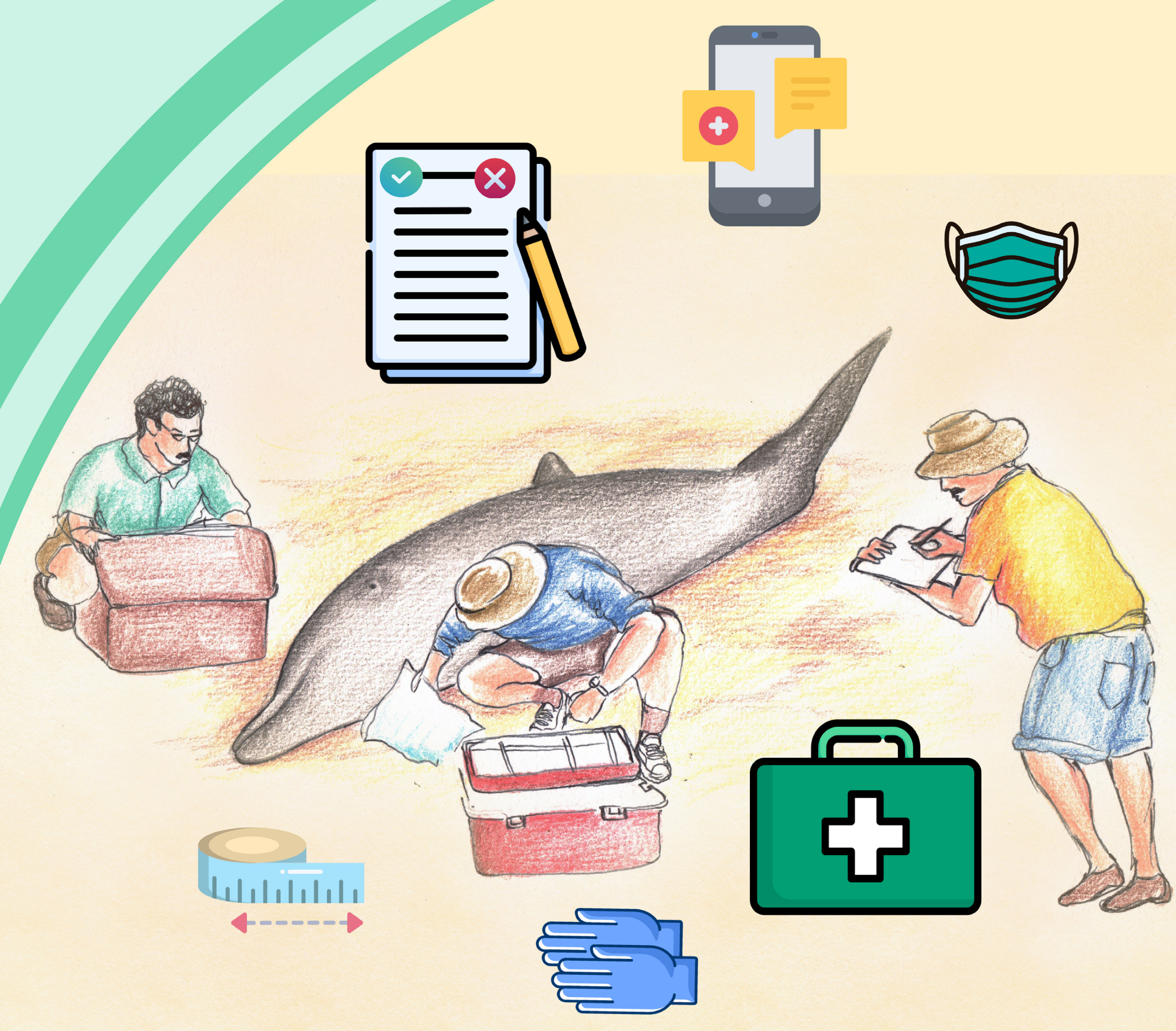
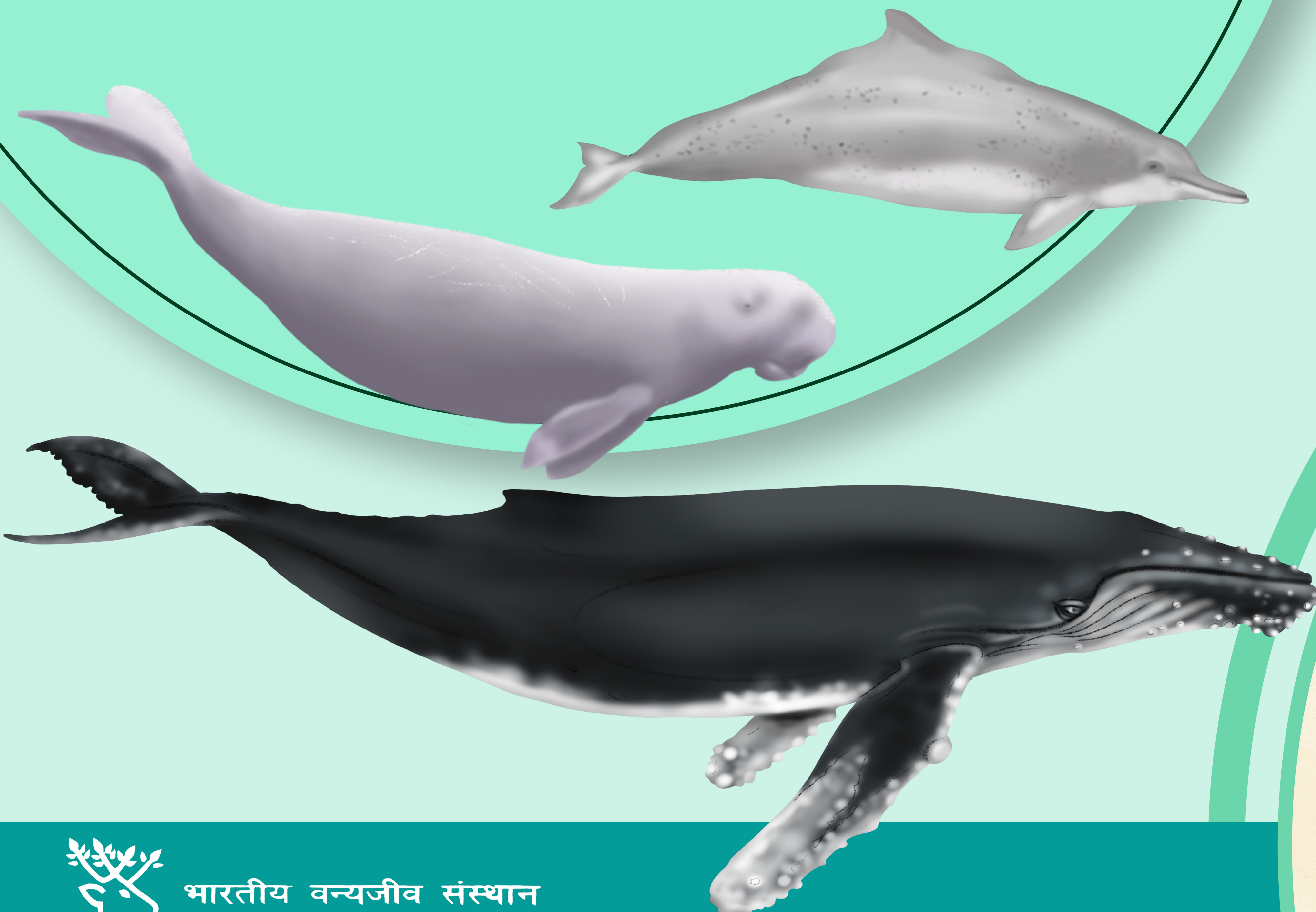


# A MANUAL ON MARINE MAMMAL STRANDING RESPONSE

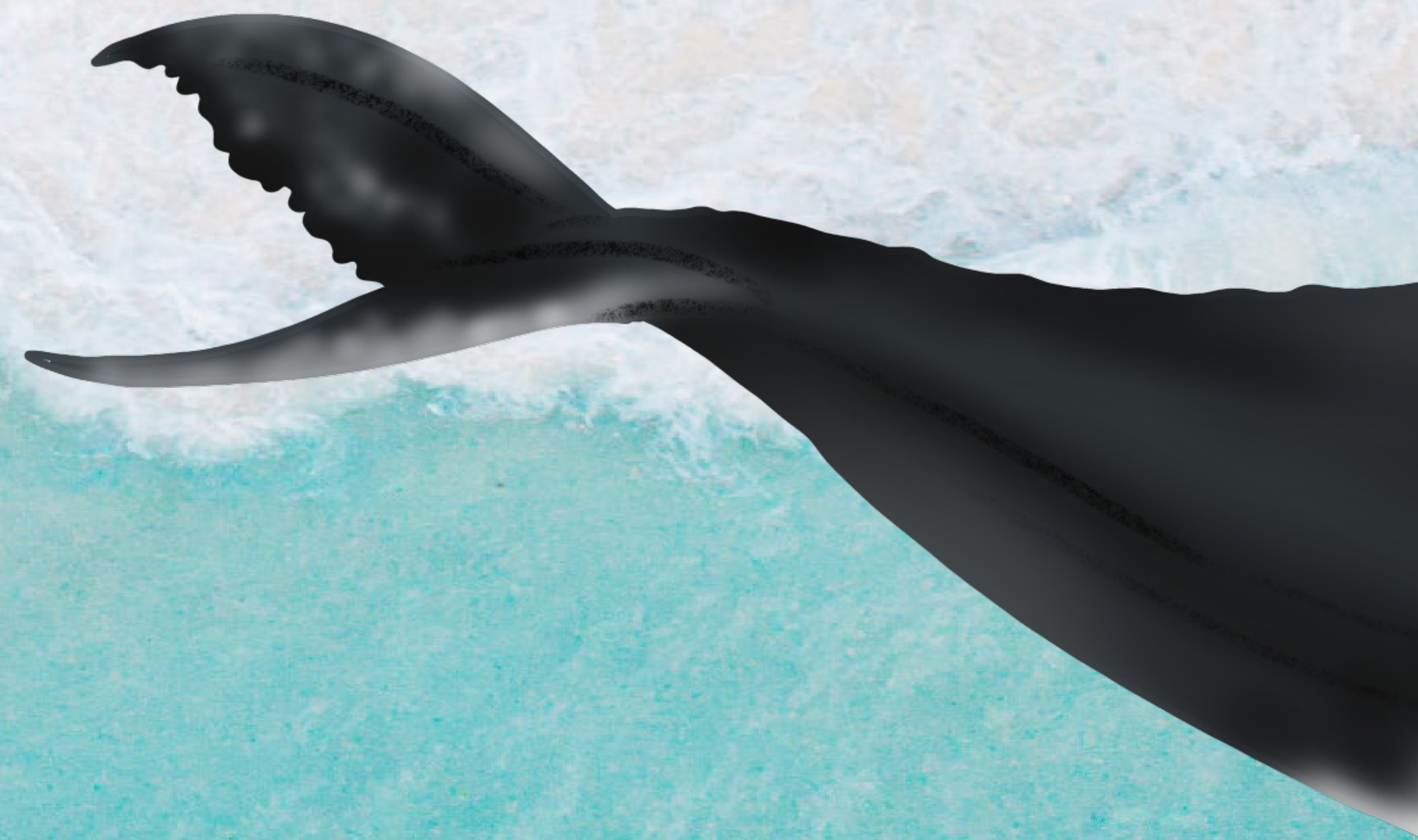




A MANUAL ON

**MARINE MAMMAL**


**STRANDING RESPONSE**






# A MANUAL ON MARINE MAMMAL STRANDING RESPONSE

 @CAMPA dugong\_WII

 @dugongsforever

 @dugongsforever

@CAMPA dugong\_WII @dugongsforever

## Manual Citation

Sivakumar, K., Rajpurkar, S., Tripura, V., Dixit, D., Pande, A., Prabakaran, N., Johnson, J.A. (2022). A Manual on Marine Mammal Stranding Response. Wildlife Institute of India, Dehradun, Ministry of Environment, Forest and Climate Change, Government of India.

## Citation

CAMPA-Recovery of dugong and their habitats in India: an integrated participatory approach (2022). A manual on marine mammal stranding response, Wildlife Institute of India, Dehradun, Ministry of Environment, Forest and Climate Change, Government of India.

ISBN : 81-85496-80-3

Printed in India, 2022

The contents of the manual may be freely used for non commercial purposes with due acknowledgement.

## Disclaimer

The information presented in the manual are of authors and do not represent the views of the institution.

The manual is also available online at [https://wii.gov.in/dugong\\_publications](https://wii.gov.in/dugong_publications)  
WII website link: <http://wii.gov.in/>

## Published by

© Wildlife Institute of India 2022

## Authors

Dr. K Sivakumar, Sagar Rajpurkar, Vabesh Tripura, Diksha Dixit, Dr. Anant Pande, Dr. Nehru Prabakaran, Dr. J A Johnson

## Design & Illustrations

Vabesh Tripura

## Other contributors

Dr. H.S Das  
Chinmaya Ghanekar  
Rukmini Shekar  
Madhu Magesh



# ACKNOWLEDGEMENT

The Manual on Marine Mammal Stranding Response is an attempt to help stranding networks and forest departments to aid in quick response to both alive as well as dead marine mammal strandings, sample collection and necropsy protocols. This manual is envisaged keeping in mind the requirement of a pocket guide to field researchers, college students, forest personnel, naturalists, marine respondents, life guards or anyone responding to a stranding.

We are indebted to the funding agency Compensatory Afforestation Fund Management and Planning Authority (CAMPA), Ministry of Environment, Forests and Climate Change, Government of India, New Delhi for providing sufficient funds to bring out this much needed knowledge product. We are deeply grateful to the Director, Dean, Research Coordinator, faculty and technical staff of the Wildlife Institute of India for their unwavering support to the CAMPA-Dugong Recovery Program.

This product would not have been possible without the support of the officials and field staff of State Forest Departments of Gujarat, Tamil Nadu and Andaman & Nicobar Islands. Special thanks to our key stakeholders, Indian Navy, Indian Coast Guard, Marine Police, Fisheries departments, fisher communities, dive schools and local people of Gujarat, Tamil Nadu and Andaman & Nicobar Islands. We deeply acknowledge the photographs provided by Dr. Himansu Das, Environment agency, Abu Dhabi.

A big cheer to the Dugong Ambassadors, the Dugong Scholarship Program beneficiaries, the flagbearers of the CAMPA-Dugong Recovery Program across these sites who keep the inquisitiveness alive.

Last but not the least, we are hugely thankful to the entire Dugong Team including all interns, volunteers and field assistants at field sites for their tremendous support to the project.

We are grateful to the Wildlife Division of MoEFCC, Government of India for the support and guidances.



बिभाष रंजन  
BIVASH RANJAN



सत्यमेव जयते

अपर वन महानिदेशक  
- भारत सरकार  
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय  
ADDITIONAL DIRECTOR GENERAL OF FOREST  
GOVERNMENT OF INDIA  
MINISTRY OF ENVIRONMENT, FOREST AND  
CLIMATE CHANGE



### Foreword

I am delighted to know that the Wildlife Institute of India has brought out this unique publication titled 'A Manual on Marine Mammal Stranding Response' through the CAMPA funded project on 'Recovery of Dugongs and their habitats; An Integrated Participatory Approach'. India has a vast marine habitat home to 34 species of marine mammal like dolphins, porpoises, whales and dugongs, which are reported from various coastal states of India, including islands.

Worldwide, marine mammals have declined due to various reasons including hunting, ship strikes, pollution, habitat degradation, net entanglement etc. In addition, an increase in marine mammal live stranding cases, which requires appropriate response measures to save such live stranding. The stranding response manual will help the stakeholders and frontline forest staff in taking scientific and appropriate measures for rescuing and release of alive strandings or salvaging information from dead strandings with a stepwise, simplified and illustrated protocol.

This publication would be beneficial to multiple user groups in the society living along the coastline of India. It will help in improving coordination between different stakeholders like National and State Stranding Networks, Forest Departments, Coast Guards, Marine Police and coastal communities. I appreciate the hard work put in by the project team of CAMPA-Dugong project and congratulate Director, Wildlife Institute of India for bringing out this unique guide on marine mammal stranding response. I am confident that this Stranding Manual will serve as a very useful for conserving our marine mammals.

(Bivash Ranjan)



जे-504, जल विंग, इंदिरा पर्यावरण भवन, जोर बाग रोड़, नई दिल्ली-110 003  
फोन : 011-20819414, फेक्स : 011-20819404

J-504, JAL WING, INDIRA PARYAVARAN BHAWAN, JOR BAGH ROAD, NEW DELHI-110 003,  
PH : 011-20819414, FAX : 011-20819404, E-mail : adgwl-mef@nic.in



आजादी का  
अमृत महोत्सव



सुभाष चंद्र  
Subhash Chandra



सत्यमेव जयते

अतिरिक्त वन महानिदेशक एवं मुख्य कार्यकारी  
अधिकारी राष्ट्रीय प्राधिकरण कैम्पा, भारत सरकार  
पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय  
ADDL. DG FORESTS & CHIEF EXECUTIVE  
OFFICER, NATIONAL AUTHORITY CAMPA,  
GOVERNMENT OF INDIA  
MINISTRY OF ENVIRONMENT, FOREST &  
CLIMATE CHANGE,

## Foreword

Wildlife Institute of India is implementing the 'Endangered Species Recovery Program' for four wild species viz. Great Indian Bustard Manipur Deer, Gangetic Dolphin and Dugong, which has been support by the National Compensatory afforestation Fund Management and Planning Authority (CAMPA), Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India. I am delighted to see a unique and informative publication "A Manual on Marine Mammal Stranding Response" coming out from the Dugong Recovery Program. Under this component, necessary ground interventions are being undertaken for dugong conservation through the support of the local communities and other stakeholders.

Capacity building, awareness programs and participation of various stakeholders like Forest Department, Indian Navy, Indian Coastguards, Marine Police, Fisherfolks etc. are a few key initiatives that have been helpful in conservation of dugongs and their habitats in India. It is observed that just like dugongs, other marine mammals such as dolphins, porpoises and whales too facing the problem of live/ dead stranding.

In this context, this manual would be of immense utility to the field workers, researchers and frontline forest personnel for responding to these marine mammal strandings across India's vast coastline. I highly appreciate the efforts of Dugong Project Team at Wildlife Institute of India for bringing out this unique field guide. I congratulate the Director, Wildlife Institute of India and the Project Principal Investigator for this special publication under the national CAMPA support 'Endangered Species Recovery Program' and hope that this will bring out new perspectives on Marine Mammal conservation in India.

  
(Subhash Chandra)



A -232, 2<sup>nd</sup> Floor, Agni Wing  
INDIRA PARYAVARAN BHAWAN, JOR BAGH ROAD, NEW DELHI-110003  
Ph: 011-20819359, E-mail: subhash.chandra65@gov.in



आजादी का  
अमृत महोत्सव





भारतीय वन्यजीव संस्थान  
Wildlife Institute of India

(An Autonomous Institute under Ministry of Environment, Forest & Climate Change, Govt. of India)  
पत्रपेटी सं०/Post Box No. 18, चन्द्रबनी, देहरादून/ Chandrabani, Dehradun - 248001, उत्तराखण्ड, भारत/ Uttarakhand, INDIA

75  
Azadi Ka  
Amrit Mahotsav

Dr. S.P. Yadav, IFS  
Director  
Wildlife Institute of India, Dehradun



### Foreword

Marine mammals are the flagship species of the marine realm and India is home to 34 species ranging from whales, dolphins, porpoises and the only marine megaherbivore, the dugong. Marine mammals act as keystone species in the marine ecosystem and support the ecological balance in the food webs. They provide a wide range of ecosystem services in these habitats thus are a priority for conservation. In the present scenario, worldwide, marine mammal populations have seen a decline due to various threats like incidental catch, boat strikes, oil spills, net entanglements, natural calamities like cyclones, typhoons etc. In addition to this, there is an increase in marine mammal stranding cases occurs along the Indian coasts, which requires continuous surveillance and monitoring.

In this contextual, the Ministry of Environment, Forest and Climate Change, Government of India, entrusted Wildlife Institute of India to implement the Species Recovery Program for dugongs in the country. The task involved assessment of habitats, ascertaining the threats, generating awareness and enhancing the capacity of stakeholder to monitor regionally endangered dugongs and their habitats. Over the last 6 years, a multistakeholder approach has helped reduce mortalities of dugongs due to poaching, generated awareness amongst thousands of people including local communities and trained frontline agencies to monitor the dugong habitats. Dugongs that were entangled in fishing nets were released by local fisherfolks due to the efforts in awareness and outreach.

As part of the ongoing dugong recovery programme, the research team has brought out a manual on the Marine Mammal Stranding Response with an insight to save marine mammals stranded alive and salvage maximum information from dead strandings. The illustrated manual will be useful for on field data stranding response across different scenarios of animals being stranded on the shore and aid in rescue and release. It is easy to follow yet detailed steps will be able to help the frontline personnel of the Forest Department, stranding response teams and researchers alike working in the maritime states of the country. I believe that this manual will bring immense value to the National and State Stranding Response Networks and their databases and help us in marine mammal conservation and quickly respond to stranded animals.

(S.P. Yadav)



ई.पी.ए.बी.एक्स/EPABX : +91-135-2640114, 2640115, 2646100; फ़ैक्स/ Fax : 0135-2640117



ई-मेल/Email: wii@wii.gov.in वेब/ Website www.wii.gov.in



Twitter: @wiofficial1



# PROJECT INFORMATION

## Recovery of Dugong and their habitats in India: an integrated participatory approach

Dugong (*Dugong dugon*), also known as Sea Cow, is one of the four surviving species in the order Sirenia and the only existing species of exclusively herbivorous marine mammal. Dugongs are naturally found in calm sheltered, nutrient-rich water, generally in bays, shallow island and reef areas, which are protected from strong winds and heavy seas (Heinsohn *et al.*, 1977) and forage upon extensive seagrass beds (Marsh *et al.*, 2002). In India they are found in Gulf of Mannar, Palk Bay, Gulf of Kutch and Andaman and Nicobar Islands.

In 2015, the Ministry of Environment, Forests and Climate Change entrusted the Wildlife Institute of India to prepare and implement Endangered Species Recovery Plans (ESRP) of Dugong along with 3 other wild animal species (Great Indian Bustard, Gangetic Dolphin and Sangai) under the National Compensatory Afforestation Fund Management and Planning Advisory Council (NCAC). The Dugong ESRP includes research and management actions imperative to stop the population decline and support the recovery of these highly threatened animals. The population of dugongs in India is expected to be less than 250 individuals in highly fragmented habitats. Several threats contribute to their continuous population decline, which include seagrass habitat loss, fishnet entanglement, hunting and pollution. With substantial funding under this program, necessary ground interventions have been initiated to ensure the long-term survival of dugongs in the wild through multi-stakeholder partnerships and support of the local communities. This project aims at implementing the “National Action Plan for Dugong Conservation in India” jointly with various stakeholders such as State Forest Departments, other line agencies and local communities to recover the population and habitat of dugong in India within next two decades.



The main objectives of the project includes:

- Species conservation and management- Assess dugong population status through advanced census techniques and determine its abundance and distribution, identify critical habitats, classify threats and develop site-specific monitoring plan to reduce poaching and incidental entanglements.
- Habitat conservation and management- Characterize the critical dugong habitats, reduce direct and indirect threats, control modifications in and around the habitat and improve habitat quality through management interventions and participatory approaches.
- Participatory management of dugong and their habitats - Raise awareness on the species and encourage the participation of the local communities; include other stakeholders like fisheries department and religious heads in conservation efforts; enhance Dugong conservation program by spreading awareness on a national scale.
- Capacity-building of State Forest Departments & local communities - Enhance the capacity of the State Forest Department staff and develop/implement smart patrolling tools to improve protection enforcement; train forest staff and local communities in underwater surveys for long-term habitat monitoring.



# RECOVERY OF DUGONGS AND THEIR HABITATS IN INDIA: AN INTEGRATED PARTICIPATORY APPROACH

## TEAM

- Dr. J.A. Johnson, Scientist-E
- Dr. Nehru Prabakaran, Scientist-C
- Ms. Swapnali Gole, Project Fellow
- Ms. Sameeha Pathan, Project Fellow
- Mr. Sagar Rajpurkar, Project Fellow
- Ms. Shivani Patel, Project Fellow
- Ms. Prachi Hatkar, Project Fellow
- Ms. Sweta Iyer, Project Fellow
- Ms. Chinmaya Ghanekar, DST- Inspire Fellow
- Mr. Sohom Seal, UGC- Research Fellow
- Mr. Vabesh Tripura, Project Assistant
- Mr. Sumit Prajapati, Project Assistant
- Ms. Srabani Bose, Project Assistant







PHOTO CREDIT: SAGAR RAJPURKAR  
WILDLIFE INSTITUTE OF INDIA



# CONTENTS

Section	Title	Page
1.	Aknowledgement	
2.	Foreword	
3.	About marine mammal stranding.....	1
4.	Components of a rapid response team.....	8
5.	Response to a stranding.....	11
	a).Emergency response to a live stranding.....	13-14
	b).Emergency response to a dead stranding.....	16
	c).Necropsy protocal.....	21-22
	d).Dos and don'ts.....	29-30
6.	Appendices	
	a).Marine mammal species list of India.....	31-35
	b).Points of contact	
	c).Chemical preparation.....	36
7.	Glossary.....	37-38
8.	References.....	39-40



# ABOUT MARINE MAMMAL STRANDING

Like terrestrial mammals, marine mammals too breathe air, give birth to young ones, live in complex social structures, and exhibit remarkable levels of cognition. They spend their lifetimes in water, sometimes at/near the surface, breathing, playing, or reproducing and sometimes at depths of up to 2000 meters, hunting and feeding. Occasionally, these animals are also found stranded on shores, dead or alive, alone or in groups. Strandings can be natural as well as human-driven. Senescence, disease, and predation are common agents of natural mortality and subsequent strandings, while physical trauma due to a stab, boat strike, or net entanglement are some of the anthropogenic causes of strandings.

Dealing with and managing strandings in an informed and organized manner is very crucial. A stranded animal, dead or alive, is a plethora of knowledge about itself and its habitat. The location of strandings provides an idea about their distribution. Post mortem study of a dead stranded mammal reveals its anatomy and feeding habits, which otherwise are challenging to study in their natural habitat. Physical and chemical evidence from their bodies, for example, stab wounds, blunt force trauma, ingested plastic, toxins in tissues, etc., reflect the impacts of anthropogenic interference and thus, the health of the oceans. Thus, stranded animals can be used as sentinels of ocean health. Moreover, a stranded animal could also be a carrier of zoonotic diseases which could be dangerous for humans. Hence, it becomes imperative that stranded marine mammals are handled with utmost care and vigilance.

A step-wise approach to stranding can make animal/carcass handling easier and effective. This manual is a guide to emergency responses to both, alive and dead strandings, and to protocols for necropsy and sampling.

Ministry of Environment, Forest and Climate Change, Government of India has published a 'Marine Megafauna Stranding Management Policy Guidelines' to manage the stranded marine megafauna including marine mammals in India. This manual is to support the implementation of this guideline at the field level.

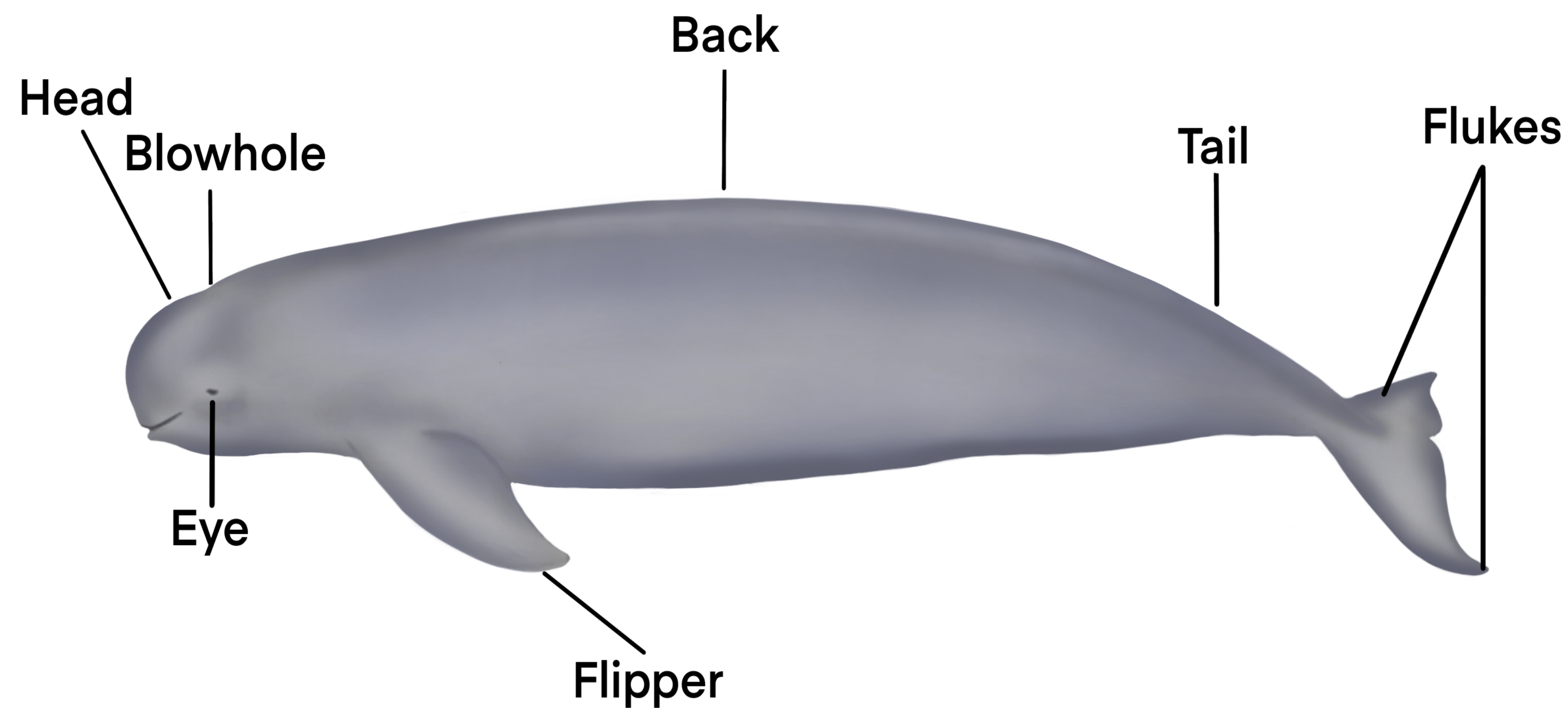


# BASICS OF MARINE MAMMAL MORPHOLOGY

Marine mammals found in Indian waters include Cetaceans (baleen whales, toothed whales, dolphins, and finless porpoise) and, Sirenians (dugongs), which are protected by law under Schedule I, Part I of the Wildlife (Protection) Act, 1972.

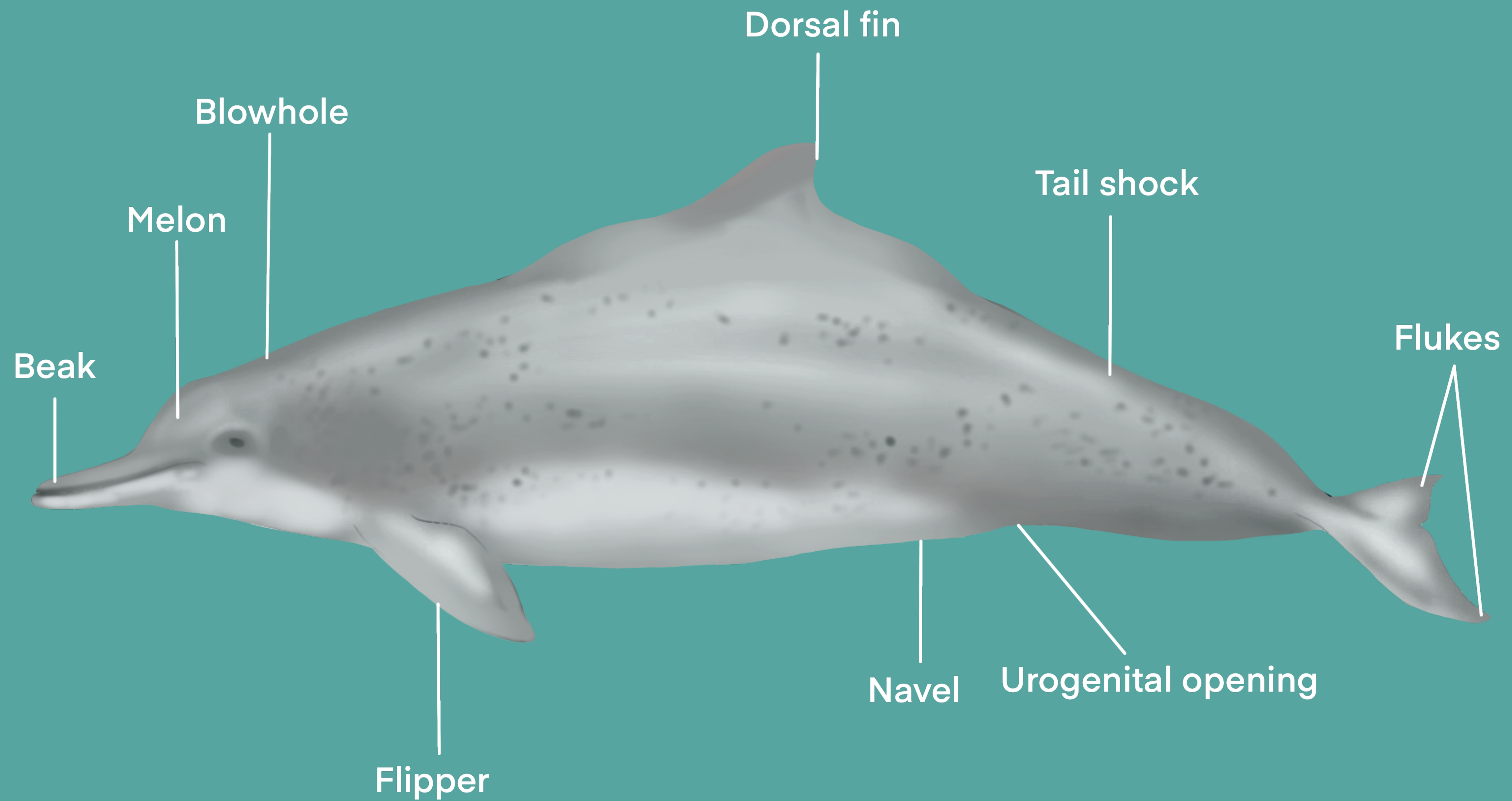
The basic morphology of major marine mammal groups found in India is shown below:

## GENERAL MORPHOLOGY OF PORPOISE



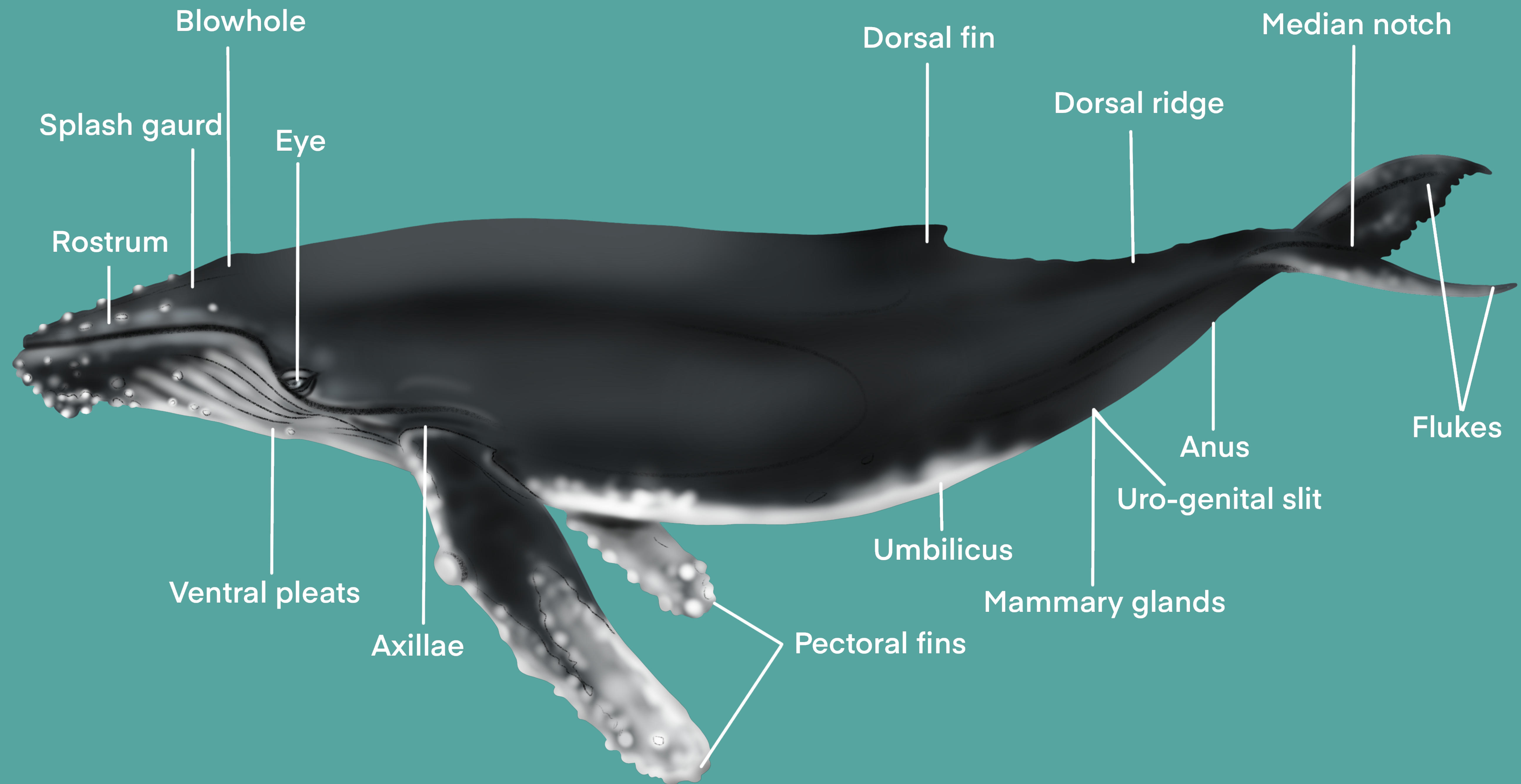


# GENERAL MORPHOLOGY OF DOLPHIN



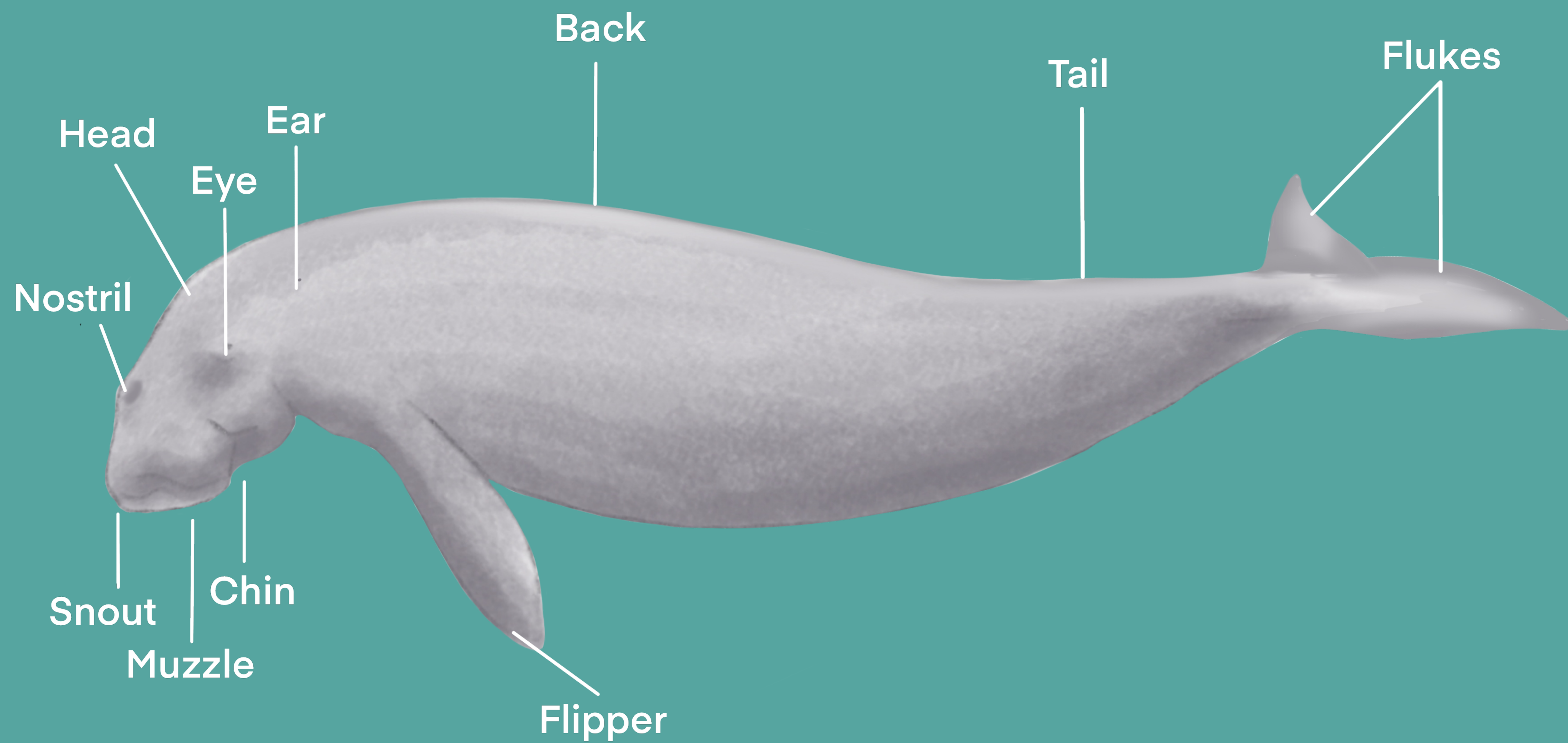


# GENERAL MORPHOLOGY OF BALEEN WHALE (HUMPBACK WHALE)





# GENERAL MORPHOLOGY OF DUGONG





# MAIN CAUSES OF MARINE MAMMAL STRANDINGS INCLUDE:

Below shown are three major anthropogenic causes of marine mammal strandings and deaths in India

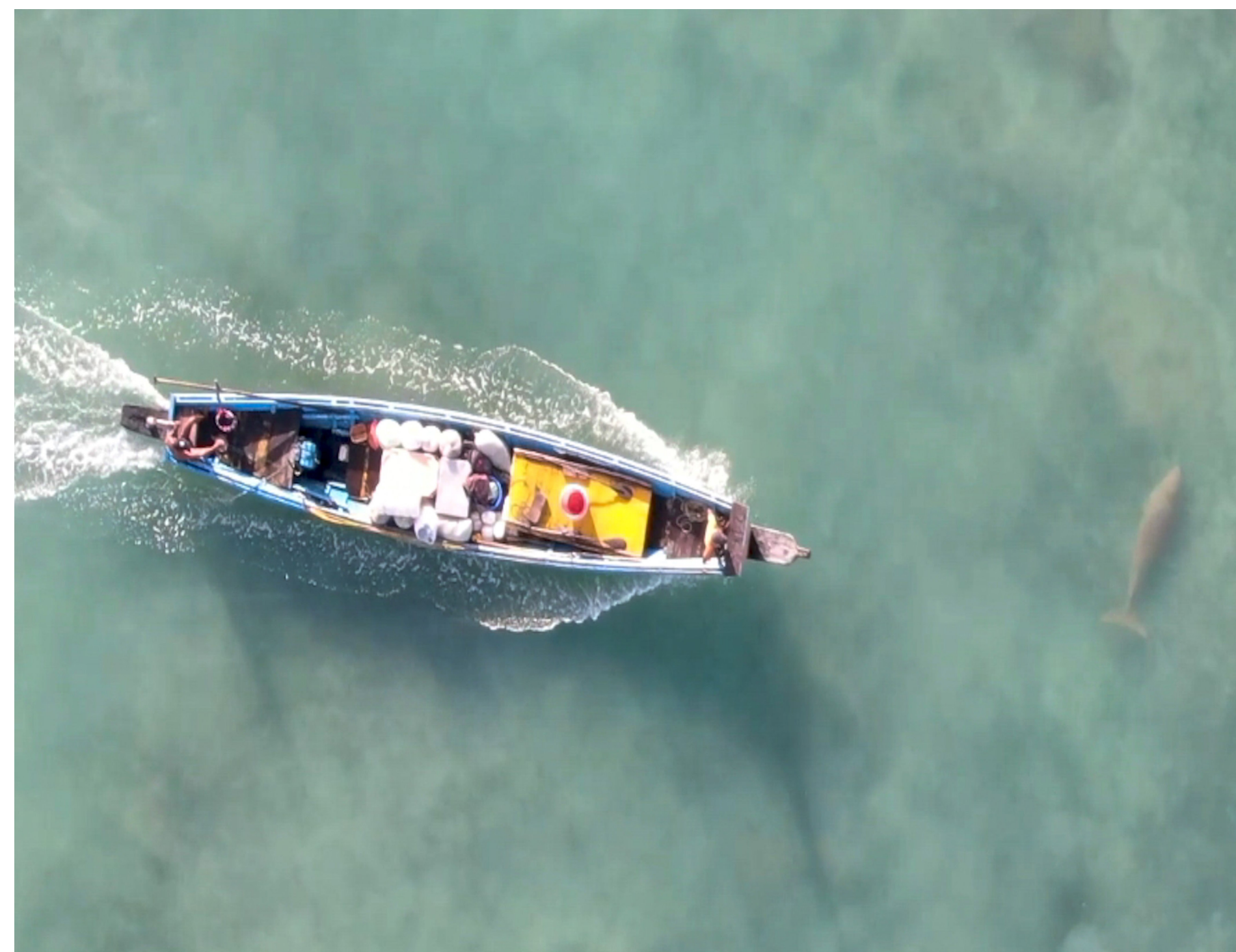
A



B



C



Boat Strike



Poaching/ Hunting

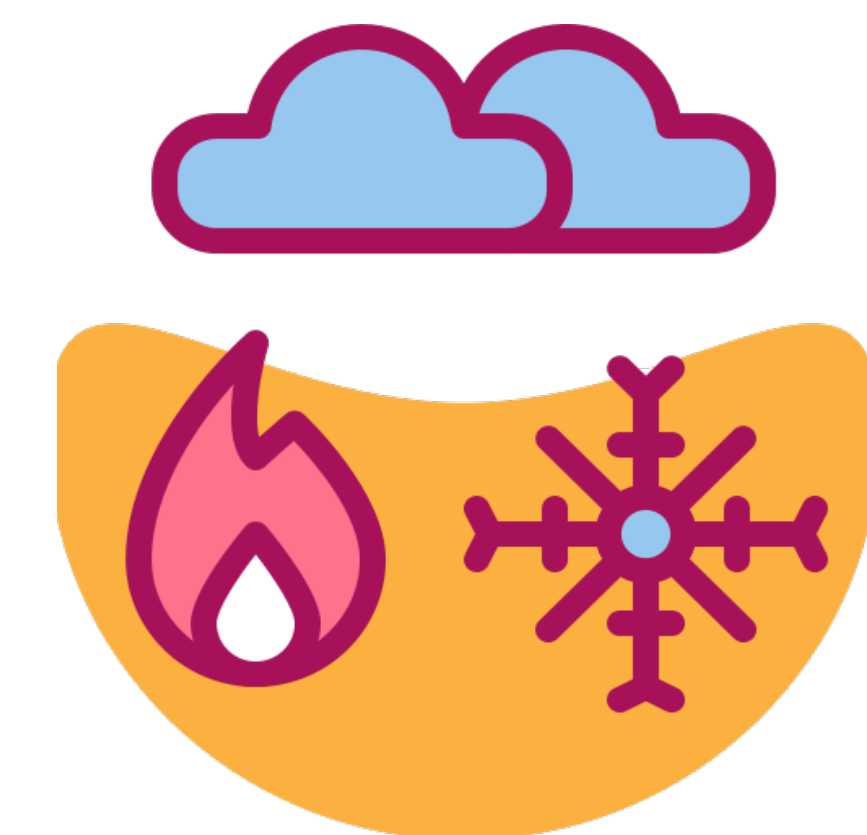
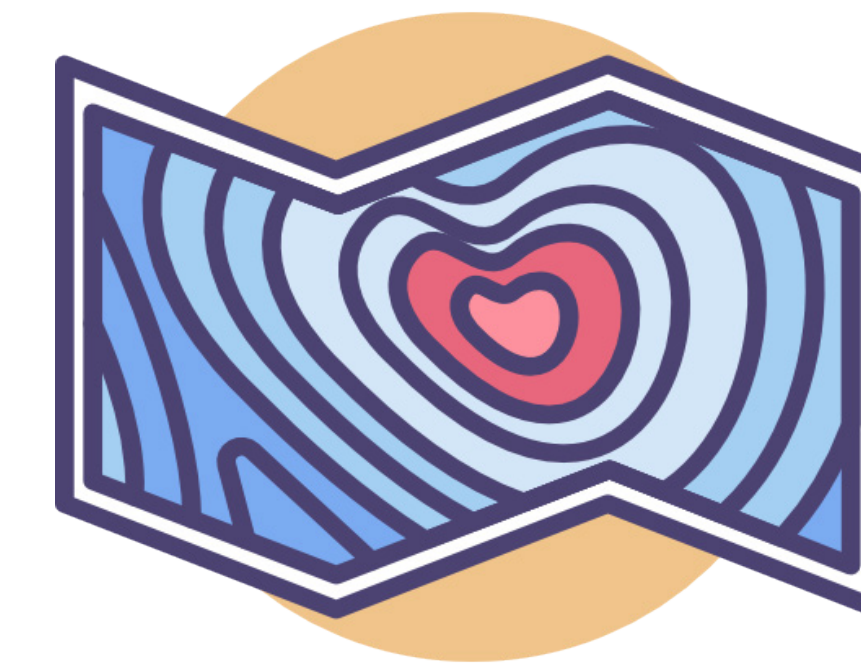


Incidental Bycatch



## SOME OF THE OTHER CAUSES OF MARINE MAMMAL STRANDINGS INCLUDE:

- Plastic ingestion
- Social adherence
- Natural Calamities or Extreme weather conditions
- Toxins- Pollution and Harmful Algal Blooms (HAB)
- Noise Pollution
- Oil spills
- Injury & Diseases





# COMPONENTS OF A RAPID RESPONSE TEAM

- A Rapid Response Team (RRT) has to be formed as per directions given by National Stranding Centre (NSC) and State Stranding Centres (SSC). This has to be done in accordance to National Marine Mega Fauna Stranding Guidelines, 2021.
- In case of a stranding, the first respondent will contact the State Coordinator or Nearest Stranding Network Coordinator who will contact the Forest Department, Veterinerian and Scientists or Researchers. Information regarding the stranding has to be sent to Indian Coast Guard and Marine or Coastal Police.
- A Rapid Response Team (RRT) is a group formed by local stranding response networks, formed by SSCs. Each RRT comprises of equipped personnel, trained to handle any kind of marine mammal strandings. Such a team will be well connected with volunteer networks through a hotline or a mobile application for managing marine mammal strandings

## Stranding Rapid Response Team (RRT) Members:

1. Trained veterinarian (at least one)
2. Marine Mammal Protectors
  - a) Trained supportive care personnel (at least two)
  - b) Logistics Handlers- for transport, rescue equipment, crowd control, and dealing with media (at least two)

Data collected to be provided to National and State Stranding Center within 15 days.



# CHECKLIST OF RESCUE EQUIPMENT:

1

## For the response team:

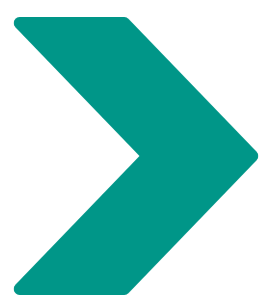
- a) Sterilised heavy gloves (10)
- b) Masks (10)
- c) Rubber boots/clogs (10)
- d) Safety vests (10)
- e) Aprons (5)
- f) Disinfectant soap (1)
- g) Hand towels (5)
- h) Medical supplements for the response team (ORS or glucose powder)
- i) First aid kit



2

## For site management and data recording:

- a) Datasheets (2)
- b) Notepad (2)
- c) Pen/pencil/waterproof markers (3)
- d) GPS (1)
- e) Digital camera with memory card and spare batteries (1)
- f) Waste storage bags (2)





3

For supportive care and release:

- a) Measuring tape- 50 and 100 m (1)
- b) Stainless knives (2)
- c) Pliers/tweezers- large and small (2)
- d) Medical supplements for the animals
- e) Buckets (3)
- f) Towels (3)
- g) Thermometer (1)
- h) Shading equipment-umbrella or tarpaulin (3)
- i) Stretchers (variable sizes)
- j) Weighing balance (least count  $\leq 1\text{gm}$ ) (2)
- k) Inflatable boats (2)

4

Dissection kit:

- a) Sharp scissors- medium (2)
- b) Scalpel with spare blades (2)
- c) Forceps- small and large (2)
- d) Bone saw/hack saw (1)
- e) Large surgical knives and sharpening stone (2)

5

Sample collection:

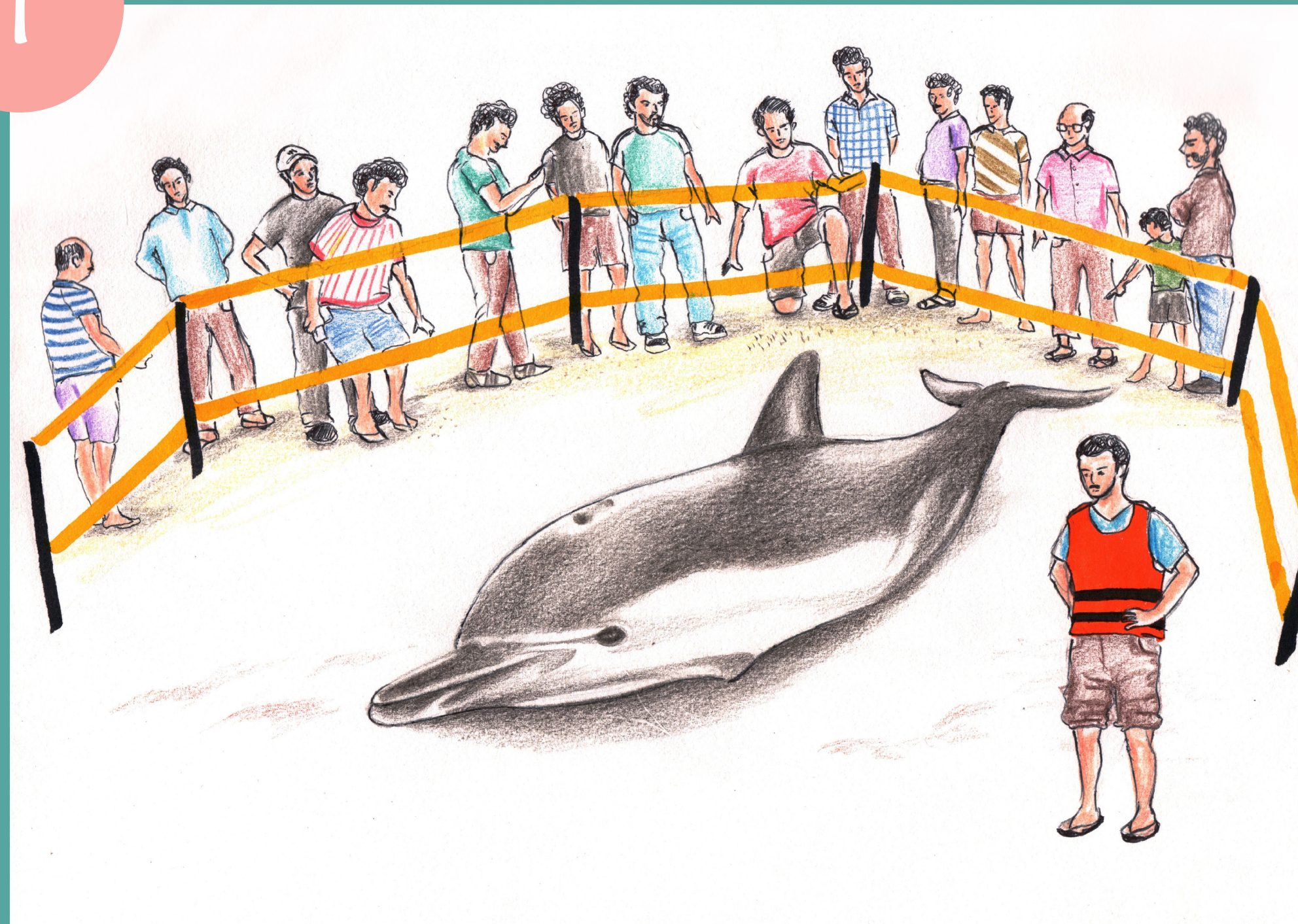
- a) Jars/vials/zip-lock bags and waterproof labels (20)
- b) Syringes, needles, and pipettes (5)
- c) Required preservation reagents
- d) Microbiological sterilization kit
- e) Ice boxes (2)



# RESPONSE TO A MARINE MAMMAL STRANDING

1. Informing the forest authorities and arrival at site securing, and crowd control

1

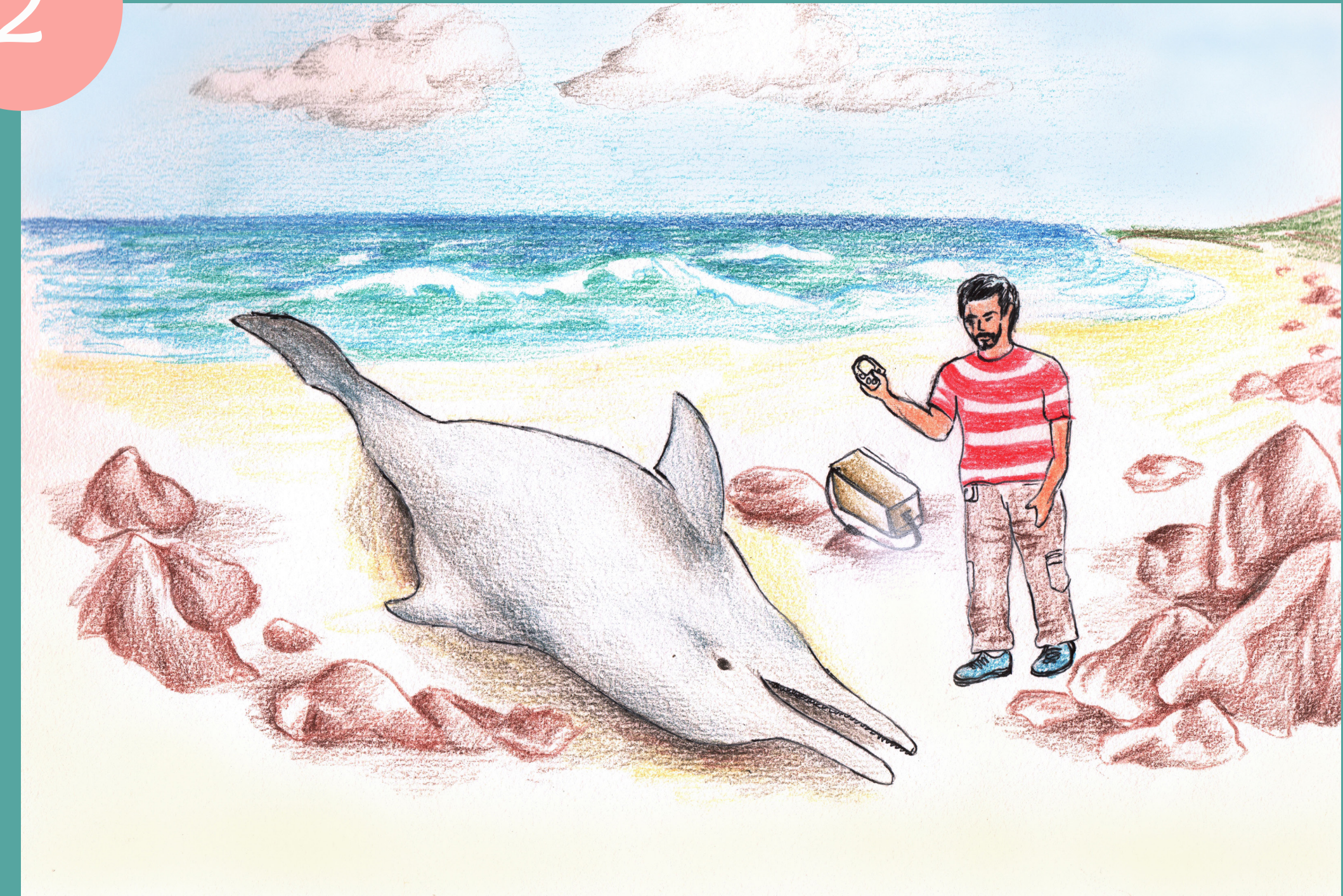


2. Recording data, weather condition, tidal regime, shore type, state of body condition and position of the animals (filling of marine mammal stranding datasheet)

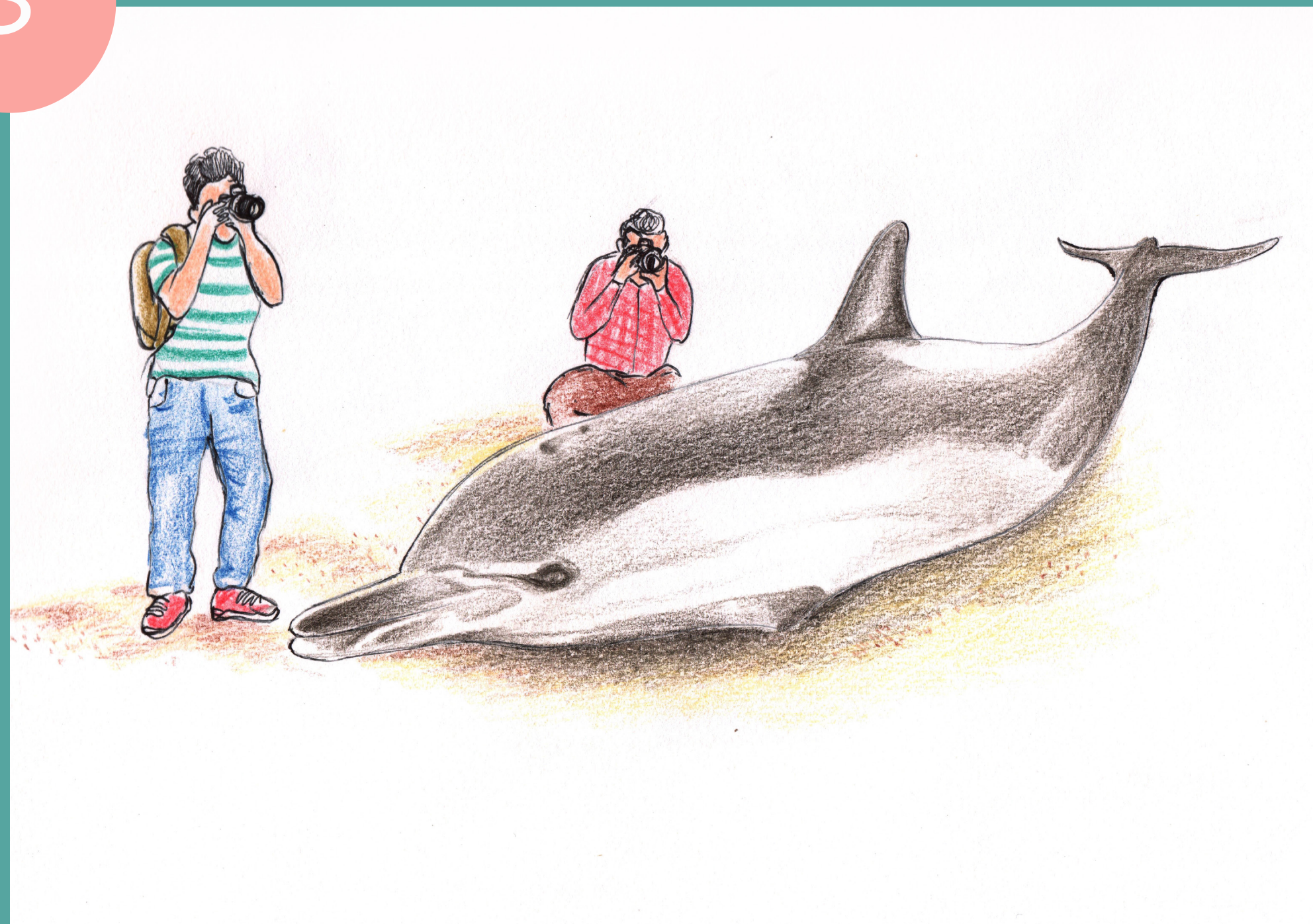
3. Photographic recording of the event.

4. Physical assessment of the animal(s).

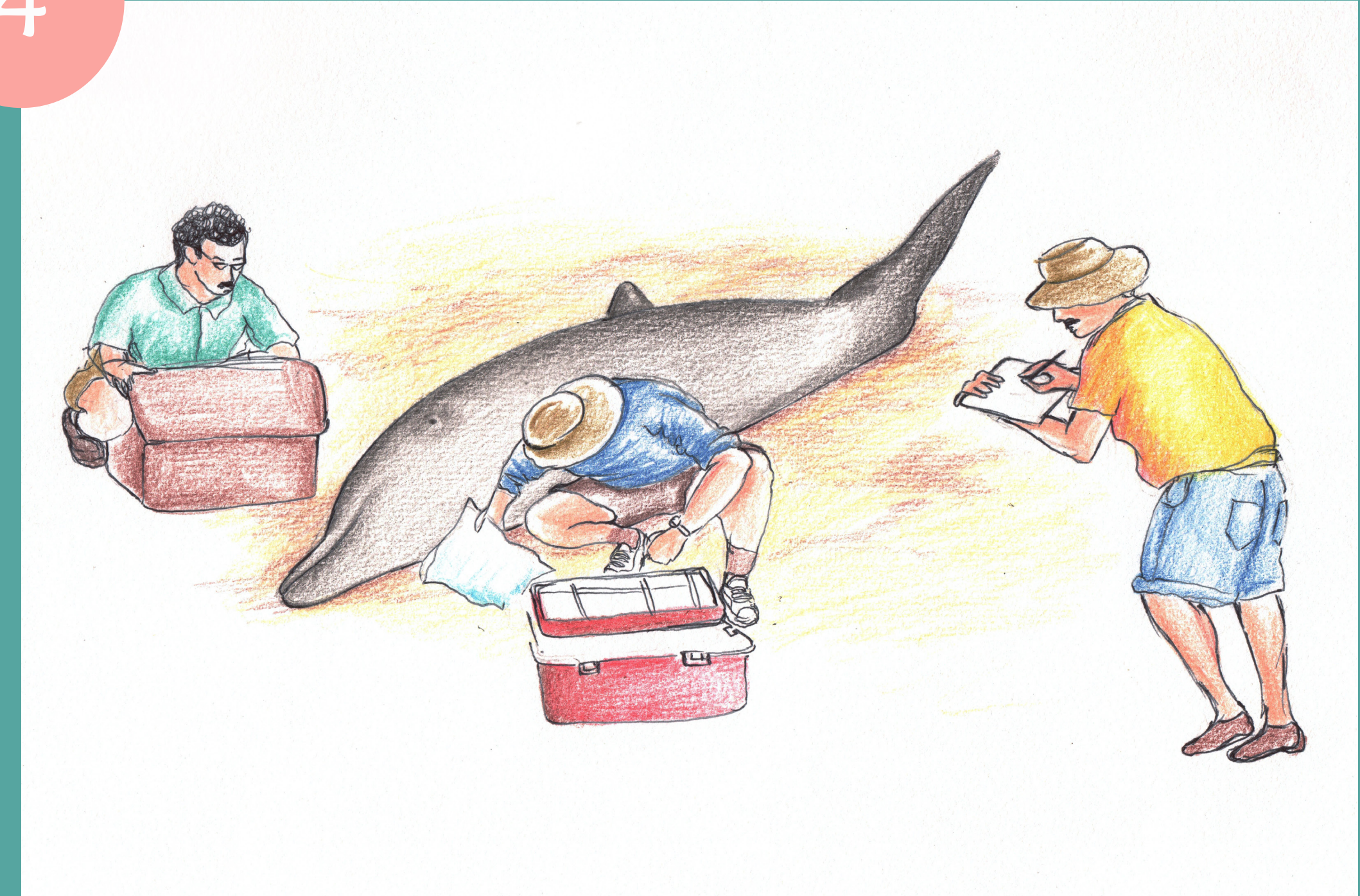
2



3



4





## PHYSICAL EVIDENCES

Marks, cuts, bite marks, rope burns, etc. provide evidences for the determination of the cause(s) of strandings. Physical examination also helps in setting a course to stranding response depending upon the health and stability of the animal.

1. Sharp cuts seen on the carcass may be indicative of poaching, hunting or boat strike
2. Marks of a boat strike causing haemorrhage
3. Injury of net burns may indicate net entanglement or death by suffocation



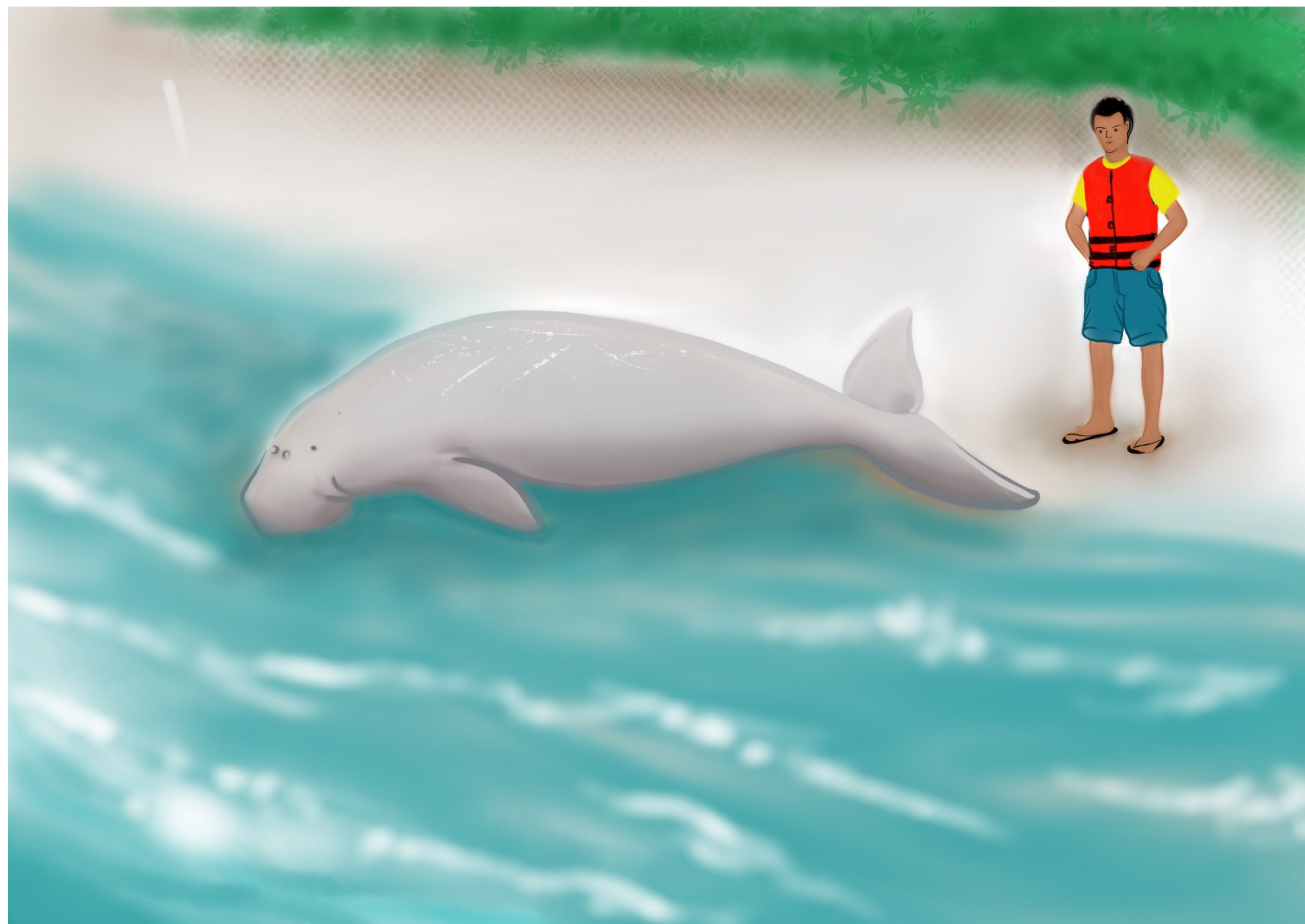


# EMERGENCY RESPONSE TO AN ALIVE STRANDING

## SUPPORTIVE CARE

1. Maintain minimum disturbance and interaction with the animal
2. Keep the animal in an upright position on its belly

1



2





3. Keep the blowhole clear of any obstruction, debris, and water; and eyes clean and wet

4. Monitor and regulate temperature

5. Monitor heartbeat and behaviour for identifying stressors

3



4



5





# EMERGENCY RESPONSE TO AN ALIVE STRANDING - SAMPLE COLLECTION AND DECISION MAKING

● Sample collection



● Release





# EMERGENCY RESPONSE TO A DEAD STRANDING

## CHARACTERISATION OF CARCASS

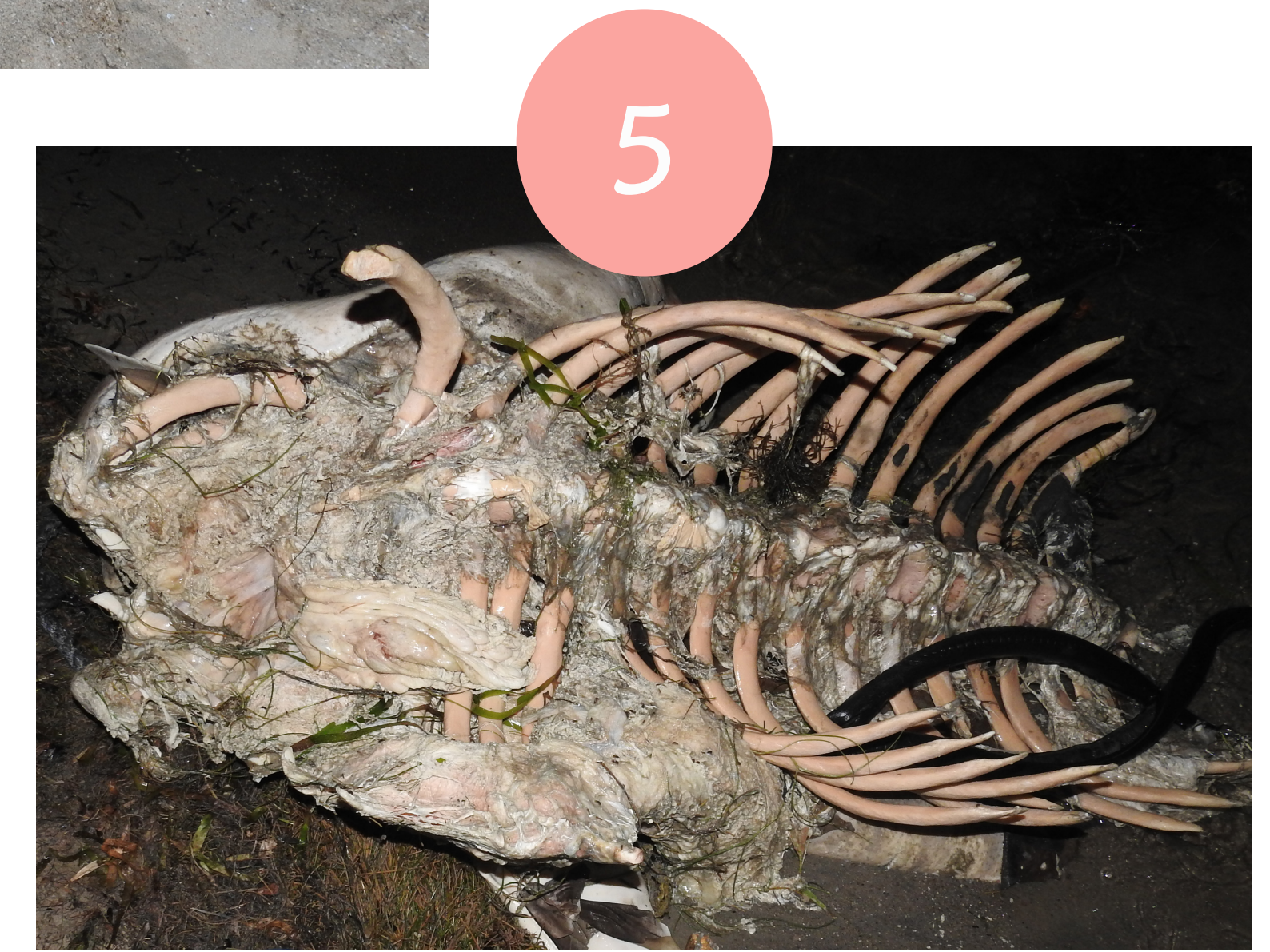
Code 1: Stranded alive

Code 2: Recently died, still fresh

Code 3: Decomposition starts

Code 4: Advance decomposition

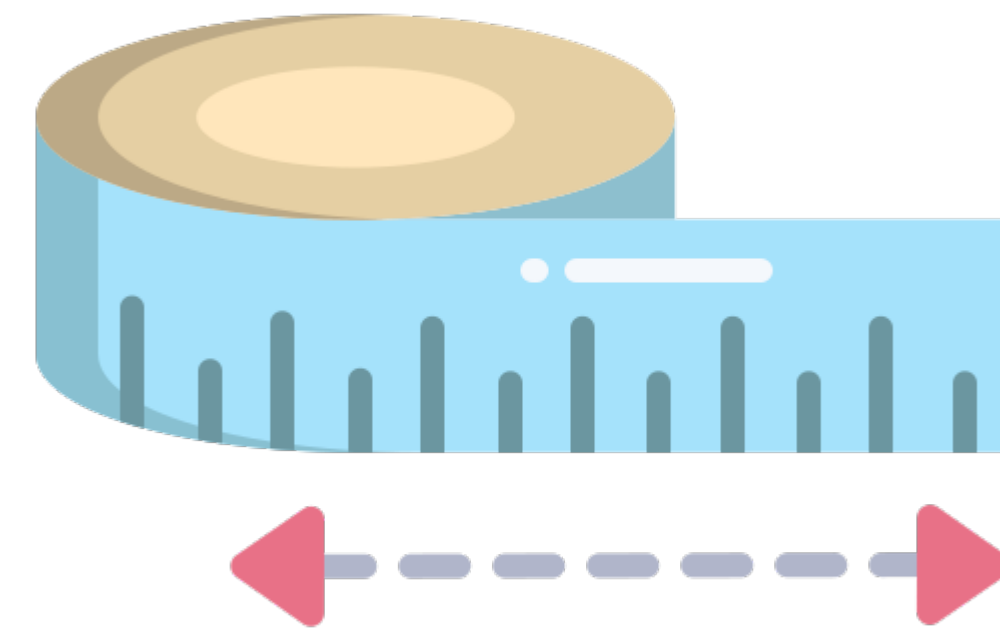
Code 5: Mummified or skeleton





## EMERGENCY RESPONSE TO A DEAD STRANDING – MORPHOMETRIC MEASUREMENTS

- Body Length
- Head Length
- Flipper Length
- Flipper Width
- Tail Fluke length
- Teat Length Auxiliary
- Girth Maximum Girth
- Genital Opening to Anus



## EMERGENCY RESPONSE TO A DEAD STRANDING – PHOTOGRAPHIC RECORD

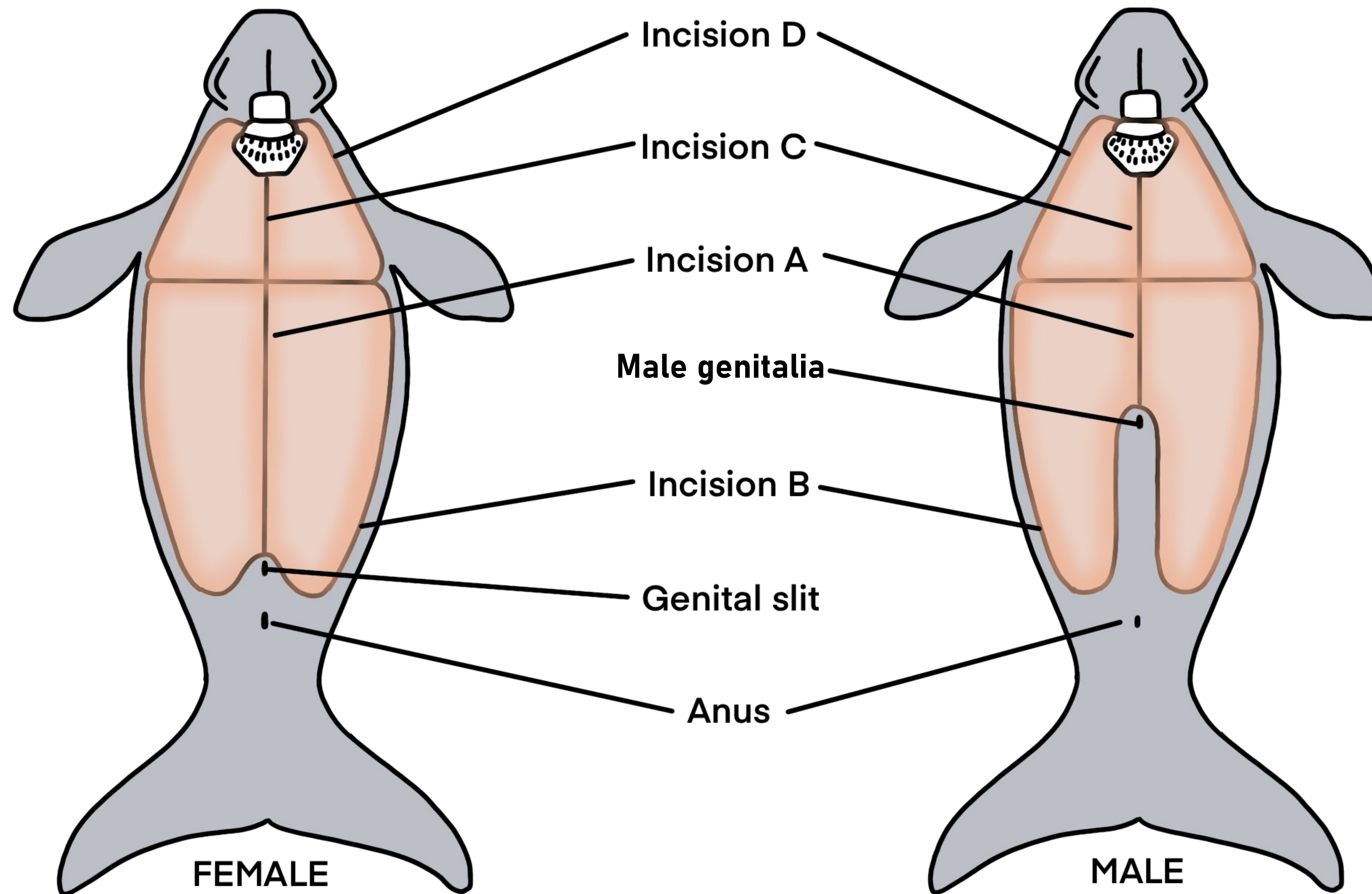
Photographs of the following body parts must be taken:

- External views before incisions
- External abnormalities, old and new scars
- Dermis layers after first incisions
- All organs in situ after first incisions
- Gastrointestinal tract including the stomach, small intestine, large intestine, caecum, spleen, pancreas Transverse colon (when exposed)
- Liver, gall bladder
- Dorsal and ventral surfaces of the lung and any unusual features
- Heart
- Urinary tract including kidneys
- Entire reproductive tract (male or female - including each ovary)
- Foetus (if present)
- Brain.



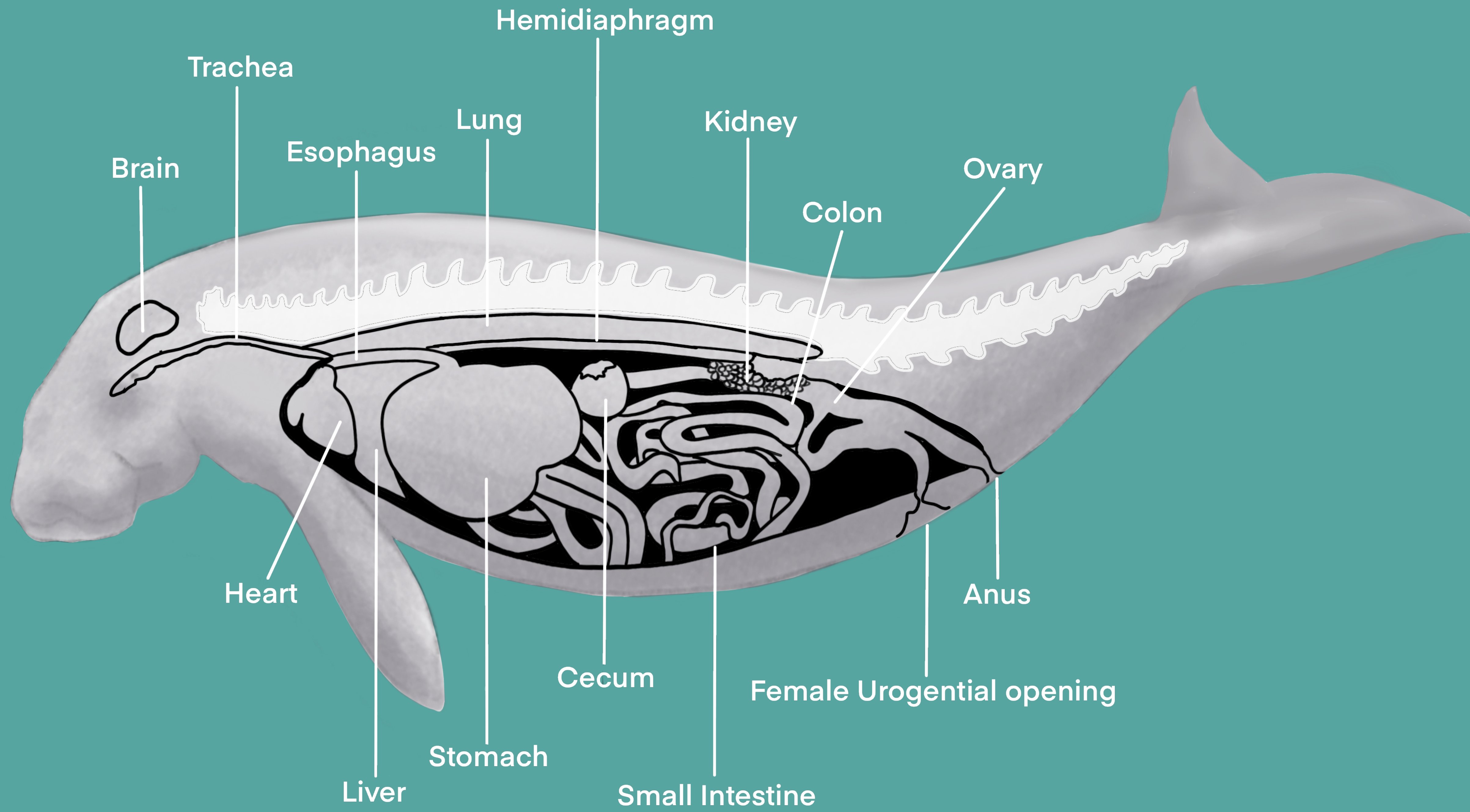


# EMERGENCY RESPONSE TO A DEAD STRANDING – NECROPSY PROTOCOL



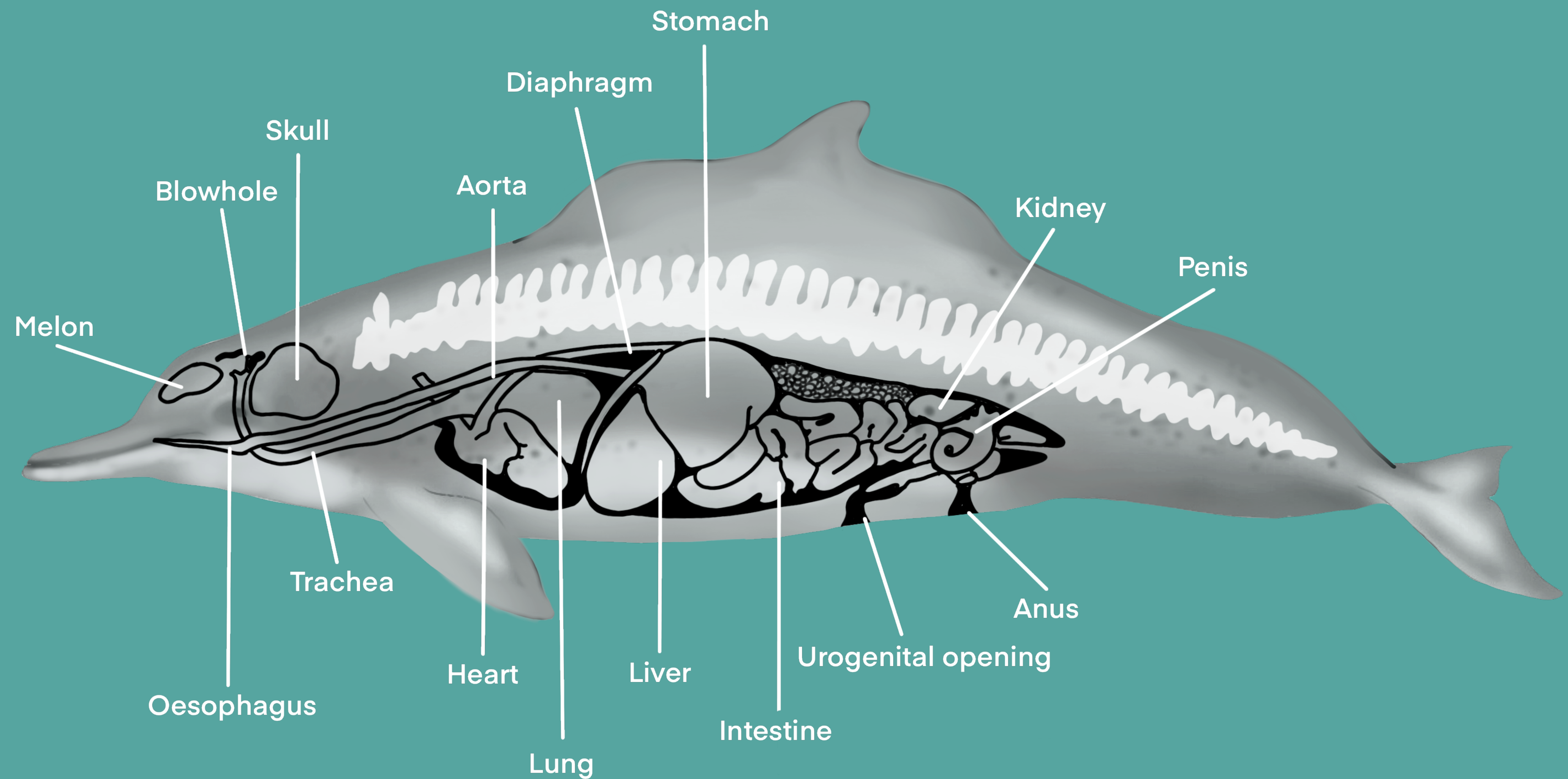


# ANATOMY OF DUGONG





# ANATOMY OF DOLPHIN





# EMERGENCY RESPONSE TO A DEAD STRANDING – NECROPSY PROTOCOL

- Place animal on the dorsal side, so ventral side is uppermost.
- Make a ventral midline incision through dermal layers (moving to the left or right of the genital opening). Be extremely careful to prevent the sudden, unexpected release of gas and fluids.
- The second incision should extend from the sternum laterally to a point just ventral to the distal tips of the right ribs. Follow the line of the rib cage caudally, re-joining incision, just cranial to the anus. Remove the entire right slab.
- Remove a mirror image on the other side by following the same procedure.
- Survey exposed surfaces, observing organs and noting any abnormalities.
- Remove the entire gastrointestinal tract (stomach and intestines) from the abdominal cavity and examine.)
- Remove liver and gall bladder.





- Make an incision along the ventral midline from the sternum to the chin and from the chin postero-laterally to each axilla, and from each axilla caudally to the open abdominal cavity
- Survey exposed surfaces, observing organs, noting any abnormalities.
- Remove heart; examine externally and internally, remove each hemidiaphragm.
- Remove and further examine lungs. Remove and further examine both kidneys
- Examine urinary tract. Dissection of the urinary tract may be reserved until after dissection and removal of the reproductive tract.
- Remove and further examine male or female reproductive tracts. Examine head and neck region. Remove and examine the thyroid gland
- Remove and examine trachea, hyoid bones, and tongue.
- Remove brain (ideally using a large bone saw or circular saw).

*(incorporated from Eros & Marsh et al 2007)*



# EMERGENCY RESPONSE TO A DEAD STRANDING – SAMPLE COLLECTION AND PRESERVATION

SI NO.	SAMPLE	ANALYSIS REQUIRED	COLLECTION AND SAMPLE SIZE	PRESERVATION TECHNIQUE
1.	Lung, Liver, Heart, and abnormalities or lesions if any	Bacteriology and virology	Aseptically collected pieces (0.5 cm x 0.5 cm)	Chilled on ice/Frozen
2.	Blubber, muscle, liver, kidney, milk, Brain.	Toxic Element and Organohalogen Analysis	50-100g of each; as much milk as possible. Collect with sterile stainless steel instruments	Frozen (-10°C)
3.	All organs (liver, lung, heart, kidney, pancreas, spleen, gastrointestinal tract) Brain (sliced)	Histopathology	2cm x 2cm x 0.5cm sections One section of the stomach and five other sections of the intestinal tract equally spaced between the stomach and anus	10% neutral buffered formalin



SI NO.	SAMPLE	ANALYSIS RE- QUIRED	COLLECTION AND SAMPLE SIZE	PRESERVATION TECH- NIQUE
4.	Gut Contents	Gut Analysis	100 ml sample each collected from Mouth (if present), stomach, duo- denum, mid-small intestine, caecum, mid-large intestine, and faeces.	80% Ethanol
5.	Parasites- Nem- atodes, flukes, and trematodes	Parasitology	Collect if any present in nasal pas- sage, gut, or lungs.	Nematodes- 1 min in gla- cial acetic acid and store in 80% Ethanol. Flukes- Killed in hot wa- ter (80°C) and preserve in 80% Ethanol



SI NO.	SAMPLE	ANALYSIS REQUIRED	COLLECTION AND SAMPLE SIZE	PRESERVATION TECHNIQUE
6.	Skin and muscle	Genetics	1 cm x 1 cm sample collected from liver, gonad, or muscle from the fresh carcass (Stage I-III)	80% Ethanol
7.	Female reproductive Tract or Male reproductive Tract depending on the sex of the animal	Life History	Female-Whole ovary, embryos or foetus, if present, or entire tract Male-Testis, Epididymis or entire tract	10% neutral buffered formalin or Bouin's for 24 hours then transferred to 70% EtOH



SI NO.	SAMPLE	ANALYSIS RE- QUIRED	COLLECTION AND SAMPLE SIZE	PRESERVATION TECH- NIQUE
8.	Swabs.	Microbiology	Swabs of body fluids or areas suspected of pathogens collected aseptically without contamination. Specimens may also be collected using rat-toothed forceps and scissors (from sterile packets) and placed in sterile plastic vials on ice. A sampling of the pleural surface of the lungs, bronchi, stomach mucosa, and perineal fluid, fluid in the pericardial sac, brain surfaces, abscesses, or infected areas is recommended for relatively fresh (Categories I-III) carcasses.	Swab samples to be chilled and sent to a microbiology laboratory for analysis within 72 hours.



SI NO.	SAMPLE	ANALYSIS REQUIRED	COLLECTION AND SAMPLE SIZE	PRESERVATION TECHNIQUE
9.	Blood	Toxic element and biochemical analysis	20-30 ml from the left ventricle of the heart from a fresh sample	Frozen (-20° C)
10.	Urine	Histopathology	Urine can be collected from the urinary bladder of relatively fresh (Categories 1-3) carcasses with a sterile syringe. If the bladder is not distended it may be desirable to slit it to remove the urine with a syringe.	Refrigerate the urine and submit it for culturing or clinical pathology as soon as possible after collection. Samples can otherwise be frozen for later determination of osmolality and other urine values.
11.	Tusks/Dentition and Eyes	Age determination and life history	Collect both tusks and one eye.	Tusks to be dried and eyes to be preserved in formalin after slitting corner of the eye to aid fixation.



# CARCASS DISPOSAL

1. Disposal by burying
2. Disposal by leaving carcass on the beach
3. Disposal by burning
4. Cleaning up the site





## DO'S

- Keep yourself safe
- Keep minimal contact with the animal
- Keep one knee up when next to an animal and know your escape route
- Keep away from thrashing animals
- Place the animal in a comfortable position on, its belly
- While monitoring breathing patterns, count the number of cycles (one inhale and exhale) per minute every 10 minutes (normal: 4/minute).
- Look for signs or sounds that indicate difficulty in breathing
- Look for irregularities in heartbeat
- Check for and eliminate stressors





## DON'TS

- Do not disturb the animal by making noises and commotion
- Do not let the crowd within 150m of the animal
- Do not obstruct the blowhole
- Do not, in any case, step on the animal
- Do not handle the animal with flippers and tail fluke
- Do not stay in the water for long after releasing the animal
- Do not collect samples from a stressed animal
- Do not leave the carcass on a busy beach for disposal





# APPENDICES

## APPENDIX: 1 MARINE MAMMAL SPECIES LIST

Suborder: Odontoceti

Family: Dephinidae – Marine Dolphins


Common Name	Scientific Name	IUCN Status	
Common bottlenose dolphin	<i>Tursiops truncatus</i>	Least Concern (LC)	LC
Fraser's dolphin	<i>Lagenodelphis hosei</i>	Least Concern (LC)	LC
False killer whale	<i>Pseudorca crassidens</i>	Near Threatened	NT
Irrawaddy dolphin	<i>Orcaella brevirostris</i>	Endangered (EN)	EN
Indian ocean humpback dolphin	<i>Sousa plumbea</i>	Least Concern (LC)	EN
Indo-pacific humpback dolphin	<i>Sousa chinensis</i>	Least Concern (LC)	LC
Indo-pacific bottlenose dolphin	<i>Tursiops aduncus</i>	Data Deficient (DD)	DD






Killer whale	<i>Orcinus orca</i>	Least Concern (LC)	DD
Long-beaked common dolphin	<i>Delphinus delphis</i> (Indian ocean- <i>Delphinus delphis tropicalis</i> )	Least Concern (LC)	LC
Melon-headed whale	<i>Peponocephala electra</i>	Least Concern (LC)	LC
Pan-tropical spotted dolphin	<i>Stenella attenuata</i>	Least Concern (LC)	LC
Rough-toothed dolphin	<i>Steno bredenensis</i>	Least Concern (LC)	LC
Risso's dolphin	<i>Grampus griseus</i>	Least Concerned (LC)	LC
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	Least Concerned (LC)	LC
Spinner dolphin	<i>Stenella longirostris</i>	Least Concerned (LC)	LC
Stripped dolphin	<i>Stenella coeruleoalba</i>	Least Concerned (LC)	LC



Family: Phocoenidae - Porpoises






Common Name	Scientific Name	IUCN Status
Indo-Pacific Finless porpoise	<i>Neophocaena phocaenoides</i>	Vulnerable (VU) 

Family: Physeteridae – Sperm Whales

Common Name	Scientific Name	IUCN Status
Dwarf sperm whale	<i>Kogia sima</i>	Data Deficient (DD) 
Pygmy sperm whale	<i>Kogia breviceps</i>	Data Deficient (DD) 
Sperm whale	<i>Physeter macrocephalus</i>	Endangered (EN) 







## Family: Ziphiidae – Beaked Whales


Common Name	Scientific Name	IUCN Status
Blainville's beaked whale	<i>Mesoplodon densirostris</i>	Data Deficient (DD) 
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	Least Concerned (LC) 
Deraniyagala's beaked whale	<i>Mesoplodon hotaula</i>	Data Deficient (DD) 
Ginkgo-toothed beaked whale	<i>Mesoplodon ginkgodens</i>	Data Deficient (DD) 
Longman's beaked whale	<i>Indopacetus pacificus</i>	Data Deficient (DD) 



Family: Mysticeti - Baleen Whales

Common Name	Scientific Name	IUCN Status
Blue Whale	<i>Balaenoptera musculus</i>	Endangered (EN) 
Bryde's Whale	<i>Balaenoptera edeni</i>	Least Concerned (LC) 
Humpback Whale	<i>Megaptera novaeangliae</i>	Endangered (EN) 
Omura's Whale	<i>Balaenoptera omurai</i>	Data Deficient (DD) 

Family: Dugongidae – Dugong

Common Name	Scientific Name	IUCN Status
Dugong	<i>Dugong dugon</i>	Vulnerable (VU) 



## APPENDIX: 2 CHEMICAL PREPARATION

### Preparation of Neutral Buffered Formalin:

100 ml of formalin (37% Formaldehyde) + 900 ml of Distilled or tap water 900 ml  
Disodium hydrogen phosphate ( $\text{Na}_2 \text{HPO}_4 \cdot 2\text{H}_2\text{O}$ ) - 6.5g +  
Sodium dihydrogen phosphate ( $\text{Na}_2 \text{H}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$ ) - 4.5g

### Preparation of Bouin's Solution:

750ml of Saturated aqueous picric + Formalin- 250ml  
50 ml of Glacial Acetic Acid





# GLOSSARY

**Alive Stranding:** When the stranded animal is alive.

**Anthropogenic:** Originating in human activity.

**Beaching:** Synonym of ‘stranding’; generally used for dead stranding.

**Dead Stranding:** When the stranded animal is dead.

**Euthanasia:** Putting an animal to death using measures that cause minimal pain and suffering, to end the animal’s pain.

**Harmful Algal Blooms (HAB):** Explosive growth of toxin-producing unicellular algae, phytoplankton.

**Mass Stranding:** When two or more than two animals strand, excluding cow-calf pairs.

**Rehabilitation:** Treatment and care of an animal is an injured or sick animal before subsequent release in the wild.



Release: Release of an animal to its natural habitat.

Restranding: Returning to the shore by an animal that was previously rescued from a stranding.

Single Stranding: When only one animal or a mother-calf pair strand.

Stranding: Running aground/ashore of an animal with no means of movement or unable to return to its natural habitat on its own.

Stressors: A chemical or biological agent, environmental condition, external stimulus, or an event that causes strain to an organism.

Supportive care: Between the actual stranding and implementation of decisions, it is imperative to keep the animals as comfortable as possible. This is done through supportive care.

Tail Fluke: Lobe of the tail of a mammal.

Tidal regime: Tide plan of a region, including tidal height and time.

Toxicology: Study of the adverse effects of chemical substances on living organisms and the practice of diagnosing and treating exposures to toxins and toxicants.



# REFERENCES

- Srinivasan, Mridula, Moore, Michael J., Moore, Katie, Simeone, Claire, Wilkin, Sarah, Sharp, Brian, “Stranding Response Reference Materials”, 2015, <https://hdl.handle.net/1912/8800>
- Eros, Carole & Marsh, Helene & Bonde, Robert & O’Shea, Thomas & Beck, Cathy & Recchia, Cheri & Dobbs, Kirstin & Turner, Malcolm & Lemm, Stephanie & Pears, Rachel & Bowater, Rachel. (2007). *Procedures for the Salvage and Necropsy of the Dugong (Dugong dugon) - Second Edition*. Research Publication No. 85.
- Srinivasan, Mridula, Simeone, Claire, Moore, Katie, Sharp, Brian, Moore, Michael J., Wilkin, Sarah, “Cetacean Stranding Response Resources”, 2017-03-15, <https://hdl.handle.net/1912/879>
- Blair, D. 1981a. ‘Helminth parasites of the dugong, their collection and preservation, pp. 275-285 in *The Dugong: Proceedings of a seminar/workshop held at James Cook University 8-13 May 1979*. H. Marsh (ed.) James Cook University, Townsville, Queensland, Australia.
- Blair, D. 1981b. ‘The Monostome flukes (Digenea: families Opisthotrematidae Poche and Rhabdiopoeidae Poche) Parasitic in Sirenians (Mammalia: Sirenia)’. *Australian Journal of Zoology Supplementary Series* 81, 1-54.
- Bonde, R. K., O’Shea, T. J. & Beck, C. A. 1983. *Manual of Procedures for the Salvage and Necropsy of Carcasses of the West Indian Manatee (Trichechus manatus)*. National Technical Information Service, Springfield, VA. Doc. No. PB83-255273, 175 pp.
- Bossart, G. D., Meisner, R. A., Rommel, S. A., Lightsey, J. D., Varela, R. A. & Defran, R. H. 2004. ‘Pathologic findings in Florida manatees’. *Aquatic Mammals* 30(3), 434-440.
- Crusz, H & Fernand, V. S. F. 1954. ‘The trematode parasites of the dugong with descriptions of two new monostomes and histopathological changes in the host’. *Journal of Parasitology* 40, 499-507.
- Eros. C & Marsh H 2007. “Procedures for the salvage and necropsy of the Dugong- Second Edition.”
- Geraci, J. R. & Lounsbury. V. J. 1993. *Marine Mammals Ashore: A Field Guide for Strandings*. Texas A&M University Sea Grant College Program: Texas. TAMU-SG-93-601. 305pp. (Updated in 1998 and available on CD-ROM from the National Aquarium, 501 E. Pratt St., Baltimore, MD 21202, USA.).
- Geraci, J. R. & V. J. Lounsbury. 2005. *Marine Mammals Ashore: A Field Guide for Strandings*. Second Edition. National Aquarium in Baltimore, Maryland, USA. 372pp.
- Haynes, D., Carter, S., Gaus, C., Müller, J. & Dennison, W. 2005. ‘Organochlorine and heavy metal concentrations in blubber and liver tissue collected from Queensland (Australia) dugong (*Dugong dugon*)’. *Marine Pollution Bulletin* 51, 361-369.



- LV Aragones et al *A guide for the rescue rehabilitation and release of stranded cetaceans and dugong in the Philippines in marine mammal stranding response* 2013
- Lanyon, J. M., Smith, K. M. & Carrick, F. N. 2005. 'Reproductive steroids are detectable in the faeces of dugongs'. *Australian Zoologist* 33(2), 247- 250.
- Lawler, I., & Andre, J. 2001. *Analysis of stomach contents of dugongs stranded in the Central Region of the GBR Marine Park: May-August 2000*. 7pp. (Available from [www.gbrmpa.gov.au/corp\\_site/info\\_services/library/resources/documents/stomach\\_contents\\_report\\_2001\\_03.pdf](http://www.gbrmpa.gov.au/corp_site/info_services/library/resources/documents/stomach_contents_report_2001_03.pdf)).
- Marsh, H. & Glover, T. D. 1981. 'A preliminary description of the reproductive organs of the male dugong and suggested methods of specimen collection', pp. 261-274 in *The Dugong: Proceedings of a seminar/workshop held at James Cook University 8-13 May 1979*. H. Marsh (ed.) James Cook University, Townsville, Queensland, Australia.
- Marsh, H., Channells, P. W., Heinsohn, G. E. & Morissey, J. 1982. 'Analysis of stomach contents of dugongs from Queensland'. *Australian Wildlife Research* 9, 55-67.
- Tikel, D., Blair, D. & Marsh, H. D. 1996. 'Marine mammal faeces as a source of DNA'. *Molecular Ecology* 5, 456-457.
- Vetter, W., Garson, J. J., Fahey, S. J., Cameron, G. M., Gaus, C. & Müller, J. F. 2001. 'Anthropogenic and Natural Organohalogen Compounds in Blubber of Dolphins and Dugongs (*Dugong dugon*) from Northeastern Australia'. *Archives of Environmental Contamination and Toxicology*. 41(2), 221-231



# CONTRIBUTOR DETAILS

Dr. K. Sivakumar is a Professor at Department of Ecology in the School of Life Sciences at Pondicherry University. He has more than 30 years of experience in the field of Wildlife Conservation. He is a member of Marine Mammal Task Force Committee and is actively involved in Marine Mammal Conservation Programs in India.



Sagar Rajpurkar is a Marine Biologist and is pursuing his doctoral research from Wildlife Institute of India on dugongs in the Andaman Islands. His work focuses on studying dugongs and their habitats, understanding their behaviour and analysing the threats to their populations using Unmanned Aerial Vehicles (UAVs). He has been working in the CAMPA-Dugong Project as a Project Fellow in the Aerial Monitoring Component. His research interests include marine mammal ecology and conservation, UAVs in marine megafaunal monitoring and capacity building and using Artificial Intelligence (AI) and deep learning approaches in marine megafaunal research.





Vabesh Tripura works as project assistant (outreach and awareness) for CAMPA dugong recovery program in Wildlife Institute of India. He has developed a keen interest to work for conservation of both terrestrial and marine animals. He has an expressive skill of art and the ability to create communicative illustrations to spread awareness in the community to show how wildlife plays an important role in order to keep the balance and sustainability in nature. He has also illustrated “A field guide to Seagrass of India and associated fauna”.



Diksha works as a Dive Master at one of India’s leading dive schools, DIVEIndia, and heads their ocean research and education wing - DIVEIndia Conservation. She was formerly associated with the CAMPA-Dugong project. Her research is based in the coral reefs of Andaman and Nicobar Islands where she studies reef ecology and impact of human intervention on reefs. Her work also includes understanding marine debris around the islands and its management. She is an avid educator. She conducts seminars and excursions focused on island ecology and awareness about changing islandscapes under human influence. Her idea of research is to pose simple questions and make science accessible to all.





Dr. Anant Pande works as Program Head at Marine Program, Wildlife Conservation Society-India. His work focuses on the interface of science, society, and policy with respect to marine megafauna conservation. His broad interests include marine megafauna ecology, conservation, and management; climate change, science communication, and conservation outreach. He has obtained a Ph.D. in Wildlife Science from the Wildlife Institute of India, Dehradun, India. His doctoral research, the first of its kind from the Indian Antarctic Program, focused on understanding the ecology of Antarctic seabirds.

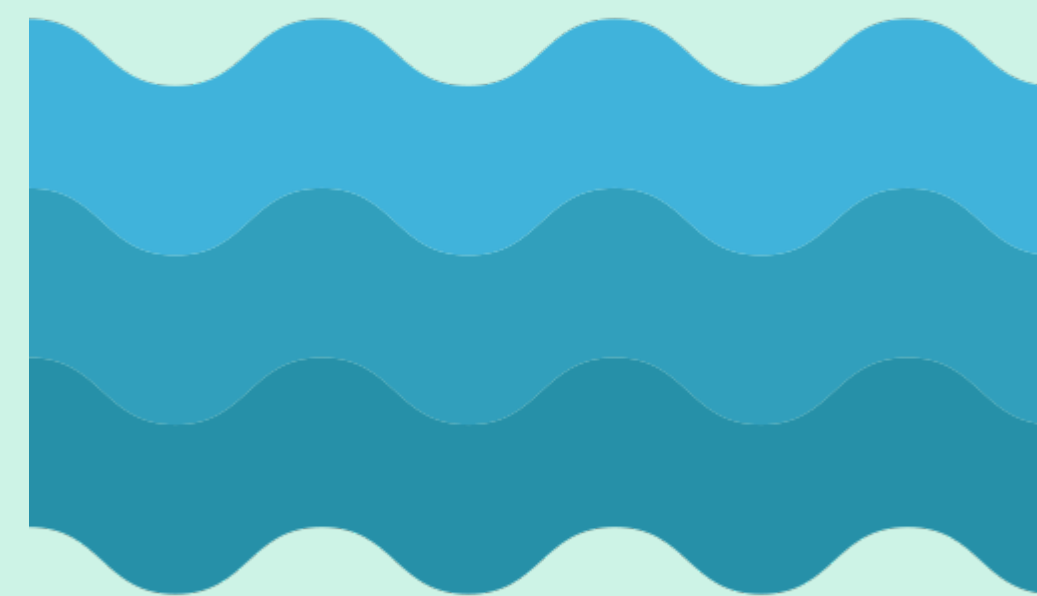


Dr. Nehru Prabakaran is a faculty at the Wildlife Institute of India and has more than a decade of experience in studying the coastal ecosystems. His research mostly focused on understanding the impacts of sea level change and other disturbance factors on the coastal ecosystems such as mangroves and seagrasses.





Dr. J.A. Johnson (Scientist-E) has 25 years of research experience in the field of Aquatic Ecology, Conservation and Management of Freshwater and Marine Ecosystem. His research includes species distribution patterns, community structure, spatio-temporal changes in resource (food and space) partition among co-existing species and conservation of rare and threatened species. Currently he is leading the CAMPA-Dugong species recovery program in India.











सत्यमेव जयते



*Tamil Nadu Forest Department*

