and Brando S, 2006. Reactions of captive harbor porpoises (*Phocoena phocoena*) to pinger-like sounds. Marine Mammal Science, 240-260.

Thewissen JGM, 2002. Hearing. P. 570-574. In: Perrin WF, Würsig B and Thewissen JGM, eds. Encyclopedia of marine mammals, Academic Press, California, USA.

ToA, 1997. Treaty of Amsterdam, text. Office for Official Publications of the European Communities, Luxembourg. ISBN: 92-828-1652-4. Viewed at: <http://www.europarl.europa.eu/topics/treaty/pdf/amst-en.pdf> , on 24 April 2019.

Wade PR, Watters GM, Gerrodette T and Reilly SB, 2007. Depletion of spotted and spinner dolphins in the eastern tropical Pacific: modelling hypotheses for their lack of recovery. Marine Ecology Progress Series 343, 1-14.

Walsh MT, Ewing RT, Odell DK and Bossart GD, 2001. Mass strandings of cetaceans. p. 83-95. In: Dierauf LA and Gulland FMD, eds. CRC handbook of marine mammal medicine, CRC Press, Washington DC, USA.

Wells RS, Allen JB, Hofmann S, Bassos-Hull K, Fauquier DA, Barros NB, DeLynn RE, Sutton G, Socha V and Scott MD, 2008. Consequences of injuries on survival and reproduction of common bottlenose dolphins (*Tursiops truncatus*) along the west coast of Florida. Marine Mammal Science 24, 774-794.

Wells RS, Fauquier DA, Gulland FMD, Townsend FI and DiGiovanni R, 2013. Evaluating post-intervention survival of free-ranging odontocete cetaceans. *Marine Mammal Science* 29, E463-E483.

Whitlow WL, 2002. p. 358-366. Echolocation In: Perrin WF, Würsig B and Thewissen JGM, eds. *Encyclopedia of marine mammals*, Academic Press, California, USA.

Würsig B, 2002. Intelligence and cognition. p. 628-637. In: Perrin WF, Würsig B and Thewissen JGM, eds. *Encyclopedia of marine mammals*, Academic Press, California, USA.

Young NM and Shapiro SL, 2001. US federal legislation governing marine mammals. p. 741-766. In: Dierauf LA and Gulland FMD, eds. *CRC handbook of marine mammal medicine*, CRC Press, Washington DC, USA.

DRAFT

ANNEX 1: Response to the first round of stakeholder reviews

As may be imagined, the wide range of experts consulted (see page 6), resulted in a wealth of feedback and suggestions, and predictably, in some cases, suggestions from one reviewer directly conflicted with those of another. While the consultant carefully took into consideration ALL feedback that was received, he, in consultation with the WWF contracting team had to use his best judgement on how to respond to suggested changes. Consequently not every suggested change has been incorporated into the new draft. However, on the whole, the feedback that has been integrated into the document, has made this draft more robust and suitable for use by the intended audience.

Received feedback can be classified into four main categories, 1) requests for clarification of the intended audience and application of the guidelines, 2) technical corrections or elucidations, and 3) Suggestions for additional content or topics to be addressed in the guidelines, and 4) suggested improvements for language flow and/or formatting of the document.

1) Requests for clarification of the intended audience and application of the guidelines

Perhaps the most common thread to feedback received from a majority of reviewers was a lack of understanding of the target audience of the guidelines, and/or a concern that the current format was too wordy and detailed for practical use by fishing crews themselves. This was an oversight on our part, and should have been better explained both in the request for review and in the text of the guidelines. The opening paragraph of the Summary of the guidelines, as well as the first section on the 'purpose and scope of the document' now reads as follows, and should help to make this clearer to users as well as future reviewers:

'These guidelines, in their full text format, are intended to provide fisheries managers at any level, as well as those who work with fisheries to improve their sustainability, with best-practice methodology on the safe and humane handling and release of small cetaceans accidentally bycaught in fishing gear. They are intended to enable managers and 'trainers', as well as anyone involved with fisheries policy or management to understand the rationale and need for 'best practice', as well as the science that supports the recommended practices. The illustrations provided with these guidelines, as well as the bullet-pointed handling notes, can be used to develop 2-page laminated fisher-friendly 'Flips' (ready reckoners) that contain clear, concise, bullet-pointed instructions pertinent to each specific fishery. These 'flips' can be used by fishing crews on deck for quick consultation.'

Following this first round of consultation, the guidelines will be shared with the IOTC (Working Party on Ecosystems and Bycatch) and the FAO with the aim of obtaining feedback from fisheries stakeholders. Both meetings will take place in September 2019. It is hoped that these guidelines will be published under the joint banner of the FAO and/or a number of Regional Fisheries Management Organisations (RFMOs), with endorsement from the NGOs and IGOs that have already been consulted (although each organisation will have their own formal endorsement process to go through, with the timeline dictated by each body's annual or biennial Conference of Parties/Commission meeting, etc.). It is thus hoped that these guidelines will be widely promoted and distributed by all of these organisations, but most importantly, that they are incorporated into standard policy, training and practice for fisheries and fisheries management organisations around the globe.

A concern was also expressed that these guidelines might be put into practice without the benefit of the three-step training that is recommended in this document. While the authors understand that

this is a serious concern for large whale entanglement response, where injury or death can result from untrained personnel attempting disentanglements, it was felt that dealing with small cetaceans presents less of a risk to crew members. At the same time, these guidelines emphasise in several different parts of the text that safety of crew members is always the primary concern, and protocols include specific measures and warnings to reduce risk to crew (e.g. NEVER get in the water with entangled cetaceans, avoid the mouth head and tail fluke area, etc.). Furthermore, it is common knowledge that fishers all over the world are engaging in handling and release of small cetaceans without any training or guidelines, and familiarity with these guidelines, even if not accompanied by the recommended training, will only improve their safety and well-being, as well as that of the animals.

2) technical corrections or elucidations

In many cases, expert reviewers provided technical corrections, additional published references, or clarifications. These included, for example, refining the definitions in the glossary of terms, refining the suggestions for specialised or adapted equipment that can be used (along with useful illustrations), or correcting terminology for physiological responses in small cetaceans. In almost all cases these have been gratefully accepted and integrated into the revised text. In a few isolated cases, it was felt that the additional detail or language suggested by reviewers would have been too technical for the intended audience, and was therefore either simplified or left out altogether.

3) Suggestions for additional content or topics to be addressed in the guidelines

A few enthusiastic reviewers suggested including additional content as specified below. In general, this extra content was not added, in order to keep the focus of these guidelines limited and clear. The list below includes details of how we responded to this category of suggestions:

- Include a review of bycatch mitigation measures: This was not included, partly because such a review has already been conducted under a separate WWF consultancy and published under [CMS technical guidelines](#). Additional reviews are available in peer-reviewed journals (e.g. [Baker and Hamilton 2019](#)). Furthermore, the FAO is in the process of drafting technical guidelines on the mitigation of marine mammal bycatch, and it is hoped that these more specific guidelines on safe handling and release can be published as an annex to those.
- Include a review of all that is known about live entanglement and release. While this would be an interesting and worthwhile exercise, it is somewhat at odds with other suggestions to keep these guidelines concise and fit-for-purpose for the target audience in mind. It is unfortunately beyond the scope of this exercise. However, numerous references to peer-reviewed publications about this topic are included in the text.
- Include in the recommended protocol the tagging of animals to be released in order to monitor their survival post-release. The authors agree that better information is needed on post-release survival in order to improve future handling and release practices and know whether they are indeed extending life or possibly prolonging suffering. However, the authors felt that encouraging a tagging protocol in these guidelines would be both unrealistic for the target audience, who we want to enable to conduct safe handling and release with the minimum amount of extra training and equipment, and potentially harmful to the individual

animals who may be further stressed by the application of tagging equipment when they are already compromised by the entangling event.

- Address the issue of crowd control: Perhaps unlike entanglements of large whales in busy harbours or fishing areas that may draw a large crowd of curious onlooking vessels, it was felt that entanglement of small cetaceans is likely to be less conspicuous and less likely to draw onlookers. It was felt that the clear guidelines to keep movement and noise to a minimum in the vicinity of the animal should be sufficient.
- Provide specific guidance on safe-handling and release in low-light/night time conditions: This was carefully considered, but in the end decided that the advice would not be much different than the recommended practice for daylight. The recommendations already include a caution against shining bright lights directly into animals' eyes. Fishing crew members will be well versed in the extra safety precautions they need to take during night-time operations, and these will apply to cetacean handling and release as well.
- A proscriptive incident reporting template with a greater level of detail than is included in the bullet points listed: Throughout the document, the authors are aware of the challenge of striking the correct balance between recommended practices that will be viewed as realistic and practical by the fishing industry, while at the same time promoting the welfare of the individual cetaceans involved. As cetacean researchers themselves, the authors recognise the potential value of samples that could be collected from animals, or detailed measurements and other data that could be collected. However, the authors are also very aware that if reporting templates become too detailed and demanding, they are unlikely to be completed by crew members. For this reason, it was felt that it would be best to include a list of the minimum types of data that should be collected, and trust each fishery to develop their own reporting template. It is possible that collaboration with the FAO and/or the IOTC or other RFMOs will result in templates that can be used by other fisheries as well.
- A requirement/encouragement that crews keep carcasses of bycaught cetaceans that are confirmed to be dead for research purposes. As with the point above, the authors fully recognise the opportunity that carcasses can provide for learning and understanding. However, the consultant's long history of work with fisheries has led him to believe that it is important to keep this issue separate from the focus of what is needed to safely handle and release a live small cetacean. Avoiding mention of carcasses or suggested collaboration with research teams will not preclude these collaborations (Indeed, in some cases, national or local legislation will dictate that carcasses be preserved, and/or collaborations will already be in place). However, it was felt that including an encouragement to preserve carcasses and work with research teams may act as a 'red flag to a bull' in some fisheries where this suggestion will give the impression that there are ulterior motives to the guidelines. The consultant feels that more time is required for these guidelines to be tested and accepted before the next stage of collaboration is incorporated.
- Include more detail around how fishers/crew members assess the state of health of an animal and how their actions must be consistent with ethical standards: Some text has been devoted to this in section 2.4. However, it was felt that providing too much detail here would be asking too much of fishing crews, and potentially provide an excuse not to undertake the immediate actions required to safely release the animal as quickly as possible. As such, only very simple

guidance is given, with the over-arching principal that if there is any doubt as to whether the animal is (newly) dead or simply unresponsive, it should be treated as if alive, and the recommended best practice followed for release.

4) suggested improvements for language flow and/or formatting of the document.

The large volume of wording/language suggestions that were made using tracked changes made it impossible to accept all the suggestions that were made. However, many suggestions were incorporated, especially in cases where re-wording was required to bring points across more clearly and/or concisely and/or avoid repetition. A final check has been conducted for grammatical errors and consistency of spelling (English-UK).

While the document in its final form will be completely re-formatted by a professional designer, a number of suggestions were made regarding formatting of text to ensure that certain points stand out to the reader and/or are easier to digest. Where possible in the current MS-Word document format, we have added some bold text to highlight the most important points, clarified headings, and used more bullet points and text boxes. We have also moved the illustrations into the body of the text so that it is easier for users to imagine how the illustrations and bullet points could be combined into laminated 'flips'/guides that could be used by crew members on deck. These issues will be more fully addressed in the final professional formatting of the document. At the same time the illustrations will be re-done by a professional illustrator in a digital format that will make them easy to combine with the handling notes and key instructions for release from each type of fishery in the format of 2-page laminated 'flips' for fishers to use on deck.