Marine Mammal Stranding Response Manual

2nd Edition

Philippine Marine Mammal Stranding Network

A GUIDE FOR THE RESCUE, REHABILITATION AND RELEASE OF STRANDED CETACEANS AND DUGONG IN THE PHILIPPINES

Edited by
LV Aragones, GE Laule and BG Espinos

Editors :
Lemnuel V. Aragones, Gail E. Laule and Bianca G. Espinos

Authors and Contributors :

Lemnuel V. Aragones,
Edwyn B. Alesna,
Richard P. Encomienda DVM,
Bianca G. Espinos,
Mariel B. Flores DVM,
Noreen G. Follosco,
Gail E. Laule,
Micaela C. Ledesma,
Francis E. Maniago,
Wayne F. Philips,
Mary Anne A. Roque,
Leo A. Suarez DVM,
Christopher S. Torno DVM,
Ariel T. Torres,
Robert Braun DVM MS,
Sonja Luz DVM,
Hazel Lopez RMT,
Inez Togle-Vasquez, LL.B

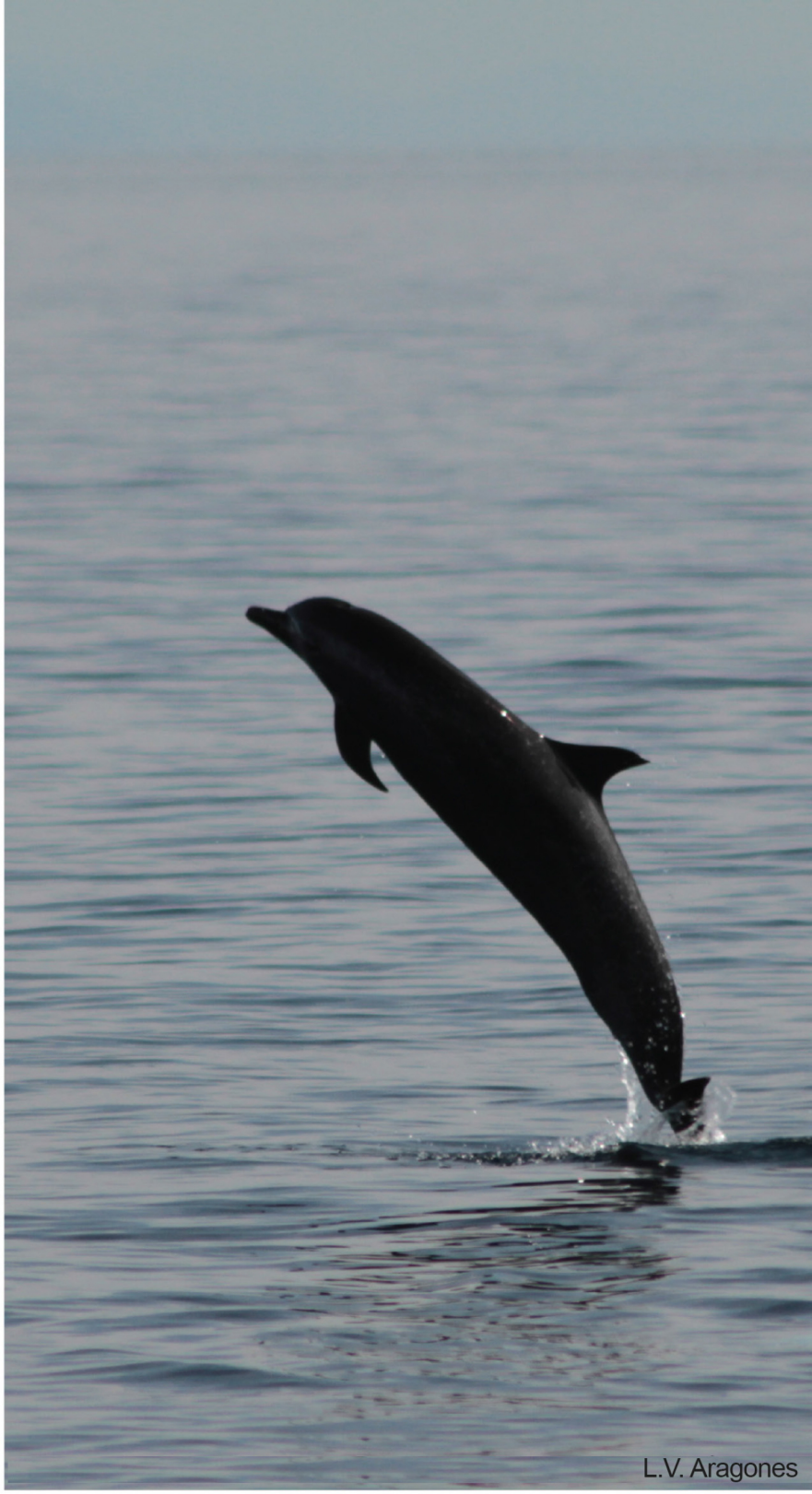
Illustrators :
Joseph D. Villaruel and Micaela Ledesma-Trebol

Layout :
Lei Canlas

Published by :
Wildlife In Need Foundation Inc. and
Ocean Adventure, SBMEI
Camayan Wharf, West Ilanin Forest Area
Subic Bay Freeport Zone 2222
Philippines

Produced with the generous support of
Sea World and Busch Gardens Conservation Fund

ISBN 978-621-95024-1-2



L.V. Aragones

2nd Edition

WIN
WILDLIFE IN NEED

Ocean Adventure
SUBIC BAY
PHILIPPINES

CONSERVATION FUND
SEAWORLD BUSCH GARDENS

Marine Mammal Stranding Response Manual

A GUIDE FOR THE RESCUE, REHABILITATION AND RELEASE OF STRANDED CETACEANS AND DUGONG IN THE PHILIPPINES

Lemnuel V. Aragones, Gail E. Laule, and Bianca G. Espinos (Editors)

Second Edition
2013

About the Editors

Lemnuel V. Aragones, PhD is an Associate Professor in the Institute of Environmental Science and Meteorology at the University of the Philippines - Diliman. He received his PhD from James Cook University in Townsville, Queensland, Australia. He has been working on marine mammals in the Philippines since 1989. He was also an adjunct assistant professor in the Rosenstiel School of Marine and Atmospheric Science - University of Miami. He is currently also a consultant for Ocean Adventure, Subic Bay Freeport Zone and the President of the Philippine Marine Mammal Stranding Network, Inc. (PMMSN).

Bianca G. Espinos is the Executive Director of Wildlife in Need Foundation (WIN) and the Director for Conservation Science of Ocean Adventure (OA) in Subic Bay, Philippines. She served as the Vice President for Zoological Operations in OA from 2008 to 2011. Bianca graduated with a Bachelor's Degree in Marine Biology at Silliman University, Dumaguete, Philippines. She is currently a board member of PMMSN.

Gail E. Laule, MA is the President of Wildlife in Need (WIN), a US-based non-profit conservation and animal welfare NGO. She is also the Executive Vice President of Ocean Adventure in Subic Bay Freeport Zone, Philippines and the Vice President of PMMSN. She provides technical direction for the management, training, presentation, and welfare for all marine and terrestrial animals at the park. Gail divides her time between the Philippines and the US, where she still maintains an animal behavior, care and welfare consulting business called Active Environments.

Authors

Edwyn B. Alesna
Fisheries Quarantine & Wildlife Regulations Section
Bureau of Fisheries and Aquatic Resources
edwyn_alesna@yahoo.com

Lemnuel V. Aragones, PhD
Associate Professor
Institute of Environmental Science & Meteorology
University of the Philippines Diliman
lemdva2001@yahoo.com

Robert Braun, DVM, MS
Veterinary Consultant
Ocean Adventure
rbraun@lava.net

Gloria C. Diaz, PhD
Board Member
PMMSN
jun2det@yahoo.com

Richard P Encomienda, DVM
Veterinarian
Vets In Practice
darncat@yahoo.com

Bianca G. Espinos
Director for Conservation Science
Ocean Adventure
bgespinos@oceanadventure.com.ph

Mariel B. Flores, DVM
Veterinarian
Vets In Practice
mariel_04@yahoo.com

Noreen G. Follosco
Graduate Student
Institute of Environmental Science & Meteorology
University of the Philippines Diliman
noreen118@yahoo.com

Gail E. Laule, MA
Executive Vice President
Ocean Adventure
moonshadowe@earthlink.net

Micaela C. Ledesma-Trebol
Philippine Reef and Rainforest Foundation
kaila.ledesma@gmail.com

Francis E. Maniago
First Responder / Team Leader PMMSN
tubongbeda@yahoo.com

Wayne F. Phillips
General Manager, Puerto Vallarta Adventures
Puerto Vallarta, Jalisco 48354, Mexico
wphillips@dolphin-adventure.com

Mary Anne A. Roque-Borigas, MS
University Research Associate
Institute of Environmental Science & Meteorology
University of the Philippines Diliman
meanne.roque@gmail.com

Leo Jonathan A. Suarez, DVM
Marine Mammal Staff Veterinarian
Ocean Adventure
ljasuarez@oceanadventure.com.ph

Ma. Inez Togle-Vasquez, LLB
Legal Officer
Legal Office
University of the Philippines Diliman
maria.inez@gmail.com

Christopher S. Torno, DVM, MS
Veterinarian
Marine Life Park, Resorts World Sentosa
chris.torno@rwsentosa.com

Ariel T. Torres
Lead Aquarist - Vet Tech
Dubai Aquarium, United Arab Emirates
atorres@emaar.ae

Acknowledgments

This Manual is the result of a great deal of hard work by a relatively small number of professionals. It stems from a firm commitment to help stranded marine mammals. It is a major contribution to the dream, now a reality, of developing a Philippine Marine Mammal Stranding Network. Everyone involved in this project, especially the authors of each chapter, spent many hours of their own time researching, writing, editing, proofing, designing, and creating this Manual. Everyone deserves to feel a sense of pride in the final product.

Many thanks to Tim Desmond, CEO of Ocean Adventure (OA), who came to the Philippines with a history of involvement in stranded marine mammals and has generously and continuously offered the resources and expertise of OA. Without the full support and participation of OA staff, this Manual would never have been written.

We would like to recognize the NGO Wildlife in Need for providing staff and significant grant monies to support the development and printing of this Manual.

SeaWorld Busch Gardens Conservation Fund has provided generous and ongoing funding for the Marine Mammal Stranding Response Workshop and the Medical Management of Stranded Marine Mammals Workshop, both of which are the basis for this manual. The Conservation Fund has supported the printing and distribution of over two thousand manuals over the years. Monies have also gone to produce the accompanying video, and for site visits to some of the BFAR Regional offices. Without their financial assistance, much of our efforts would still be just a good idea.

This project has been a unique collaboration between governmental agencies, educational institutions, and the private sector. We are grateful for the vision and support of The Bureau of Fisheries and Aquatic Resources, especially that of former Director Malcolm Sarmiento and current Director Assis G. Perez, of Mr. Edwyn Elesna, Chief of Fisheries Quarantine and Wildlife Regulations Section, and of Director Jovita Ayson of Region II BFAR. Special thanks also to Ms. Gloria Diaz of NFARMC.

Recognition and sincere gratitude also goes to Rene N. Rollon, Ph.D., Director of the Institute of Environmental Science and Meteorology, University of the Philippines, for supporting the efforts of Dr. Aragones and the Stranding Network as a whole.

We are thankful for the contributions of authors who were part of the original core group but have moved on elsewhere – Dr. Mariel Flores, Wayne Phillips, Ariel Torres, Dr. Richard Encomienda, and Dr. Chris Torno. Special thanks to Dr. Robert Braun, consulting veterinarian of OA, whose extensive knowledge and experience in marine mammal strandings was invaluable. We also extend our thanks to Scott Sharpe of Ocean Adventure who has contributed greatly to our Workshops and whose input was integrated into the Manual (Chapter 5).

Finally, we extend special recognition to Josh Villaruel for his wonderful illustrations, Micaela Ledesma-Trebol for her artwork, and LeiAnne Canlas for the excellent layout. It took a team to succeed, and we are grateful to all.

Foreword

Marine mammals in the Philippines include the cetaceans, i.e. whales and dolphins, and the dugongs. These marine mammals are primarily long-lived and have low reproductive potential. Thus, are often prone to becoming threatened, vulnerable or even endangered. In the Philippines, the Bureau of Fisheries and Aquatic Resources has mandate over the whales and dolphins while the DENR has mandate over the dugongs. However, we believe that the long term protection and conservation of these animals require a special collective effort not only from the mandated agencies but also with the help of the entire society. For instance, a recent study (Aragones et al. 2010) of stranded marine mammals in the Philippines, reported a high proportion of live animals among stranders, and they suggested that such could be caused by acoustic trauma (from blast fishing), entanglements from fishing gears, and possible linkage to red tides through their food.

The Philippine Marine Mammal Stranding Network Inc (PMMSN) is the key organization we are collaborating with in terms of addressing stranded marine mammals. Since the establishment of the PMMSN in October 2005, more than 2,500 Filipinos have been trained regarding the Do's and Don'ts on marine mammal stranding response. These trainings and actual responses have been enhanced by the 'Marine Mammal Stranding Response Manual – A guide for the rescue, rehabilitation, and release of stranded cetaceans and dugongs in the Philippines', which was first published in 2008. This second edition has updated and expanded previous chapters and even added a new relevant chapter – Medical Management of Stranded Marine Mammals. This Manual is the best guide for our response to stranded marine mammals throughout the Philippines. This publication is a highly commendable piece of work as we continue to develop, enhance and promote the national program for the conservation of marine mammals in the Philippines.

Congratulations to the authors for their passion and commitment to protect the country's marine mammals.

Asis G. Perez
Director
Bureau of Fisheries and Aquatic Resources

Foreword

A well organized effort to rescue a sick or injured marine mammal, or collect detailed information from a dead marine mammal, has a far greater impact than just the fate of the individual animal or the collection and documentation of a single case study. A stranding is a powerful tool to raise awareness of the value of marine mammals and to motivate communities to be more concerned about the preservation of their marine resources as a whole.

This training manual is the culmination of efforts made by several contributors over the past 12 years, and it stands as a key step in the successful development of the Philippine Marine Mammal Stranding Network. Ocean Adventure (OA) has made the Stranding Network a priority program for its corporate social responsibility since beginning operations in the Philippines in 2001. The founding staff brought with them over 35 years of technical experience with assessment, stabilization, transport, and rehabilitation of stranded marine mammals from the United States and elsewhere around the world. OA is the host facility for the Marine Mammal Stranding Response Workshop, offering Workshop attendees direct access to animals, equipment, and expertise necessary to develop the skills for successful marine mammal stranding efforts. The majority of authors of this manual are OA staff who have devoted substantial time and effort in developing and serving as instructors for the Workshop.

Wildlife in Need (WIN), led by Gail Laule, has been centrally involved in this process by obtaining international funding support from SeaWorld Busch Gardens Conservation Fund for not only training first responders, but assisting the Bureau of Fisheries and Aquatic Resources (BFAR) in the development of the Stranding Network. WIN has taken the lead in organizing and conducting the Workshops and in the production of the written materials such as this manual.

BFAR has been mandated to protect the marine mammals of the Philippines. BFAR's former Director Malcolm Sarmiento and current Director Asis G. Perez have followed through on that mandate by organizing support within BFAR to ensure that as many BFAR staff as possible participate in the training programs.

Furthermore, Dr. Lem Aragones of the University of the Philippines Institute of Environmental Science and Meteorology, a leading marine mammal scientist in the Philippines, has passionately dedicated his services to the development of these efforts. He has co-authored much of the materials for the Workshops and this manual. He has served as a primary Workshop instructor, sharing his knowledge and experience to ensure the success of these Workshops and the realization of the Stranding Network.

Finally, there are a few individuals who stand out as 'driving forces' that have provided a tremendous boost to the development of the marine mammal stranding work by willing their organizations to provide the maximum support. The first is Director Jovita Ayson of Region II BFAR. She is a tireless promoter and motivator who mobilized her staff to attend the workshops and then to implement what they had learned in the field. Similarly, Mr Edwyn Alesna of BFAR main office and Ms Gloria Diaz of NFARMC are the key coordinators of these Stranding Workshops. Finally, there is Mayor Hernani Braganza of Alaminos City, Pangasinan who mobilized his community's total support for a series of strandings that occurred within his city.

It is the efforts of all of these individuals and institutions, as well as the many others who played important roles in the conduct of these trainings and in the development, publication, and dissemination of this manual, which will ensure the ultimate success of the Philippine Marine Mammal Stranding Network!

Timothy Desmond
CEO
Ocean Adventure

Preface

This manual is a compilation of the information developed to date for the Marine Mammal Stranding Response Workshops presented by Ocean Adventure and Wildlife In Need in cooperation with UP-IESM and the Bureau of Fisheries and Aquatic Resources. This is a living document with future revisions and improvements. We, the editors, Workshop instructors, and core group members of the Philippine Marine Mammal Stranding Network (PMMSN) felt there was a need to develop a manual specifically for the Philippines, even though there are already excellent stranding manuals from western countries available through the internet. In our experience, the scenario here is quite different in comparison to other areas in the world where these stranding manuals have been produced. Firstly, marine mammal stranding response is yet to be mainstreamed in the Philippines, so the capability to respond to strandings in terms of resources, logistical support, and expertise is limited. Secondly, these manuals are based on decades of acquired experience through functioning stranding networks in Western countries, so the cultural context, technical language, and level of detail are not appropriate for most local people and relevant stakeholders here.

This manual draws on that wealth of experience in marine mammal rescue from the international community. It is designed to provide a basic understanding of marine mammal strandings, and to provide recommendations and procedures for handling stranded animals, whether alive or dead. It provides practical support to wildlife professionals and volunteers undertaking this challenging yet enormously rewarding work.

Ideally, this manual should be used in conjunction with the Marine Mammal Stranding Response Workshop and the Medical Management of Stranded Marine Mammals Workshop, which are designed to provide practical and hands-on training in the basic skills of marine mammal rescue and the pursuit of valuable scientific information from stranded animals, both alive and dead. We are pleased to say that these efforts have led to the development of the Philippine Marine Mammal Stranding Network, which is functioning throughout the country. For us, we have achieved true successf if it helps to rescue a stranded animal, or enables us to learn more about environmental factors and behavioral and medical conditions that force marine mammals from their world into ours.

Lemnuel V. Aragones, Gail E. Laule and Bianca G. Espinos
Editors

Table of Contents

Chapters

Chapter 1

The Philippine Marine Mammal Stranding Network (PMMSN)

Lemnuel V. Aragones, Mary Anne A. Roque, Gloria C. Diaz, and Edwyn B. Alesna

Rationale

The waters surrounding the Philippine archipelago are home to 29 confirmed species of marine mammals. This includes 27 species of whales and dolphins, the dugong *(Dugong dugon)* and the small clawless otter *(Aonyx cinereus)* (see Chapter 2 for more details). A marine mammal strands when the animal has run aground or is in a helpless situation. The rationale behind the establishment of a national network for stranded marine mammals in the Philippine rests on the following concerns.

- Philippine marine mammals, in general, are often misperceived by many Filipino fishers (and even laypersons) simply as big fish. Unfortunately, this misperception often leads to the mistaken belief that all marine mammal species are abundant and thus harvestable and/or consumable.
- Marine mammals, in general, are prone to overexploitation because they have low reproductive potential (i.e. few live offspring in their lifetime, unlike the thousands to millions of eggs from a single female fish). Marine mammals are generally long-lived and require pre-reproductive years. Several species are classified as endangered, threatened, or vulnerable to extinction.
- These animals are threatened in the Philippines primarily by opportunistic hunting, incidental catch, pollution, and habitat loss.
- In the Philippines, 65% of stranding events involve live strandings (Aragones et al. 2010). This appears to be a relatively high rate internationally compared to other countries, and may reflect a high level of man-made threats.
- The Philippine archipelago, which has at least 7,100 islands with a total coastline of 36,289 km (The Official Portal of the Government of the Philippines 2010) and maritime area, make it highly probable that numerous stranding events may occur.
- Lastly, based on the aforementioned factors, marine mammals require special protection and conservation since they play an important role in the marine ecosystem.

About the network

Marine mammals and other similarly threatened wildlife are protected by several laws in the Philippines. In particular, Section 4 of Republic Act 9147 (Wildlife Conservation and Protection Act) clarifies that the Department of Agriculture - Bureau of Fisheries and Aquatic Resources (BFAR) has jurisdiction over all marine mammals, except the dugong. A more detailed discussion of the Philippine laws relevant to marine mammals is presented in Chapter 11. To further pursue the conservation and management of Philippine marine mammals, an inter-agency workshop on marine mammals was held at Ocean Adventure, Subic Bay in 2003. The following year, BFAR entered into a Memorandum of Agreement with the Subic Bay Marine Exploratorium, Inc (owner of Ocean Adventure). This partnership focused on capacity-building and program development for marine mammal conservation in the Philippines. Among the ideas nurtured between the two institutions was the establishment of a national stranding network, including the dugong even though

it was outside the mandate of BFAR. Thus, the Philippine Marine Mammal Stranding Network (PMMSN) was established.

In 2005, Wildlife In Need Foundation (WIN) an NGO, Ocean Adventure (OA), and BFAR agreed to develop a training workshop for the staff of BFAR and local government units (LGUs). Through the generous support of the SeaWorld Busch Gardens (SWBG) Conservation Fund, WIN and OA developed and conducted two 4-day Marine Mammal Stranding Response Workshops in October 2005 and February 2006. These Workshops provided formal training for 65 individuals representing the various BFAR Regional Offices throughout the country. This led to the decision to offer Workshops on an ongoing basis. Consecutive annual grants from the SWBG Conservation Fund through 2012 provided financial support for multiple Workshops every year, plus site visits to various regions, with corresponding one-day hands-on workshops at Ocean Adventure. In addition, the generous and continuing support of the SWBG Conservation Fund has enabled us to develop and produce the following:

1. Full color posters and information flyers on marine mammals and stranding response, which are distributed to all participants from various regions
2. The first, and now the second edition of the Stranding Response for Marine Mammals Manual and accompanying training video.
3. The Medical Management of Stranded Marine Mammals Workshop for veterinarians and other medical personnel to serve the PMMSN, offered on an annual basis.

By 2007, the PMMSN's core group member institutions were BFAR, OA, WIN, and the University of the Philippines - Institute of Environmental Science and Meteorology (UP-IESM). These organizations were instrumental in creating the PMMSN and they continue to offer trainings and workshops for the network and provide assistance to stranding responses nationwide. In 2008, the University of the Philippines' Outright Grant provided funding to develop the Philippine Marine Mammal Stranding Database which is managed through UP-IESM and can be found at www.pmmmsndatabase.upd.edu.ph.

At the end of 2012, over 2,500 members have been trained nationwide. These members have attended the full Marine Mammal Stranding Response at OA or a regional training, and/or the one-day hands-on training and have been certified as first responders. In addition, 45 veterinarians have attended the Medical Management of Stranded Marine Mammals Workshop. This has led to the development of a pool of individuals within the Stranding Network who are capable of providing appropriate medical care for live stranded cetaceans and collecting greater scientific data from both living and dead animals. It has also led to an increasing frequency of reported strandings nationwide, a much higher level of care for stranded animals, and the ability to treat and rehabilitate when appropriate rather than resorting to the default mode of pushing the animal back into the ocean. Interesting to note that when we released the first edition of this Manual in 2008, we only had 225 government staff and relevant stakeholders trained at that time.

Objectives of the PMMSN

The Network aims to accomplish the following objectives:

1. To develop the capability on a national level to respond to every stranded marine mammal for rescue, release and/or rehabilitation;
2. To standardize and systematically collect as much information as possible from every stranding, alive or dead, to contribute to the body of scientific knowledge regarding marine mammal biology, natural history, and the many natural and human-made threats facing these animals in the wild;

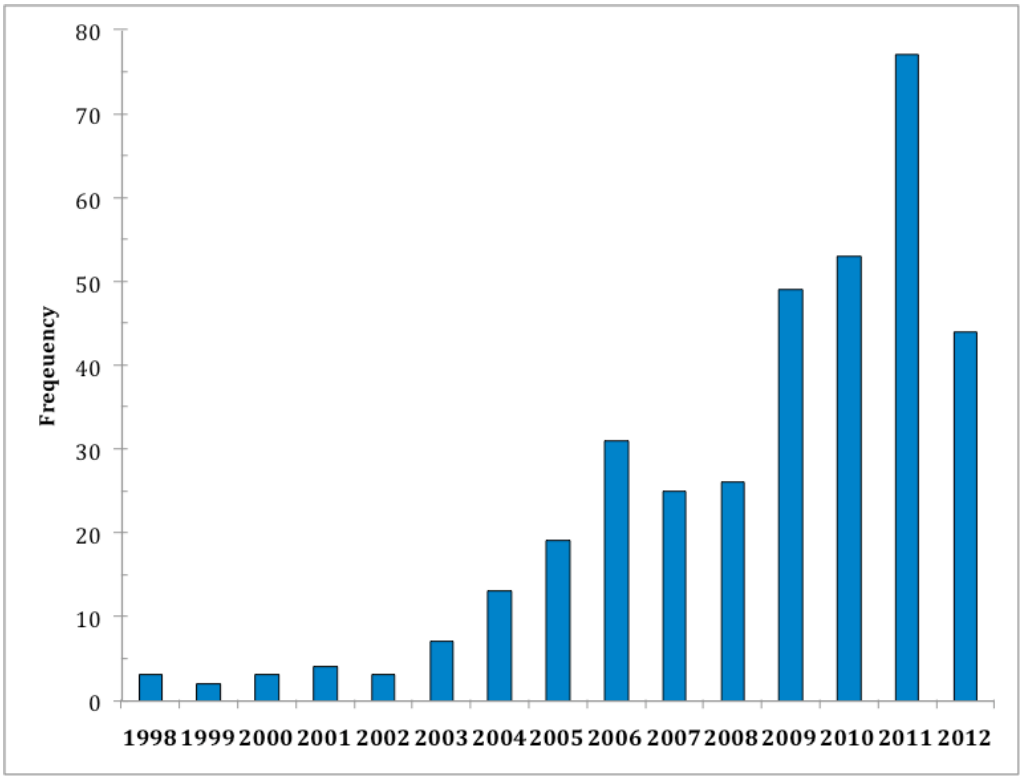


Table 1. Annual frequency of stranding events from 1998 through 2012 (after Aragones et al. 2010, with latest data from Aragones et al.)

3. To collate all data on stranding events nationwide, building a comprehensive marine mammal stranding database (i.e. Philippine Marine Mammal Stranding Database);
4. To educate the public, particularly coastal communities, on the importance of marine mammal conservation;
5. To empower and develop the capacity of BFAR and DENR personnel and other pertinent stakeholders (e.g. LGUs) to organize and implement marine mammal stranding response.

Issues addressed by the network

Marine mammals strand for various reasons (see Chapter 3). Physical injury from predators and/or those caused by human activities (e.g. dynamite blasts, boat collision), errors in navigation, illness, malnutrition, and infectious diseases are some of the main causes. Further, complex topography (e.g. sandbars) and inclement weather conditions, as well as tight social bonds of these animals are potential contributing factors to strandings. A recent study in the Philippines (Aragones *et al.* 2010) showed a significantly high proportion of live marine mammal strandings (65%) and suggested three possible explanations: (1) acoustic trauma (from dynamite blasts), (2) entanglements from fishing gears (i.e. fisheries interactions), and (3) biotoxins connected in within their food chain (e.g. fish kill poisoning episodes from harmful algal blooms such as red tide). In comparison to other countries which also maintain national stranding databases, the proportion of live stranders recorded ranges from 9-17% only (Aragones *et al.* 2010). The survival of the stranded animal is often dependent upon the assistance of humans and the welfare of each individual is the most pressing concern. Furthermore, the protection of individuals may lead to preservation of populations of animals, therefore a systematic response to every live stranded marine mammal individual, and the collection of reliable scientific data from animals both living and dead, are equally important.

The PMMSN Chapters and Its Structure

The PMMSN is evolving and growing with the establishment of regional-, provincial- and municipality/ city-level chapters nationwide. Support for the establishment of these chapters has been via counterpart funding from the various stakeholders. Workshops and professional expertise are provided by OA and UP-IESM while the host region or province provides the venue, food and accommodations for the participants and instructors. Often the various local Fisheries and Aquatic Resources Management Councils (FARMCs) of BFAR contribute as well.

There are three teams that compose every PMMSN Chapter. First, the Monitoring, Enforcement and Response Team (MERT) with the local chief executive (mayor) as head. This team is further divided into sub-teams: Monitoring, Enforcement and (First) Response. Monitoring includes reporting every unusual event in the coastal and marine areas (e.g. aggregation of dolphins near shore, dynamite blasting) that may potentially contribute to a stranding event. The fisherfolk are usually the best candidates for this task. The Enforcement Sub-Team's responsibility is to apprehend people who are allegedly performing the illegal acts such as dynamite fishing. This sub-team is also expected to be on the stranding site to protect the animal(s) from being killed or butchered. The (First) Response Sub-Team includes individuals who have been trained through the Workshops to provide the care and management of the stranded animal at the site, including controlling the crowd and getting their support and assistance as needed.

Second, the Stranding Response, Diagnostic, Treatment, and Carcass Disposal Team covers the second and third stages of strandings, which includes continuing treatment or long-term rehabilitation of the animal, if required, and necropsy. This team is headed by a veterinarian from the Provincial or City Veterinarian Office.

Third, the Information, Education, and Communication (IEC) and Capacity Building Team, plays an important role in engaging the participation and support of the chapter members. This team is headed by BFAR and is responsible for developing and disseminating the IEC materials and resources, and as it is the main NGA mandated to protect these animals.

The PMMSN in 2013

The PMMSN is growing and attracting more and more professionals, semi-professionals, and volunteers throughout the Philippines who are committed to responding to stranded marine mammals, dead or alive. Marine mammal experts and animal care specialists from OA and UP-IESM continue to provide guidance and assistance in stranding response.

As much as possible, every stranding event is documented, collated, and analyzed; and the results are disseminated by UP-IESM through the PMMSN Database website (www.pmmsndatabase.upd.edu.ph). The collection of pertinent data from every stranding event and stranded animal is requested including the Stranding Report Form (see Appendix 1), photographs, physiological data, and tissue samples. Research is being conducted and encouraged through the University of the Philippines, College of Science through the IESM and University of the Philippines Los Baños, College of Veterinary Medicine (UPLB CVM).

Individuals who have the passion to rescue, save, and protect marine mammals are encouraged to join

the PMMSN. Members can help in many ways beyond the actual stranding event itself. The PMMSN is dedicated to educating the public, particularly coastal communities, on the importance of marine mammal conservation. Every member can help by carrying forth that message and increasing public awareness and support for marine mammal stranding efforts and marine mammal conservation.

If you are interested in more information on the PMMSN or want to report a stranded marine mammal, please contact us at any of the hotlines below:

OA – (047) 2529000
WIN – (047) 2528494
Dr Lem Aragones of UP-IESM – 09285018226

To submit stranding reports, please email to lemdva2001@yahoo.com or philmarmamstrandingnetwork@yahoogroups.com or strandings@oceanadventure.com.ph.

The PMMSN's future directions

The PMMSN will continue to conduct Workshops on marine mammal stranding response as a permanent training resource for the network. We will continue to identify stranding hotspots in the Philippines and it is our goal to assist in establishing regional marine mammal rescue centers in these critical areas. The PMMSN will play an important role in working with BFAR in the formulation of an appropriate Fisheries Administrative Order (FAO) that will institutionalize the PMMSN under its mandate on dolphins and whales. This will further empower the various existing chapters and enjoin others to establish their own. Furthermore, we would like to develop and offer more advanced training workshops for medical and other interested personnel (including researchers) on biological procedures and data collection for marine mammals (e.g. necropsy, histopathology, genetics, toxicology, etc). Ultimately, the PMMSN envisions a National Marine Mammal Stranding Laboratory, which could also serve as the National Marine Mammal Tissue Bank.

References

Aragones, L.V., M.A. Roque, M.B. Flores, R.P. Encomienda, G.E. Laule, B.G. Espinos, F.E. Maniago, G. Diaz, E.B Alesna and R.C. Braun. 2010. The Philippine marine mammal strandings from 1998 to 2009: Animals in the Philippines peril? Aquatic Mammals 36(3): 219-233.

Aragones, L.V., M.A. Roque, A.S. Amor, E.O. Keith. [Unpublished data]. Ecology and conservation of small cetaceans in southern Tañon Strait, Philippines.

The Official Portal of the Government of the Philippines. 2010. General Information. Retrieved 28 January 2010 from www.gov.ph/index.php.

Chapter 2

An Overview of Philippine Marine Mammals

Lemnuel V. Aragones

Introduction to marine mammals

The waters of the Philippine archipelago are home to a diverse array of marine mammals. "Marine mammals" is a collective term pertaining to animals that have the following characteristics:

- air breathing
- warm-blooded (endothermic) vertebrates
- have hair (for whales and dolphins these are just a few hairs around the upper jaw present at birth)
- feed their young with milk produced by mammary glands of the female
- rely mainly on aquatic habitats for their food
- have evolved anatomical features and physiological adaptations to live in the aquatic environment

Marine mammals include the members of various Orders (taxonomic grouping in scientific classification) such as Cetacea, Sirenia and Carnivora. Cetaceans, the most aquatically adapted group of marine mammals include the whales, dolphins, and porpoises. The cetaceans are ecologically diverse, as they live in rivers and oceans and in the tropical and polar regions (Barnes 2002). Sirenians comprise the sea cows, such as manatees and dugongs. The sirenians are the only herbivorous mammals to have ever become totally aquatic. The carnivorous marine mammals represent a diverse array of ecological adaptations – from the solid ice (and land) to oceans and also tropical to polar latitudes. The main groups include the pinnipeds (such as sea lions, seals and walruses), aquatic otters (riverine and marine) and the polar bear. However, the aquatic carnivores are much less diverse in comparison to their terrestrial counterparts. Note that one of the most important features shared by all mammals is the development of the three middle ear bones (i.e. the malleus, incus, and stapes).

Five main groups of marine mammals in world:

Marine mammals are well adapted for life in the water with similarly evolved anatomical features (Fig 1 and 2) and physiological adaptations. Anatomical features include:

- A general body shape hyrdodynamically designed to move easily in the aquatic environment (see Fig 1) and to chase fish and other prey items.
- Eyes, nose, ears and limbs adapted to a variety of aquatic environments.
- A dorsal fin to stabilize the animal like the keel of a ship.
- Pectoral fins (flippers) equivalent to arms of terrestrial mammals.
- A tail fluke corresponding to our feet and providing propulsion of fully aquatic marine mammals i.e. cetaceans and the dugong.
- Increased insulation through the development of a blubber or dense fur layer.

These basic anatomical parts together with the presence or absence of a beak and specific color patterns are the main characteristics used to identify different cetacean species.

Most marine mammals have evolved similar physiological adaptations. A countercurrent heat exchange system helps them cope with extreme heat (by dumping body heat through their uninsulated dorsal fins, flukes and flippers) and cold (through the blubber which acts as an insulative layer with plenty of blood vessels close to it for heating). They are capable of prolonged dives by storing oxygen primarily in the blood and muscles (~ 90-95%) in comparison to humans who store oxygen mainly in the blood and lungs (~ 86%) (Kooyman 1985).

Figure 1. The streamlined body and external anatomy of a dolphin.

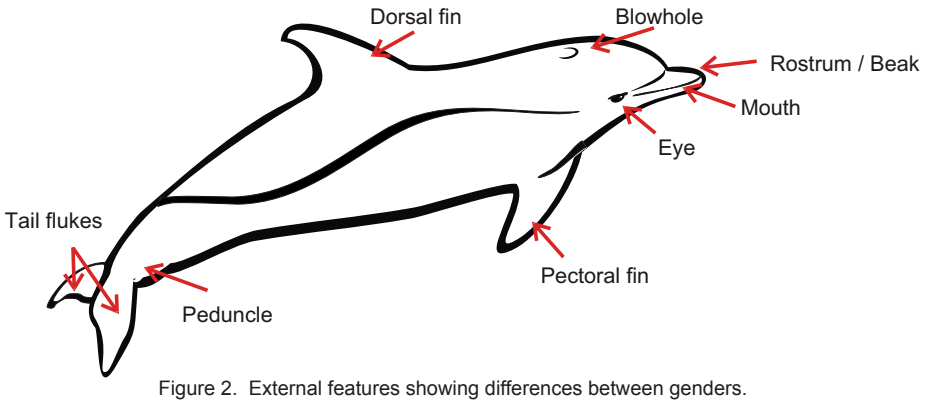
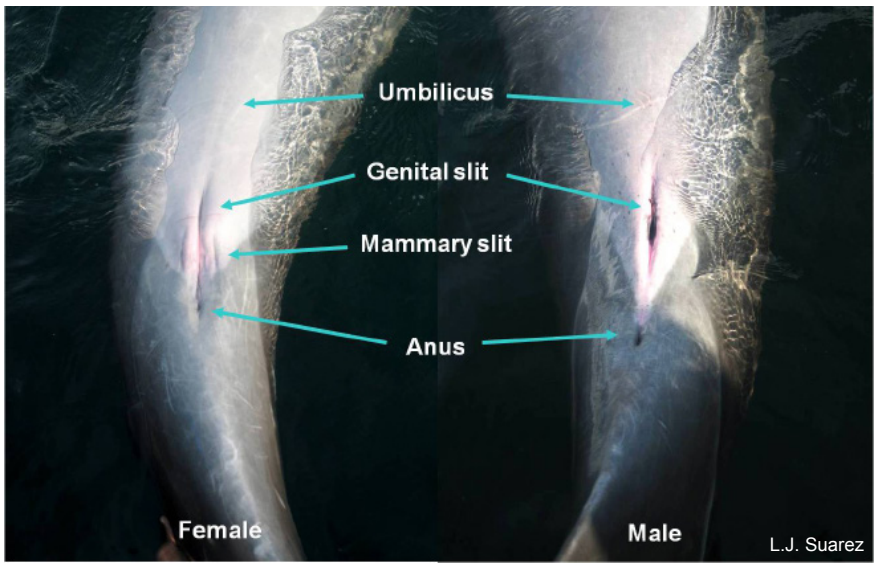


Figure 2. External features showing differences between genders.



Another amazing adaptation of dolphins and toothed whales to living underwater is their ability to echolocate. Echolocation is the production of sounds that enable an animal to orient itself and locate objects through echoes or returning sounds. The basic sound is produced in the upper nasal passages, magnified or transmitted by the melon (forehead), and the returning sounds are then received by the lower jaw, which conducts the sounds to the middle ear via the tympanic membrane (Berta *et al.* 2006). Unfortunately, if these animals are within the range of dynamite blasting, they are prone to acoustic trauma since sound travels five times faster in water than in air. This often results in disorientation which may then lead to stranding.

Philippine Marine Mammals

There is a rich variety of marine mammals found in the Philippines, comprised primarily of cetaceans and the dugong. Table 1 shows the list of various marine mammals recorded in the Philippines. To date, there have been 29 confirmed marine mammal species in the Philippines as follows:

- 27 cetacean species – 20 small and 7 large; or 21 toothed whales and dolphins (odontocetes) and 6 baleen whales (mysticetes)
- dugong
- small clawless otter (restricted to Palawan)

The Asian small-clawed otter *(Amblonyx cinereus)* is more of a terrestrial to riverine mammal, but it intermittently ventures towards the coastal and estuarine areas. This species gets little attention in the Philippines and would be a good subject for some research and study, and thus warrants inclusion in this list. There are also two recently confirmed cetacean species (Gingko-toothed beaked whale and pygmy sperm whale) recorded from stranding events and one unidentified seal reported in Aparri in 1998 (most likely Phoca sp. from southern Japan).

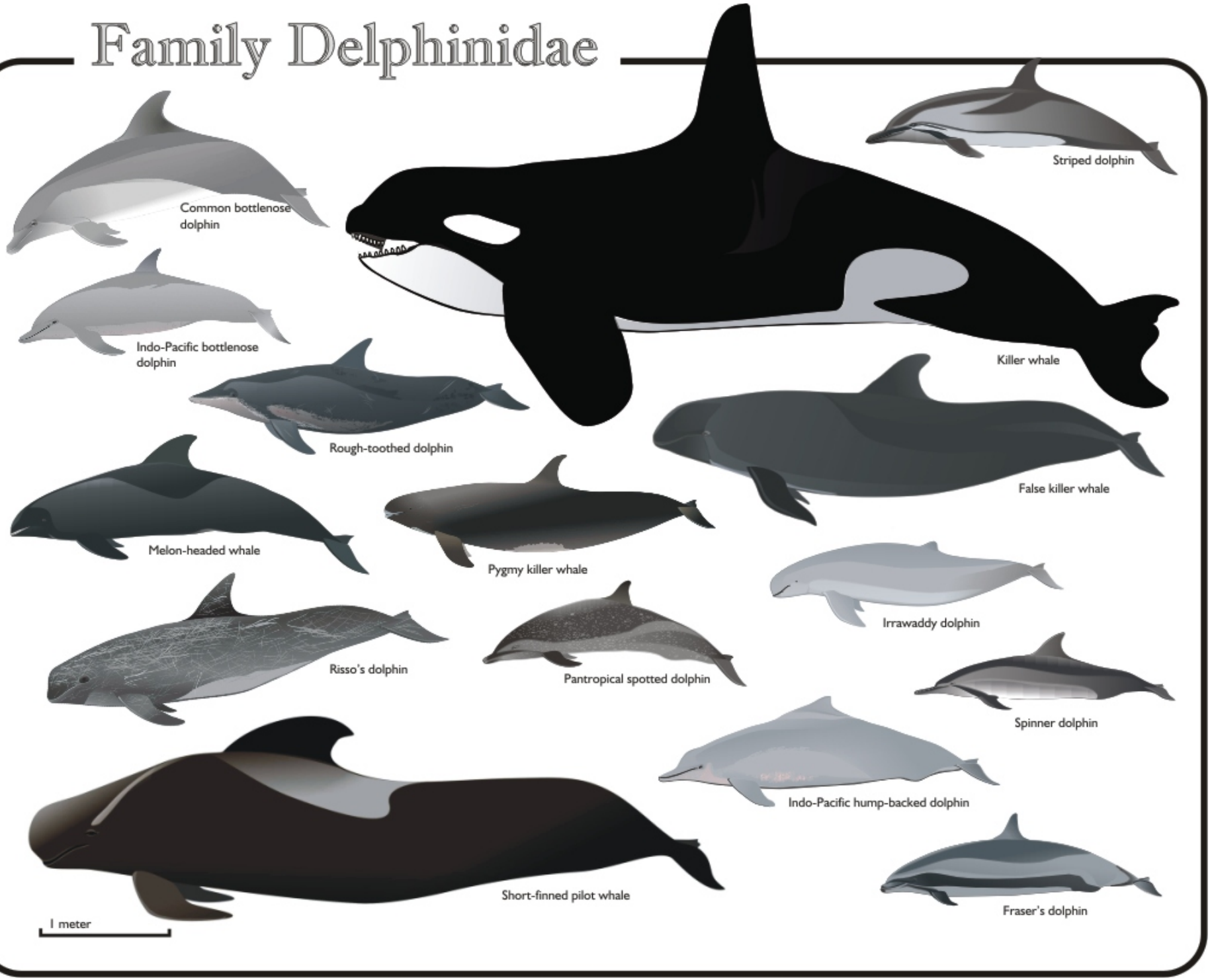
The following section lists the various marine mammals found in the Philippines and describes their basic characteristics. This species listing is arranged following the conventional taxonomic (hierarchical) grouping. Each species has been given a rating based on the recorded number of strandings to date (very frequent strander, frequent strander, rare strander, and never stranded yet) as an easy guide for responders. A summary of the marine mammal species that have stranded in the Philippines based on Aragones *et al.* (2010) and the most recent data through 2011 is shown in Figure 3. Twenty-four (24) of the 30 species reported here have stranded at least once. So far, the total number of reported strandings in the database from 1998 to 2012 is 359 (N) with the highest number of recorded strandings for any year being 2011 (n=77). The main reference used in this section (species description) was Reeves *et al.* (2001) A Guide To Marine Mammals Of The World.

Table 1. An updated checklist and status of marine mammals confirmed within the Philippine waters (as of December 2012) (after Perrin et al. 2005; Aragones 2008, Aragones *et al.* 2010).

	CITES Classification (Appendices[1])	Status
ORDER CETACEA		
Suborder Odontoceti (Toothed whales, dolphins, and porpoises)		
Family Delphinidae		
1. Spinner dolphin *(Stenella longirostris)*	II	very common
2. Pantropical spotted dolphin *(Stenella attenuata)*	II	common
3. Striped dolphin *(Stenella coeruleoalba)*	II	rare
4. Fraser's dolphin *(Lagenodelphis hosei)*	II	rare to common
5. Bottlenose dolphin *(Tursiops truncatus*)	II	common
6. Indo-Pacific Bottlenose dolphin *(Tursiops aduncus)*	II	rare to common
7. Risso's dolphin *(Grampus griseus)*	II	rare to common
8. Melon-headed whale *(Peponocephala electra)*	II	common
9. Pygmy killer whale *(Feresa attenuata)*	II	rare
10. Short-finned pilot whale *(Globicephala macrorhynchus)*	II	rare to common
11. False killer whale *(Pseudorca crassidens)*	II	rare
12. Killer whale *(Orcinus orca)*	II	rare
13. Rough-toothed dolphin *(Steno bredanensis)*	II	rare
14. Indo-Pacific humpback dolphin *(Sousa chinensis)*	II	unconfirmed
15. Irrawaddy dolphin *(Orcaella brevirostris)*	I	very rare
Family Kogiidae[2] (Pygmy and dwarf sperm whales)		
16. Pygmy sperm whale *(Kogia breviceps)*	II	recently confirmed
17. Dwarf sperm whale *(Kogia sima)*	II	rare to common
Family Physeteridae[2]		
18. Sperm whale *(Physeter macrocephalus)*	I	rare to common
Family Ziphiidae[2] (Beaked whales)		
19. Gingko-toothed whale *(Mesoplodon ginkgodens.)*	II	recently confirmed
20. Blainville's beaked whale *(Mesoplodon densirostris)*	II	rare
21. Cuvier's beaked whale *(Ziphius cavirostris)*	II	rare
22. Longman's beaked whale *(Indopacetus pacificus)*	II	very rare
Suborder Mysticeti (Baleen whales)		
Family Balaenopteridae[2] (Rorquals)		
23. Humpback whale *(Megaptera novaeangliae)*	I	rare
24. Common Minke whale *(Balaenoptera acutorostrata)*	I	rare to common
25. Omura's whale *(Balaenoptera omurai)*	I	rare to common
26. Bryde's whale *(Balaenoptera edeni)*	I	rare to common
27. Fin whale *(Balaenoptera physalus)*	I	very rare
28. Blue whale *(Balaenoptera musculus)*	I	very rare
ORDER SIRENIA (Family Dugongidae)		
29. Dugong *(Dugong dugon)*	I	very rare, threatened
ORDER CARNIVORA (Suborder Pinnipedia; Family Phocidae)		
30. Larga seal[4] *(Phoca largha)*	II	extralimital record[4]
Family Mustelidae		
31. Asian small-clawed otter[5] *(Amblonyx cinereus)*	II	restricted to Palawan

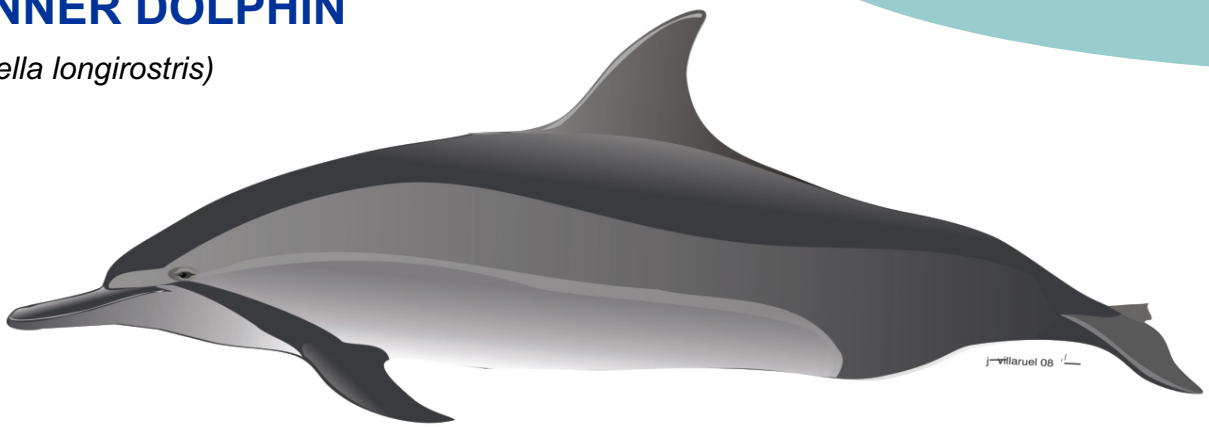
(1) **CITES Appendix I**, includes species threatened with extinction and for which trade must be subject to particularly strict regulation and only authorised in exceptional circumstances.
CITES Appendix II, include species that are not necessarily threatened now with extinction but may become so if trade is not strictly regulated.
(2) Protected under Fisheries Administrative Order Nos. 185 series of 1992, and 185-1 series of 1997.
(3) Protected under DENR Administrative Order No. 55 series of 1991.
(4) Extralimital record only (i.e. outside the normal limits of an animal's distribution)
(5) Not an exclusive marine mammal; thrives in rivers to estuaries.

Family Delphinidae



SPINNER DOLPHIN

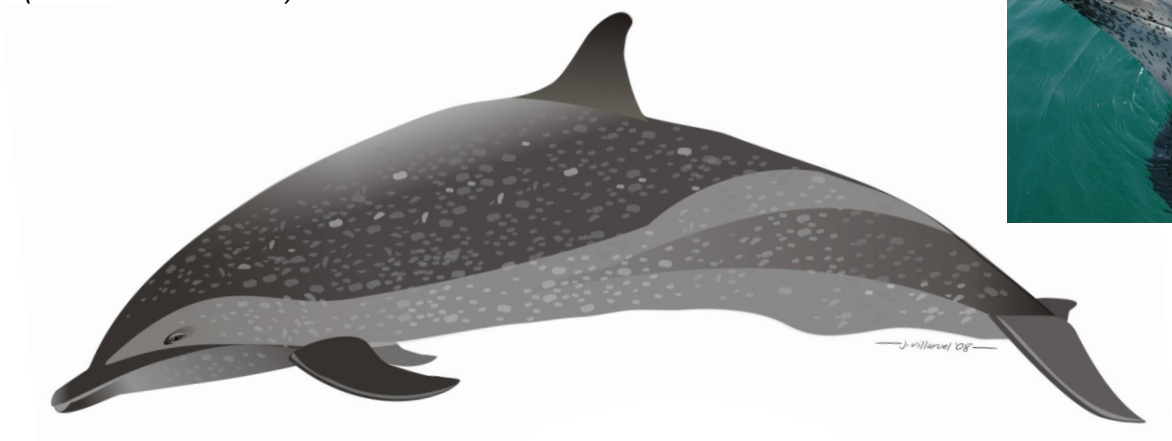
(Stenella longirostris)



This species is named for its unique behavior of leaping above the water and spinning on its longitudinal axis. There are several subspecies for this species and the one found here in the Philippines is the Hawaiian race or the Gray's spinner dolphin. It is characterized by a very long narrow beak, robust slender body and flat melon. The basic color pattern is a dark dorsal cape with lighter gray sides, and white belly. The common sizes for adults range from 2.0 to 2.4 m long. This species is very common throughout the waters of the Philippine archipelago and is nocturnal (feeds at night and rests at daytime). In southern Tañon Strait (~100 km2), a population of 600 to 1000 individuals has been estimated through mark-recapture estimates using photo ID techniques (Aragones et al. unpublished data). Among the marine mammals in the Philippine, the spinner dolphin so far, has the highest recorded stranding frequency (see Fig 3). **Very frequent strander**

PANTROPICAL SPOTTED DOLPHIN

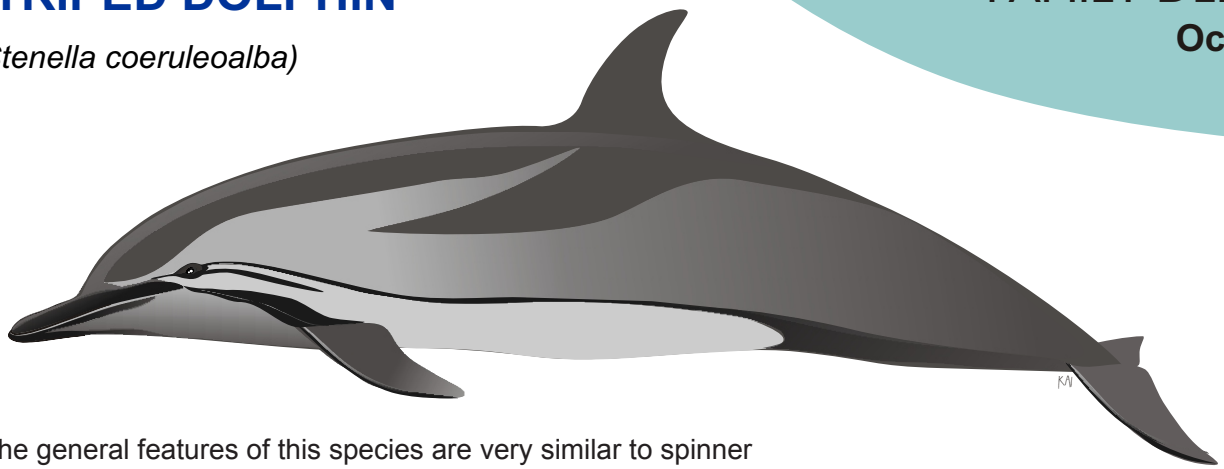
(Stenella attenuata)



The Pantropical spotted dolphin is easy to identify with numerous spots found throughout its body, and most striking on the throat and underside of the body. However, the number of spots increases as they age, so calves may have no spots at all and that only a small number of spots for juveniles or sub-adults. This species is also characterized by a white tipped beak. An adult spotted dolphin is slightly larger than a spinner dolphin, ranging from 2.2 to 2.7 m long. This species is diurnal (feeds in the daytime) and is one of the most abundant cetaceans on the planet (Reeves et al. 2001). In some areas of the world it has suffered a high mortality from purse seine fisheries, and this is likely the case here in the Philippines, although no real data exists. **Very frequent strander**

STRIPED DOLPHIN

(Stenella coeruleoalba)

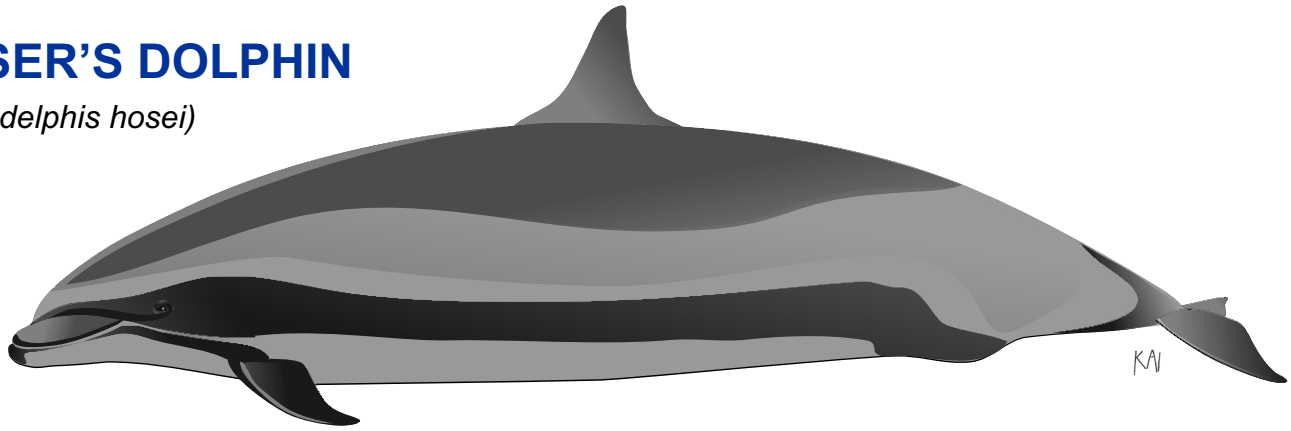


The general features of this species are very similar to spinner dolphins except that it possesses a bold narrow black stripe from eye to anus and another from eye to flipper. This is a beautiful and robust species characterized by a white to light gray shoulder blaze, sweeping back and up toward the dorsal fin. The striped dolphin is sometimes misidentified as Fraser's (see below) because they both possess stripes on their laterals. Their main difference is that the striped dolphin has a narrower stripe (from eye to anus), a longer beak, and a taller dorsal fin than the Fraser's. The striped dolphin is rarely encountered in the Philippines, with the few sightings having been mainly offshore. Adults range in size from 2.1 to 2.7 m long.

Rare strander

FRASER'S DOLPHIN

(Lagenodelphis hosei)

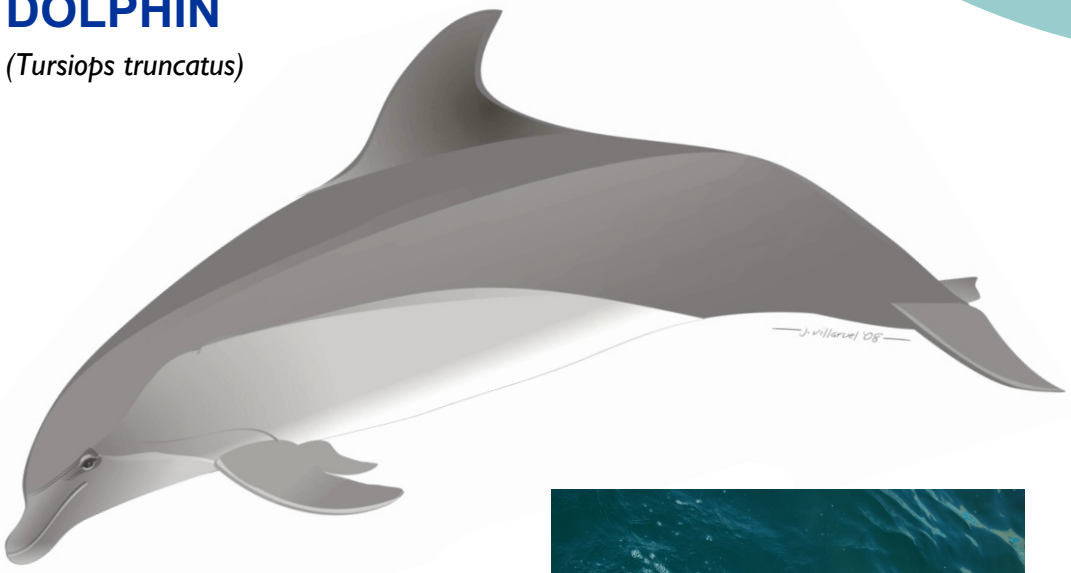


This species has a very short beak, small triangular dorsal fin (set at midbody), small flippers (in relation to its body size), and a robust body. It has a broad dark stripe running all the way from the face to the anus. However, in some individuals this feature may not be that obvious. Adults range in size from 2.4 to 2.7 m in length. In the Philippines, the Fraser's has commonly been misidentified as the common bottlenose dolphin or as a striped dolphin (see above). This species ranges from rare to common. When sighted in the Visayan region, they are often found in huge groups of hundreds of animals and in deep offshore waters. Note, this species is prone to stress myopathy; thus making its rehabilitation from stranding very challenging.

Very frequent strander

COMMON BOTTLENOSE DOLPHIN

(Tursiops truncatus)

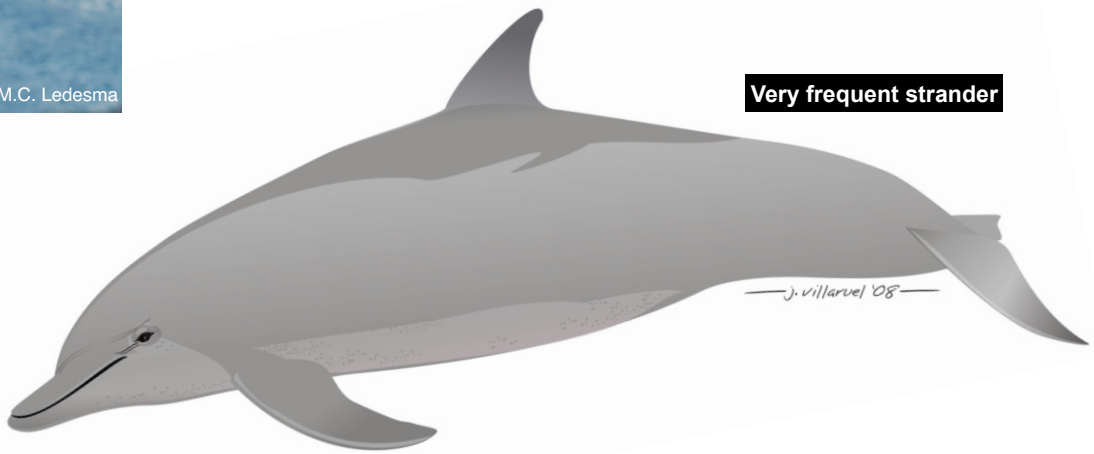


This species was popularized by the TV series 'Flipper' and is one of the most adaptable and cosmopolitan dolphin species. The common bottlenose dolphin has a robust gray (ranging from slate gray to light charcoal) body with a large falcate (sickle shape or back curved) dorsal fin, and short beak. This species has recently been separated from the Indo-Pacific bottlenose *T. aduncus* dolphin. The main differences between these two species are a shorter beak for the common bottlenose and the presence of dark spots on the belly in T. aduncus. The adult common bottlenose species is quite large ~ 2.2 to 3.8 m long. The bottlenose dolphin, based on opportunistic sightings, can range from rare to common in the Philippines.

Very frequent strander

INDO-PACIFIC BOTTLENOSE DOLPHIN

(Tursiops aduncus)

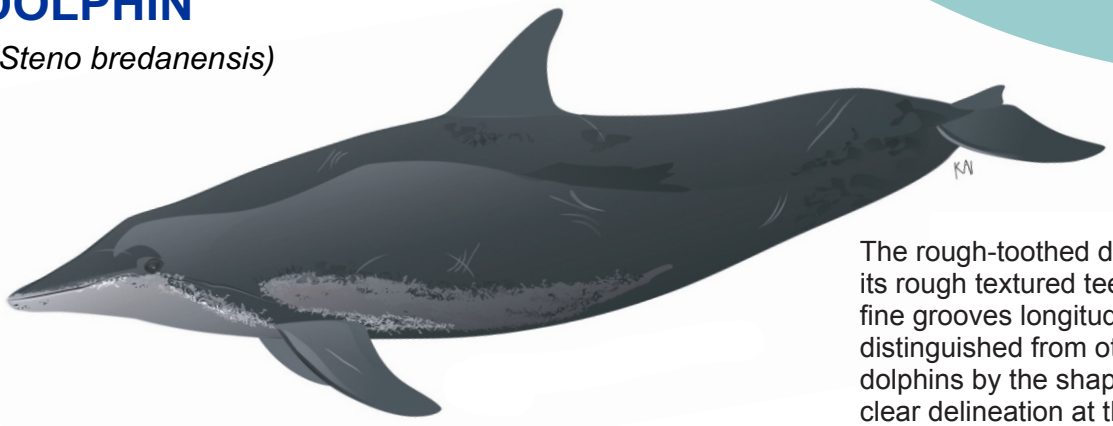


The features of the Indo-Pacific bottlenose dolphin are very similar to the common bottlenose and spinner dolphins. It is often very difficult to differentiate them in the field. The Indo-Pacific bottlenose dolphin is characterized by dark spotting on the belly and sometimes on the sides of adults. Its beak is relatively longer in comparison to the common bottlenose dolphins. They are relatively smaller with adults reaching ~2.2 to 2.6 m in length. This species was confirmed in the Philippines through a stranding case in Bagac, Bataan in 2003 by the Ocean Adventure Stranding Team. This species has stranded both in mass and single.

Frequent strander

ROUGH-TOOTHED DOLPHIN

(Steno bredanensis)




M.C. Ledesma

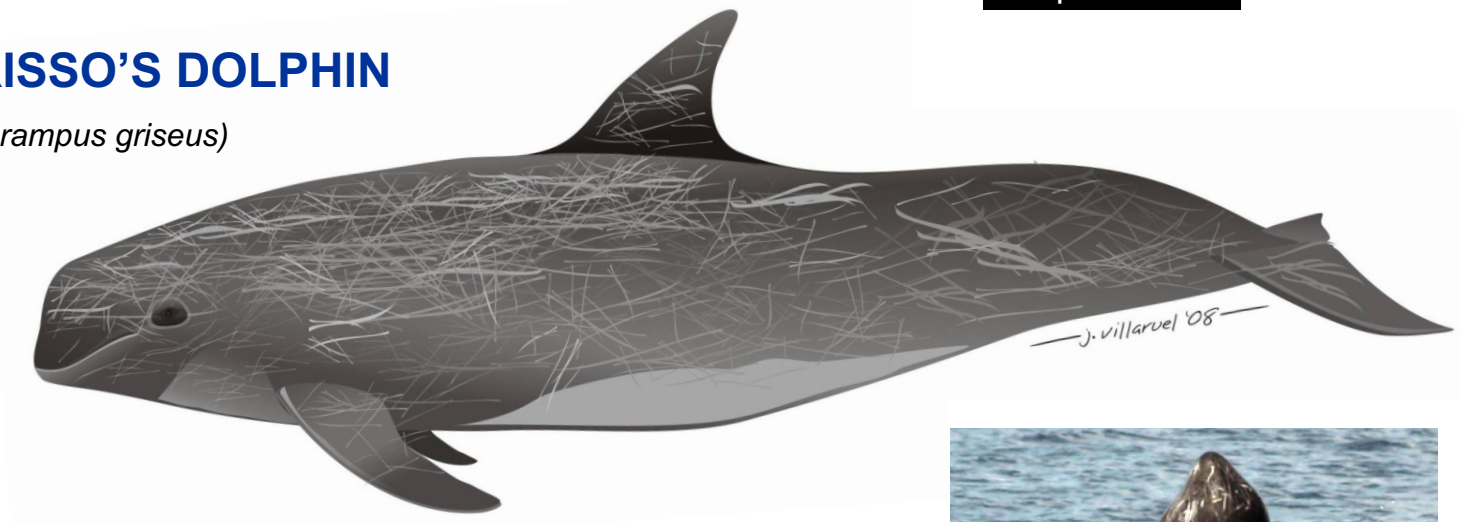

M.C. Ledesma

The rough-toothed dolphin's name refers to its rough textured teeth which have numerous fine grooves longitudinally. This species is distinguished from other similarly long-beaked dolphins by the shape of its head, which lacks a clear delineation at the base of the melon, and a 'forehead' that slopes smoothly. It also has a long narrow beak and tall, erect dorsal fin that is set at the middle back portion of the body. Its flippers are large and long. Its color pattern is a dark dorsal cape with lighter gray (and charcoal) sides and white belly and throat area. Adult rough-toothed dolphins range in size from 2.0 to 2.7 m long. This species is rarely sighted in the Philippines and tends to be found in deep offshore waters.

Frequent strander

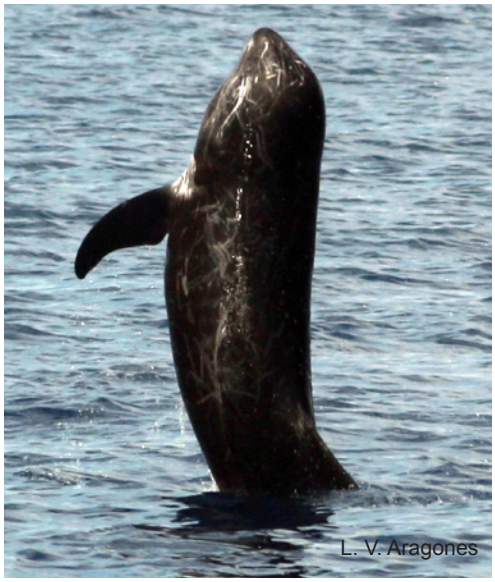
RISSO'S DOLPHIN

(Grampus griseus)



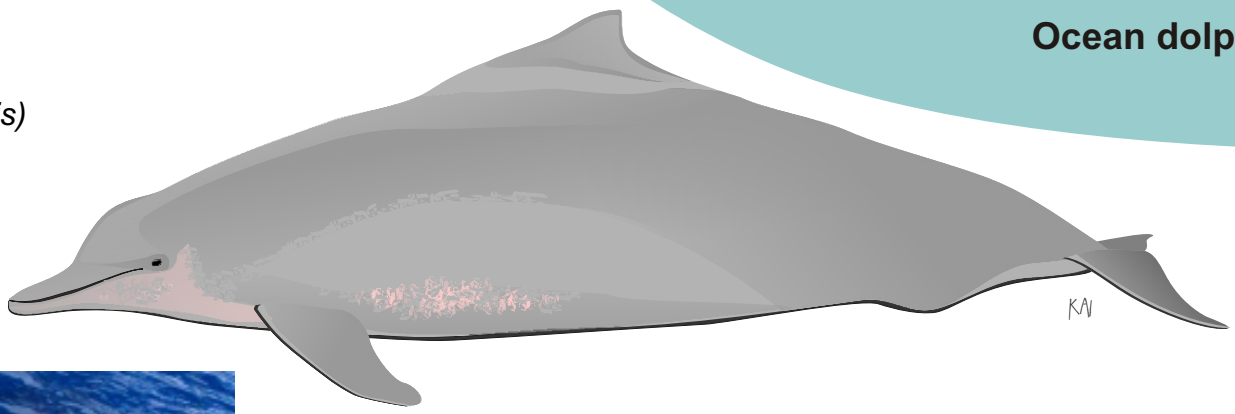
The adults of this species are often easy to recognize as they usually have extensive linear scars throughout their bodies. The Risso's dolphins possess a broad head, squarish in profile, with no beak but with a cleft melon, and they have a tall, erect dorsal fin. Note that the calves and juveniles of this species may have little or no scars. The eye area often has a dark shade. The older individuals are light in color and sometimes almost white as a result of the overlapping scars. All adults have an anchor shaped chest patch or light gray to white markings on the under (ventral) side of their bodies. The Risso's dolphin is sometimes misidentified as a pygmy killer whale or young false killer whale. Adults range in size from 3.0 to almost 4.0 m long. Sightings in the Philippines range from rare to common. This species is the second-most frequent strander (n=30), and has stranded both in mass and single.

Very frequent strander


L. V. Aragones

INDO-PACIFIC HUMPBACK DOLPHIN

(Sousa chinensis)




Nopphakarn Singkhum

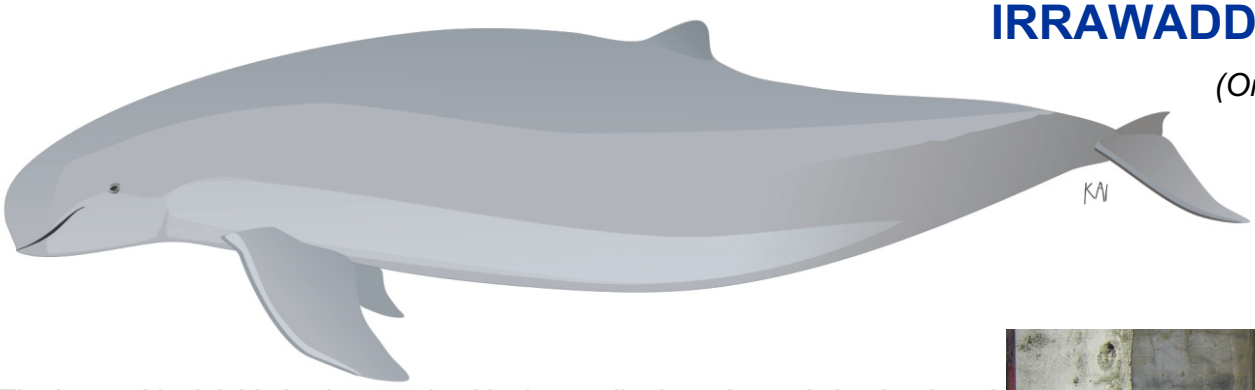

Ming Chang-Liu

This species is distinguished by the prominent hump at the base of its small dorsal fin, which, along with its body coloration, varies regionally (Pacific and Indian Oceans). When there is no clear hump, the base of the dorsal fin is often unusually long. It has a relatively long, slender beak and thick caudal peduncle. It has been suggested that 'Sousas' in Southeast Asian waters usually have dark and heavy spotting along their often gray to brown bodies (Reeves et al. 2001). This species yet to be confirmed. Although a recent report (Perrin et al. 2005) listed is as confirmed. However, in the absence of any recent sighting or stranding, the validity of the species confirmation remains in doubt within the Philippine waters. Based on its current distribution in the region, the shallow waters along the coasts of Palawan may have the closest resemblance. Adults can range from 2.0 to 2.8 m long.

Never stranded yet

IRRAWADDY DOLPHIN

(Orcaella brevirostris)



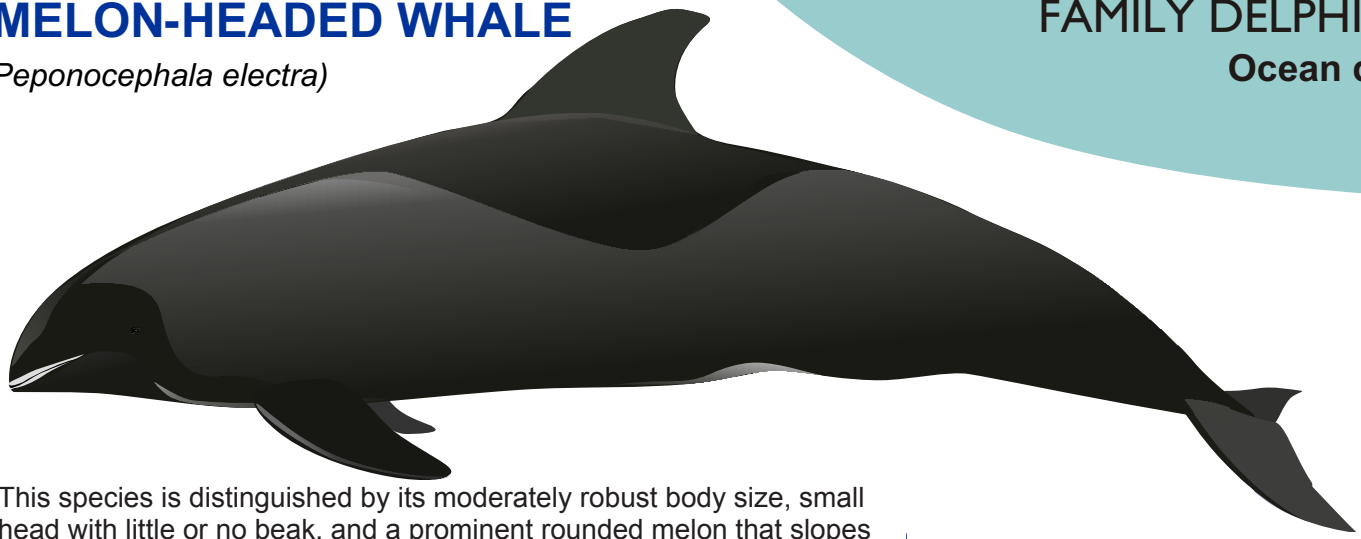

BFAR 6

The Irrawaddy dolphin is characterized by its small, triangular and slender dorsal fin located in the middle of the back. Its head shape is smoothly rounded with no beak. Its flippers are disproportionately large and broad. The color of the body is often uniformly light to dark gray with lighter belly. From the aerial view, the species could sometimes be misidentified as dugong. This is probably one of the most endangered marine mammal species in the Philippines and was thought to have a restricted distribution (Malampaya Sound, Palawan only). However, in 2006 one of the PMMSN members shared a photo of a stranded dolphin in Dumangas, Iloilo, which turned out to be an Irrawaddy dolphin (see picture below). To date, this species is believed to have at least a separate distinct population in the coastal waters of Region 6 (ranging from southern Iloilo, northern Guimaras to Negros Occidental area). Adults range in size from 2.0 to 2.8 m long.

Rare strander

MELON-HEADED WHALE

(Peponocephala electra)

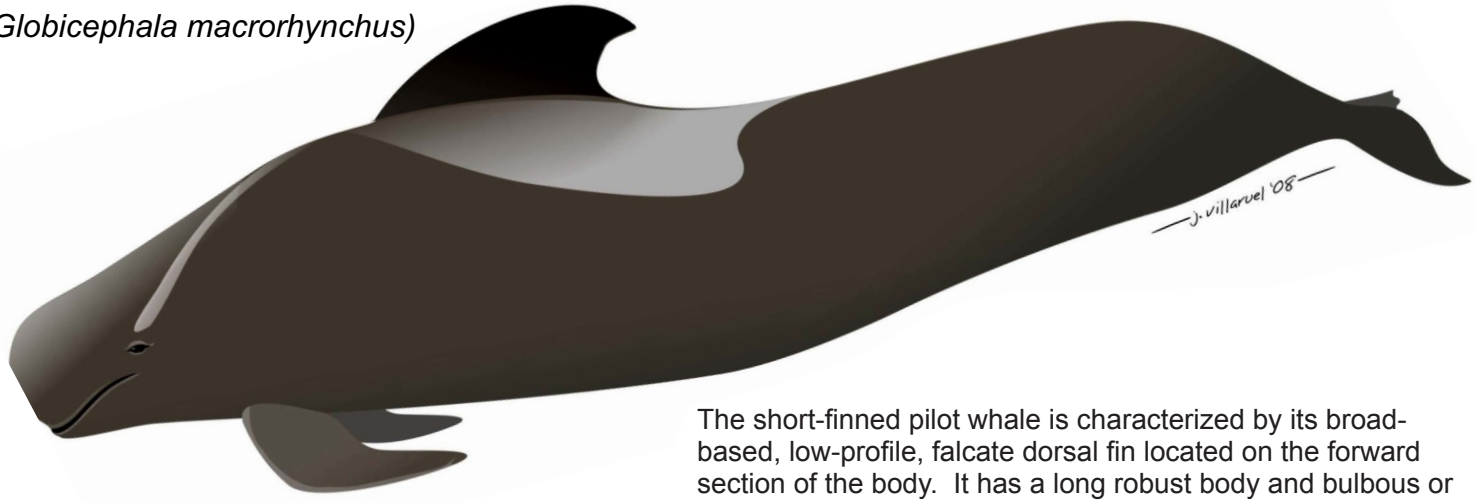


This species is distinguished by its moderately robust body size, small head with little or no beak, and a prominent rounded melon that slopes downwards drastically (~ 45° angle). It has a prominent and erect dorsal fin, and flippers which are tapered and pointed (an important feature to differentiate from pygmy killer whales and young false killer whales). This species has a dark body color and white lips; easily confused with pilot, pygmy and false killer whales, all referred to as 'blackfish' species. Whenever possible, an ideal way of validating ID for these 'blackfish' species is to determine the number of teeth. The melon-headed has 20-26 pairs of teeth in both upper and lower jaws compared to fewer than 15 pairs for the other 'blackfish' species. The adult sizes range from 2.0 to 2.9 m long. This is the third-most frequent strander in the Philippines (n=28). On 10 February 2009, an estimated 250-300 melon-headed whales were involved in a near mass stranding (out of habitat) in Pilar, Bataan. Less than a month later on 3 March 2009 approximately 150-200 animals near mass stranded in Odiongan, Romblon (Tablas Island) and were recorded to be out of habitat. **Very frequent strander**

L.J. Suarez

SHORT-FINNED PILOT WHALE

(Globicephala macrorhynchus)



M.C. Ledesma

The short-finned pilot whale is characterized by its broad-based, low-profile, falcate dorsal fin located on the forward section of the body. It has a long robust body and bulbous or squarish melon with a barely discernable beak. This species is relatively longer (~ 4.8 to 7.2 m long) than most of the other similar 'blackfish' species (i.e. melon-headed, false killer and pygmy killer whales). Other features to confirm this species are a large, usually conspicuous light gray saddle shape patch behind its dorsal fin, and a light streak behind the eye, extending up towards the front section of the dorsal fin. This species is known to intermittently mass strand in certain areas including New Zealand and Cape Cod on the northeast coast of the US. Fortunately in the Philippines, so far, we have recorded single strandings only. **Very frequent strander**

FALSE KILLER WHALE

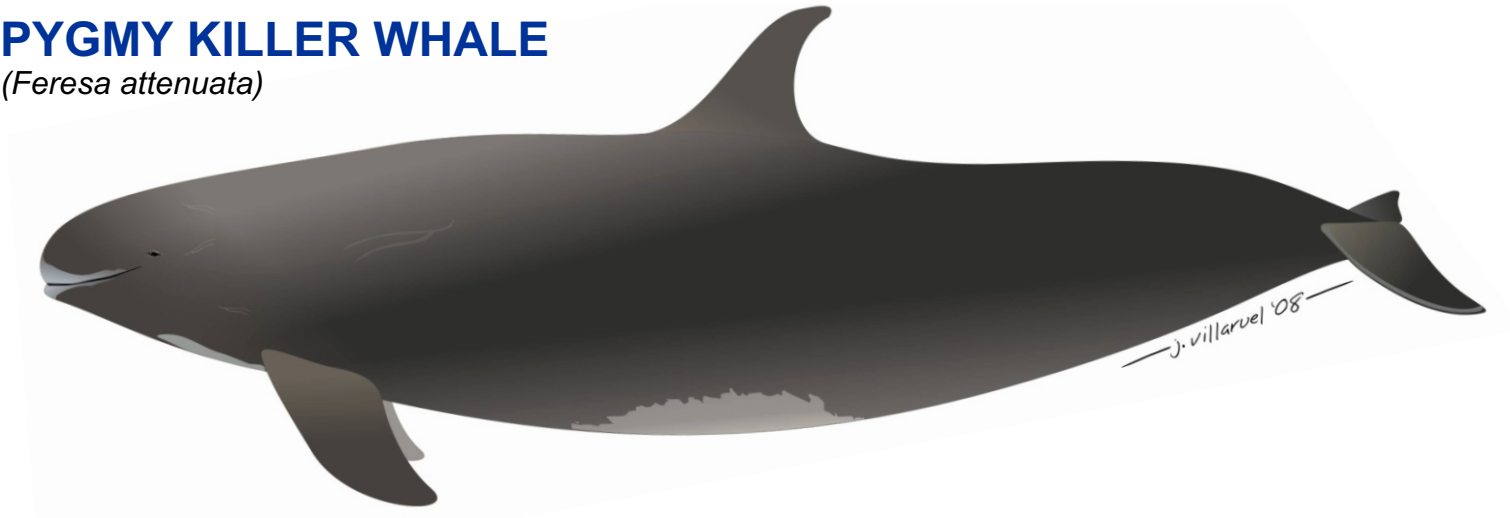
(Pseudorca crassidens)

This species is characterized by a slender black body (also a 'blackfish' species) with a conical but blunt head without any beak. It has a tall, slender, erect and falcate dorsal fin which is located in the middle section of the body. A good way to differentiate them from similar species (e.g. melon headed & pygmy killer whales) is the hump on the leading edge of its flippers. The ventral section, such as the throat and chest is white or lighter coloration than the rest of the body. There may also be a distinct light gray patch on the sides of the head. This species has 7-12 pairs of teeth in both the upper and lower jaws. An adult of this species is slightly smaller than the pilot whale, about 4.8 m to 6.0 m long. False killer whales are quite rare to sight in the Philippines.

Rare strander

PYGMY KILLER WHALE

(Feresa attenuata)

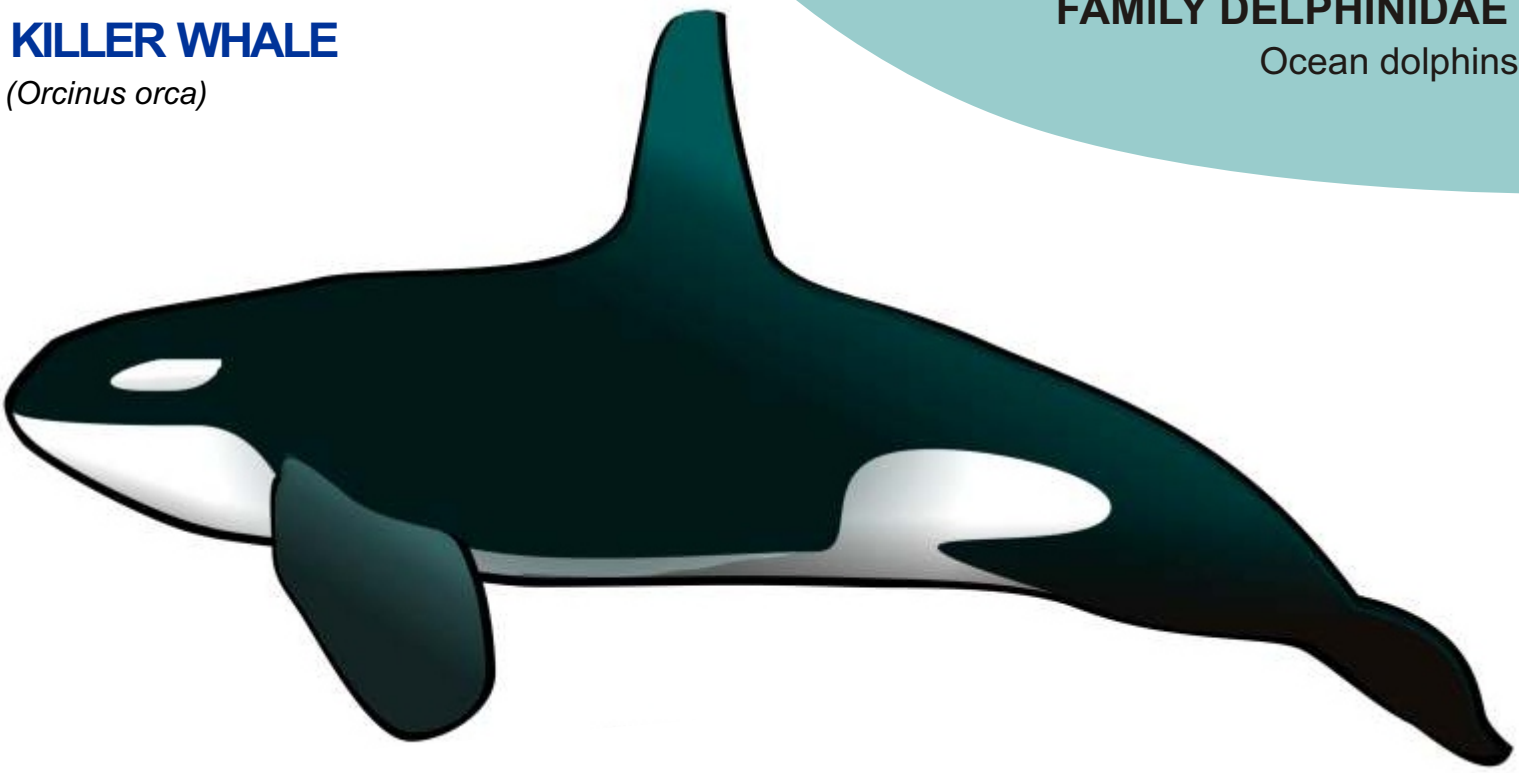


The pygmy killer whale has a small, mostly dark body (another 'blackfish') which is moderately robust in the chest area and more slender in the back area. It has a rounded head with melon extending forward of the front of the mouth with white lips (and belly). It also has a large erect and falcate dorsal fin located at or slightly behind the middle of the back. Its flippers are moderately long, relative to its size, and tapered. This species, which can be easily confused with the melon-headed whales and young false killer whales, has 8-12 pairs of teeth in the upper jaw and 10-13 pairs in the lower jaw. The adult sizes of this species range from slightly over 2.0 m to 2.6 m long. They are rarely sighted or encountered in the Philippines and are difficult to identify in the field. This species frequently strands in mass and single.

Frequent strander

KILLER WHALE

(Orcinus orca)



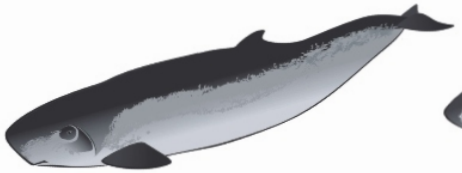
L.V. Aragones

The killer whale is the largest member of the family Delphinidae (~ 7.0-9.0 m long). It has an extremely robust body, conical head, and large flippers and dorsal fin. The height of its dorsal fin can be used in determining gender: in males it can reach 1.0-1.8m high, while for females it is of ordinary size. This species is famous for its distinct black and white color pattern (e.g. white oval patches slightly above and behind the eyes and white on the throat and underside of the body). There is a gray to white saddle shape marking on the back behind the dorsal fin, which could be variable, depending on the populations. This species is quite rare in Philippine waters. Fortunately, it has not stranded yet.

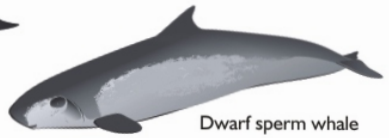
Never stranded yet

http://swfsc.noaa.gov/news.aspx?id=18434

Family Kogiidae

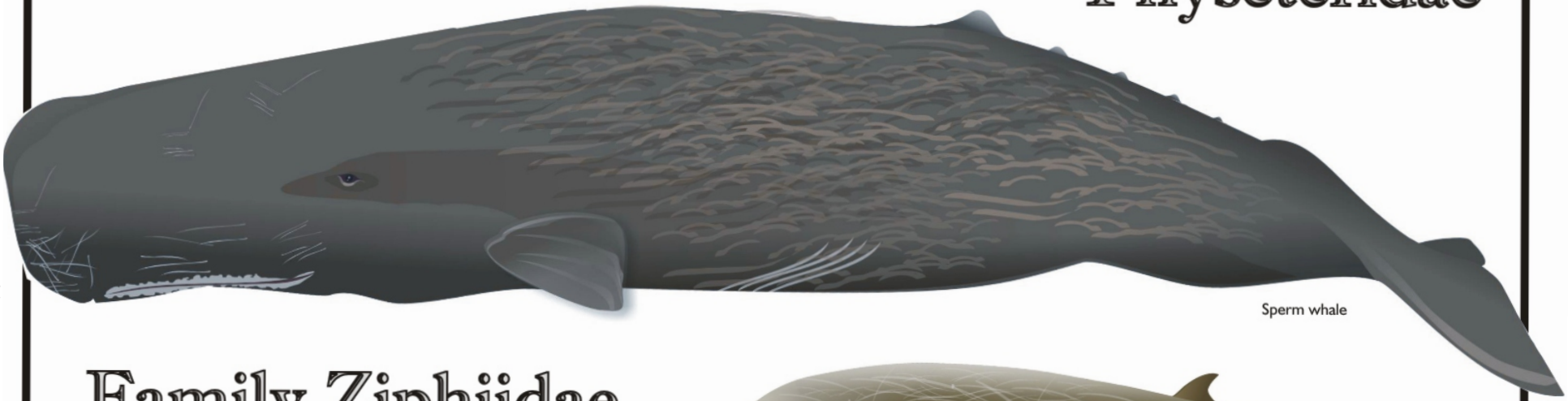


Pygmy sperm whale



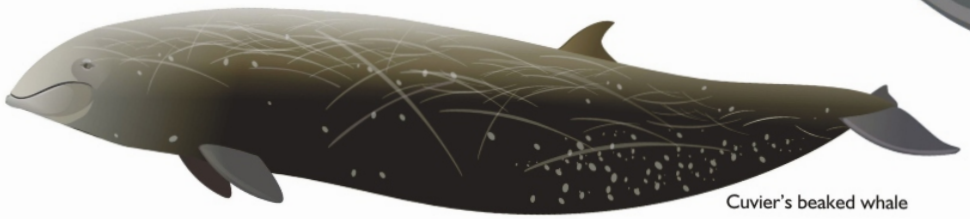
Dwarf sperm whale

Family Physeteridae



Sperm whale

Family Ziphiidae



Cuvier's beaked whale

Longman's beaked whale

Blainville's beaked whale

Gingko-toothed beaked whale

1 meter

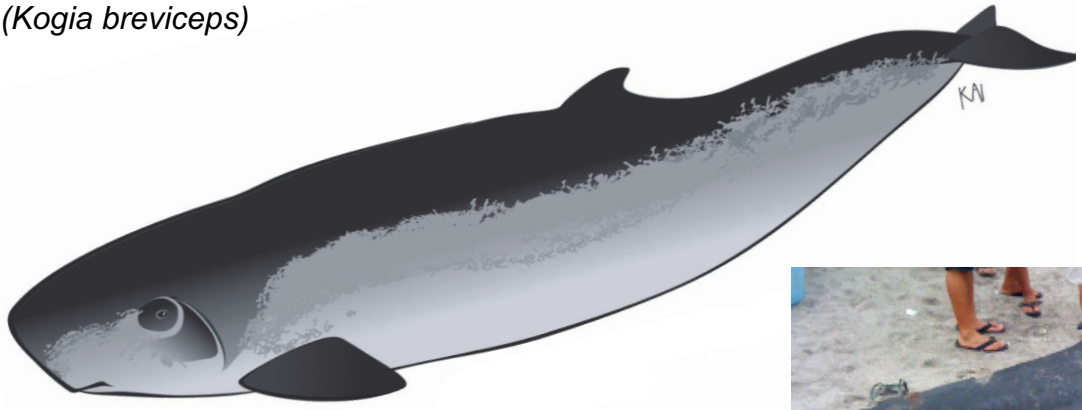
DWARF SPERM WHALE

(Kogia sima)

The dwarf and pygmy sperm whales are very similar in appearance and both have superficial resemblance to sharks in the form of the false gills found between the eye and flipper. Therefore, the strandings of these species has sometimes been misreported as sharks. The dwarf sperm whale is characterized by a more prominent dorsal fin which is falcate and located in the forward middle section of the body. This species may have several short longitudinal grooves on the throat section. It has 7-12 (sometimes 13) pairs of teeth in the lower jaw and three pairs of teeth in the upper jaw. The adult sizes range from 2 to 2.7 m long. They are rare in the Philippine waters but common in Tañon Strait. This species is prone to stress myopathy so rehabilitation is often very challenging. **Very frequent strander**

PYGMY SPERM WHALE

(Kogia breviceps)

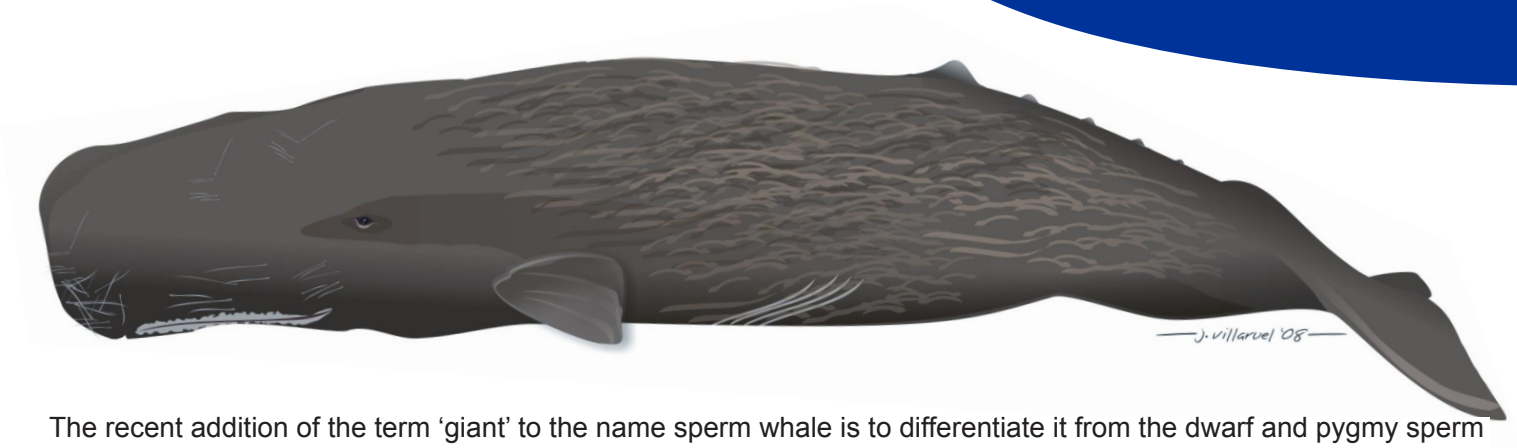


The pygmy sperm whale is very similar to the dwarf sperm whale. The main difference is that the dorsal fin of the pygmy sperm whale is relatively shorter, falcate and located behind the midpoint of the body. The pygmy sperm whale has 12-16 (sometimes 10-11) pairs of teeth in the lower jaw that are very sharp and without enamel. Adults range in size from ~ 2.2 to 3.5 m long, which is slightly longer than the dwarf sperm whale. This species has recently been confirmed in the Philippines through two single strandings.

Rare strander

GIANT SPERM WHALE

(Physeter macrocephalus)



The recent addition of the term ‘giant’ to the name sperm whale is to differentiate it from the dwarf and pygmy sperm whales. This is the largest toothed whale, reaching lengths up to 18.3 m. It has a disproportionately large head (more distinct for adult males). The lower jaw is narrow with about 20-26 pairs of large teeth that fit into sockets in the upper jaw. Their skin behind the head section is often wrinkled and very different from the smooth skin typical of dolphins and other whales. The blowhole is located in the anterior section of the head more on the left side. Its dorsal fin is low, thick and rounded. There are some 2 to 10 short deep grooves on the throat section. This species is rare to common in Philippine waters with sightings in the Luzon, Visayas, and Mindanao areas. This species has stranded mainly in single but twice as mass: 1998 in Aparri, Cagayan Province and the oldest official recorded stranding in the Philippines, 1967, where 12 sperm whales mass stranded in Cadiz City, Negros Occidental (Aragones et al. 2010).

Frequent strander

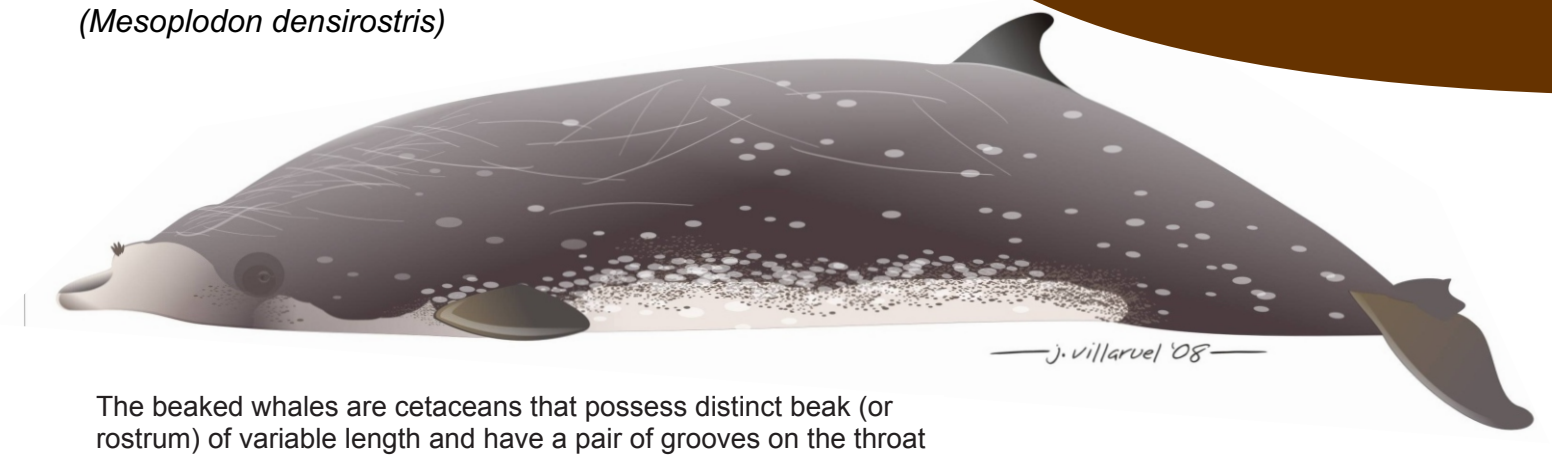
http://www.mrwallpaper.com/Sperm-Whale-wallpaper/

The Giant Sperm Whale is the largest of all toothed whales.

http://sites.scran.ac.uk/voyage_of_the_scotia/scotia/vs004-076.htm

BLAINVILLE'S BEAKED WHALE

(Mesoplodon densirostris)



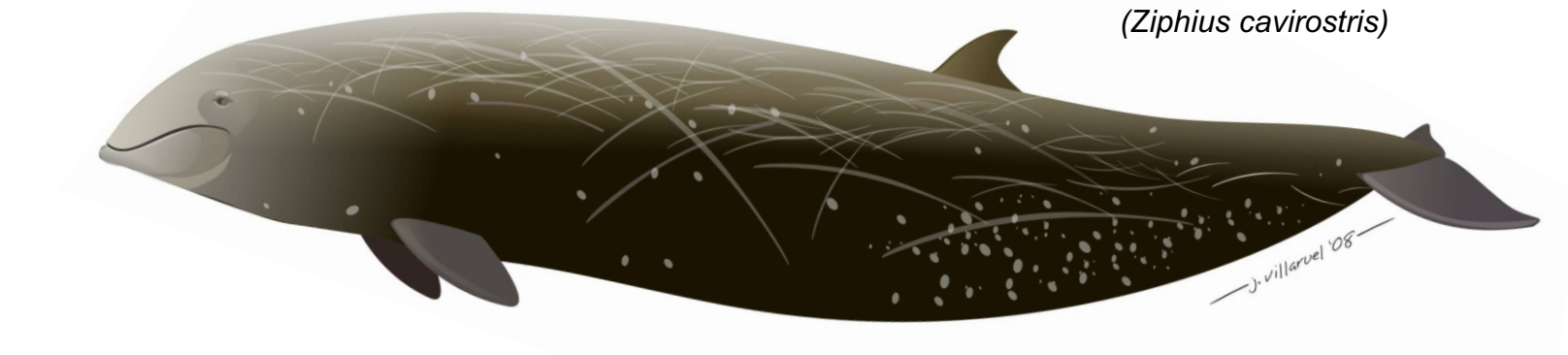
The beaked whales are cetaceans that possess distinct beak (or rostrum) of variable length and have a pair of grooves on the throat that converge towards the head. They are often difficult to observe in the wild and most of the information on this species is from stranding, bycatch, or opportunistic observations. The Blainville's beaked whale has a robust body that is laterally compressed (particularly in the tail section). It has a small and triangular to falcate dorsal fin positioned at about two-thirds of the body. The adult male has a strongly arched rear half of the lower jaw and forward-tilting erupted teeth whose exposed portions are often infested with clusters of barnacles. They may also have long white scratch scars on their bodies. Coloration of both sexes includes dark bluish gray on the dorsal and lateral areas and light gray on the ventral section. There are also occasionally many white oval scars in the genital area, possibly due to cookie-cutter shark bites. This is one of the most widely distributed mesoplodonts worldwide. Adults range in size from 3.3 m to 4.6 m. This species can be easily confused with the Gingko-toothed beaked whale (see below). In the Philippines, like all beaked whales recorded so far, this species is very rarely sighted (mainly in Sulu Sea).

http://sosoceanos.blogspot.com/2012/01/los-zifios-bajan-hasta-los-mil-metros.html

Rare strander

CUVIER'S BEAKED WHALE

(Ziphius cavirostris)

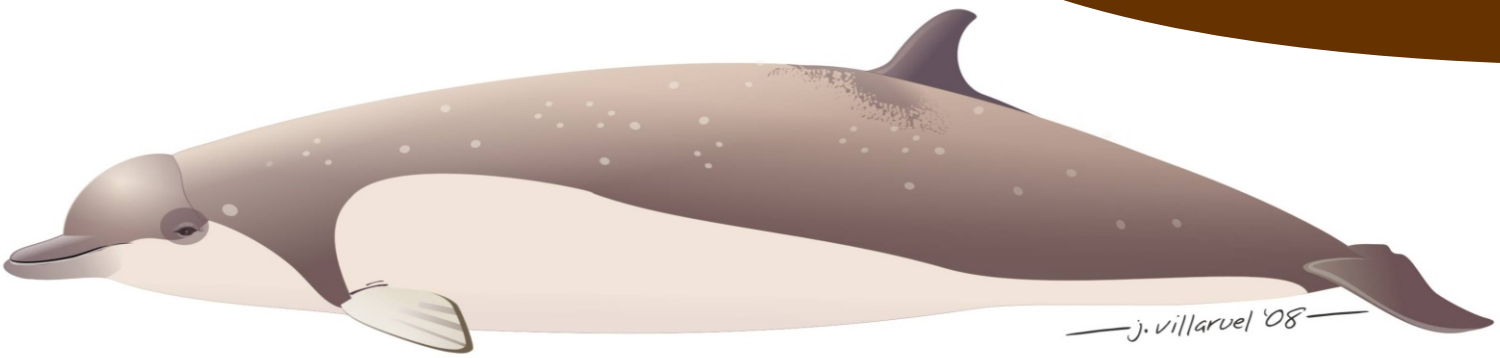


The Cuvier's beaked whale is also referred to as the 'goose-beaked' whale as its head resembles a goose-like profile. This species has a rotund body shape and a considerably shorter beak than other ziphiids. It has a melon that slopes drastically but smoothly onto the short thick beak. Its dorsal fin is small and falcate and positioned about two-thirds of the way down the body. The small, narrow flippers often fit into "flipper pockets", which are slight depressions on the sides of the body that are typical of the mesoplodonts. The body appears as dark gray to reddish brown with countershading. The head may be white or lighter in color in adult males. The size range for adults is 5.0 to 7.0 m long. This species is very rare in Philippine waters.

Rare strander

LONGMAN'S BEAKED WHALE

(Indopacetus pacificus)

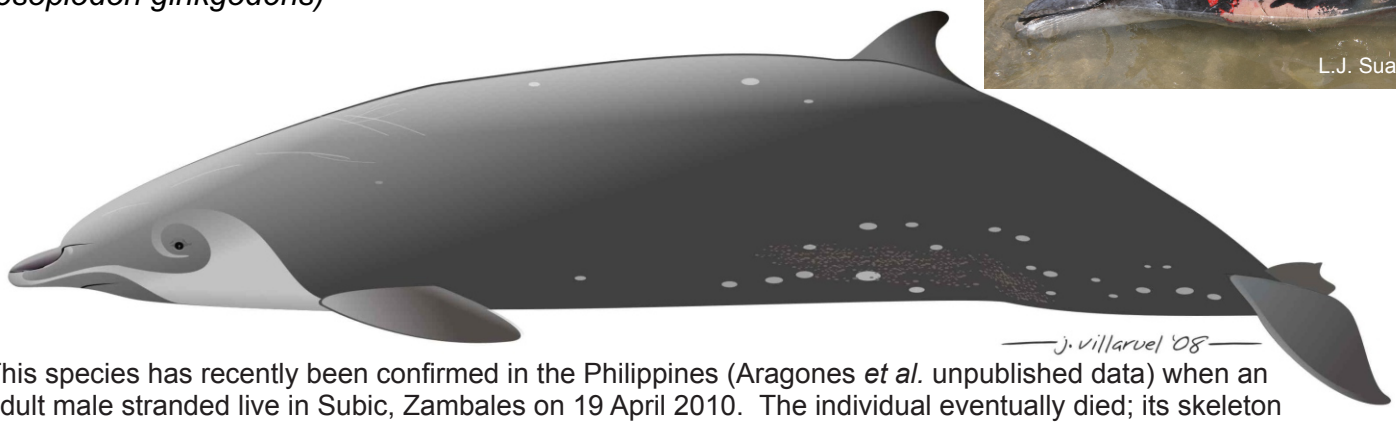


The Longman's beaked whale is one of the rarest cetaceans with no confirmed observations in the wild. Most of the information known about this whale is from the limited specimens from stranded individuals (~ 10 worldwide, so far). In the Philippines, this species was confirmed from an individual that stranded live in Davao (Mindanao) in January 2004 (Acebes et al. 2005) and was the 8th specimen worldwide. The 9th and 10th specimens have been reported in Taiwan (Chou 2007, pers. comm.). They possess two teeth near the tip of the lower jaw and v-shaped throat grooves. This species has a pronounced melon and its dark brown body is mottled with small white spots of various shapes. The size range for adults is estimated to be from 6.0 to 8.0 m long, as actual sizes are based on very few specimens. An almost complete skeletal system from the Davao stranding is displayed in BFAR Regional 11 Office.

Rare strander

GINGKO-TOOTHED BEAKED WHALE

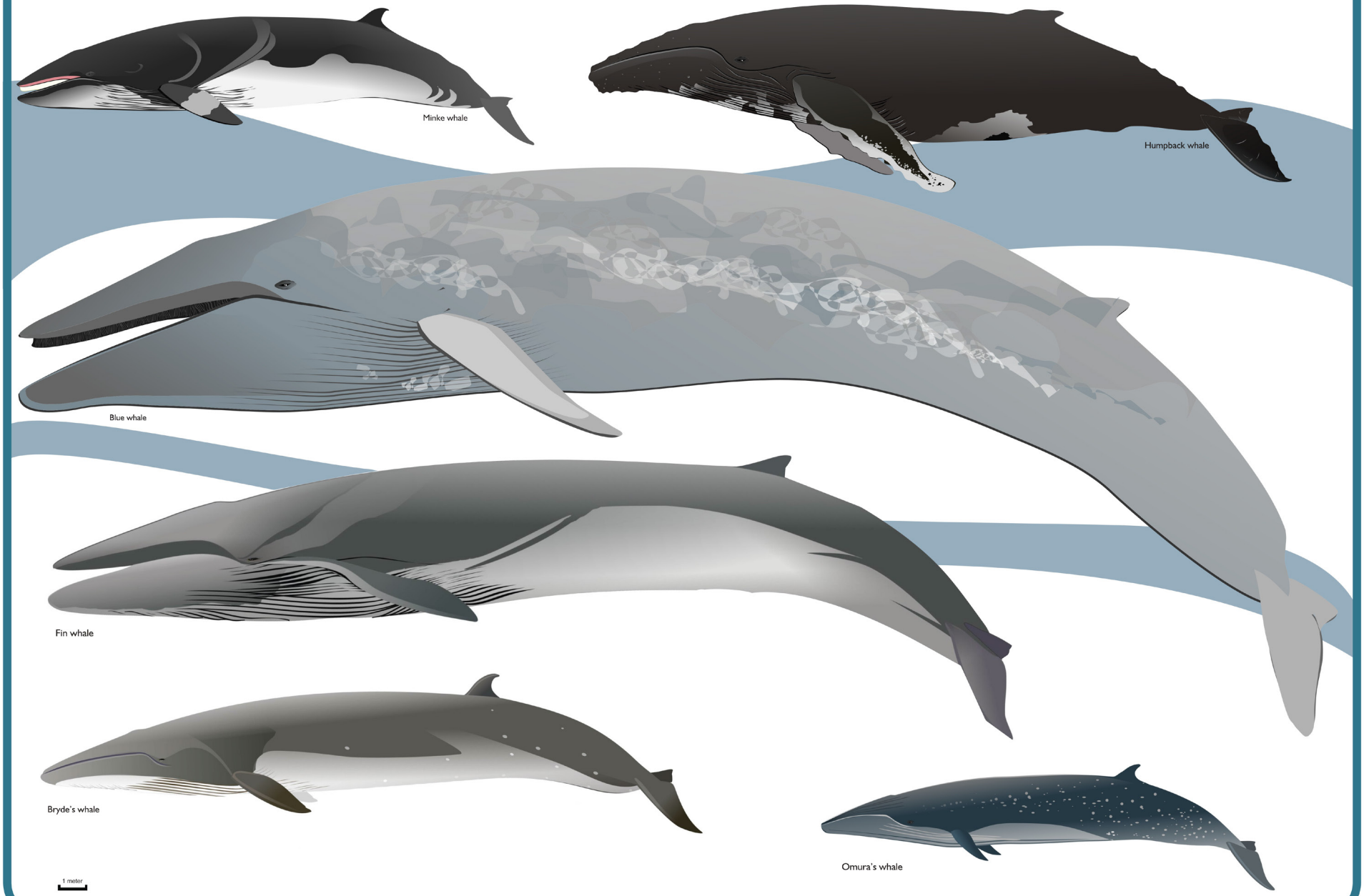
(Mesoplodon ginkgodens)



This species has recently been confirmed in the Philippines (Aragones *et al.* unpublished data) when an adult male stranded live in Subic, Zambales on 19 April 2010. The individual eventually died; its skeleton and skull were collected for proper documentation. Adult males have teeth that resemble the shape of the leaves of the gingko tree. These teeth are mostly covered by the gums and lips and do not protrude beyond the upper jaw area. Adult males also have an upward curve in the rear half of the mouthline. This whale has a robust body with a small and often falcate dorsal fin set about two-thirds on the back of the body. They are colored dark gray with lighter areas on the anterior section of the beak and have many white spots on the ventral section of the caudal peduncle. The size range for adults is from 3.5 to 4.9 m long. The Gingko-toothed beaked whale can easily be confused with the Blainville's beaked whale. Before the recent stranding in Subic Bay, several reports have implicated an unidentified beaked whale in their surveys and cruises.

Rare strander

Family Balaenopteridae



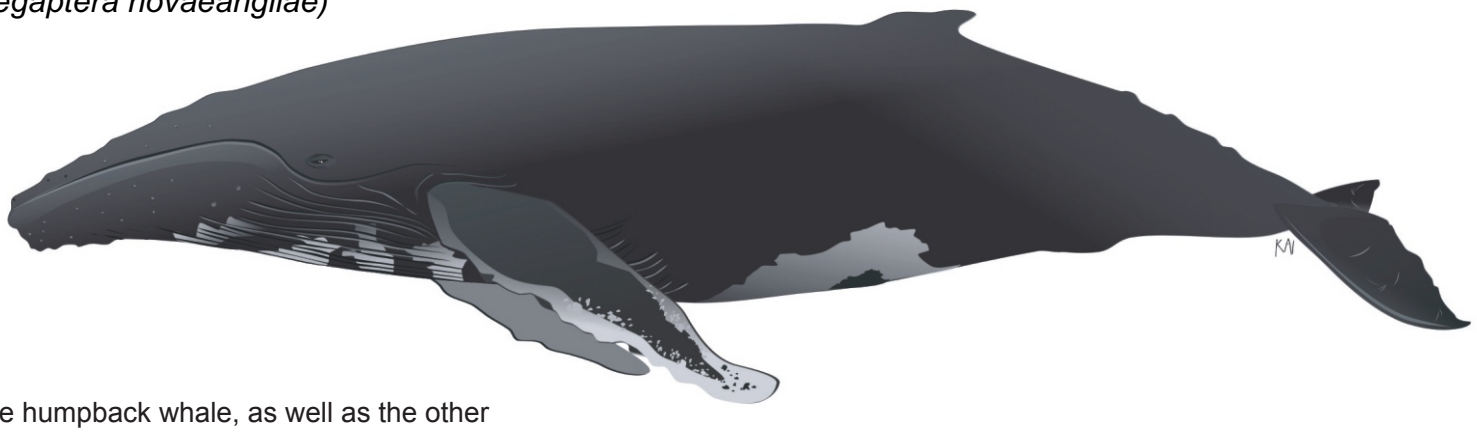
Suborder Mysticeti (Baleen whales)

FAMILY BALAENOPTERIDAE

Rorquals

HUMPBACK WHALE

(Megaptera novaeangliae)



The humpback whale, as well as the other rorquals, belongs to a much larger group called baleen whales. These whales do not have teeth, unlike the odontocetes (toothed whales), but have baleen. Baleen consists of a series of comb-like plates primarily made of keratin suspended from the upper jaws and used for filtering water and trapping food including zooplankton and small fish. Baleen whales possess a pair of blowholes instead of a single one for odontocetes.

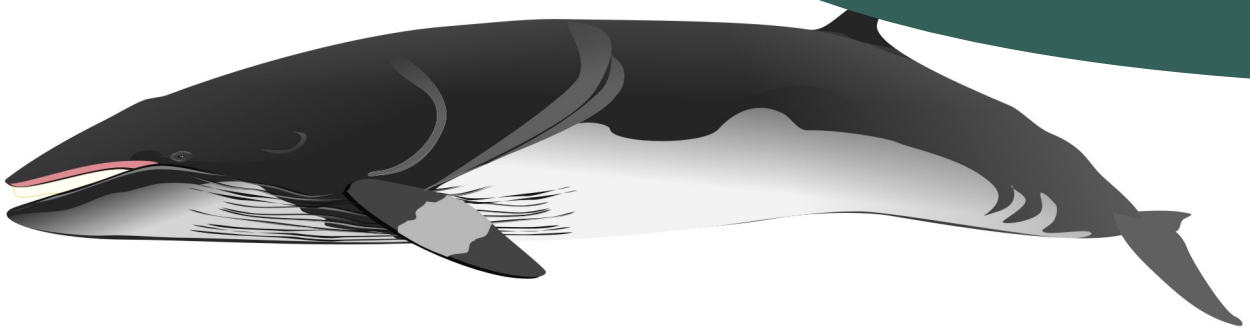
The humpback whale is distinguished by its extremely long flippers (~ one-third body length). Similarly, it has an extremely large robust body and the adult sizes can range from 12 to 17 m long. Another obvious feature used to identify this species is the presence of rounded protuberances, called tubercles, on the head and lower jaw. The baleen plates are primarily black with about 270-400 per side. There are only 14-22 ventral pleats, fewer than other rorquals, that extend from the tip of the lower jaw to the umbilicus. The humpback whales in the Philippines are primarily visitors from Alaska that 'winter' in the waters off Batanes and Babuyan island groups and northern Luzon for breeding and nursery purposes from November to May. A juvenile and a calf stranded live in Claveria, Cagayan Province in June 2006 and May 2007, respectively. A skull specimen from Bohol collected by Dr. Alcala of Silliman University was the first sample used to confirm the existence of this species in Philippine waters (Leatherwood et al. 1993). This may imply that the humpback whales from Alaska, or from another population from the southern hemisphere, may have used the Visayan and Mindanao areas as wintering grounds.

Http://www.moc.noaa.gov/gu/visitor/gu0501/gu0501.htm

Rare strander

MINKE WHALE

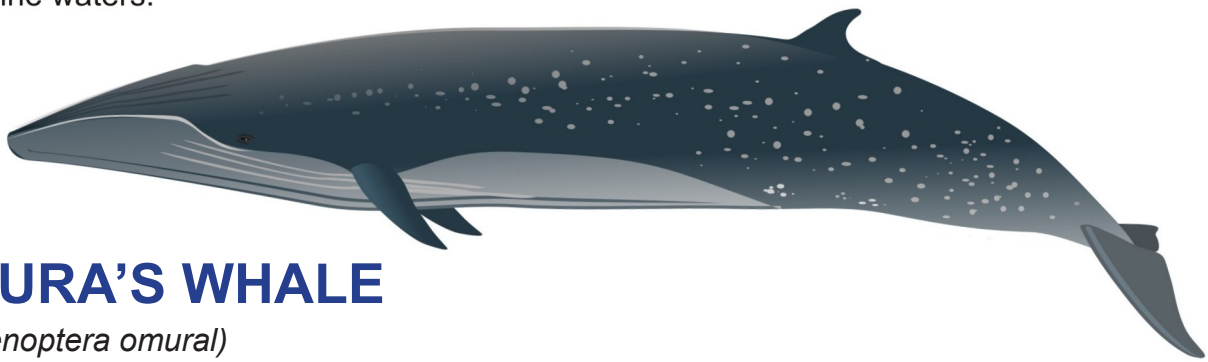
(Balaenoptera acutorostrata)



The minke whale is the smallest of the rorquals with adult sizes ranging from 6.0 to 10.7 m long. It is still unclear which subspecies is found in the Philippines, either the North Pacific minke *(B. acutorostrata scammoni)* and/or the dwarf from *(B. acutorostrata subspecies)*. So the description below is general and applicable to both. The minke whale's most recognizable characteristic is the presence of a white band across its flippers. For the dwarf minke whale, this white band almost fills the entire two-thirds of the flipper (from the base) and extends into a white shoulder patch right above the flipper. Further, its flippers are narrow and have pointed tips. The minke whale is not only small but also very sleek. Its head is sharply pointed and resembles a V-shape when viewed from above. There are about 230 to 360 (200-300 for the dwarf form) short white to cream colored baleen on each side of the mouth. This species has 50 to 70 ventral pleats. The body is primarily black or dark gray above and white ventral section. This species is rare to common in the Philippine waters.

http://www.arkive.org/common-minke-whale/balaenoptera-acutorostrata/image-A20924.html

Never stranded yet



OMURA'S WHALE

(Balaenoptera omural)

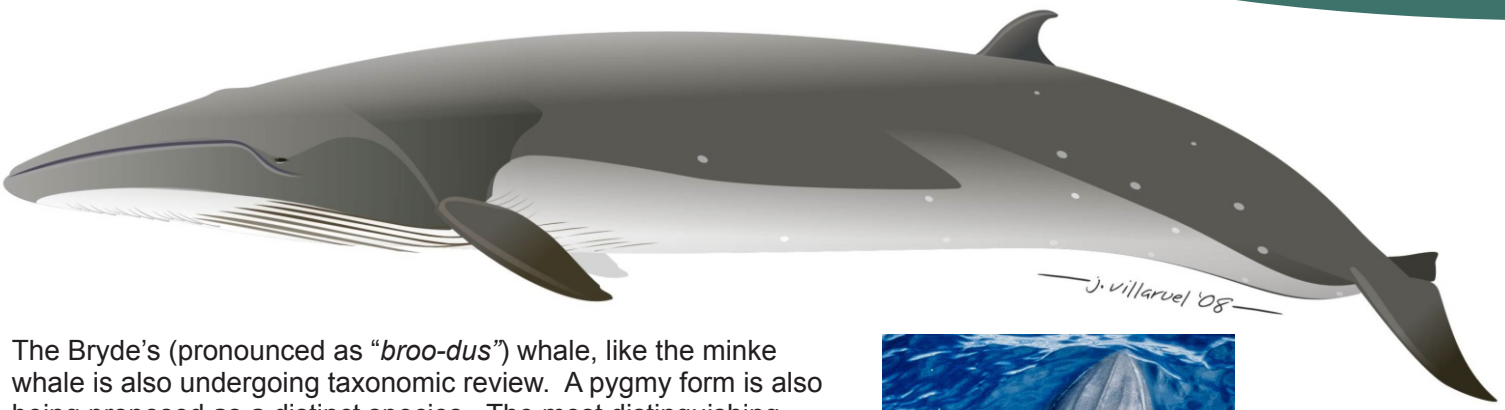
L.J. Suarez

The Omura's whale is a newly discovered baleen whale. Although it is still a taxonomically controversial species as some scientists are not convinced that it is a separate species, while obviously others are. This species was discovered in 2003 by a group of scientists from Japan's National Research Institute of Fisheries Science. The identification of the Japanese scientists was based on the morphological and mitochondrial DNA analyses from nine (9) individuals caught by a Japanese research vessel in the late 1970s in the Indo Pacific region and another specimen collected in 1998 from the Sea of Japan. They described this species as resembling the fin whale in external appearance but much smaller. The genes though were closest to the Bryde's whale. In the Philippines, this species was confirmed by Dr Louella Dolar, formerly of Silliman University, from strandings in the Bohol Sea and Tañon Strait areas. The body length is said to be 11-12 m long.

Rare strander

BRYDE'S WHALE

(Balaenoptera edeni)



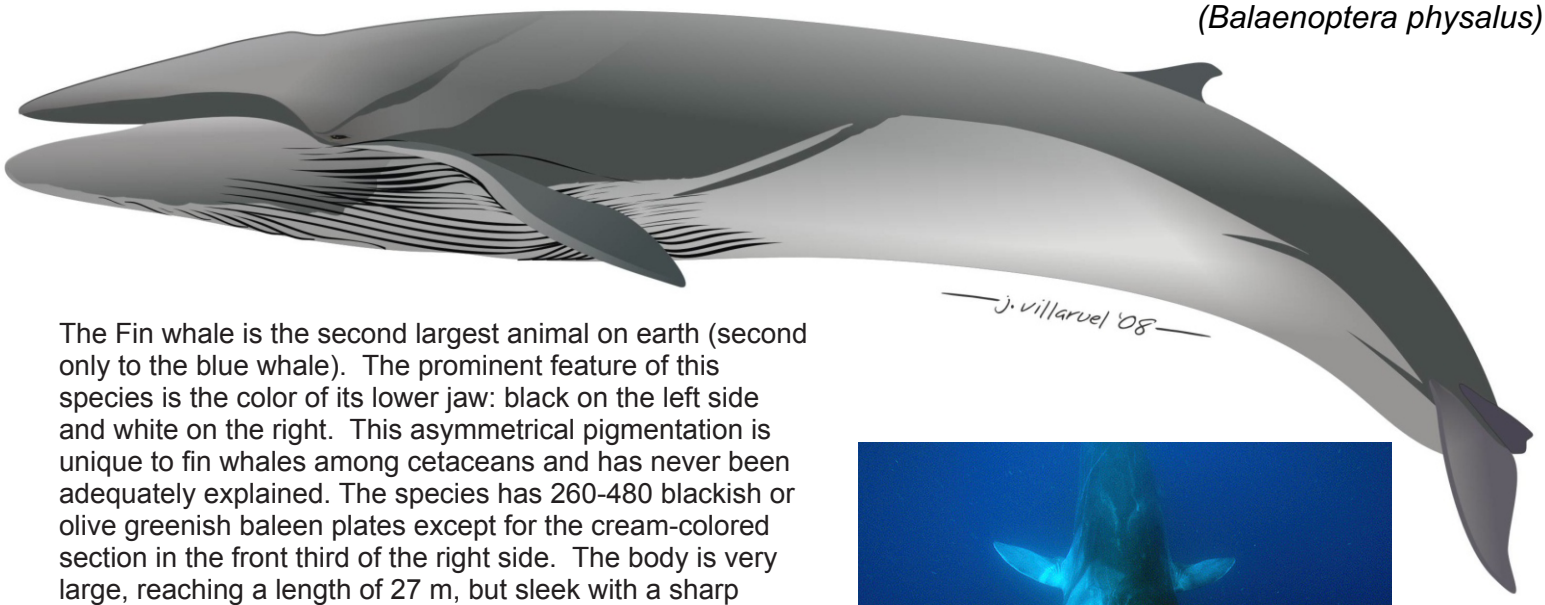
The Bryde's (pronounced as "*broo-dus"*) whale, like the minke whale is also undergoing taxonomic review. A pygmy form is also being proposed as a distinct species. The most distinguishing feature of this species is the presence of three longitudinal rostral ridges, although recent reports have confirmed that these ridges could be indistinct or even absent in some individuals. The body of Bryde's whale is dark gray above and light gray or white (sometimes pinkish) in the ventral section. There are about 250-370 grayish baleen plates. Its dorsal fin is tall and extremely falcate. The adult sizes for this species range from 8.0 m to 15.6 m long. The average length of calves is 4.0 m. The Bryde's whale is rare to common in Philippine waters and can be easily confused with the Omura's whale (see page 26). The Bryde's has stranded mainly in the southern section of Luzon and in the Bicol peninsula.

Rare strander


http://www.marinespecies.org/cetacea/aphia.php?p=image&id=22019

FIN WHALE

(Balaenoptera physalus)



The Fin whale is the second largest animal on earth (second only to the blue whale). The prominent feature of this species is the color of its lower jaw: black on the left side and white on the right. This asymmetrical pigmentation is unique to fin whales among cetaceans and has never been adequately explained. The species has 260-480 blackish or olive greenish baleen plates except for the cream-colored section in the front third of the right side. The body is very large, reaching a length of 27 m, but sleek with a sharp (either pointed or falcate) dorsal fin. This species is known as the 'greyhound of the ocean' as it is presumably one of the fastest baleen whales. This species has been confirmed in southern Philippines (Perrin et al. 2005).

Never stranded yet

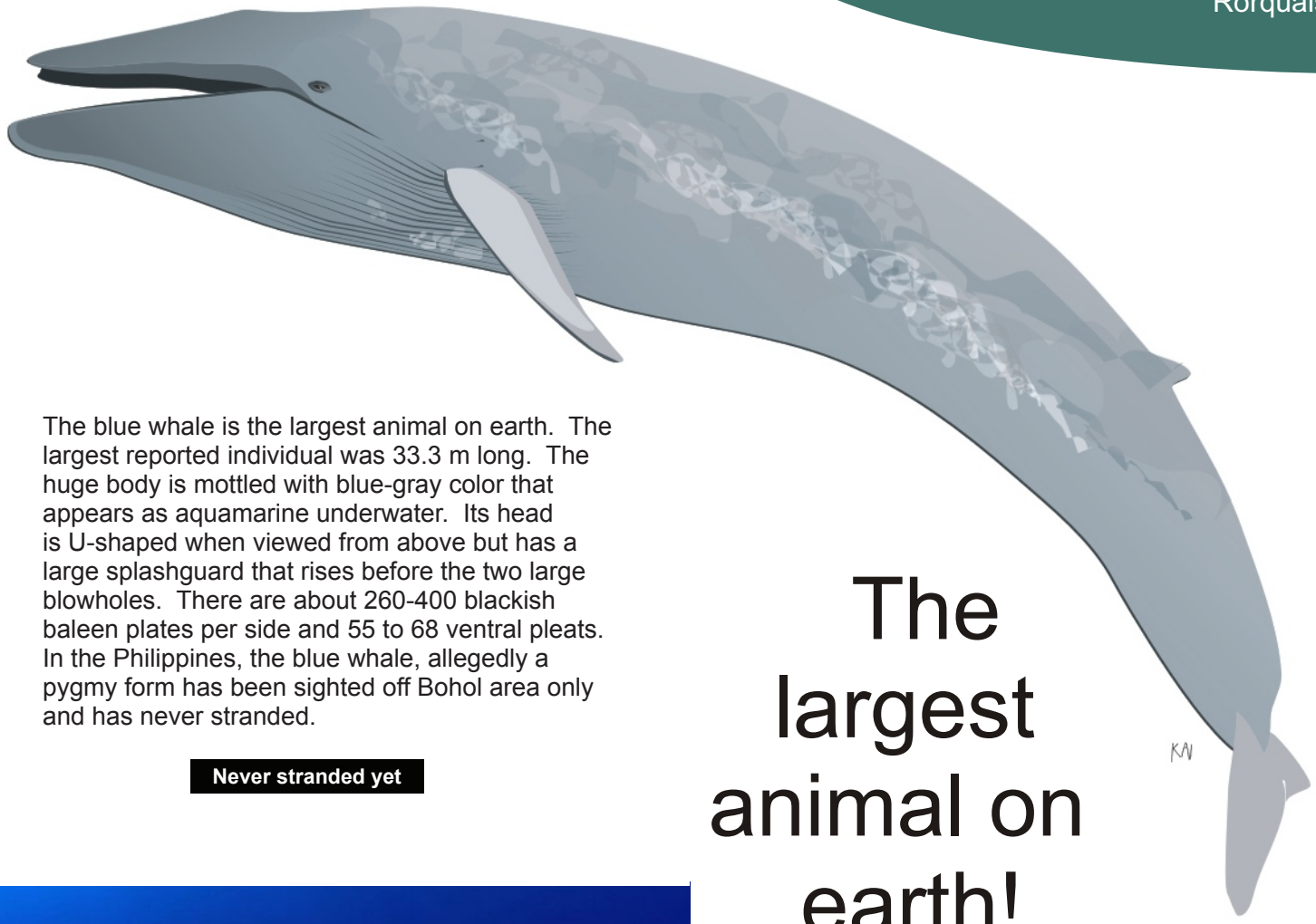

http://www.flickr.com/photos/corkyorca/favorites/page3/?view=lg

BLUE WHALE

(Balaenoptera musculus)

FAMILY BALAENOPTERIDAE

Rorquals



The blue whale is the largest animal on earth. The largest reported individual was 33.3 m long. The huge body is mottled with blue-gray color that appears as aquamarine underwater. Its head is U-shaped when viewed from above but has a large splashguard that rises before the two large blowholes. There are about 260-400 blackish baleen plates per side and 55 to 68 ventral pleats. In the Philippines, the blue whale, allegedly a pygmy form has been sighted off Bohol area only and has never stranded.

Never stranded yet

The largest animal on earth!

http://animalworld.com.ua/news/10-samyh-neobychnyh-jazykov-v-zhivotnom-mire

http://www.nefsc.noaa.gov/faq/fishfaq9.html

DUGONG

(Dugong dugon)

The dugong is the only living species in this Family. The other member, Steller's sea cow *(Hydrodamalis gigas)*, is now extinct, one of the first victims of overexploitation by humans. The species was exterminated by 1768, 27 years after its discovery. The dugong is quite different from cetaceans. It has a large fusiform body, not as robust as in dolphins, with brownish to dark gray skin that is sparsely covered with hair. It has paddle-like flippers and no dorsal fin. The lower part of the body is flattened and ends in a fluked tail similar to dolphins. Dugongs have nostrils that are located on the tip of the muzzle with flaps that close when the animal submerges. The dugong is found in coastal areas feedling on seagrass and is a severely declining population. The coasts of northeastern and eastern Luzon, all of Palawan (including the Cuyo and Calamianes Group of Islands), northern Negros Occidental, northeast and southern Mindanao (including the Sulu archipelago) and Guimaras Strait are home to an unknown number of dugongs. The dugong was the first ever stranding that OA responded to in 2001.

Frequent strander

OTHER MARINE MAMMALS

Unidentfied Phoca seal *(Phoca sp.)*

Photos of 2 unidentified seals were reported in 1998 by BFAR officials in Aparri. That was an El Nino year, so it is possible that some individuals from the populations of harbor seal, *Phoca vitulina* or largha seal, *P. largha* from Japan made their way down to the tip of Luzon. This event is referred to as an extralimital recording, i.e. when a species is recorded outside its normal distribution range.

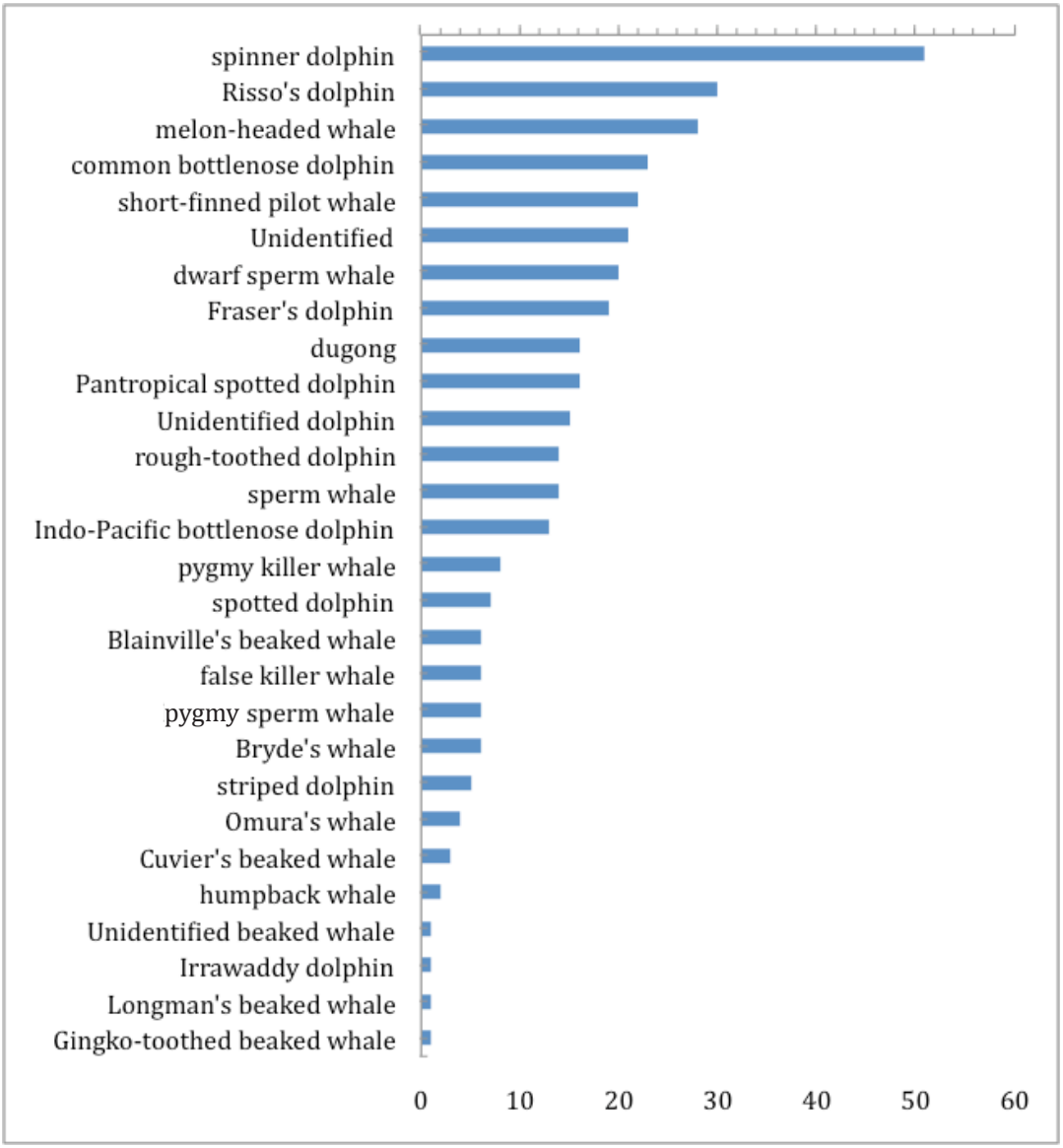
Extralimital record

Asian small-clawed otter *(Amblonyx cinereus)*

The small clawless otter is found primarily in rivers, mangroves and estuaries. This is the smallest of the 13 species of otters. In the Philippines, it has only been recorded in mainland Palawan. This is not exclusively a marine mammal species. It is included here for purposes of identification in the event that an individual gets entangled as a bycatch or is found stranded.

Never stranded yet

Figure 3. Summary of the marine mammal species that have stranded in the Philippines based on PMMS database from 1998 to 2012 (after Aragones et al. 2010).



References

Aragones, L.V., M.A. Roque, M.B. Flores, R.P. Encomienda, G.E. Laule, B.G. Espinos, F.E. Maniago, G. Diaz, E.B Alesna and R.C. Braun. 2010. The Philippine marine mammal strandings from 1998 to 2009: Animals in the Philippines peril? Aquatic Mammals 36(3): 219-233.

Aragones, L.V., M.A. Roque, A.S. Amor, E.O. Keith. [Unpublished data]. Ecology and conservation of small cetaceans in southern Tañon Strait, Philippines.

Aragones, L. V. (2008). Overview of Philippine marine mammals. In L. V. Aragones, & G. E. Laule (Eds), Marine mammal stranding response manual – A guide for the rescue, rehabilitation, and release of stranded cetaceans and dugongs in the Philippines (pp 7-30). A Wildlife in Need (WIN) and Ocean Adventure publication. Subic Bay Freeport.

Berta, A. J.L. Sumich, K.M. Kovacs (eds). 2006. 2nd Ed. Marine mammals: Evolutionary biology. Elsevier Inc. USA. 547 p.

Perrin, W. F., Reeves, R. R., Dolar, M. L., Jefferson, T.A., Marsh, H., Wang, J. Y., & J. Estacion (Eds.). (2005). Report of the Second Workshop on the Biology and Conservation of Small Cetaceans and Dugongs of Southeast Asia. CMS Technical Publication No. 9.

Chapter 3

Understanding Strandings

Bianca G. Espinos

Terminology

A strand is a “beach”. A stranded marine mammal refers to one that has beached or run aground in a helpless situation. Any animal that has lost the capability to return to its normal habitat, such as entangled in a net, is also referred to as stranded. The term “beached” is sometimes used to refer to a stranded animal that is already dead. However, in general, it has been acceptable to use the term “stranded” to refer to a live or dead animal, and that is how the term will be used in this manual. Marine mammal strandings include cetaceans, pinnipeds and sirenians. In the Philippines, a stranding would involve primarily cetaceans, and occasionally a dugong.

A stranding could either be single or mass. A single stranding refers to an individual animal, or a mother/calf pair. A mass stranding refers to a simultaneous stranding of two or more cetaceans other than a mother/calf pair. In the Philippines, the most frequently encountered strandings are

single. Restranding refers to the situation when a stranded live animal returns to shore again despite efforts to return it to the sea.

There are many reasons and factors as to why cetaceans strand. It is likely that the cause of a stranding event is a combination of factors rather than a single reason.

Threats to marine mammals

Marine mammals worldwide face many threats in the wild, both natural and man-made. These threats may be linked to why these animals strand. A natural threat to marine mammals is predation. Certain sharks hunt cetaceans for food, while larger toothed whales such as the killer whale are

known to prey upon smaller cetaceans. Extreme climatic changes also affect marine mammals by altering the behavioral pattern of their food source. The most serious threat to the health of marine mammals in the wild comes from biotoxins. Animals become sick and debilitated from biotoxins and acquire various illnesses and disease as a result. However, the most distressing threats to marine mammals come from human activities.

In the Philippines, Aragones (2001) summarized the threats to marine mammals as direct (but opportunistic) fisheries, incidental catch (indirect fisheries), habitat degradation and pollution. Below are some examples of how human activities, in general, threaten the lives of marine mammals.

Direct fisheries

- Commercial whaling operations still exist in a few countries, including Japan, Iceland and Norway. Japan does whaling under the guise of "research" whaling.
- Humans and many species of cetaceans prey on the same fish. Thus, some fishing communities perceive them as a threat to their catch and intentionally hunt them to control their population and eliminate the so-called "competition".
- In the Philippines, some communities still hunt these animals for food or bait.

Japanese drive fishery; as many as 20,000 dolphins and small whales are killed each year.

Indirect fisheries

- Each year hundreds of thousands of marine mammals get entangled in fishing nets and drown.
- In many parts of the world, drift nets, trawlers and purse seine fishing operations catch significant numbers of non-target animals including marine mammals, sharks, sea turtles and birds, often resulting in the "incidental" mortalities of these animals.

A dolphin accidentally caught in net.

Habitat destruction and/or alteration

- Asia's river dolphins are endangered because of damming activities.
- Excessive boat traffic disturbs normal behavior and can drive away the local population.
- Siltation and agricultural runoff may lead to habitat loss, such as seagrass beds where dugongs feed.

Chemical (and Physical) Pollution

- Industries produce billions of tons of liquid and solid wastes annually. As liquid wastes enter the sea and ocean they alter its natural chemistry, affecting the health of fish and other marine life that cetaceans prey upon.
- Scientists believe that toxins such as organochlorides, heavy metals, nuclear wastes, sewage and petroleum hydrocarbons, to mention a few, can cause a range of disorders. The accumulation of contaminants in tissues of males can impair testosterone production, while preliminary findings suggest that even relatively low levels of PCB's and DDT metabolites can result in a decline in immune system function.
- Oil spills reduce the diversity and abundance of marine animals in the affected area resulting in

die offs of fish and other invertebrates. Oil spills put tremendous pressure on all animals, increasing stress levels and susceptibility to infection. Baleen whales may be unable to filter food efficiently when their baleen becomes matted with oil.
- Marine debris such as plastics are mistaken for natural food items like squid and jelly fish by certain cetaceans and when ingested can occlude the stomach and eventually cause illness and death.

Dead whale due to infamous Exxon Valdez oil spill in 1989.

Noise pollution
- Underwater explosions, such as those in seismic surveys and oil drilling exploration projects, may cause high levels of stress or hearing impairments.
- In the Philippines, dynamite fishing can cause similar problems.
- Low frequency sonar systems, such as those used in naval activities and fishing gears, may disrupt distribution patterns, disorient animals and hide predators and prey.

Other human activities
- Collision with marine vessels causes physical injury, which may lead to death.
- The increasing number of ecotourism activities such as whale watching tours, if unregulated, may put pressure on marine mammals. Without strict implementation of appropriate policies (e.g. cetacean watching protocols), these activities can adversely affect marine mammals by altering their natural migration routes, feeding and mating behaviors, and resting patterns. Excessive boat traffic can be highly stressful and ultimately drive these animals away from important feeding, resting, breeding, and birthing sites.

Possible causes of cetacean strandings

It has been noted in other countries that pelagic species, or those that live offshore, are more likely to strand. (As noted in Chapter 2, and based on PMMSN stranding database information, the top five most frequently observed species to strand in the Philippines include the spinner dolphin *(Stenella longirostris)*, short- finned pilot whale *(Globicephala macrorhynchus)*, melon-headed whale *(Peponecephala electra)*, Risso's dolphin *(Grampus griseus),* and common bottlenose dolphin *(Tursiops truncatus)*.

Below are the most common reasons why cetaceans strand.

1. Illness, malnutrition, natural toxins, parasites, or infectious disease

Cetaceans, like other animals, get sick. When they become stressed or weak they will instinctively search for a safer area where they can rest and conserve energy. This may mean desperately coming into calm, shallow water where they can stay upright with minimal effort and maintain their breathing.

As an example, a melon-headed whale that stranded along the coast of Bataan in 2005 was

diagnosed with aspergillosis, a systemic illness caused by the fungus *Aspergillus sp*. An extreme example of a killer disease occurred in the Mediterranean between 1990 and 1992, where more than 1,000 stranded striped dolphins died from an outbreak of the morbillivirus. In other cases, toxic poisoning of beached dolphins have been linked to natural toxins such domoic acid, a biotoxin that accumulates in fish.

2. Physical injury or escape from predators

An Injury from a predator may be serious enough to compromise the animal to the point that it is no longer able to support itself and consequently must seek calm shallow water to rest. Or in an effort to escape predation, it may simply panic and run into shallow, unfamiliar waters. There is evidence that marine mammals may strand as a result of getting "bends." Bends or decompression sickness is a diver's disease and occurs when a marine mammal, such as a deep diving cetacean is forced to ascend rapidly, such as when it is trying to escape a predator. This rapid ascent does not allow enough time for gases in the blood to dissolve, causing the decompression sickness.

3. Human activities

Sea vessels collide with unsuspecting whales, dolphins and dugongs resulting in major injuries or even instant death. Hunting activities can cause physical injury and/or death from being struck by a harpoon or gunshot. Further, marine mammals may become accidentally entangled in fishing nets (bycatch) or trapped in fishing nets or pens in their efforts to hunt for food. For instance, three spotted dolphins were trapped in a "baklad" (fish corral) along the coast of Samal, Bataan in 2004. Two died and one survived and was rescued and successfully rehabilitated.

As mentioned earlier, plastics thrown in the sea may be mistaken as jellyfish or other edible fish or invertebrates. In May 2004, the necropsy of a stranded Fraser's dolphin in Masinloc, Zambales revealed plastic contents in the stomach which were the likely cause of death. Ear damage caused by loud underwater sounds has been linked to strandings. Post mortem studies of mass stranded animals in the Bahamas and in the Canaries have revealed evidence of hemorrhaging and ear damage (auditory 'trauma') that may have resulted from low frequency active (LFA) sonar produced during naval exercises in the area.

4. Complex topographic conditions and inclement weather

Wide, gently sloping beaches may lead to strandings because sonar pulses (which animals use to navigate) are not reflected accurately. An animal or pod may swim too close to shore, and combined with environmental conditions such as heavy seas or low tides, may become stranded. Funnel-shaped topography, such as estuaries, may also cause confusion and eventual disorientation. These areas are known as "whale traps".

Some researchers have correlated strandings with periods of climatic warming and oceanic current changes that lead to an overall reduction in available food prey or an unpredictable shift in prey distribution. For example, in July 2004, Australian scientists predicted that the shift in the climatic phenomenon called the zonal westerly winds would cause colder, nutrient-rich waters to move closer to shore. In December of that year they suspected that this caused more than 170 whales and dolphins to strand and eventually die on the beaches of Australia and New Zealand.

5. Errors in navigation and judgment

Some animals may follow prey inshore and as a result get disorineted or lost. Long-finned pilot whales that pursue squid into shallow water are known to strand. Young juvenile males of highly pelagic species such as the striped dolphin may get lost or displaced from their bachelor group and seek refuge in shallow water.

A disturbance in the animals' echolocation capabilities can result in disorientation and subsequent stranding. Human activities often play a major role in this disruption. Noise pollution or sonar disturbances have a direct impact on cetaceans because they rely heavily on sound to feed, communicate, navigate and socialize. These harmful sounds can come from seismic surveys, oil exploratory drilling, and underwater explosions from dynamite fishing and high-powered sonar from military activities.

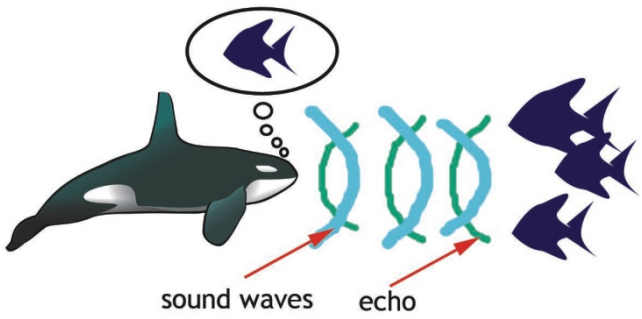
These noises may cause hearing impairments and deafness, which in turn affect the ability of the animal to navigate correctly. Or they simply mask important auditory indicators which cause disorientation.

Scientists believe that certain species of cetaceans use the earth's magnetic field to navigate. There is evidence that at least some cetaceans have particles of magnetite in their brain which responds to the earth's magnetic field. Correlational studies suggest that they can use the earth's magnetic fields to navigate. Geologically, there are alternating bands of magnetic orientation running north to south, parallel to the mid-ocean rift. If whales are able to sense the alternating magnetic fields, they can use them as patterns for a north-south route on their annual north-south migration. Magnetic field dips can also provide information on position along this axis and whales may use this information to guide east-west positioning.

In a study in the UK comparing locations where dead stranded cetaceans were found and live strandings occurred, it was found that all cases of live strandings took place where local lows or valleys in the magnetic fields intersected the coast or islands (Klinowska 1986). A study in the US established similar conclusions (Kirschwink et al 1986 &1990). The study found that certain species (i.e. pilot whales, striped dolphin, Atlantic spotted dolphin, Atlantic white-sided dolphin, sperm whales, pygmy sperm whale, fin whale, common dolphin and harbor seals) were likely to strand at sites where geomagnetic lows intersected the coastline. No information is available to date as to whether this phenomenon occurs in the Philippines.

6. Tight social bonds

We know that marine mammals are very social animals. The bond between mother and calf is strong, even after the nursing years. When the mother falls ill and comes ashore, the calf will follow her, and vice versa. Likewise, certain species appear to have a more tightly knit social



Echolocation is a biological sonar. Animals emit sounds and listen to the echoes as these sound waves bounce back from various objects in the environment. Through these echoes, they are able to locate and identify objects, enabling them to hunt and navigate.

bond than others, such as sperm whales, false killer whales and pilot whales. A lot of the mass strandings around the world have been attributed to this tight social bond. Scientists suggest that whenever a dominant individual strands, the rest of the pod stays with it, stranding themselves in the process.

As an example, in 1977 at the Dry Tortugas, USA, a pod of 30 false killer whales stayed in very shallow water around a large male that appeared to be dying of illness or injury. The whales became agitated when would-be rescuers tried to separate them and persevered to remain together around the large male. The pod only returned to deep water after the individual died 3 days later. To date, no such example has been documented in the Philippines.

Near mass stranding of
Melon-headed whales in Pilar, Bataan

Restranding may also occur as a result of tight social bonds between individuals in a pod. After a successful release of a sub-group of stranded animals where one or a few have been left on the beach for various reasons, the released animals have been known to re-strand on a nearby beach within a few hours or days. For example, on July 30, 2002, US rescuers saved and released back into the ocean 46 of 55 pilot whales which stranded in Cape Cod. The next day, all 46 surviving animals stranded again. Thirty-one were successfully re-floated, only to strand again some 40 kilometers away. In the end, all of the members of the entire group either died or were euthanized.

Summary

In summary, marine mammals around the world face numerous direct and indirect threats, natural and human related. Strandings may occur as a result of a single cause, or a combination of causes. Strandings may also occur because of certain phenomena that we are just recently beginning to identify and understand. Consequently, the more information we are able to gather from each stranding, the better we are able to understand strandings as a whole. Strandings also reveal important information about the health of our oceans and alert us to a global nature to environmental problems and the pressing need for international teamwork to address them.

Chapter 4

Why Respond to a Stranded Cetacean?

Gail E. Laule

Marine mammals have come ashore in various states of illness, injury, and disorientation over the ages, for reasons that are only recently becoming understood. Responding to a live stranded marine mammal with the intention of helping that animal is a conscious choice. The easier, less expensive, less emotionally draining option is to simply walk away. For some people, the more practical option is to kill and eat it. So, why make the choice to intervene and try to help a stranded marine mammal?

Why We Should

Animal welfare of individuals

Helping a stranded marine mammal is an issue of individual animal welfare. It is that individual animal who is in trouble, and it is that animal alone that will benefit from human intervention. Cetaceans are perfectly designed for life in the sea. So when a cetacean has come up on the beach for whatever reason, they are totally helpless. They are in that condition because they have exhausted their resources and their ability to function in their home environment. In these circumstances, human intervention is their best, and perhaps only chance for survival. So the one thing we can say for sure, is that responding to a stranding is about helping the individual animal or animals in need.

Moral and ethical imperative

Sadly, humankind is the most destructive species on the planet. Much of our daily lives, business practices, and recreational activities threaten the very survival of animals and their habitats. Slow moving, gentle dugongs are entangled in nets and caught in fish corrals. Dolphins become ill from eating fish that has accumulated pollutants and other toxic substances from the waste we dump in the water. Whales are struck by boats and severely injured. Oil spills result in shore birds and countless other sea life covered in oil and slowly dying.. As discussed in Chapter 3, we humans play a major role in creating threats to marine mammals in the wild. Therefore, we have a responsibility to mitigate our destructive impact. Helping these animals when they are injured or ill, either from human- inflicted or natural causes, is something we can and should do.

There is a flip side to our destructive behavior, and that is the most wonderful generosity of spirit that we humans are capable of. The average person would not respond to a stranding merely because the animal has some scientific value. If that were the only motivation, the next dolphin to struggle onto a beach would probably be left abandoned. Most often, we are moved by the inherent human desire to help an animal in distress. That is the caring and compassionate part of humanity that is expressed when we rescue and care for a stranded marine mammal.

Community support for a stranded melon-headed whale.

Conservation benefits

Today, scientists view marine mammals as sentinels of the condition of the ocean habitats in which they live. Strandings of marine mammals signal the need to examine what biological and environmental factors may be at play. Thus these animals have become a symbol of the battle to protect the marine ecosystem and its rich biological diversity. Every dolphin caught in a fishing net or lying dead on the beach from ingesting a plastic bag carelessly thrown into the ocean raises the level of uneasiness about the health of our oceans and is a dramatic reminder of the need to take action before it's too late. This is particularly true in recent times, as the

incidence of large-scale die-offs of dolphins, fish, plant life, invertebrates, and other species seems to have accelerated. A concerted effort to help a stranded cetacean can draw attention to the need for basic conservation measures. When a stranding response involves local coastal inhabitants, it gives these residents the opportunity to observe, and even participate in the stranding effort, which is the best public education venue imaginable.

The conservation benefits of rescuing individual members of an endangered species are difficult to quantify. The more endangered the species, the more valuable each individual member is to the gene pool of that species. One could argue that each individual saved is one step towards sustaining and potentially replenishing depleted populations. If multiple animals of an endangered species strand, this rationale becomes more plausible.

Scientific knowledge

Probably the greatest benefit of responding to stranded cetaceans is the scientific knowledge acquired from such an effort. Every stranded cetacean, whether dead or alive, provides a rare opportunity to learn about marine mammal biology, illness, and life history characteristics (e.g. longevity, survivorship). Knowledge gained from marine mammals washed ashore grows in small increments. To produce data that is reliable and useful, it must be collected in a standardized, systematic way, include as many specimens as possible, and extend over time. Such consistency is difficult to achieve and requires formal, written protocols that everyone agrees to adhere to. An organized stranding network provides the ideal opportunity to produce this kind of quality data on a broad range of species over time.

Such efforts worldwide have been rewarded. The existence of some marine mammal species is known only from strandings. The first documented case of an Indo-Pacific bottlenose dolphin in Philippine waters came from a stranding event in Bagac, Bataan in 2003, which was responded to by Ocean Adventure. Similarly, the presence of Gingko-toothed beaked whales *(Mesoplodon ginkgodens)* in the Philippines (Aragones *et al.* unpublished data) was confirmed through the stranding of an adult male in Subic, Zambales in 2010. Globally, data accumulated over the years have provided valuable information on growth rates, age at maturity, gestation period, birth intervals, reproductive season, longevity, and population dynamics of numerous species. We have gained valuable information about diseases that effect marine mammals on an individual basis, as well as large scale mortalities and die offs caused by viruses, bacteria, parasites, and algal toxins that effect entire populations. In some cases, data collected by rescuers has made it possible to detect and determine the cause of unusual marine mammal mortalities. There has also been valuable data produced on the types, amount, baseline

Morphometrics being collected from an Indo-Pacific bottlenose dolphin.

concentrations, geographic sources, and trends in the levels of chemical contaminants, biochemical components, biotoxins, and heavy metals in the water and in marine mammals themselves. Furthermore, a well organized stranding database can help scientists to understand and better interpret these events and their consequences. When expertise and resources have been available, some stranding events have provided the opportunity to use radio tracking to follow the movements and study the behavior and home range of the released individuals.

Finally, those animals brought into captivity for rehabilitation, which for various reasons are deemed unreleasable, may become powerful vehicles for public education, raising awareness of critical conservation issues,. The best way to highlight destructive human behavior is by telling the story of a stranded animal that was once the victim of such actions.

Why We Should Not

There are those that feel the rescue of stranded marine mammals is not practical. Those opposed to such actions would most likely advocate simply leaving the animal on the beach to die a natural death, or in some cases, may support humane euthanasia to alleviate suffering. The reasons for not intervening include the following:

Low survivorship of stranded animals

Unfortunately, the percentage of cetaceans that actually recover from a stranding event is quite low. The fundamental reason is simple. Once a cetacean is no longer capable of maintaining the basic requirements for survival – swimming and buoyancy - and is forced to come onto the shore, that animal is critically ill. So most rescue efforts begin with an animal that is already in the later stages of illness or injury. They may have been fighting the disease for some time and are often emaciated, dehydrated, and weak. These factors lead to a low survival rate of sick animals.

Survivorship of rehabilitated and released animals is difficult to determine unless telemetry equipment is used or the animal is found and reported to re-strand. Some argue that without tracking capability, release of stranded animals should not be attempted.

Rehabilitation is expensive and labor intensive

Rescuing a stranded cetacean can be expensive and is always labor intensive. An entire team of individuals is required to implement an emergency stranding response. Transportation for humans to and from the site, possible handling and transport of the animal, specialized equipment, medical supplies, and logistical support are required. If the animal is brought into a facility

Administering IV fluids to a stranded striped dolphin.

for rehabilitation and long term care, the manpower, medicines, and food expenses accrue on a daily basis. Twenty-four hour care is often required for the first few days or longer until the animal is stabilized and can float and swim unassisted. Unless an appropriate rehabilitation facility is available, this kind of effort is impossible.

In general, the most common marine mammal strandings are of species that are more abundant. For that reason, it is a reasonable argument that rehabilitating an individual animal for eventual release will unlikely benefit or contribute to the wild population in any way.. However, the rescue of an endangered species is another matter where every "saved" individual will have a measurable effect on a very small population. Still, only time may tell whether reintroducing any animal that was "weeded out" in the first place is, in the long term, beneficial to the wild population.

Disease transmission

There has been concern raised over the potential for introduction of diseases to wild populations by releasing a stranded cetacean. This result has been documented in terrestrial reintroductions, but would be extremely difficult to do so in marine mammal species where carcass recovery is rare. So the risk, which would be most significant to endangered species, is possible but unproven. However, if a stranded cetacean is brought into a captive facility for rehabilitation with a resident population of animals, there is a very real risk of disease transmission to those captive animals. There have been tragic incidences in the US of a stranded animal suffering from a highly infectious virus that is transmitted to resident animals, eventually killing them. This tragedy can be avoided by insuring that the stranded animal is properly quarantined, i.e. housed in a separate water system, or at a far enough distance in an open-water system, and strict disinfection policies adhered to. The safest methodology is to have a separate team of individuals to care for the stranded animal who have no contact with resident animals until the cause of the illness is determined.

Valuable data from necropsy

There is a strong argument that scientific information obtained from necropsy may be as valuable, or more so, than that gained from rehabilitating and gathering data on a live animal. Certainly the type and degree of information gained from dissecting a carcass is more detailed as the veterinarian can actually examine the physical body, collect tissue and organ samples, biopsy lesions and tumors, etc. If these samples are collected and stored properly, and sent to experts in histopathology, a tremendous amount of data can be collected on an individual animal.

Conclusion

This manual is based on the choice of intervening and attempting to save a live stranded cetacean. But, there may be controversy and protest from both lay persons and experts, and arguments like those presented here may be aired, which you should be prepared to respond to. Because, in the end, we have a choice and we should make the most informed choice possible.

Chapter 5

Emergency First Response

Gail E. Laule, Wayne F. Phillips, Christopher Torno, Mariel B. Flores, Francis E. Maniago, Richard Encomienda, Mary Anne Roque, and Lemnuel V. Aragones

Emergency Stranding Response

The primary objective of responding to a live stranded marine mammal is to do everything appropriate and possible to save the animal's life. The outcome will always be unsure, but providing high quality care during the stranding response increases the chance of survival and at the very least lessens the suffering of the animal. A response that is immediate and well organized can make the difference. In the course of that effort, it is also the responsibility of the Stranding Team to gather as much objective and reliable data as possible when the animal is alive, and when/if the animal does not survive.

An emergency stranding response includes two basic phases: 1) information gathering and instructions for initial care by the "First Responder", and 2) the arrival and subsequent actions of the Stranding Team.

PHASE 1 - INFORMATION GATHERING AND FIRST RESPONSE

The initial information regarding a stranding will likely come via a telephone call from the discovering party. If these individuals are inexperienced with cetacean strandings, they will be highly dependant on your input and direction. Therefore a "stranding hotline" or contact number for receiving calls and directing actions for a response is important. This hotline will be the most efficient way to contact an appropriate person who can gather details about the stranding event and provide information and guidance for the response. Clear, concise information is imperative because these on-site immediate caregivers, or "First Responders", just like in human emergency situations, can increase the chances of survival of the stranded animal significantly if they act appropriately. Similarly, they can endanger the life of the animal if they do not know the proper procedures and commit very basic mistakes.

The Process

1. Receive the call and gather relevant information. The stranding form (see Appendix A) should be used to gather the necessary information in sections A, B, and C: local contact person and information, stranding site address and description, and occurrence details.
2. Call to confirm the information received. Contact the person to validate the call and the contact number, and to confirm the information just obtained.
3. Relay instructions to the First Responder. After the initial stranding information is gathered, the Stranding Team representative can designate the caller (or local contact person) as "First Responder" and relay the specific steps to take to provide appropriate care for the animal until the Stranding Team arrives. Communications with the First Responder should be maintained as much as possible until the Stranding Team arrives on site.
4. Notify the appropriate authorities and other relevant parties. All species of marine mammals in the Philippines are covered by specific laws (see Chapter 11) which require notification and potential

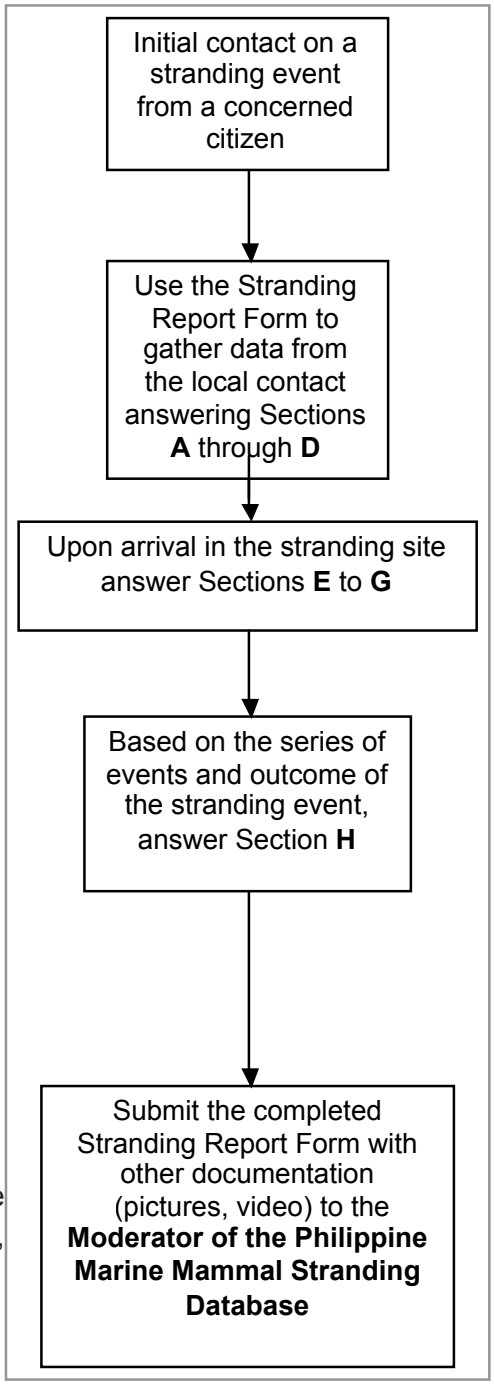
intervention of proper authorities. The agency with overall authority regarding cetaceans and stranding incidents is DA-BFAR. The DENR-PAWB has mandate over dugongs. However, cooperation and support of local community leaders at the Barangay and municipal levels from local LGU's, FARMC'S, and NGO's can ensure a more effective response.

5. Respond! Plan and mobilize. Based on the information obtained from the local contact person on site, the Stranding Team should move as quickly as possible. A protocol should be in place for contacting Team members, gathering necessary supplies and appropriate equipment, organizing transportation, and determining the best access to the site in the timeliest manner. A quick and well organized response is critical.

Stranding Report Form

The information gathered from a stranding only has scientific value if it was carefully and accurately documented. A standardized Stranding Report Form is provided in this manual and insures consistency and ease of recording and filing. All accomplished Stranding Report Forms should be submitted to the Philippine Marine Mammal Stranding Database c/o Dr Lem Aragones of the University of the Philippines – IESM. See contact information and specific details for filling out the form in Appendix A. Whenever possible, video and still images of the animal and stranding site are highly recommended. They are a visual record of the event, and can be sent to other experts for possible assistance and/ or analysis. Images should be taken with a reference scale with known standard size (e.g. ruler, coin) and labeled with the Date, Time, Location, and Animal's Code Number, if applicable.

Reporting Flowchart



THE FIRST RESPONDER

The First Responder is the animals' (and your) best friend. They can care for the animal and protect it until help arrives. If the Stranding Team is more than a couple hours away, this care becomes even more critical. It is very important to brief the First Responder on basic cetacean anatomy to ensure that they cause no harm. Providing first responder care for a stranded cetacean is not a one-person job! It can be difficult and tiring and almost always requires help from others.

Instructions for the First Responder

- **Approach with care!** Before approaching an animal, take time to observe his behavior. Approach slowly, calmly and carefully, avoiding loud noises and abrupt movements. A stranded animal is unlikely to be aggressive, but care should be taken, especially around the mouth and tail regions. A stressed and

frightened animal can accidentally hurt someone by simply pumping his tail or swinging his head while attempting to move away.

- **Supportive care.** The first priority is to prevent further injury to the animal and to keep him comfortable while minimizing handling and disturbance. Have only the necessary number of people required to administer first aid and stabilize the animal. All others should stand back and give the First Responders room to move around the animal. These are wild animals that may be sick or in pain, and most likely frightened. A large crowd of people will increase stress and discomfort.

- **Protect the blowhole.** This is the NUMBER ONE RULE of cetacean stranding first aid. The blowhole is the nose on top of the head. The First Responder should ensure that no water, sand or objects of any kind get into the blowhole, as they will end up in the animals lungs. Do NOT cover the blowhole with towels or sheets as this will obstruct the airway and cause difficulty in breathing and possible suffocation.

- **Protect the eyes.** Just like for us humans, eyes are an important anatomical feature of any animal. Protect them at all times from sand and other debris and from the hands and fingers of volunteers attempting to help. Injuring an animal's eye during handling lessens the chance of eventual release. The eyes also need to be kept moist by carefully flushing regularly with water.

- **Protect the pectoral fins.** Pectoral fins are the flippers on either side of the animal's body. These fins have a shoulder joint and bones that must be protected. If the animal is completely out of the water, or resting on the sand in shallow water, digging holes under the pectoral fins helps relieve pressure on these fins. Breaks, dislocation, sprains, and potential permanent damage to the pectoral fins can compromise the animal's ability to steer through the water.

- **Support the animal in an upright position.** It is much easier to protect the eyes, to keep water and sand out of the blowhole, and to minimize risk to the lungs if the animal is in an upright position. Responders should place themselves on both sides of the animal to gently support and stabilize him in shallow water. If the animal is being supported in an upright position completely out of the water, ensure that the area under the animal is cleared of sharp rocks and shells to prevent damage to the underside of the body.

- **Protect the skin and keep it moist.** Wet sheets or towels can be used to gently cover the animal, placing them just behind the blowhole and leaving the dorsal fin exposed. This material can then be kept moist by periodically dousing or spraying with water. Remember, care should always be taken to ensure that no water goes into the blowhole during this process.

- **Minimize stress.** All stranded animals are experiencing severe stress. It is very important to maintain good crowd control, keep people a safe distance away, and minimize noise and other distractions as these can be major stressors to a compromised animal. Stress is dangerous and can kill an animal that is already sick and likely in shock from the stranding.

- **Protect the animal from the elements.** For the animals' comfort and well being, provide shade from direct sunlight and protection from the wind.

It is always best to get the animal back into the water, then provide as much physical support as necessary to keep the animal stable, upright, and free to breathe. Floating in the water is the easiest and most natural way to keep the animal moist, relieve pressure on the pectoral fins and internal organs and to minimize stress since you are now maintaining the animal in his natural environment.

PHASE 2 - THE STRANDING TEAM RESPONSE

With all the relevant information gathered from the First Responder, the Stranding Team should formulate an initial plan taking into account the size of the animal, reported physical condition, location, and environmental conditions. The Stranding Team then gathers the necessary equipment to execute the plan. The Team members each have different tasks to fulfill, depending on their expertise. The group can be organized with sub-groups such as medical team, handling team, and transport team. Each sub-group must be led by at least one qualified individual with appropriate skill and/or training, and then other team members may consist of volunteers.

Stranding Team Composition

The Stranding Team should be led by a competent decision maker and is comprised of the following team members:

- Individuals who are experienced in marine mammal rescue, transport, and rehabilitation. They are the ones in charge of handling and moving the animal.
- An experienced veterinarian who will be in charge of monitoring the vital signs of the animal and administering clinical and diagnostic procedures. The veterinarian may be called upon to assist the handlers, when necessary.
- Qualified volunteers who have received some training and/or certification.

The Stranding Team should bring all equipment needed to handle and transport the animal and all medical supplies needed for diagnostics and treatment. A complete list of items in a Stranding Response Kit is provided in Appendix D.

ONSITE ASSESSMENT

It can be difficult to get a detailed onsite assessment of the animal based solely on the circumstances of the stranding. The veterinarian is therefore challenged to get as much information as possible in order to make an informed decision on how to proceed.

Determination of a live animal

The first question to answer is whether the animal is alive or dead. This seems like an obvious determination, but it can require more careful observation than one would think. For instance, respirations

should be checked by watching the opening and closing of the blowhole. However, cetaceans do not breathe in and out continuously like terrestrial mammals, they hold their breath. Large whales may hold their breath for a long time, several minutes. So, while waiting the veterinarian may check the corneal reflex as well.

A stranded animal on the beach in a surf line may appear to be moving, and thus look alive, particularly to First Responders unfamiliar with marine mammals. However, movement like this is deceiving if the animal is being moved by waves rather than by its own power. So direct observation and physical inspection by the Stranding Team is always required.

Physical examination

An onsite physical examination is necessary, and can be challenging due to a variety of factors. Smaller animals will be easier to examine simply because they are easier to handle and restrain when conducting the examination. An animal that is still partially in the water is easier to turn onto its side to examine the underside, listen to heart and lungs, etc. An animal completely out of the water, unless very small, will be more difficult to manipulate. With a large whale that cannot be physically manipulated at all, the physical examination will be limited to those body parts that are exposed.

An emaciated pygmy killer whale with a "peanut" shaped neck.

Cookie-cutter shark bite

An important evaluation of health status of a stranded animal is to determine the state of nutrition by checking the profile of muscle mass below the dorsal fin. Emaciated animals have a visible 'dipping' of the muscle masses or a sunken look. The animal may also appear to have a visible 'neck'. This is described by some as the animal having the profile of a peanut – head rounder and neck thinner and then body angling out again. The greatest difficulty in determining a state of emaciation is if the animal is completely out of the water. A more careful examination is required to determine the true configuration of the muscle mass profile, as the weight of the body resting on the ground may 'lift' the muscles around the dorsal fin.

Any visible trauma like cuts, abrasions, bites, and lacerations should be noted and carefully examined to determine if they are from human causes like being hit by moving boats or injured with propellers. Any signs of entanglement with ropes or nets should be noted. This is all important information and should be recorded in the stranding form. Compiling data on human-related causes of stranded marine mammals from the national database can be of value in broader discussions of human impact on marine mammals. One common injury found on cetaceans is round wounds (about half an inch deep and about 2-3 inches

in diameter) caused by cookie-cutter sharks. Injuries like these must be carefully examined because they are oftentimes mistaken for gunshot wounds.

Superficial bleeding may be related to the stranding condition where an animal has been moved around by the surf, or is struggling to stay buoyant in shallow water and rubs against rocks, barnacles, or oyster beds. Internal bleeding will most likely be evidenced by blood coming from the mouth, blowhole, anus, or in the urine.

General behavior should be noted, and abnormal behavior such as twitching, muscle tremors, pronounced and sustained lateral or ventral flexion of the body, listing to one side, and lack of responsiveness or movement should be recorded in detail.

Breathing

To monitor breathing, one watches the blowhole of the animal. The breathing rate is taken by counting the number of breaths that occur at regular intervals. The best method is to count the number of breaths, or inhalations, per minute. A single breath occurs as follows: 1) the blowhole opens, 2) an exhalation occurs, 3) an inhalation, immediately follows, and 4) the blowhole closes. In small cetaceans, 2-5 breaths/minute is normal while it is about 1 breath/minute in medium to large cetaceans.

It is also important to listen to the quality and sound of the breaths. Normally, the breaths should be clear, strong and quick. Listen closely for any raspy or gurgling sounds that indicate congestion. Observe the length of time between exhale and inhale - they normally occur one right after the other. Any delay should be noted. Also note if the inhalation is a series of short breaths (which is abnormal) instead of a single strong inhalation, which is a normal breath. Check for discharge from the blowhole upon exhalation and smell the animals' breathe for any strong odor (but do not stick your nose directly over the blowhole please!). Auscultation (listening to the heart and lungs with a stethoscope) should be done, if possible.

Skin condition and hydration

Evaluate the skin condition of the animal. Normally, it should be wet and smooth like rubber. If the animal has been out of the water for sometime and the skin has been exposed to the air, wind, and heat of the sun, it may begin to look dry and wrinkled. With extended exposure it may begin to peel. It is therefore important to keep the skin wet and protected from the elements. It is also important to look closely at any sun burn patterns. For example, if the animal has sun burned skin only on the right side, this indicates the animal was floating right side up, which may be indicative of problems associated with the right lung.

Push down on the skin with fingers or hand to roughly check the animal's current state of hydration. The skin of a well hydrated animal is firm to the touch, while those with possible dehydration are "squishy". A more objective way of determining the state of hydration is through a blood profile. This takes time as a blood sample must be drawn and analyzed for the results, but it will give you precise information as to the degree the animal is dehydrated. Animals that are emaciated, have not been eating normally for some time, and/or are suffering from illness are likely to be dehydrated. Those that have stranded for other reasons (i.e. followed prey to shore, got 'lost', etc.) or have recent injuries that are not life threatening are usually well hydrated.

Body Temperature

Measuring body temperature is done with a probe and should only be implemented by a qualified veterinarian. The normal temperature range can be from 36.5˚- 38˚C. A temperature over 40˚ is considered critical. A note of caution, however, as an elevated temperature of a struggling animal may not reflect infection or inflammation but just body heat from exertion. So, body temperature of a stranded marine mammal must be carefully evaluated in relation to other factors, and is often not useful.

Age estimation

Age estimation can be useful information in the case management of a stranded animal. Unfortunately, it is difficult to determine the exact age of a stranded animal unless it is obviously a stillborn or neonate. Cetaceans and dugongs are generally classified as calf, subadult or adult. Very young calves, or neonates, can be fairly easily determined by size, clean unscratched skin, and the lack of teeth. The fleshy umbilicus may be present as well. If a young calf strands, there is always a small possibility that the mother may still be offshore, so ask the First Responders and recruit community members to look for sightings of another animal in the area likely to be the mother. Neonates require very specialized around the clock care and will need to be fed a specially designed formula instead of whole fish.

As much morphometric information as possible should be collected. This includes length and width or girth (see Chapter 10, Figures 1 and 2 for diagrams of locations to take measurements on cetaceans and dugong). The size and shape of all fins (dorsal, pectoral, and tail fluke) and location of blowhole are also helpful to note. Check the teeth, if possible, for overall condition and amount of wear (minimal to maximum wear). With morphometrics and this other information, as well as an identification of the species of the stranded animal, it is possible to estimate age classification of the animal.

Diagnostic sampling

If at all possible, diagnostic sampling should be done at the stranding site. This provides much more detailed information on the health status of the animal which is important in deciding whether to release, rehabilitate, or euthanize the animal. Complete diagnostics will be necessary to develop a medical management plan if rehabilitation is pursued.

Blood is the most important biological sample that a medical practitioner uses to assess, diagnose, and medically manage the animal. When there is an opportunity to collect more samples, blowhole and fecal samples are next in importance. Test results from these samples can provide information on more specific illnesses like respiratory infections, diarrhea, and gastrointestinal parasitism. See Chapter 6 Medical Management of Stranded Marine Mammals for a complete description of these procedures.

DECISION MAKING – CHOOSING THE APPROPRIATE OPTION

When to Intervene

Not every animal on the beach needs help. A cetacean may play in the surf near shore, spend time in shallow water, or on rare occasions even come briefly onto the sand, and not be in imminent danger. Recognizing normal behavior will avoid any unnecessary action. In time, every would-be rescuer faces an animal in circumstances that are ambiguous. What should be done for a lone young dolphin swimming

in shallow water, or an apparently healthy whale too far upriver to find its way to the ocean? Deciding what action to take in these situations requires an understanding of the specie's natural history, an educated assessment or guess as to the reasons for the presenting behavior, an awareness of what typically happens when no action is taken, and judgment that comes only with experience (and mistakes).

What are the options?

1. Immediate release or refloatation - return the animal to sea
2. Rehabilitation - transport and provide treatment for the animal at an appropriate rehabilitation facility
3. Euthanasia - the animal is suffering and no appropriate help is available and the likelihood of recovery is remote

Decision making is easy when the animal is showing normal swimming and buoyancy and simply needs assistance in returning to deeper water. Most situations, however, are more complex, and managing them requires assessing many factors, and predicting the likelihood of success. The decision making begins with the broadest question common to all situations—is there enough help available? Other essential questions include:

- Are environmental conditions moderate enough to make rescue possible?
- Is the animal's size manageable?
- Is the animal's condition stable enough to handle and/or transport?
- Is a suitable rehabilitation facility available?

From these, a series of criteria will guide the approach of what the Stranding Team chooses. As the options are weighed, the most important issue is to take no action that will only prolong suffering.

Criteria For Making Decisions

Logistic support

Almost anything is possible with adequate resources; little can be done without them. An experienced, organized, and well-equipped Response Team is ideal. If volunteers with little or no training are being used, choices are limited. Good planning and the required level of support and expertise are critical to guarantee the success of the operation. Attempting too much with limited support can cause needless risks to both the rescuers and animals. For instance, dragging a pilot whale across a rocky beach without a proper stretcher or transport equipment is harmful to the animal and dangerous to people.

Numbers of animals

A small animal on an accessible beach presents many options, whereas a large whale or mass stranding requires much more resources, manpower, and logistical support. Attempting to give equal attention to more animals than resources permit assures inadequate care for everyone. For example, the action plan for a tight knit group of stranded pilot whales must take into account their social needs as well as physical health. A lone young survivor is unlikely to survive if it is released in an area with no other pilot whales. In that case, the animal's best chance of survival may be in a permanent care facility.

Environmental conditions

The action plan must take into account the time of day, beach topography, sea state and weather conditions. The terrain may be too rocky, muddy, or littered with sharp debris to move animals safely or use vehicles. Remote locations are naturally more difficult to manage. Harsh terrain, rough seas, darkness, or simply a rising tide can increase the risk to animals and the team, and impede the rescue effort.

Severe weather may limit the team's options to simply observing the animal and offering as much support and protection as possible. A stranded cetacean should be moved to a safer site if possible, and never released into dangerous heavy surf.

Pygmy sperm whale rescue in rough conditions.

Cetaceans are prone to hyperthermia or over-heating. Those with dark skin are even more vulnerable, as their dark colors absorb heat, and the blubber contains it. Cetaceans' adaptations for cooling are not efficient on land and fail completely when the animal is in shock. For many reasons, the larger the animal, the greater the problem of maintaining appropriate body temperature. Extended exposure to the sun and hot winds can cause dehydration, severe sunburn, and skin damage. A cetacean on a hot beach requires immediate attention. Wind-blown sand is irritating to the eyes and mouth, and can be blown with enough force to injure animals and their rescuers.

Animal condition

A healthy animal can survive a fair amount of handling and stress. A sick or injured animal is already extremely compromised and may not have the strength to survive a complicated or prolonged rescue attempt. However, it is very difficult to determine just how much an animal can tolerate from his physical appearance. In fact it may be difficult to determine from a distance whether a whale is even alive, much less his state of health. Unfortunately, marine mammals show little in the way of expressions or postures that would indicate pain or discomfort. Their body is formed largely by blubber, which retains its basic shape even when the animal has lost a moderate amount of weight. In cold environments, a decrease in blubber eventually leads to hypothermia, so a dolphin in these climates is likely to die before becoming emaciated. But in the tropics, hypothermia is not a concern, so they may live longer in poor health, and become very thin in the process. For the most part, the true health of an animal can be determined only after rigorous clinical examination.

Generally, it can be assumed that single stranded cetaceans that are displaying abnormal swimming patterns and difficulty with buoyancy, or are on the beach, are ill. Because of their inability to swim normally, they have become separated from their social group, which is vital to their survival.

Larger, older animals generally decline in health more rapidly than smaller more robust animals. Large size is detrimental to beached cetaceans because of the damaging effects of the pressure their large body mass puts on their lungs and other organs. Prompt action can slow, but not entirely stop the deterioration of an animal's health on the beach. It has been reported that pilot whales released within

24 hours of coming ashore have re-stranded days later, still showing evidence of stress and shock caused by the first event. Unfortunately, sufficient information to predict this outcome could not have been determined by a simple physical examination of the whales when they were pushed out. Blood chemistry might have been more revealing, but the analyses take time. Before returning any animal to sea, consider that the process of recovery may take longer than environmental conditions will allow.

Ease of handling

The ability to approach, handle and move an animal depends on its size, physical strength, and attitude. Some dolphins are small enough to be carried in a person's arms while some whales are simply impossible to move without heavy equipment and huge risk. Sadly, little can be done for a large whale stranded high up on the beach, unless an incoming tide can refloat it sufficiently. When deciding to handle, move, or transport a stranded cetacean, always consider first the interest of the animal and the safety of the people.

Release of a rehabilitated Fraser's dolphin.

Decision Making - Options

(See Decision-Making Flowchart in Appendix E)

1. Immediate release or refloatation

The decision to immediately return a stranded cetacean back to the sea is based on a very careful assessment of the animal while on the beach, to avoid refloatation of animals that will simply re-strand or disappear and die. A rapid response is also essential to minimize the time the animal remains out of the water and thus the possible deterioration in the animal's condition from the stranding event itself. This includes the onset of shock and muscle damage, which are often difficult to identify. Recognizing that the animal will deteriorate with time is essential for an effective, realistic response, particularly when animals re-strand. Release should take place either from the area of origin or, if conditions are unsuitable, from an area nearby after a limited period of controlled transport. Possible candidates include weaned juveniles or adults, usually of pelagic species, in good or moderate-to-good body condition, with no evidence of significant clinical disease or trauma. Refloatation of large cetaceans, though complicated by size and weight, is possible.

Return to the sea is an option when:

- Animal appears to be in good body condition (robust, no life threatening wounds)
- Animal is able to swim normally and maintain proper buoyancy on his own
- Animal appears to have stranded solely due to a navigational error
- Animal has been intentionally or accidentally collected by fishermen
- Animal's size is manageable and logistic support is adequate
- Beach and environmental conditions are favorable
- Social requirements can be met (maternal care, group members present)
- Age appropriate for survival (not too young or too old)
- Animal is too big to transport or rehabilitate and best chance of survival (even if less than ideal) is back in the ocean
- Area of release is within normal range, suitable, and navigable
- Danger from human intervention is minimal (heavy fishing activity, nets, traps in area)

Whether or not to release a large whale or individuals of a mass-stranding of smaller cetaceans will be determined almost entirely by the available logistical support. When dealing with a stranding of multiple animals, attention should be given first to younger animals, those in apparent good health, and those on the beach for the shortest time. Before returning animals to sea, a plan should be in place for visual monitoring and for reporting restranding of these animals.

After an animal has been evaluated and has met the criteria for immediate release, some guidelines must be observed.

- Consider the weather and sea condition. Unfavorable conditions may pose a threat to a successful release and increase safety issues for both the animal and the release team. Do not attempt the procedure if these conditions are not acceptable.
- If conditions are acceptable, a couple members of the Stranding Team should carefully approach the animal from the side. Gently maneuver the animal to face the open sea by guiding it with the dorsal fin and pectoral fins. Avoid handling the tail as he will be swinging and pumping his tail to maintain balance and gain forward motion. Slowly push the animal into deeper water providing as little force as possible. Give him time to gain control of his balance. Allow him to swim into deeper water with less and less assistance, until he is moving completely on his own.
- Observe the animal for as long as possible after release.
- Inform nearby coastal communities about the release activity to achieve a greater monitoring and response if needed. Provide contact information in the event the animal is spotted or restrands.
- If the animal restrands immediately, or any time in the future, it becomes a subject of the next 2 options.

2. Rehabilitation

Portable Sofpool for rehabilitation of small cetaceans

In many circumstances, stranded cetaceans may benefit from a period of assessment and treatment in captivity. Possible candidates include weaned juveniles or adults in poor body condition, or with evidence of significant disease or trauma. Survival rates, unfortunately, are poor for these animals because once they strand they are critically ill and have often lost the ability to function in their natural conditions. Therefore, rehabilitation should only be considered if there are suitable facilities and experienced staff within a 3 to 4 hour transport from the stranding site. Holding stranded cetaceans in inadequate facilities, or transporting severely compromised animals that are unlikely to survive are not humane choices. Transport of even relatively healthy stranded cetaceans is stressful so approriate equipment and methods must be used. These are discussed later in this chapter in the Handling and Transport section.

Rehabilitation is an option when:

- Thorough examination of the animal indicates that he may have a reasonable chance of recovery. To a great extent this is a subjective decision, and one best made by a qualified veterinarian.
- Appropriate rehabilitation facilities are available and properly equipped
- Safe and short transport (3-4 hours or less) is possible
- Animal is of a manageable size and appropriate disposition
- Financial and staff resources are available to provide care for a sustained period of time

- Appropriate permanent housing and care is available if animal is deemed unreleasable

Note: *Long-term care facilities for cetaceans in the Philippines are rare. At the present, Ocean Adventure is the only fully equipped marine mammal facility capable of providing long term care for whales and dolphins up to the size of a pilot whale or false killer whale. Therefore, rehabilitation of a stranded cetacean as an option is only feasible if the stranding team can create a short term situation suitable for supportive care until the animal can be transported to a long term situation. One of the primary objectives in developing a national stranding network is to develop regional stranding facilities for rehabilitation and long term care of cetaceans.*

Once an animal has entered rehabilitation, if the effort is successful, there will come a time when the decision must be made as to whether to release the animal, or keep him in a permanent human care situation.

Release after rehabilitation is an option when:
- All criteria of release (Option 1) are met
- No identifiable risk of disease transmission to wild populations is present
- Cause of illness that led to stranding does not have a known genetic basis
- Female candidate is not in estrus
- Appropriate social needs of the animal can be met once released (i.e. other members of the species are confirmed to be in the area)

3. Euthanasia as an option

Euthanasia for marine mammals is a contentious and emotional issue. It is currently allowed only in exceptional cases in the Philippines. According to the Philippine Wildlife Conservation and Protection Act or RA 9147 (see Chapter 11) euthanasia is allowed if a marine mammal is inflicted with an incurable disease or when it is deemed necessary to put an end to his misery. Only an experienced veterinarian should make this decision. It is recommended that the Stranding Team inform an official from BFAR (for cetaceans) or DENR (for dugong) of the decision to euthanize an animal before conducting the procedure.

The Animal Welfare Act in the US defines euthanasia as the humane destruction of an animal, using a method that produces near instantaneous unconsciousness and rapid death without evident pain or distress, or using anesthesia to produce painless loss of consciousness. Candidates for euthanasia include individuals of any species and of any age that are suffering from severe disease or trauma which is unlikely to respond to rehabilitation efforts. In some cases, dependent calves that have been separated from their mothers may be considered candidates for euthanasia. However, before considering euthanizing a calf, every effort must be made to determine if the mother is still in the vicinity of the stranding, as there has been at least one report of a stranded calf and its mother being reunited. If the mother cannot be found, rehabilitation efforts would require that the calf be bottle-raised. This has been done in many captive situations, but it is extremely time, labor, and resource intensive. And ultimately the animal must be provided a situation where he will have social contact with other cetaceans, as a hand-raised animal will never be a candidate for release.

In the absence of suitable rehabilitation facilities, euthanasia also should be the option for animals with any disease, trauma or condition that is likely to compromise their ability to survive after release.

Euthanasia is an option when:

- Animal is suffering and condition is irreversible
- No appropriate rehabilitation facility is available
- No resources available for care of neonate or nutritionally dependent young
- The distressed stranded cetacean is attracting others and creating the risk of a mass stranding
- Release has been attempted and animal repeatedly restrands
- Qualified person with appropriate experience is present to make the decision and perform the procedure
- Necessary and appropriate drugs and/or equipment are available
- Procedure can be carried out humanely

Intravenously administered anesthetic agents and euthanasia preparations have been used successfully and humanely in small cetaceans. When properly done, a lethal injection administered to dolphins has a quiet and rapid outcome. The same procedure in a small whale may result in a brief period of unconsciousness (anesthesia), accompanied by tail-lobbing or thrashing. There is no preferred method for euthanizing large whales, with lancing and shooting being the most likely scenarios. When shooting the animal, a large caliber rifle is recommended. Most importantly, whatever method is chosen it must be done by an attending veterinarian with the expertise to do so humanely and without causing more suffering than a natural death.

Euthanasia as an option is difficult to deal with at a stranding site, especially if there are community members present. Many would argue that if the animal is to be destroyed, it should be given to the community for food. Others simply do not want to see an animal die at the hands of humans who are supposed to be there to save it. Sometimes team members may be unwilling or unprepared to accept this action after having struggled earlier to save the animal's life. In the end, euthanasia is a method to end pain and suffering humanely when no other options exist. If it is simply impossible to carry out, then the only alternative is to make the animal as comfortable as possible and allow it to die unassisted.

Handling and Transport

Why move a stranded animal?

The ability to move an animal in a stranding situation depends on the size of the animal, environmental conditions, and number of individuals available to lift and carry. Small cetaceans can be placed in a stretcher and carried by several people, while large cetaceans require a lot more resources. Just getting a large animal in a stretcher can be difficult. In some cases large pieces of machinery may be required just to relocate an animal from the beach into the water.

When the physical moving of an animal is required for release, small cetaceans can be carried relatively easily in boats. Larger species, however, are a challenge. Special re-floatation devices are being used in the UK and have improved the rate of success with large whales.

It may be necessary to move a stranded animal for any of the following reasons:

- Conditions are too poor for a release attempt at the stranding site so the animal must be moved to a more favorable location.

- Poor weather conditions require the relocation of an animal to a temporary holding site to provide medical care or until conditions improve for a release attempt.
- The stranded animal is completely out of the water so moving him into the water is desirable to stabilize and care for him or for a release attempt.
- A decision to rehabilitate is reached and the animal must be relocated to a rehabilitation facility.
- The animal is ready for release after a successful rehabilitation.

Short moves

Short moves are those considered 10-15 minutes or less. A strong well made stretcher is your most important piece of equipment, and can be made from a variety of locally available materials. Stretchers are designed to carry the animal while dispersing the weight evenly across the body. Depending on the size and weight of the animal, a stretcher can be made of tarpaulin, blanket, canvas, carpets (even 'banig'), old banners, sheet, or even a large towel. Any of these materials can be successfully used in individual cases provided that they can hold the weight of the animal. If the ground is relatively smooth and free of rocks, corals, and other sharp items that could cut the animal's skin, carrying or dragging the animal on a sheet is an appropriate method of moving him over short distances. Air beds, mattresses or anything soft can be used to support the animal. The amount of cushioning needed will depend on the size of the animal and the environmental conditions you are dealing with.


M.C. Ledesma

For short moves, it is not necessary to cut holes in the stretcher material for the pectoral fins to fit through. Instead the fins should be carefully tucked against the side of the animal's body to avoid being sprained or broken in the move.

Long moves

A move of more than 15 minutes is considered a long move. For this, rescuers need better equipment to make the animal comfortable, to allow heat dissipation, and to achieve as close to a weightless state as possible for normal breathing. Small cetaceans have been successfully handled, moved and transported in marine parks and aquariums for over 40 years. Some transports have gone for as long as 40 hours. The techniques are well defined in this type of setting, staff is well trained, and the animals are healthy. In the stranding situation it becomes much more difficult because the animal's health is already compromised.


Ronaldo Bernandino

The basic equipment for a long transport includes the following (see Appendix E for complete list):

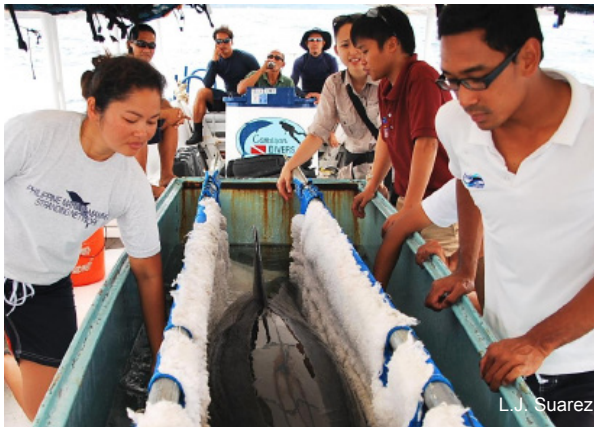
- Stretcher and poles for safely lifting and carrying the animal

- Rope or straps for lifting and rigging
- Mattresses or foam
- Water buckets, scoops, and/or sprayers
- Fabricated transport box to hang stretcher in (if a wet transport)
- Extra water and ice
- Transport vehicle with bed long enough to handle transport box

The stretcher should be made of strong non-abrasive material, generally canvas or nylon. It may also be lined with something softer, such as fleece, to make it more comfortable for the animal. The stretcher has holes for the pectoral fins to fit through and, in some cases, for the genital slit. The animal is positioned in a stretcher so that pressure is not focused on any points along the body or flippers which might lead to pressure necrosis or abrasion.

Truck with transport box inside.

When the animal is able to float in the water, stretchering is relatively easy. Often the biggest issue is sufficient manpower to prepare, lift, and carry the animal. The stretcher is slid underneath the animal and laid out flat, then both sides of the stretcher are slowly lifted up parallel to the animal. It is important to make sure that the pectoral fins are secured and the eyes are protected. In cases where the animal is totally out of the water, stretchering is more difficult and the animal may need to be rolled on one side as the stretcher is placed underneath him, then rolled the other direction until it is positioned properly and can then be slowly pulled up and around him.



Stretcher hanging inside a transport box with water for long transport.

Transport boxes are made of different materials that can hold water. Fiberglass, plastic and plastic lined frames have all been used successfully. The animal is lowered into the box while in the stretcher and water is added until approximately two-thirds of the animal's body is in water. Generally an individual animal is placed in its own box, although two small animals in a single box have been successfully done. (For specific information on stretcher and transport box designs, contact Ocean Adventure at strandings@oceanadventure.com.ph)

General rules for transport

- Transport can happen by road or sea. As much as possible, transport time should not exceed three to four hours. Prolonged duration of transport can cause more stress and transport-related injuries and abrasions to the skin, fins, eyes, etc.
- During transport, the animal should be supported by airbeds or mattresses or placed in a transport box with water. A cetacean's body weight is heavy enough to inflict damage on internal organs when placed on an inadequately cushioned surface.
- The animal's body should be kept moist by using sprayers and wet cloths or towels while always protecting the blow hole. Cetaceans do not have sweat glands so it is very important to keep them wet and cool.

A qualified veterinarian or designated team member should monitor and record the condition and regularity of the animal's breathing throughout a transport. This information may serve as a diagnostic reference. During a vehicle transport the animal should be protected from exhaust fumes and the driver should avoid quick stops, sharp turns, and attempt to keep the motion of the vehicle as smooth as possible.

Pygmy killer whale on mattress and foam for short boat transport.

LIVE DUGONG STRANDING

In general, the discussion and protocols in this chapter regarding First Responder and Stranding Team response to cetacean strandings are applicable to the care and management of a stranded dugong. Some additional and specific comments on the handling of a stranded dugong follow.

Single Live Stranding

Adult dugongs do not usually strand alive, therefore in such incidents the animal is probably in critical condition. Young animals separated from their mothers are the individuals most often involved in live strandings. The management options for a single live dugong stranding are detailed below.

1. Immediate release

Blood analysis and a thorough veterinary assessment of any stranded dugong should be conducted before a decision to release. If possible, the animal should be tagged and/or its distinguishing features noted for future identification. A stranded animal should be released immediately only if experienced members of the Stranding Team are confident that it is not sick or injured.

Immediate release is an option when:

- Unusual weather conditions (e.g. tidal surges due to typhoons, etc.) cause the animal to strand
- Complex topographic and oceanographic conditions such as shifting sandbars or fast-flowing tides cause the dugong to become entrapped in fish corrals, and estuaries and consequently strand
- Beach and environmental conditions are favorable for the animal's quick release
- Stranding involves juveniles (note: excessive scarring from tusks may indicate orphan status)

2. Treatment at a temporary site

If the stranded animal is apparently sick or injured, a qualified veterinarian should be responsible for the medical management of the animal. The animal may be held in a temporary rehabilitation site or transferred to a long-term care facility. An acceptable temporary site may be a swimming pool with lowered chlorine levels, small protected bay, etc. Release may follow when the animal recovers after treatment.

3. Rehabilitation

In Australia, which has the most advanced knowledge on rehabilitation of dugongs, there has been limited success in treating and releasing stranded dugongs. Therefore, animals should be carefully assessed for a reasonable chance of recovery. If rehabilitation is recommended, the availability of resources and adequate facilities must be guaranteed. It is not appropriate to hold stranded animals in inadequate facilities (e.g. small pool) and with compromised resources. Most often a special milk formulation made from powdered milk for human infants containing short chained fatty acid and low concentration of milk is required for rehabilitating calves. It is important to note that it is assumed that a young dugong calf may not yet have the useful bacteria for ingesting seagrasses as these are often acquired from the seagrass meadow environment itself. Thus, real or artificial salt water conditions must be maintained in the rehabilitation pool for the intermediate to long term rehabilitation of young dugongs. While the animal is being nourished with milk formula, and is stabilized, sea grass can be provided in the rehabilitation pool. Close monitoring should be conducted and consumption of sea grass recorded. As time goes on, and the animal is progressing on sea grass forage, adjustment can be made on the feeding procedure and amount of milk formula.

Physical exam of stranded neonate dugong.

Tube feeding a neonate dugong.

4. Euthanasia

If the assessment of a veterinarian shows that the recovery of a stranded dugong is improbable, euthanasia should be considered. All the same issues and considerations discussed regarding euthansia of cetaceans applies to dugongs as well.

Multiple Live Stranding

In the case of a multiple stranding, a larger number of Stranding Team members and volunteers, as well as more equipment will be required and must be mobilized quickly. Thus, help from the local government agencies as well as community members should be sought immediately. When dealing with a mass stranding, younger animals should be given attention first. Dugongs that are partially in water can survive for a long period of time. Thus, if there are dugongs that are on dry land and others that are partially in water, the former should be rescued and released first. Prior to return of the animals to the sea, a plan for monitoring and reporting of cases of re-stranding should be in place.

Chapter 6

Medical Management of Stranded Marine Mammals

Mariel B. Flores, Leo Jonathan A. Suarez, Christopher Torno, Hazel Lopez, Sonja Luz, and Robert Braun

INTRODUCTION

The practice of marine mammal medicine is rooted in the same fundamentals used in the practice of veterinary medicine for other species. However, the veterinarian must be familiar with the natural habitat, special anatomical, physiological, behavioral and social aspects of the animal, as well as the specific medical techniques. As with all wild species, captive care can be profoundly stressful no matter how necessary it may be. There are medical techniques that apply to marine mammals in general, and a subset of those that are species specific. Becoming knowledgeable on both levels is the challenge for the veterinary practitioner that may be involved in marine mammal strandings. Fortunately there is much information available from veterinarians practicing marine mammal medicine in marine parks, from organizations like the International Association of Aquatic Animal Medicine (IAAAM), and in literature taken from decades of stranding response, diagnostics and treatment. The most comprehensive single book for marine mammal medicine is the CRC Handbook of Marine Mammal Medicine (Dierauf and Gulland 2001) – a book that any veterinarian working with marine mammals should have access to as a reference. In the Philippines, Ocean Adventure has experienced marine mammal veterinarians on staff that are willing to provide information and medical assistance in stranding events.

The following chapter will provide some basic information on the medical management of stranded marine mammals, which are useful to veterinarians involved in stranding events and rehabilitation efforts.

PART 1: DIAGNOSTICS

Having nearby access to a medical laboratory experienced with marine mammal samples and the capability to process the different biological samples taken from the animal (i.e. blood, feces, urine, sputum, etc.) is ideal, although extremely rare in the Philippines. Therefore, most likely the diagnostic samples will be sent to nearby laboratories or human/veterinary hospitals for processing. It is important to develop a list of these facilities, their capabilities and willingness to process stranding samples. It is recommended to develop a relationship with them in advance of future needs.

Ultrasound on a rough-toothed dolphin that ingested a hook.

Diagnostic imaging tools such as x-ray machine, ultrasound and endoscopes are extremely valuable.However, since such equipment are expensive and not easily available, it is useful to

do some research in your area for local facilities such as a veterinary hospital or human hospital that would be willing to provide the equipment (and the necessary attending experts) at a reasonable cost. For example, Ocean Adventure has developed a good working relationship with local hospitals and universities as a source for specialized equipment and diagnostic testing on an as-needed, case-by-case basis. Access to equipment goes hand in hand with having knowledgeable technical personnel to operate it and interpret results. While there will not always be animal experts available to perform these specialized tasks, human medical practitioners can contribute immensely by applying their expertise to animals.

<u>Restraint during sample collection</u>

Before collecting the necessary diagnostic samples, proper restraint procedures of a cetacean should be planned by the veterinarian and responders/volunteers. This will ensure that the human safety protocol is enforced and the veterinarian can safely collect the necessary samples in the quickest time possible while minimizing stress to the animal. Depending on the situation, size and condition of the animal, restraint can take place in the water or on the ground.

Restraint of small cetacean for blood draw.

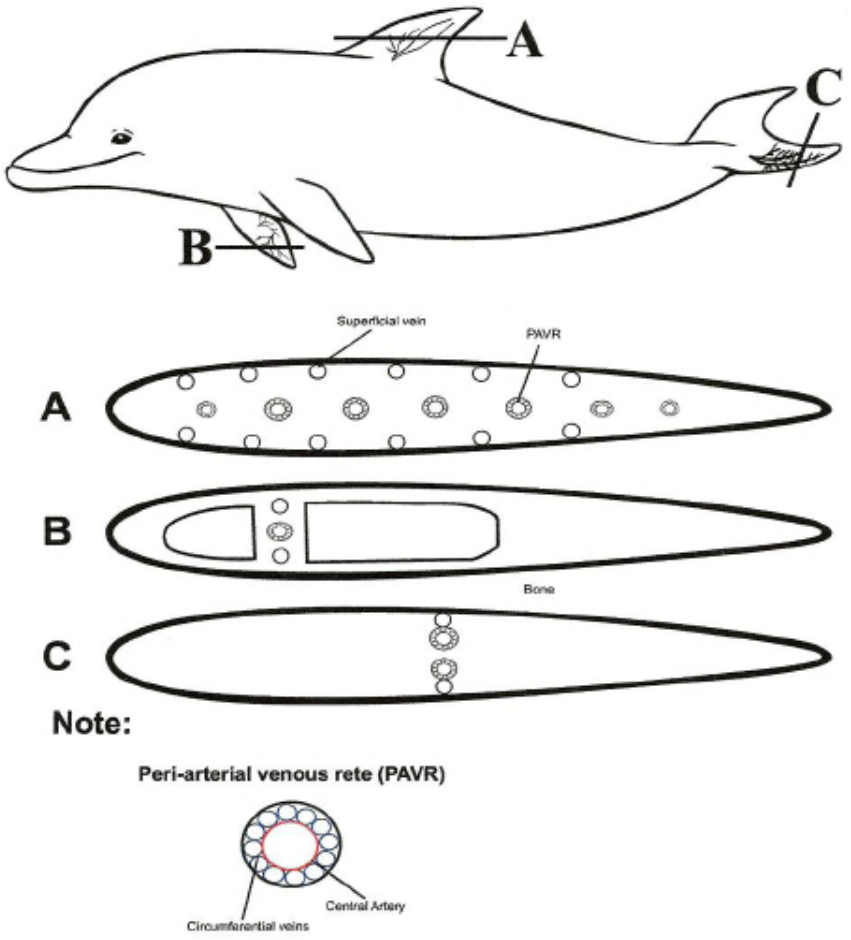
Blood Collection

Figure 1. Blood Collection Sites

Blood is the most important biological sample that a medical practitioner uses to assess, diagnose, and medically manage the animal. If collected and processed properly, a blood sample will provide information about health issues which are not apparent or discoverable in a physical examination or from clinical signs or medical history.

<u>Sampling site</u>

Blood samples in cetaceans may be collected from the superficial vein that runs on both surfaces of the dorsal fin, pectoral fin and tail fluke (see Figure 1). However, the preferred site, in smaller cetaceans is the ventral side of the tail fluke. Here, the veins are more easily seen or felt with a finger as a ridge that runs along the midline of the



John Farinas

surface. For animals that are struggling a lot or are too large, the tail fluke may be a dangerous and difficult area to work with. In that case, it may be better to collect blood from the dorsal surface of the pec or lateral aspect of the dorsal fin.

Blood sampling from ventral side of tail fluke.

Sample collection technique

After cleaning and disinfection of the area with alcohol, a 23 gauage needle (for small animals) or 21 gauage (for large animals) should be inserted perpendicular into the superficial vein. Inserting the needle at an angle, although possible, may cause a break in the vein and skin if the animal struggles, which can bleed profusely. A blood collection set (with butterfly) is recommended because the flexible tubing prevents the needle from being detached if the animal moves its fluke. If a blood collection set is unavailable, an appropriate size syringe can also be used. Blood is drawn into different blood collection tubes:

- Purple top tube with EDTA f or whole blood and plasma to run hematology
- Blue top coagulation tube with sodium citrate for Erythrocyte Sedimentation Rate (ESR) and fibrinogen
- Red top with no anticoagulant for serum chemistry OR
- Yellow top tube with clot activator for serum chemistry
- Blood culture tube is used in rare cases when testing is required for specific microorganisms, and the whole blood added by syringe.

Analysis of the collected blood samples is best done within two hours of blood collection. (See Technical Aspects and Interpretation of Clinical Pathology section in this chapter for details.)

Standard Order of Draw

As practiced in human hospitals, blood collection tubes are normally drawn in a specific order to avoid cross-contamination of additives between tubes. The recommended order is as follows:

If using a red top tube without clot activator:

1. Red top
2. Blue top
3. Purple top

If using yellow top with clot activator:

1. Blue top
2. Yellow top
3. Purple top

Restraint

The tail is the most powerful part of a cetacean's body and should be properly restrained during blood collection to prevent injury to humans and the animal. Multiple people will be needed to restrain the animal depending on its size and medical condition. If the cetacean is in the water, it is restrained by a well coordinated effort where multiple individuals approach from both sides, moving in and grabbing

hold of the animal from the head to the tail end. They then hold or “hug” the animal to restrain. The individual(s) restraining the lower body then raise the tail fluke to expose the ventral surface, or lay it flat if the dorsal side is the preferred collection site. If the animal is in a pool, the tail end may be placed on the edge of the pool for additional support. The pool edge should be padded with a mattress or towels to prevent injury to the tail. If the animal is out of the water, it must be placed on mattresses (foam thickness depending on the size of the animal) before restraining in similar fashion with people on both sides.


Restraint of a strong dolphin for blood draw.

Do not attempt to restrain and collect biological samples from an animal if you do not have the proper situation, people and supplies. A failed attempt is dangerous for people as well as the animal, and will make the next attempt much more difficult.

When there is an opportunity to collect more samples, blowhole and fecal samples are next in importance. Test results from these samples can provide information on more specific illnesses such as respiratory infections, diarrhea, and gastrointestinal parasitism.

Blowhole Sample

A respiratory sample or sputum is collected by placing a clean wide-rimmed collecting container (like a film canister or a Petri dish) over the blowhole and waiting for the animal to exhale. To avoid or lessen contamination with sea water, one can wait for the water to be blown off from an exhalation before positioning the collection container over the blowhole and waiting for the next breath. Carefully wiping the top of the blowhole with a clean piece of gauze prior to collection can also be done, but be very careful that the animal does not inhale at the same time and accidentally aspirate gauze fibers into the lungs. The sputum collected can be evaluated for cytology or cultured for bacteria and fungi.

Feces

Cetacean feces are generally green or olive green with some shades of brown or yellow. Collection of feces is done by carefully rolling the animal onto its side and inserting a lubricated plastic tube (ie. F14 stomach tube) inside the anal opening of the animal up to about 7 to 10 inches deep. Once inserted, the end of the tube is kinked then slowly pulled out. “Kinking” the tube keeps the fecal sample inside the tube as you pull out. The feces is then dispensed into a clean container and evaluated for cytology. For bacterial culture, a sterile swab can be directly inserted into the anus and then placed in a sterile container with transport media and taken to the laboratory for testing. If it is impossible to get to the ventral side of the animal, one can opportunistically collect feces when the animal defecates while being placed in a stretcher or in the water. A clean container should be on

Tube insertion for fecal sample.

hand as collecting feces from the water must be done quickly since it quickly dissipates. Note however, that this is not the best sample to be evaluated as it is already contaminated by saltwater.

Restraint

Restraining the animal for fecal sample collection is similar as described above in blood collection. To expose the underside of the patient, the animal is tilted to one side. However, care should be taken not to submerge the blowhole under the water to avoid drowning the animal during the process.

Gastric Content

A gastric sample may be opportunistically collected if the patient is restrained for intubation for oral hydration and/or medication or force feeding. The sample is always collected before the fluid, food or medicine is given to the animal (see Drug Treatment and Administration section in this chapter for details). The tube used is normally a nasogastric or stomach tube used for large domestic animals like horses, the size of which depends on the size of the animal. A 9.5 mm diameter tube is usually good for small odontocetes and for larger ones, the 16 mm diameter of medical grade tubing is appropriate. The length of the portion to be inserted to insure it reaches the stomach can be premeasured and marked from the tip of the rostrum to caudal to the last rib. Another method of measurement is to go to the anterior end of the base of the dorsal fin or the end of the pectoral fins in species where the dorsal fin is further back on the body.

Restraint and Sample Collection

Gastric intubation requires a team of highly skilled handlers which are assigned various tasks. The procedure is done with the animal held by several members on either side of the body with his head raised above the water. Animals that cannot be managed well in the water can be placed in a stretcher and lifted and carried out of the water and onto a mattress where it is easier to support the animal safely while manipulating and holding the jaws open for tube insertion. While the patient is restrained on both sides, one person carefully pries the mouth open by pressing the ramus of the mouth. One person in front of the animal then inserts two towels that are folded lengthwise and then placed on top of each other and laid out across both sets of teeth. One or two members then open the mouth by gently pulling the top towel upwards around the upper jaw, while the towel below is wrapped around the lower jaw and either carefully pulled down or just held in place. Use appropriate force as too much pulling can dislocate the lower jaw and not enough force can potentially trap the veterinarian's hand as he or she inserts the tube in the animal's mouth and throat. Upon insertion of the lubricated tube, there is a slight resistance where the tube hits the epiglottal beak. Redirecting the tube to one side and giving it a slight push should get the tube past the epiglottal beak and then slowly feed the tube down

Gastric intubation of small cetaceans.

the throat to the mark that indicates the stomach has been reached. Gastric content may be collected by bringing the other end of the tube lower than the animal. Sometimes, a little suction is needed to start the flow of the content. The end of the gastric tube may be kinked and slowly pulled out as soon as a backflow of the stomach contents enters the tube.

Swab Samples and Biopsies

Depending on the severity, expanse and appearance of wounds or skin lesions, swab samples may be collected for tests like cytology or culture and sensitivity (bacterial or fungal). Collection is done by dabbing the lesion with a sterile swab or gauze pad first to remove contaminants (i.e. seawater). The lesion is then swabbed with a sterile swab (i.e. cotton tip applicator stick) that can be moistened with a sterile saline solution. This is then rolled onto a glass slide for cytologic evaluation or stored in a tube with culture medium or a sterile glass tube. It is recommended that you use 1 swab per test. 6mm biopsy punches are useful in getting a sample and safe for the operator and patient. One may also do excisional “lemon wedge” biopsies. However, this is an invasive procedure, so post-sampling wound care is needed.

PART 2: LABORATORY WORK

The availability of a quality laboratory that can quickly and reliably run important tests on biological samples is often challenging, but necessary. The veterinarian should always practice proper collection techniques as well as handling and transport of samples. Maintaining the integrity of this process is the basis of an accurate clinical interpretation.

Specimen Handling

Labeling

Labeling of specimens should be consistent with the following information printed on the sample container:

- species (common and scientific name)
- animal name and/or code
- date of collection
- type of sample

Storage and Transport

Specimens must be kept in a clean, cool, insulated and secure container during transport to the lab or hospital to maintain the viability of the sample. A cooler with ice or icepack is sufficient for a short transport. For a transport longer than 10 hours, a styrofoam container with numerous icepacks may be used to ensure the temperature inside is maintained below 10°C.

Tissue, plasma, and serum samples may be stored for future tests at -10°C or lower. It is recommended that plasma and serum samples are divided into several test tubes and properly labeled before storing in a freezer. Samples of whole blood (no additive) should not come in direct contact with ice packs as this could lyse the blood cells.

Sample Processing

Blood

Specimen quality is extremely important for accurate results and must be taken into consideration when drawing, storing, and transporting blood specimens. Specimen quality issues include the following:

1. Hemolysis: Serum tubes should be promptly centrifuged and separated as soon as the blood is fully retracted. Analytes such as glucose, potassium, LDH, cholesterol, creatinine, iron, phosphorous, calcium, and most enzymes are affected by hemolysis and/or prolonged contact with the clot. Hemolyzed specimens are not suitable for hematologic and coagulation testing. Causes of hemolysis:

When using Evacuated Tubes:

- Improper choice of puncture site
- Insufficient venipuncture indicated by slow blood flow
- Small bore needle/Large bore needle
- Vigorous mixing or shaking of tube

Syringe Draws:

- Pulling the plunger of a syringe too far
- Forcing blood from a syringe needle into a tube (take needle out first before dispensing blood in tube)

Specimen Transport

- Excessive heat or cold exposure

2. Inadequate Draw – Quantity not sufficient (QNS): Hematology and coagulation tests require a full tube of blood. The ratio of anticoagulant is specific for the volume of specimen. Coagulation tests cannot be performed on short-draws. Short draw hematology tubes will result in RBC crenation, reduced Mean Corpuscular Value (MCV) and hematocrit, and possible changes in white blood cell (WBC) morphology, platelet and total WBC count.

3. Clotted Specimens - All hematology and coagulation testing utilizes anticoagulated blood. Clots, large or small, will lead to erroneous results for these tests.

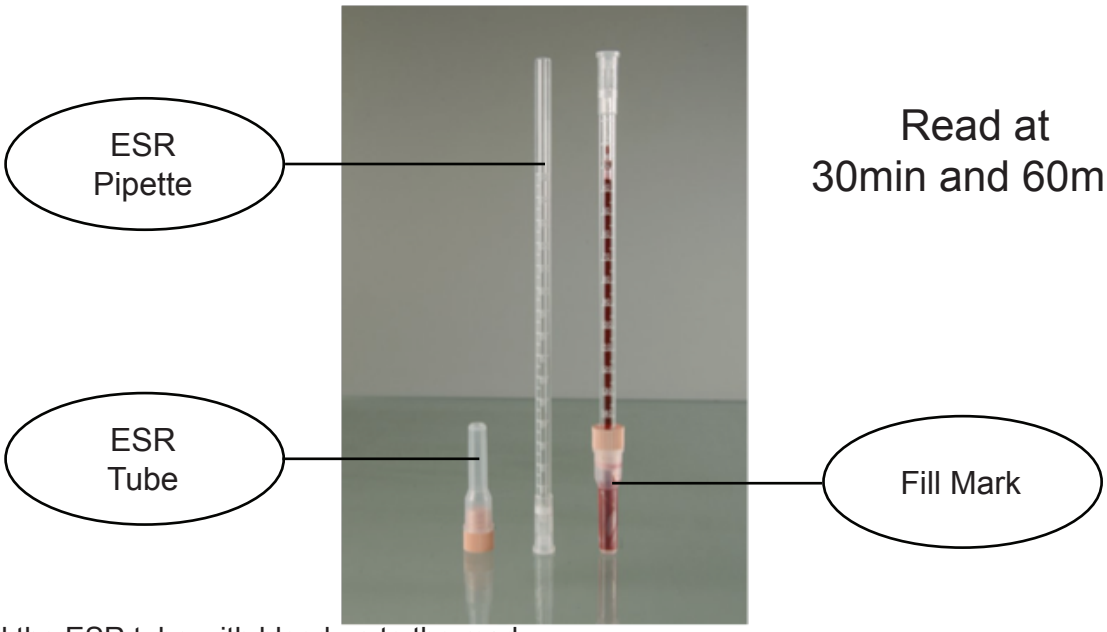
4. Lipemia - Lipemia can falsely elevate alanine aminotransferase (ALT) and aspartate aminotransferase (AST). It can also affect the results for complete blood counts (CBC's).

5. Poor Preservation / Old Specimens: Hematology specimens need to be tested within 24 hours. Old specimens will yield unreliable cell counts and distorted cell morphology. Coagulation plasma (citrated plasma) should be centrifuged, separated, and stored appropriately until testing can be performed.

Erythrocyte Sedimentation Rate (ESR)

ESR is a test that can be used in monitoring the presence and intensity of inflammation in cetaceans. This test may be performed using the Westergren method. Depending on the manufacturer, citrated tube or EDTA tube may be used. Citrated tube is commonly used in most clinical laboratories.

Procedure:



1. Fill the ESR tube with blood up to the mark.
2. Insert ESR pipette into the tube without creating bubbles.
3. Pipette should completely touch the bottom of the tube.
4. Place sample in vertical position using a rack.
5. Leave sample on a vibration-free surface.
6. Read at 30 min and 60 min.

Note: Refrigerated blood sample increases ESR. Blood should be allowed to return to room temperature before the test is performed.

Cytology

The preparation of samples for cytology depends on the type of sample collected and the specific investigation being done by the veterinarian.

Stains

The following are various types of stains that can be used based on the purpose of the cytological examination.

1. Cell Differentiation
   a. New Methylene Blue
   b. Wright-Giemsa Stain
2. Fungal Detection
   a. 10-20% KOH
   b. India Ink
   c. Lactophenol Blue
3. Bacterial Identification
   a. Gram Stain
   b. Ziehl Nielsen Stain

Slide preparation methods will depend on the stain to be used. Slides should be prepared immediately after collection to attain the best quality.

PART 3: CLINICAL PATHOLOGY

Once quoted by Wills and Halsted in 1967: “A physician who depends on the laboratory to make his diagnosis is probably inexperienced; one who says that he does not need a laboratory is uninformed. In either instance, the patient is in danger.” This summarizes the importance of complementing clinical laboratory data with thorough clinical examination and background investigation of the patient.

Blood Values

The blood values are to be considered as guidelines for baseline data for each marine mammal species.

Table 1: Ranges of Hematology and Biochemistry Values in some Cetaceans

Parameter	Free-Ranging Bottlenose Dolphins *(Tursiops truncatus)*	Captive Pilot Whales *(Globicephala macro-chynchus)*	Captive Common dolphins *(Delphinus delphis)*	Stranded Juvenile Grey whale *(Eschrichtius robustus)*
RBC (106/ mm3)	3.1 – 4.0	3.3 – 3.7	4.6 – 4.9	3.0 – 4.0
Hb (g/dl)	12.7 – 15.5	15.1 – 16.0	16.1 – 19.4	13.0 – 16.0
HCT (%)	37 – 47	43 – 45	46 – 55	39 – 47
MCV	111 – 127	123 – 129	100 – 114	129 – 142
MCH	36 – 43	43 – 46	35 – 40	43 – 48
MCHC	32 – 35	34 – 36	34 – 36	33 – 34
PLATELETS (10^3/ mm^3)	92 – 217	70 – 90	55 – 100	60 – 304
RETICULOCYTES (%)	N.D.	0.7 – 1.2	0.8 – 1.4	0 – 2
nRBC	0	0	0	0
ESR (at 60 mins)	N.D.	16 – 52	0	48 – 100
Leuckocytes / ul	5600 – 12400	4720 – 6500	4570 – 4900	2700 – 10710
Neutrophil (Band)	0	0	0	0 - 30
Neutrophil (Mature)	2540 – 6140	2930 – 4360	2590 – 4150	1670 – 9250
Lymphocyte	520 – 2420	660 – 2080	380 – 850	300 – 1120
Monocyte	80 – 610	190 – 460	120 – 350	40 – 910
Eosinophil	740 – 4530	240 – 870	620 – 1280	0 – 30
Basophil	0 – 30	0	0	0
Serum Proteins (g/dl)	6.4 – 8.8	5.3 – 6	6.3 – 7.3	4.0 – 7.0
Albumin (g/dl)	2.9 – 3.7	2.9 – 3.3	3.9 – 4.7	3.0 – 4.0
Globulin (g/dl)	3.1 – 5.5	2.2 – 3.0	1.8 – 3.0	1.0 – 3.0
Glucose (mg/dl)	62 – 139	98 – 106	91 – 119	47 – 147
BUN (mg/dl)	45 – 72	46 – 55	22 – 46	21 – 75
Creatinine (mg/dl)	1.0 – 2.1	2.0 – 2.4	0.9 – 1.3	1.0 – 2.0
Bilirubin T/D (mg/dl)	0.1 – 0.4/ N.D.	0.1/ ND.	0.1 – 0.9/ N.D.	0 – 0.2/ N.D.
Cholesterol (mg/dl)	137 – 235	187 – 288	130 – 200	136 – 1470
Alkaline Phos (U/l)	51 – 610	143 – 243	202 – 580	1263 – 3017
ALT (U/l)	9 – 33	26 – 69	49 – 84	3 – 12
AST (U/l)	133 – 318	170 – 317	191 – 236	41 – 113
GGT (U/l)	17 – 31	39 – 41	37 – 44	2 – 52
CK (U/l)	N.D.	55 – 80	N.D.	107 – 255
LDH (U/l)	324 – 538	425 – 505	354 – 568	120 – 584
Calcium (mg/dl)	8.2 – 9.4	7.8 – 8.4	8.8 – 9.6	8.0 – 11.0
Phosphorus (mg/dl)	3.2 – 7.2	4.3 – 4.8	2.8 – 5.3	3.7 – 9.0

Sodium (mEq/l)	151 – 158	153 – 154	152 – 159	146 – 154
Potassium (mEq/l)	3.2 – 4.4	3.7 – 4.2	4.0	4.0 – 5.0
Chloride (mEq/l)	108 – 118	118 – 119	120 – 121	106 – 115
Iron (mcg/dl)	74 – 176	108 – 179	184 – 270	54 – 328
Fibrinogen (mg/dl)	N.D.	280 – 445	N.D.	277 – 517

Reference:
Bossart, G.D., T.H. Reidarson, L.A. Dierauf, and D.A. Duffield. Clinical Pathology. In Dierauf L.A. and Gulland F.M. (eds): CRC Handbook of Marine Mammal Medicine. Florida, CRC Press, pp. 703-738.

Cytology

Interpretation of samples for cytology generally includes the following:

1. Color
    a. Clear to slightly yellow – low concentration of cells
    b. White – cells, mucus, fat droplets, chyle
    c. Gray – cells, mucus, leukocytes
    d. Green – bile, bacteria, leukocytes
    e. Brown – particulate debris, digested fish, bile, hemoglobin
    f. Pink to red – erythrocytes, free hemoglobin
2. Epithelial cells – usually present in specimen
3. Leukocytes – indicative of inflammation often associated with infection and/or necrosis. The presence of leukocytes does not necessarily signify disease.
4. Erythrocytes – may indicate hemorrhage or diapedesis.

<u>Sputum</u>

1. Normal findings:
    - squamous epithelial cells,
    - bacteria not associated with inflammatory cells,
    - few ciliates, few WBCs.
2. Abnormal findings:
    - Leukocytes-to-epithelial cell ratio greater than 1
    - increased number of macrophages
    - fibrin
    - erythrocytes
    - eggs of the trematode (i.e. Nasitrema sp.)
    - heavy ciliate infection
    - bacteria (in bronchopneumonia cases)
    - fungi (i.e. Aspergillus sp.)
    - invasive small budding yeast (i.e. Candida spp.)

<u>Stomach sample</u>

Significant findings:

- presence of an increased number of leukocytes and basal cells
- long-lived macrophages suggest inflammation
- band neutrophils suggest infectious or inflammation
- presence of erythrocytes may suggest ulcers
- Nasitrema eggs from swallowed sputum

- trematode eggs
- yeast in abundant numbers (although may be an occasional normal finding)
- parasite larvae/eggs should be differentiated from parasites from food fish.

Feces
Significant findings:

- too numerous to count degenerated leukocytes
- erythrocytes (not always observed in intestinal bleeding as these may be lysed prior to excretion)
- undigested fish particles can suggest improper digestion
- budding yeast or fungal hyphae; parasitic eggs and larvae.

PART 4: TREATMENT

Marine mammal medicine has similarities to terrestrial mammal medicine with the caveat that there are differences in anatomy and the water versus land environment. It should be noted that most of the information in this field of medicine has been gathered from experience with marine mammals in captive situations including stranded animals undergoing rehabilitation with often extensive and varied medical intervention. This section is written for veterinarians with a baseline of experience with terrestrial species who are called upon to provide medical care for stranded marine mammals.

A stranded animal may need medical intervention for several reasons including: the causal factors that led to the animal stranding; the effects of stress related to the stranding and the rescue effort; and circumstances that may not be related to the stranding event at all (i.e. nosocomial disease). This is why it is important to gather as much information on the stranding event as possible in order to build a good clinical background on the patient and to understand the possible complications that can arise during the stranding itself as well as the rescue efforts.

Fluid therapy
Stranded marine mammals are commonly in a dehydrated state or are, at the very least, vulnerable to dehydration from the circumstances of the stranding event. Dehydration may result from disease, inability to feed (as food is the major source of water in marine mammals), or drying of the skin and reduced renal perfusion secondary to illness. A good clinical history (i.e. how many hours since the animal stranded), physical examination (i.e. body condition, emaciation) along with diagnostic tests are important in assessing the need to rehydrate. Animals that strand in good body condition can use their fat stores (ie. blubber) to be hydrolyzed for hydration. In cases of food-deprived stranders, some resort to consuming saltwater which worsens the dehydration and results in electrolyte imbalance.

Fluids may be administered via oral or intravenous route. The oral route is much preferred as it is quick, avoids possible complications associated with keeping an injection site sterile, and is generally safer for the people and animal during restraint.

Medication

Antibacterials

The reasons for starting a stranded animal on antibacterial treatment include addressing an ongoing primary infection and providing prophylactic treatment for a secondary bacterial infection. In assessing the need and choice of an antibacterial treatment, it is important to remember that cetaceans are not gut fermenters and are strict carnivores/piscivores. Prophylactic treatment is controversial for the primary reason that the elimination of normal flora could increase the likelihood of the overgrowth of pathogenic microorganisms. This has been illustrated in the manifestation of fungal growth from sputum, feces or gastric samples of organisms like Candida and Aspergillus, which occurred in some cases where the animals were on short-term and long-term broad spectrum antibiotic use respectively. In addition, it is also likely to exacerbate a pre-existing fungal infection.

On the other hand, prophylactic treatment during rehabilitation decreases the incidence of infection resulting from the stress the animal is exposed to during the stranding event and rescue procedures. These stressful events can result in the animal becoming immuno-compromised and susceptible to disease. It also unusual to find a stranded marine mammal who does not have significant injury from the stranding event and subsequent handling.

There are a handful of antibiotics successfully used on marine mammals. For critically ill animals, broad-spectrum, bactericidal and injectable antibiotics are preferred. Injectable preparations reach therapeutic levels quickly and reliably compared to oral preparations as the latter may be affected by vomiting, regurgitation or diarrhea. One may opt to switch to oral medications or a combination of both preparations once the animal is stabilized and consuming fish, either voluntarily or through force-feeding, for ease of drug administration.

There are some extra-label use of drugs like that with the aminoglycoside amikacin which has been found to be useful as a “gut flush” to address bacteria-related problems in the gastro-intestinal tract (some which cause ulcers), as this drug when given orally remains in the gut and is not absorbed systemically. When given parenterally, kidney function should be closely monitored, especially when dealing with a severely dehydrated animal. As for drug interactions, the use of aminoglycosides with cephalosporins increases the risk of renal toxicity as the effect of the two drugs is additive. Aminoglycosides has also been associated with renal papillary necrosis. It is important to note that gentamycin is not recommended for use in cetaceans.

Fluoroquinolones used as a broad-spectrum antibiotic have shown favorable clinical response, therefore they are a drug of choice by marine mammal veterinarians, even for juvenile patients. However, in young marine mammals, as with their terrestrial counterparts, they are used with caution due to chondrotoxicity. Therefore, it is wise to carefully monitor for symptoms related to joint pain.

Antifungals

Fungi can be found in gastric samples, feces and sputum. Commonly seen are Candida, Aspergillus and Zygomyces species. As discussed earlier, prolonged use of broad-spectrum antibiotics can lead to the proliferation of fungi. This is why antifungals are often given in conjunction with long term antibacterial treatment. Nystatin is especially effective against fungi in the gastrointestinal tract. Itraconazole is effective in addressing fungi in respiratory samples as it has better coverage than nystatin systemically.

When using Itraconazole it is important to consider the following factors. Itraconazole needs an acidic environment in the stomach to be absorbed, so exercise caution when combining with azoles with H2-blockers. Also monitor liver function when using azoles. Itraconazole may decrease appetite, although this is likely to resolve when the dose is lowered or the drug discontinued.

Antiparasitics

Most wild cetaceans have some degree of internal parasite loads. Antihelminthics are commonly given ONLY when it is deemed important to improve the condition of the animal. Acute elimination of large parasite loads may result in severe complications like impactions and septic shock. For heavy worm loads, some veterinarians opt to gently reduce parasite load with an initial pyrantel dose. Fenbendazole is used with caution due to the likelihood of adverse reactions resulting from the sudden die-off of the parasite load. Therefore very low doses of fenbendazole over 3 days is recommended to reduce the worm load of debilitated animals. Ivermectin is the drug of choice for migrating larvae. The migration of this parasite to the brain can cause eosinophilic meningoencephalitis.

Miscellaneous Therapeutic Agents

Marine mammals strand with various disease conditions and further problems can arise from rescue and rehabilitation efforts. Animals diagnosed with problems like stress myopathy, are given vitamin E with selenium. Vitamin B complex can address many issues including stimulating appetite, nervous problems, some anemias, as well as providing liver support. Other liver support agents include silymarine, phospholipids (Essentiale®) and S-adenosylmethionine (SAM-e®). Special cases are discussed further.

Pain management

The indications for pain management may be difficult to assess but can be deduced from clinical signs like the animal's "hunched" posture, abdominal spasms or cramping, bloating or dyspnea, physical injuries, and diagnostic findings. The use of non-steroidal anti-inflammatory drugs like flunixin meglumine is not recommended due to the risk of side effects like gastric ulceration and renal failure. Opiods and their derivatives have been proposed but their use is accompanied with caution due to side effects.

Gastrointestinal Tract Disorders

Gastric ulcers are fairly common findings in stranded small cetaceans. Treatment for gastric ulcers includes H2-blockers like Cimetidine and Ranitidine as well as agents that coat the stomach lining like Sucralfate. Omeprazole is contraindicated as it is too potent and can cause impactions due to incomplete digestion of fish bones. It is important to monitor gastric pH when administrating any H2-blockers as pH levels that approach neutral may interfere with fish bone digestion leaving these bones to accumulate in the stomach. Maldigestion can also occur when the animal is force-fed too frequently or with excessive amounts of fish or prior to establishing gut motility with hydration. This is indicated by malodorous gas extruded during gastric intubation. In such cases, feeding should be eliminated until return to normal motility and gastric emptying can be assured. During this time the animal is intubated with appropriate fluids to establish/maintain hydration. Feeding of small amounts is resumed when the problem is resolved and gradually increased to prevent recurrence of maldigestion. If whole fish is not yet appropriate, feeding a progression of the following: slurry of filets (boneless part of the fish blended into a slurry), then filets, then whole fish without head/tail/fins, then whole smaller species, can lead to the return to a normal diet.

Another complication to the gastrointestinal tract is the excessive accumulation of gas. This can be a life-threatening condition that can be brought about by overpopulation of gas-producing bacteria, hypomotility resulting in fermentation, or overzealous administration of H2-blockers. Decompression by releasing gas via a stomach tube can be done. To prevent recurrence, identify the cause of the problem by doing a fecal culture and monitoring gastric pH. If necessary a gastroscopy can be done to check for the presence of foreign bodies that may partially or fully obstruct the passage of food in the gut, gastric ulcers or erosions, and a large accumulation of parasites. Empirical treatment with anaerobic bacterial efficacy may be indicated.

Problems in the Respiratory System

Stranded marine mammals commonly suffer from, or develop, respiratory disease. Pneumonia can be caused by infections that are bacterial, protozoal, fungal, parasitic or a combination of these. In these cases, appropriate antimicrobials are given. Diuretics such as furosemide can be useful to address pulmonary edema associated with trauma, near-drowning, or shock. In cases of respiratory distress, drugs like aminophylline and steroids may provide respiratory relief.

Wound Management

Treatment of wounds can be a challenge given that the water environment immediately washes off most medications that are applied topically. However, wounds can be cleaned with disinfectant solutions like povidone iodine. The components of wound therapy include the use of antibiotics, regular debridement, flushing and cleaning, and providing a good clean water environment for the patient.

Dystocia

Dystocia is one of the reproductive emergencies of strander. This may result from a large, dead or malpositioned fetus or uterine inertia of the mother. In such cases, it is best to consult other experienced veterinarians. Close monitoring of both mother and calf is required and sound judgement in deciding when to intervene and provide assistance is essential. Oxytocin, sometimes combined with injectable calcium, may help expel the fetus. If a very large fetus is a problem, calf extraction is done with various techniques which are beyond the scope of this manual to describe. Once the calf is removed, the uterus is flushed with diluted povidone iodine in saline solution and the last flush incorporating antibiotics. Oxytocin is given again to shrink the uterus.

Complications arising with this emergency include cervical, uterine or vaginal laceration, chronic hemorrhage, septicemia and metritis. In such cases, broad-spectrum antibiotics are administered.

Central Nervous System Disorders

Neurological conditions may be due to metabolic disturbances, toxicoses, trauma and infectious disease. Seizures may be controlled with diazepam, midazolam or lorazepam initially then phenobarbital for longer-term control.

PART 5: DRUG ADMINISTRATION

The following chart lists the drugs commonly used in stranded marine mammal rescue and rehabilitation cases, the doseages, the type, size, and strength normally found, and specific comments.

Drug	Dosage	Available Preparations/Comments
ANTIBACTERIALS		
Amikacin	13mg/kg IM SID	250 and 125 mg/mL Small odontocetes; nephrotoxic
	500 - 750 mg PO as gut flush depending on size of animal	Gut flush for small odontocetes 180-250kg; scale to size for larger cetaceans; low absorption in the gut
Amoxicillin	5-10 mg/kg PO, IM BID	250 mg and 500 mg capsules/ 500 mg/vial powder, 200 mg/mL suspension for injection Can be given IM for inappetent animal; switched to oral for intubation or inserted in fish
Amoxicillin/ Clavulanic acid	5-10 mg/kg PO BID	250 mg amoxicillin + 125 mg clavulanic acid/ 500 mg amoxicillin + 125 mg clavulanic acid tablets Small odontocetes
Cephalexin monohydrate	22 mg/kg PO TID	250 mg and 500 mg capsules Small odontocetes; possible intestinal bleeding after about 20 days of use
Ciprofloxacin	10 mg/kg PO/BID	500 mg capsules Alternative fluroquinolone to enrofloxacin
Clindamycin	8 mg/kg PO BID	150 mg and 300 mg capsules Good for lesions involving bone or teeth
Doxycycline	1.5 mg/kg PO BID	100 mg capsules
Enrofloxacin	5 mg/kg PO, IM BID	50mg, 150 mg tablets 25mg, 50mg, 100 mg/mL injectable solution Drug of choice for Gram (-) bacteria that can cause pneumonia and gastrointestinal problems
Metronidazole	7 mg/kg PO TID	500 mg tablets gastrointestinal diseases; for protozoan infection
Minocycline	4mg/kg PO BID (loading) 2 mg/kg PO BID (maintenance)	50mg and 100 mg capsules For small odontocetes
Ofloxacin	5 mg/kg PO BID	200mg and 400 mg capsules For small odontocetes
ANTIFUNGALS		
Itraconazole	5 mg/kg PO TID (loading) 2.5 mg/kg PO TID (maintenance)	100 mg capsules Drug of choice for Aspergillosis; Needs an acidic pH to be absorbed
Ketoconazole	5 mg/kg BID	200 mg tablets
Nystatin	500,000 IU to 1,000,000 units PO BID to TID	500,000 IU tablets Generally gut-acting; used in conjunction with animal on prolonged anti-bacterial treatment
GASTROINTESTINAL DRUGS		
Bismuth subsalicylate	Scale to human	262 mg caplet Gastrointestinal abnormalities
Cimetidine	4.5 mg/kg PO BID	200 mg and 400 mg tablets/ 100mg/mL ampoules Indicated for gastric ulcers

Ranitidine	2 mg/kg PO BID to TID	150 mg and 300 mg tablets 25 mg/mL ampules Indicated for gastric ulcers; monitor gastric pH and putrefaction if on prolonged use
Sucralfate	1-2g BID-QID	1 g tablets Give at least 30 minutes after other drugs as this affects their absorption in the stomach
ANTIPARASITALS		
Fenbendazole	11 mg/kg PO	100 mg/mL
Ivermectin	0.2 mg/kg PO	10 mg/mL For migrating larvae
Praziquantel	 10 mg/kg PO 3 mg/kg PO	50 mg tablets for Nasitrema for trematodes
Pyrantel	5 mg/kg PO	For gentle removal of parasites
SEDATIVE AND EMERGENCY DRUGS		
Aminophyline	5.5 mg/kg IM, IV	25 mg/mL Bronchodilator
Diazepam	0.15 mg/kg IM or 0.2 mg/kg PO	5mg and 10 mg tablets 10mg/2mL ampules 5 and 10 mg tablets Prior to transport or a stressful activity like a catch; anxiolytic; appetite stimulant
Doxapram	1 mg/kg IV, SL	20mg/mL Respiratory stimulant and analeptic (cause central nervous system stimulation)
Epinephrine	0.02 mg/kg IM,IV, IT	1 mg/mL ampules
Flumazenil	0.01 mg/kg IV	0.1mg/mL Reversal agent for diazepam
Furosemide	2-4 mg/kg IM	10 mg/mL ampules 20mg and 40 mg tablet Diuretic indicated for pulmonary edema
Hydrocortisone sodium succinate	1-10mg/kg IM,IV	500 mg/4 mL or 100 mg/2 mL Rapid-onset for cases like hemorrhagic shock and anaphylaxis
FLUID THERAPY		
Water	-3 L per 200 kgs of animal as in a Tursiops-size odontocete PO depending on hydration status (maintenance 40mL/kg/day	Distilled water Rehydration
0.9% NaCl Solution		Electrolyte replacement
Dextrose solution		5% and 50% solution Energy source
Zinc Oxide	Apply on exposed skin	Desitin ® diaper rash cream

References:
Townsend,F.I: Medical Management of Stranded Small Cetaceans. In Fowler (ed): Zoo and Wild Animal Medicine: Current Therapy 4. Philidelphia, W.B. Saunders Company, pp. 485-493.
Stoskopf M.K., S. Willens and JF McBain: Pharmaceuticals and Formularies. In Dierauf L.A. and Gulland F.M. (eds): CRC Handbook of Marine Mammal Medicine. Florida, CRC Press, pp. 703-738.
McKelvey D. and K.W. Hollingshead. Small animal anesthesia: canine and feline practice. Mosby's fundamentals of veterinary technology. Missouri.

Modes of Drug Administration

The mode of administration of medication depends on the drug preparation, the condition of the animal, the availability of the appropriate materials to use, and the experience of the staff and

attending veterinarian. For example, some medications like amoxicillin are available in both oral and injectable preparations thereby making it a drug of choice for animals that are not eating and can be injected intramuscularly with the drug and then switched to the oral preparation mixed in the fluid to be intubated or inserted directly in fish. All of these procedures require the appropriate equipment and supplies including the correct size needles and syringes and correct size and length of gastric tubes. The attending veterinarian must have an experienced staff to properly and safely restrain the animal for intubation, force feeding, and intramuscular injections. In designing a treatment protocol, it is important to keep in mind that frequent handling for drug administration is stressful to the animal and can be life-threatening. So if at all possible, choose a drug regimen that requires the minimum amount and frequency of restraint on a daily basis.

Oral route

The easiest and least invasive manner of drug administration is via oral route with drugs inserted in fish and fed to an animal that is eating voluntarily. A good-sized fish is chosen and the capsule or tablet is inserted into its abdominal cavity via the gills. If the animal is not eating voluntarily, but can be safely restrained, this can be done and then the animal "force fed" the medicated fish. The restraint technique necessary for force feeding is the same as described earlier in this chapter for gastric sample collection. Once the animal is restrained, the mouth is opened with two carefully placed towels, one for each jaw, and the jaws manipulated by an appropriate amount of force so no damage occurs. Then the fish is inserted in the back of the mouth and oftentimes the animal will swallow the fish on his own. Sometimes, however, one may have to push the fish further back in the throat until the animal swallows it. If the person doing the force feeding is reluctant to insert his or her hand into the mouth of the dolphin, a PVC tube that is large enough to fit a hand through can be used to protect the hand while inserting the fish into the back of the mouth. Another technique is to use a thick hose that can fit around the caudal area of a fish and that is used to insert in the mouth, head first, until the fish is swallowed and then the tube is removed.

Using a PVC tube to protect the hand during force feeding.

Stomach tube is held high while pouring medications and fluids into the funnel.

Gastric Intubation

If the animal is not eating and must receive fluids, the medication can be administered orally along with the fluids via gastric intubation. This is done by crushing the tablets or opening capsules and adding the powdered or liquid medicine to the water as it is being intubated to the animal. For detailed instructions on oral intubation see section on Gastric Content – Restraint and Sample Collection in this chapter. The danger of intubation is getting fluid into the lungs as it is possible to accidentally insert the tube into the trachea rather than the esophagus. A mistake like this will lead to aspiration pneumonia and eventual

or immediate death if enough fluid is poured into the lungs. So, measuring the length of tube required to get into the stomach, and clearly marking the tube, is crucial. When the tube is inserted to the mark, the funnel is attached to the end of the tube. To insure that the tube is in the stomach WAIT until gurgling sounds are heard through the tube. Then WAIT AGAIN for a breath prior to pouring the fluids into the funnel. Control the fluids entering the stomach tube by insuring a continuous and steady flow. This also eliminates air getting into the stomach. When all fluids have been poured and have descended down the

Gastrin Intubation Materials Needed:

1 pc. Appropriate size tube or hose (disinfected and the tip to be inserted is smooth)
1 pc. Funnel (fits the other end of the tube)
2 pcs. Clean towels (may be cut lengthwise so as not to be too thick)
1 tube Lubricating gel
1 pc. Container with drugs dissolved in a small amount of water
1-3L Water or fluids to be intubated (depending on how much the animal needs)

Staff Needed:

2-10 To restrain the animal - depending on size and condition of the animal
1-2 To open the jaw

tube to where they are just out of visual range, crimp the tube so that no fluid gets to the trachea as the tube is being removed. then carefully and steadily pull it out. Remember to always clean and disinfect the tube after each use.

Administering an IM injection

Intramuscular Injection

Intramuscular injection is done using a syringe with a suitable gauge and length of needle. Considering the thick blubber layer, getting the drug into the muscle will entail a 40 mm or 1 ½ inch long needle for small dolphins like bottlenose dolphins and an 89mm spinal needle for larger animals like pilot whales. The needle size is usually 18 - 21 gauge and best to use 18 for spinal needles to avoid bending and for quick administration of the drug. The injection site is located on the lumbar muscles off the midline and preferably in the area slightly anterior to, parallel to or just posterior to the dorsal fin. Reminders: While restraining the animal insure that the injection site stays above water prior to and during injection. Disinfect the area with alcohol and keep the needle sterile. The veterinarian should inform the team restraining the animal when he or she is about to make the stick so they can be prepared for any adverse reaction from the animal when it feels the needle. Use a fluid motion while inserting at an angle more or less perpendicular to the body. Be careful to insert the syringe without bending the needle. As always in giving an injection to

any animal, aspirate first to make sure that a blood vessel is not hit. After the needle is removed, apply pressure to the injection site to stop bleeding prior to allowing the area to be submerged in water.

Intravenous Route

Intravenous drugs may be administered via the central veins at the dorsal and ventral sides of the fluke. The set-up is similar to a blood draw. Some drugs like ceftazidime may cause phlebitis. To prevent or lessen the inflammatory effect, immediately follow with administration of 10 mL normal saline to flush the drug from the area. The application of dimethylsulfoxide (DMSO) or hemorrhoid cream (tribenoside lidocaine) on the injection site lessens local inflammation. Fast intravenous fluid infusion can be done via the vein at the base of the fluke where the two fluke veins meet. For a small cetacean an 18-19 gauge 1 ½" long needle can be used. A "pop" can be felt when the needle hits the vein. The blood pressure here is strong therefore it cannot be used with mere gravity pressure and fluids need to be pushed in by applying pressure on the fluid bag at the end of the intravenous line. This can be a difficult procedure, therefore this route of drug administration should be used only when the oral route fails or is not sufficient, and when there is an immediate need for more fluids.

Site on ventral side of tail fluke for IV fluid infusion.

Topical Treatment

Giving medications topically is a challenge for marine mammals to insure that the appropriate contact time is achieved. Some medications are applied in ointment or salve preparations. Lanolin and petroleum gels have also been used with varying success. Wounds can be gently debrided with gauze and a Povidone Iodine solution. Zinc oxide is applied on the skin that is exposed to the elements (i.e. sun and wind) to prevent the area from drying or burning, especially if the animal tends to log at the surface or has to be supported in the water. If this is not available, exposed skin can be protected by laying wet sheets or towels on the skin, insuring that these never cover the blowhole.

Chapter 7

Rehabilitation and Long-Term Care

Mariel B. Flores

Rehabilitation involves the extended care and treatment of stranded marine mammals. Before deciding to rehabilitate, a veterinarian must thoroughly analyze the condition of the animal and develop an appropriate treatment plan. Unless an animal is deemed healthy enough to be immediately released, restoration of good health usually involves long term care treatment.

Besides the obvious rewards of a successful rehabilitation, there are benefits and disadvantages to the process, regardless of the final outcome. The benefits include an opportunity to better understand marine mammal biology and to gain new knowledge on animal diseases and treatments as well as the identification of threats to wild populations and the marine environment (i.e. biotoxins, chemical contaminants and pathogen pollution). It also provides an opportunity for public education on the threats to marine mammals and their habitat and to promote their conservation (see Chapter 10). As discussed in Chapters 3 and 4, the reasons why marine mammals strand is always worthy of investigation, and every case we respond to has the potential of uncovering further valuable information.

The disadvantages of rehabilitation are primarily related to resources – long term rehabilitation efforts require significant monetary investment and are labor intensive. In most cases there is minimal conservation value, as rehabilitation directly impacts the welfare of individual animals who make no significant contribution to large, healthy, non-threatened wild populations. Furthermore, without expensive technology like radio tracking, we rarely know if rehabilitated and released animals survive. Finally, animals requiring long term rehabilitation often end up unsuitable for release, and must then be provided a permanent home in captivity.
(See Medical Decision-Making Flowchart in Appendix F)

Providing support to a dolphin that cannot swim and maintain its buoyancy.

General considerations

Rehabilitation of marine mammals is a serious responsibility and should NOT be taken lightly. There are general considerations before embarking on such an effort for a stranded animal (see Chapter 5). These considerations include: 1) a professional assessment of the animal's health condition, 2) the availability of

an appropriate rehabilitation area or facility, 3) the appropriate equipment for a safe transport, 4) the availability of sufficient operational funds and staff, and 5) the ability to keep humans and other animals protected from potential disease transmission.

Animal Assessment

The assessment of a qualified animal health professional at the stranding site is necessary to determine the likelihood of survival, and to envision an appropriate treatment plan through rehabilitation.

Availability of rehabilitation area or facility

It is the intent of the Network to develop regional rehabilitation facilities for long term care of stranded marine mammals. At the present time, Ocean Adventure is the only facility in the country that has the capability and resources to provide long term rehabilitation of a stranded cetacean. If long term rehabilitation is indicated, please contact Ocean Adventure for input and assistance.

Transport to the rehabilitation site

Handling and transporting even a relatively healthy animal is likely to be stressful, therefore appropriate methods are required (see Chapter 5). Transporting a severely compromised animal that is unlikely to survive this type of ordeal is not in the best interests of the animal. The decision to transport a stranded marine mammal to a rehabilitation facility, and the logistics involved, depend on several factors including: the size and manageability of the animal, the availability of appropriate transport equipment and knowledgeable personnel, distance from stranding site to rehabilitation facility (it is recommended that the total travel time not exceed 3-4 hours), and vehicle accessibility of both the rehabilitation facility and stranding site.

Sufficient funds and staff

A stranding response for marine mammals can be very expensive. Therefore, it is important that sufficient financial and manpower resources are available. Volunteers can be used in rehabilitation activities, but they must be supervised by experienced marine mammal care personnel.

Animal care upon arrival from transport

Upon arrival at the rehabilitation facility, the animal is initially placed in shallow water to make it easier for the caregivers to support the animal and administer medications. The depth should be enough to keep the animal afloat and off the bottom, and to allow people to stand and physically support and walk the animal, if necessary. The swimming behavior of the animal must be observed and recorded. If he continually turns, lists to one side, or is unable to keep himself upright, the animal will require assistance, around the clock if necessary, to keep the blowhole safely above the water. This is a task the rehabilitation facility must be prepared for, with sufficient numbers of qualified staff and volunteers to provide 24/7 in-water care for the animal. If the animal can swim on his own and is relatively active, personnel are still required to continuously observe the animal for at least the first 24 to 48 hours to insure that he is sufficiently buoyant, and does not bump into the pool walls or become disoriented.

Zoonosis

A zoonosis is defined as any infectious disease that can be transmitted between different species of animals, both wild and domestic, including humans. The chance of humans contracting a disease from a stranded marine mammal is minimal. However, other mammals in the rehabilitation facility can be at significant risk if the stranded animal has any kind of transmittable disease. There is also the

possibility of humans and other animal species (dogs, cats, birds, etc.) transmitting diseases to the rescued animal. Therefore, it is important to strictly follow quarantine protocols, and if indicated, to use protective gear like gloves and masks to lessen the risk of disease transmission.

Rehabilitation management issues

Providing rehabilitative care for a rescued marine mammal involves three basic management issues: facilities, water quality, and animal care.

Facilities

Enclosure design

In taking care of marine mammals, it is important that the enclosure design fits their physical and biological needs and that safety, hygiene, and general facility maintenance are taken into consideration. Pool volumes, construction materials, surface textures, environmental conditions, access to clean salt water, species' social needs, and basic animal behavior should be considered and included in the design.

During intensive care, a smaller enclosure like a shallow portable pool (e.g. Sofpool ®) is ideal as the animal is not actively swimming and will likely require humans to support it, oftentimes 24 hrs a day. Once the animal is stronger and can swim on its own, a larger pool may be needed. A larger space allows the stranded animal sufficient room to swim straight, navigate turns, and maneuver without hitting the side of the pool. Size of water space, maneuverability, and ability to get sufficient exercise become more important as the animal is being prepared for release.

Sofpool used for marine mammal rehabilitation

Illumination, air temperature and air quality

Providing good lighting, be it natural light, artificial light or a combination of the two, is an important consideration. Proper lighting allows the animal to visually navigate comfortably and helps in regulating normal biological processes. It also allows staff to conduct medical procedures, monitor the animal, feed, clean, conduct facility checks, day and night as needed. Direct sunlight can reduce harmful microorganisms in the water. However, marine mammals can overheat if exposed to direct sunlight when out of the water (for transport or a procedure), so provide shade and a means of cooling the animal and keep the skin wet during these times using a hose, sprayer, bucket, etc.

Larger space for rehabilitation of stranded cetaceans.

Substantial shade structures, roofs and wind blocks should be provided, if weather conditions warrant. Good air quality and sufficient ventilation is important at all times.

Upkeep and repair

Inspect facilities on a regular basis and remove or detach potentially sharp or dangerous objects (i.e. foreign objects, gate attachments, loose ropes or structures) that may pose a threat to the animal, either by physical contact or by inadvertently swallowing. Keep an inventory of paraphernalia used around the area and report any missing objects immediately. Some animals, particularly if they are feeling better and getting bored, may find interest and/or amusement in playing with physical elements of the facility. Repair broken fixtures and make sure there are no sharp or rough edges that the animals can get poked, scraped, or cut on. Secure drain covers to prevent the animal from getting stuck in the open drain and drowning. Be vigilant and proactive in reporting and addressing potential problems immediately.

Hygiene

Keep animal areas and support facilities clean. Provide a means for cleaning and disinfection including water hoses, wash sink, disinfectant dips and sloping drains. Footbaths of water with concentrated bleaching solutions help control the spread of diseases that are transmitted via the footwear from one area to another. These can be as simple as shallow pans with proper disinfectant solution which are strategically located in areas where people enter or exit, at a central point in the facility, and outside food preparation areas.

Cleaning agents and disinfectants should be used according to the instructions and cautions on the label. Use the proper dilution. Protect animals and staff from contacting or breathing vapors of potentially hazardous agents. Over time some disease agents may become resistant to the disinfectant used so it is recommended to rotate or change disinfectants periodically.

General safety precautions

A lot of safety precautions have been discussed in other chapters of this manual. These apply to the rehabilitation situation as well. The following are additional basic rules of safety:

1) Upon entry to the rehabilitation area, get updated information on the animal's behavior, especially incidents of aggression or unusual behavior that may create dangerous situations for the staff.
2) Be aware of emergency exits, the presence of other people, safety equipment, and special instructions or protocols in the area.
3) Work in pairs or with additional people when in the water with an animal.
4) Know your limitations. Do not overexert yourself, or participate in an animal restraint situation where skill or physical exertion is required, if you cannot do it.
5) Read and follow instructions and cautions as they apply to the use of equipment, tools, chemicals, medications, etc.
6) Do not operate equipment, machines or vehicles unless you are competent and authorized to do so. Do not operate these devices if you are overly tired, on medication that makes you drowsy, intoxicated, and/or sick.
7) Wear safety clothing (e.g. long sleeves) and equipment as needed.
8) Take note of the location of the safety equipment in the area including fire extinguishers, first aid kits, telephone, etc.
9) Be aware of weather conditions or forecasts that can affect the animal rehabilitation operations. Regularly listen to a local radio stations for weather reports. Plan ahead if there are preparations or precautions needed in anticipation of bad weather.

Water quality

Cetaceans and dugongs spend all their lives in the water. Therefore maintaining water quality is critical to the success of their rehabilitation. The "life support systems" that insure water quality are classified as "open", "semi-open" or "closed" systems. Open water systems are facilities that house the animals in open water pens or pump the water in and out with no artificial treatment or filtration. Semi-open systems use natural seawater that is filtered, treated, used for the animals, and eventually returned to the source. Closed systems use local fresh water mixed with salt and re-circulated throughout the system. The water is continuously filtered to maintain acceptable standards in sanitation, clarity, and biochemical balance.

Below is a list of water quality management techniques:

1. Control of bacteria – chlorination, ozone, copper, copper/silver, filtration, ultraviolet light, water exchange.
2. Removal of particulate matter – filtration, ozone, flocculants, water exchange.
3. Removal of biological wastes- chlorination (normal level), chlorination (shock), ozone, activated charcoal, filtration, water exchange.
4. Control of algae – chlorination, copper, ozone, herbicides, avoidance of ultraviolet light, filtration, water exchange.
5. Removal of organic/inorganic colors- chlorination, filtration, ozone, copper, activated charcoal, water exchange.

Basic hygiene and cleanliness are fundamental to water quality, no matter how simple or how complex your system may be. Always keep a scoop or net in easy reach to remove any floating trash, debris, or foreign objects in the water. Animals can ingest these items causing gastro-intestinal problems. Debris can also get into blowholes causing respiratory problems.

<u>Water Quality Parameters</u>

Seawater contains a high concentration of dissolved sodium chloride and numerous other salts and minerals. Salinity is important for marine mammals to maintain healthy skin, eyes and internal chemical balance. It affects water density and the animal's ability to float. A salinity range between 25 to 35 parts per thousand (ppt) is ideal.

Other parameters like microorganisms, algae, chlorine, pH, ammonia, turbidity and temperature also affect water quality and the health of the animal.

- **Fecal coliform bacteria** levels should be monitored and maintained at the "most probable number" (MPN) of below 1,000 per 100mL of water. Chlorine can be effective in controlling bacteria, but its use must be carefully monitored.
- **Chlorine** is safe and effective when maintained at 0.3 to 2.0 parts per million (ppm) and at a pH of 7.2 to 7.8. Drastic changes in chlorine and pH levels can harm the eyes, skin and lungs.
- **Ammonia** is produced by the breakdown of urine and impacts the effectivity of chlorine. Levels should always be below 1.0 ppm.
- **Turbidity** is measured by the clarity of the water. While water clarity affects the aesthetics of the system as well as the ease of observation of the animal, a reduction in clarity also provides the first signs of problems in water quality.

- **Water temperature** can impact the health and comfort of marine mammals. Avoid rapid changes in water temperature even if it falls within normal ranges. When an animal is sick, injured, or not eating well, it quickly uses up energy stored as fat, which reduces the blubber layer that acts as their body's natural insulator. This loss of insulation affects the animal's ability to retain body heat which can put extra stressors on an already compromised system.

Animal Care and Management

The rehabilitation process requires on-going monitoring of the animal through observation, interpretation and record keeping. A well established animal care system will provide optimal medical management (see Chapter 6), behavioral, nutritional, social, and psychological issues.

Behavior Management

Observation, interpretation and record keeping

For one to determine if anything is abnormal in the behavior of an animal, one must know what is normal. This is difficult for those handling or observing marine mammals for the first time. It is important to seek information and input from those experienced in marine mammal care in general, and ideally with the particular species (or similar species) you are working with. In addition, there is also useful information available in books, journals, articles, and on the internet. This type of knowledge is important in determining what is normal and what is abnormal behavior for the particular species being treated. In the wild, sick and weak animals become easy prey to predators, which is why marine mammals tend to mask illness and behave relatively normally until the illness is serious and clinical signs become obvious. Unfortunately, the early behavioral changes that would indicate that the animal is sick and needs medical attention, or whose known condition is worsening, are often covert.

Below are some common physical and behavioral signs that may indicate illness or physical distress in most marine mammals:

- General - loss of or decreased appetite, picky or 'playing' with food species, food regurgitation, vomiting, tiredness, weakness, weight changes, enlargement of abdomen, scoliosis, peanut-shaped head
- Skin - wounds, bites, bleeding, eruptions, unusual rubbing
- Mouth and anus - broken teeth, unusual appearance of feces, gas bubbles from mouth or anus, frequent defecation
- Blowhole and respiration - increased breathing rate, foul smelling breath, shallow breath, difficulty in breathing, expulsion of sputum
- Eyes – squintiness, closures or discolorations
- Behavior - repeating the same behavior over and over again, sudden change in resting or activity pattern (i.e. logging, fast swimming), unusual sexual activity, nervousness, unusual aggressive or submissive behavior, unusual vocalizations, arching of back, shaking, slapping of fluke

The recognition and proper interpretation of changes in behavior comes with a great deal of experience. It is not the responsibility of the animal keeper to diagnose diseases, but to recognize behavioral changes and report them to supervisors or the veterinarian for further interpretation and treatment.

Each individual animal should have his own records that would include:

- General information – ID number, species, age, sex, weight, body measurements, stranding information, etc.
- Feeding – recommended diet, actual food intake, type of food, etc.
- Behavior – activity level, resting patterns, changes in behavior, abnormal behavior, interaction with humans, etc.
- Medical records – diagnostic and treatment procedures recommended and performed, medications, respiration counts, defecation descriptions, sputum presence, etc. (also see Appendices for SOAP form)

Nutritional Management

Fish types and variety

Wild marine mammals eat a wide variety of fish and invertebrates. In captivity, the available food items are unlikely to be as diverse as those found in the wild. In rehabilitation work it is critical to get as many calories as possible into a debilitated animal. So access to a variety of food items of high quality (fit for human consumption) is important. This will require significant effort and cost to source, purchase, store, and handle appropriate fish species. Based on available fish types, a specific diet should be established by the veterinarian and animal care supervisor, which will likely change frequently in the early stages of rehabilitation. Fish must be weighed before and after each feed and accurate records kept of the type of fish and amount consumed. The following are various aspects of good marine mammal nutrition.

Some food items fed to marine mammals in captivity: mullet, mackerel, sardines, capelin, herring and squid.

Water

Life cannot exist without water. Although marine mammals live in water, they still need fresh water in order to maintain body functions. Cetaceans get the majority of their fresh water from the food they consume. This fresh water comes in two forms: preformed moisture and metabolized water. Preformed moisture makes up about 60-80% of the body mass of fish and invertebrates, and therefore is the major water source of marine mammals. Metabolized water is produced in the animal's body when fats, carbohydrates and proteins are broken down.

When animals are sick and not eating enough fish, they are likely to become dehydrated. Therefore it is often critical to administer supplemental fluids to prevent or treat dehydration. This can be done in several ways. If the animal is eating, or being "force fed", the easiest method is to inject water into the fish before feeding it. If the animal is not eating, or is in danger of significant dehydration, it may be necessary for a veterinarian or experienced marine mammal care manager to use a stomach tube to administer a substantial quantity of water (see Chapter 6). If available, the cetacean can be moved into a holding pool where water salinity can be controlled. With reduced salinity, throwing fish into the

water for the animal to pick up and swallow is the best way to encourage ingestion of water. Ice can also be fed along with the fish.

Food handling

Food is vulnerable to spoilage, contamination, fluid loss and general reduction of quality. Proper food handling is critical to protect food quality. Proper handling begins when the fish is caught and then immediately iced or quickly frozen (recommended below -25˚C) and kept frozen until it is prepared for a feed. Once thawed, each fish should be inspected for cuts and bruises in the skin and removal of debris like twigs, sea weed, algae, etc. the fish should then be: rinsed with clean cold water, sorted, and weighed. Protect fish from access to rodents, birds, flies, cockroaches and other vermin. Never use warm or hot water to rinse fish as this will hasten the rate of spoilage. Nutrients may leach out in freshwater so avoid soaking the fish in water any longer than necessary.

Below are some qualities of good fish:

- Fresh smell
- Full and firm body texture
- No cuts, tears or punctures in skin
- Skin is bright in color
- Gills are red and moist
- Cut muscles are firm, elastic and intact

Some characteristics of poor quality fish:

- Unpleasant, sour, acidic or “cooked” smell
- Flabby, limp and/or spongy body
- Dull, pale, and/or mottled in color
- Broken, torn and/or punctured skin
- Slimy or peeling skin
- Gills light in color and/or dry
- Muscles pasty, fibrous or mushy
- Eyes dry and/or sunken

If you are unsure of the quality of food, do not feed it. Dispose of fish that has been thawed and unfed after 24 hours. Maintain the highest level of sanitation at all times as this significantly affects food quality. Fish is usually fed whole, but if it is necessary to cut or fillet a fish, do so immediately prior to feeding.

Diet composition

Marine mammal food requirements vary according to factors like animal species, size, age, sex, growth phase, reproductive phase, activity level and health status as well as the ambient temperature of the rehabilitation site. For example, growing animals need more food compared to older, move mature animals. A growing animal may require food volume that is approximately 8-15% of their body weight while older animals may require only 4-9%. Do not over-feed. Some animals may take in more than their stomachs can hold and then end up vomiting.

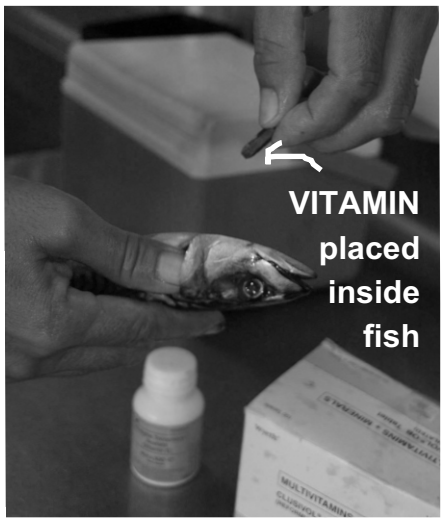
During treatment, offering a variety of food species is important to prevent an animal from getting accustomed to one type of food and then refusing other types. Diets should be determined and reviewed based on information such as weight loss/gain, medical condition, behavior, etc. Diet should be adjusted as frequently as needed, especially in the early stages of rehabilitation. Factors like fat or protein content, and number of calories of the type and amount of fish should be considered when adjusting the diet.

Food supplementation

The nutritional value of food species like fish and invertebrates is decreased after death, storage, and processing. Water soluble vitamins can be degraded or lost during thawing or if fish is left too long

in freshwater. To assure that vitamin and mineral needs are met, animals should be given vitamin supplements. For marine mammals, the most important vitamins are A, B, E, and C, and the necessary minerals are sodium, chloride, iron, calcium, potassium, phosphorus, magnesium and iodine. Some vitamins require generous supplementation like thiamine or vitamin B1, which is present in fish but is quickly destroyed after death. The minerals sodium and chloride have high concentrations in seawater, so they must be supplemented if the animal is to be housed temporarily in freshwater. Calcium and phosphorus are obtained from eating whole fish where the bones and scales are a good source of these two minerals. Supplements should be given as prescribed by the veterinarian to ensure the correct dosage.

Administering multivitamin supplements is done by inserting the pills into the fish before feeding. The gill flap is lifted and the pills are carefully pushed through the gills and into the body cavity. Vitamins in liquid form can be injected into the fish body cavity with a needle and syringe. Cetaceans eat fish whole so these techniques are easy and efficient if the animal is eating. Sick animals that do not eat can be given medication and vitamins via other means like force feeding, intubation (by adding the medication and vitamins to the fluids) and intramuscular injection (see Chapter 6).



<u>Feeding</u>

Marine mammals can consume more food when given in smaller increments, multiple times a day. Generally, a sick animal that is not eating on its own should be force fed three times at the most, and spread out over the day. This is because it is very stressful to force feed sick animals and requires skilled handlers. (For an indepth description of the process of force feeding, see Chapter 6.) The exact amount of food the animal consumes should be recorded. When the animal is better and begins eating on its own, food can be hand fed or thrown in the water one at a time. In this case, the feeding frequency can be increased. The animal should be carefully observed while feeding and behavior recorded, such as being selective about a particular food, making little effort to pick up fish thrown in the water, or refusal to eat. These cbehaviours should be reported immediately to the supervisor.

Guidelines for feeding marine mammals include the following:

1) Keep the food in the refrigerator or icebox when not being fed.
2) Take out only the amount to be fed at that time.
3) Place ice on fish that is carried to the pool to keep it cool during the feed.
4) Do not leave food in the pool longer than one hour. Scoop uneaten fish out to prevent the animal from eating spoiled or contaminated food.
5) Do not feed food that has been thawed longer than 24 hours.
6) Inspect fish before giving to the animal to insure that food is of good quality.
7) Do not feed food that has fallen on the ground or been exposed to flies, rats, cleaning materials, etc.
8) Feed fish whole when possible.

Neonate feeding

Infant marine mammals require highly specialized care and feeding techniques and artificial milk formulas. Formulas that closely resemble the dam's milk are best. These have high lipid content for high caloric density and low lactose, as most species are intolerant to carbohydrates. A recommended brand of milk formula is Zoologic ® Milk matrix. However a puppy milk replacer like Esbilac® and human low lactose or lactose free formulas like AL110® have been used successfully. Initially, water is intubated when the neonate has just been rescued. Thereafter, the replacement formula is added at increasing ratio until a desired caloric content of about 150-200 kcal/kg/day for a bottlenose or spotted dolphin is reached. Delivery is via stomach tube until the calf is taught to accept a bottle and nipple (calf-size is best). Hand-rearing paraphernalia should be cleaned and disinfected thoroughly. The frequency and amount of milk to be fed depends on the age and caloric needs of the animal. Regular weighing of the animal is important in monitoring the feeding routine. It is best to consult experts regarding hand-rearing of neonate stranders.

Medical Management

For a complete discussion of the medical management of stranded marine mammals, see Chapter 6.

Social and Psychological Management

When the animal is swimming by himself and beginning to explore his environment, it is time to introduce some enrichment. Enrichment is best described as a variety of strategies designed to simulate the natural activities that animals normally engage in order to increase behavioral choices and encourage species-appropriate behaviors in the captive setting. Marine mammals under human care for long periods of time will need some forms of enrichment to ensure their well-being. By providing enrichment, we promote mental stimulation, combat boredom, encourage species appropriate behavior, and increase physical exercise.

Intubation of milk supplement to stranded baby melon-headed whale.

There are a variety of enrichment categories, including the following:

- Physical enrichment – natural features such as rocks, sea weed, sand, etc.
- Social enrichment – when an animal's health improves and he is disease-free, the best form of enrichment is the social company of other compatible animals.
- Feeding enrichment - novelty and variety in delivering food such as live fish, frozen ice blocks with fish, puzzle feeders and other devices to make animals work for their food.
- Sensory enrichment – items and objects to rub against, lean on, swim through, etc.; a stream of water from a hose to massage body, flow into mouth, etc.
- Occupational enrichment – toys, floats, balls, and other objects to push, pull, carry around in mouth or on dorsal fin and pectoral fins, throw in the air, swim through, etc.

One of the most popular enrichment feeding devices is a ball or water bottle feeder. Use 12 inch round or larger hard plastic ball or 5 gallon water bottle. Drill 1 inch, 1 3/4 inch, and 2 inch holes randomly spaced around ball or bottle. Approximately 5 to 7 holes total. If using the bottle, attach a short rope to the neck of it with a medium size buoy to keep the bottle from sinking. The ball will naturally float on the surface of the water. Fill the bottle or ball with fish and ice cubes (the ice cubes briefly help hold the fish in). Animals must push, tug, turn, and roll the bottle or ball to get the food out. This can be manipulated by more than one animal at a time, although if multiple animals are present, multiple enrichment devices should be provided as well.

Enrichment activity! Dolphins playing with a fish bottle

Any enrichment object should be designed carefully, inspected, and monitored to insure that it is safe for the animals (i.e. cannot be swallowed or get into the blowhole, has no sharp edges, is strong enough to withstand rough manipulation, cannot entangle the animals, etc.)

Management of non-releasable animals

There is never a guarantee that rehabilitation will result in a healthy, competent animal that can now be released back into the sea. Therefore, the long term care of non-releasable animals must be addressed and resolved prior to bringing the animal into a rehabilitation situation. Given the only reasonable options of (1) permanent captivity or (2) euthanasia, if an animal is healthy but unable to be released for a variety of reasons, placement in a high quality captive situation is the most ethical option. Chapter 9 discusses a case study of an unreleasable stranded dolphin that was successfully integrated into the cetacean population at Ocean Adventure.

References

Dierauf L.A and Gulland F.M.D, CRC Handbook of Marine Mammal Medicine 2nd Edition. pp.136

Geraci JR, Lounsbury VJ. 1998. Marine Mammals Ashore: A Field Guide for Strandings (CD ROM). National Aquarium in Baltimore.

Chapter 8

Necropsy and Carcass Disposal

Richard P. Encomienda and Leo Jonathan A. Suarez

NECROPSY

Unfortunately, cetacean strandings often do not lead to successful recovery and release of animals. In most cases, these animals strand because they are in a severely debilitated state. All too often, they die shortly after stranding, or in the midst of a rescue attempt. In some cases, animals are found dead or decomposing on the beach days after the actual time of stranding. Although this may be a sad fact, there is still valuable information on marine mammal biology, illness, and mortality that can be gathered from a post mortem examination of a dead animal. This procedure is called a necropsy.

The scientific information obtained from dissecting a carcass is more detailed and probably more significant than the data that can be gathered from a live animal. The veterinarian and/or researcher can closely examine the physical body, collect tissue and organ samples, biopsy lesions and tumors, and photographically document the process. Properly collected and stored samples are sent to experts in histopathology where an even greater amount of data can be collected on an individual animal. This information can then be shared with other specialists increasing the body of biological information we have on the individual animal specifically and on marine mammals in general.

Necropsy gives the examiner information on how the animal died. It can also provide evidence of direct human impacts on marine mammals in the wild (i.e. fishery activities, boat collisions, ingestion of garbage or pollutants, etc.). Valuable information about diseases that affect marine mammal populations on an individual basis, as well as large scale mortalities and die offs caused by viruses, bacteria, parasites, and algal toxins can be gained from necropsy. There has also been valuable data produced on the types, amount, baseline concentrations, geographic sources, and trends in the levels of chemical contaminants, biochemical components, biotoxins, and heavy metals in the water and in marine mammals themselves.

Necropsy is not always easy. If the body is too large to be moved or in an advanced stage of decomposition, the procedure may have to be performed at the stranding site under less than ideal conditions – e.g. many onlookers present, or problematic weather and environmental conditions. Ideally, the carcass can be moved to a more secure and clean environment to improve sample collection and examination.

Requirements and Expertise

Conducting a necropsy is a complex process. Only by performing the procedure correctly, and properly collecting, storing, and transporting the samples to a credible laboratory will the results have merit. This will require the services of a registered veterinarian or human medical professional to organize, supervise, and perform the necropsy. This individual will conduct a thorough examination of the carcass, both external and internal. She or he will also collect biological samples, ideally with the assistance of Stranding Team members

who are familiar with the physiology and body configuration of a cetacean or dugong. This is important to avoid accidentally puncturing organs and breaking the state of asepsis while helping in the collection of samples for diagnostic tests (see Figures 3 and 4). The highest possible degree of cleanliness must be maintained during a necropsy, thereby protecting and enhancing the quality of samples collected.

A systematic necropsy also requires the expertise of a veterinary (or possibly a human) pathologist. This is an expert who specializes in recognizing and understanding how and why diseases occur. The pathologist is not necessarily on site, but is affiliated with a hospital, laboratory, or veterinary clinic where necropsy samples are sent and analyzed. The pathologist will examine all clinical data from case history, diagnostic test results, gross necropsy results, and tissue samples to attempt to determine the cause of death.

Carcass classification and corresponding sample collection

Cetacean carcasses that are already in a state of decomposition can still be a source of valuable information and samples. Carcasses can be classified by using codes formulated by Geraci and Lounsbury (1993) for the U.S National Stranding Network (Code 1 indicates a live animal). The state of the animal (live) or level of decomposition of the carcass will determine what procedures to do and what samples to take as listed below in Table 1.

Table 1. Classification of live animal or carcass condition (Geraci and Lounsbury, 1993)

Code	Definition	Gross Appearance	Specimen collection / Use of Data	Interpretation
1	Live		Morphometrics; blood; biopsy; urine. / Parasitology; DNA analysis;microbiology	
2	Fresh Dead (Good)	No Bloating; normal appearance; fresh smell, minimal drying and wrinkling of skin, eyes and mucous membranes; muscles firm and dark red; blubber firm and white; internal organs intact.	All types of specimens should be collected. / Morphometrics; DNA analysis; toxicology parasitology; microbiology.	Bacterial overgrowth may be observed on histology: some autolysis noted on histology
3	Moderate Decomposition (Fair)	Slight bloating; some skin sloughing and cracking; eyes sunken; blubber blood tinged; muscles stiff; all internal organs still have gross integrity but are soft and friable.	Morphometrics; all types of samples collected. / Gross pathology; parasitology; genetics; some histopathology.	Autolysis often masks histological assessment; decomposition may alter enzymatic, biochemical, and chemical analyses including lipid quality and quantity
4	Advanced Decomposition (Poor)	Bloated; strong odor; missing patches of epidermis; internal organs show lack of integrity and extremely friable; blubber soft with gas pockets and pooled oil; muscles nearly liquefied and easily torn.	Morphometrics; teeth, baleen, bone; organ samples. / Gross pathology, parasitology, limited DNA, life history.	Autolysis often masks cause of death; bloating and autolysis may alter morphometrics
5	Severe Decomposition	Mummified / Skeletal remains	Morphometrics; limited life history and DNA analysis.	Cause of death only rarely determined

Necropsy instruments and equipment

The attending veterinarian or medical practitioner should have the basic necropsy instruments and equipment as indicated in the checklist below.

- Necropsy form (see Appendix B)
- Digital camera
- Measuring tape & ruler
- Surgical instruments
- Knives
- Saw
- Gloves
- Containers for tissue samples
- Sterile test tubes
- Culturettes or sterile swabs
- 10% formalin
- Alcohol lamp
- Applicator sticks
- Weighing scale

Necropsy Process

The process of conducting a necropsy begins with the external body of the animal and proceeds to the internal structure and organs. Major elements of this process include the following examinations, data and sample collection.

Taking morphometrics


Necropsy procedure on an Omora's whale calf

External Examination

The first step is to identify the species and determine the sex of the animal. The body should be photographed, skin examined and physical characteristics described including color pattern, scars, injuries, external lesions, etc. External samples of skin and blubber are useful for microbiology. Tooth counts should be taken from one side of the upper and lower jaw. If any parasites or discharges are present, samples should be taken. Any evidence of human-related injuries such as gun shot wounds, boat strikes, net or rope wounds, etc. should be carefully documented.

Morphometrics

A standard set of morphometric and descriptive data should be collected and augmented by

photographs and video. Morphometric measurements can assist in species identification and age of the stranded animal. The data may also provide important information for understanding the basic biology, life history, and nutritional status of the animal, as well as aiding in epidemiological investigations of disease of the specific species. Figure 1 below shows a standard set of measurements for cetaceans and Figure 2 shows the same for dugongs.

Figure 2. Morphometric measurements for Cetaceans

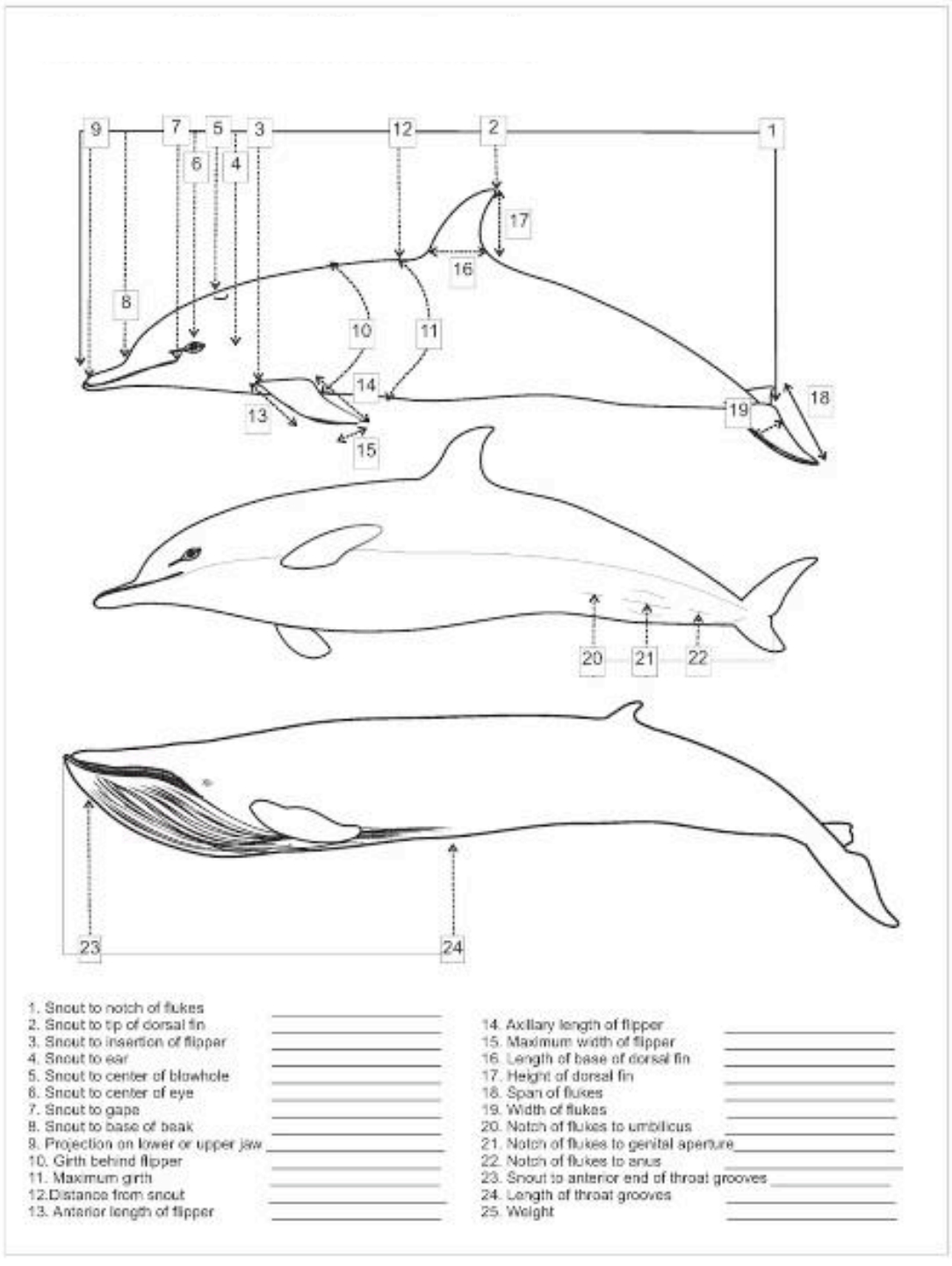
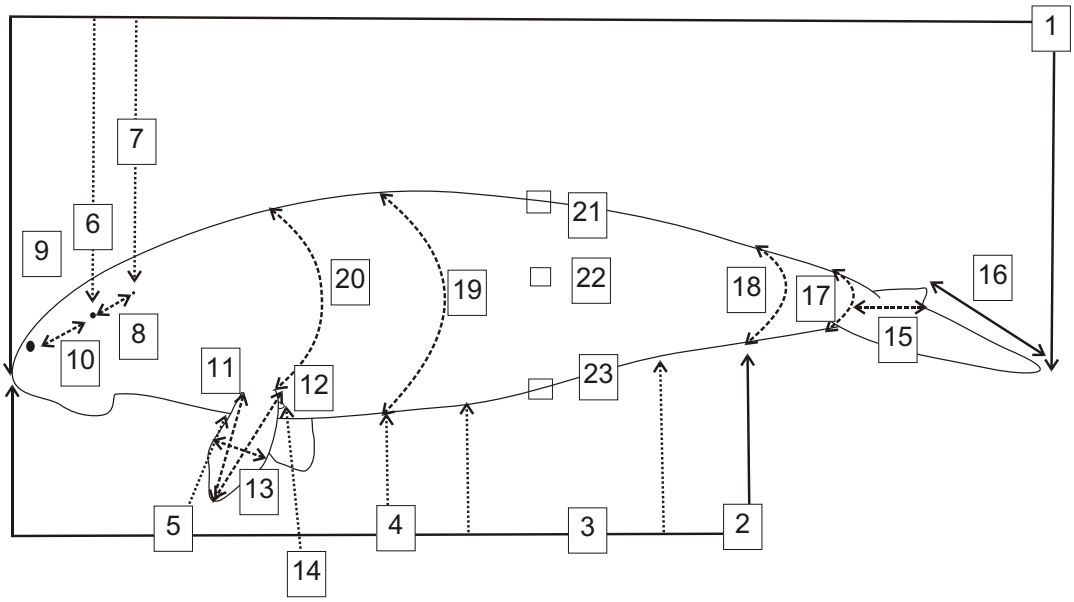


Figure 3. Morphometric measurements for Dugongs



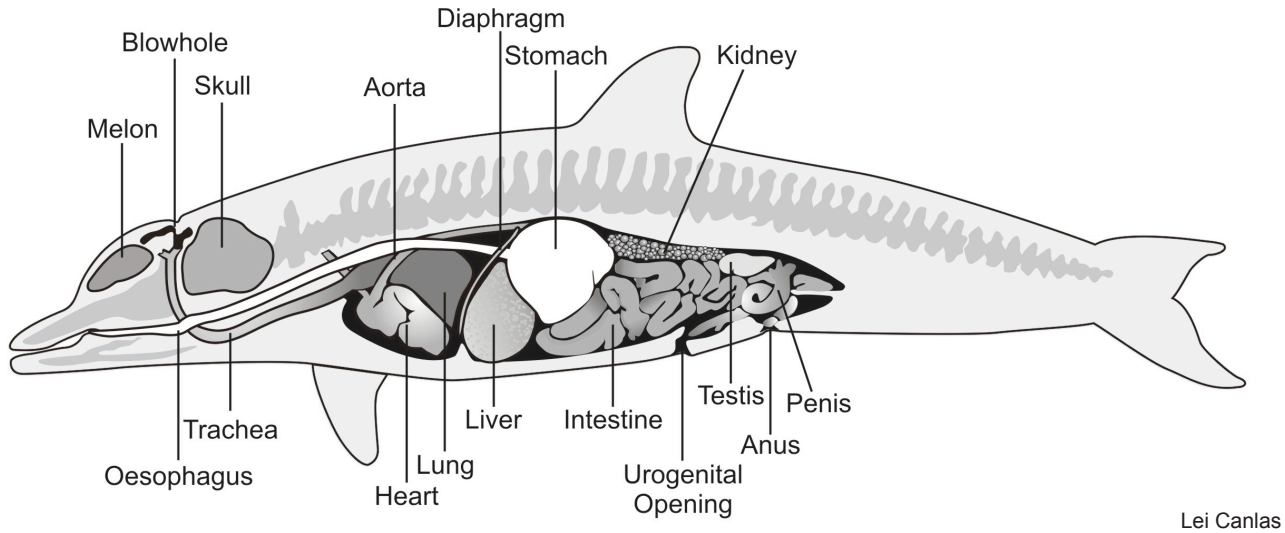
1. Tip of snout to tip of fluke _____
2. Tip of snout to center of anus _____
3. Tip of snout to center of genital aperture _____
4. Tip of snout to center of umbilicus _____
5. Tip of snout to anterior end of flipper_____
6. Tip of snot to center of eye _____
7. Tip of snout to external ear _____
8. Center of eye to ear _____
9. Distance between centers of eyes _____
10. Center of eye to center of nostril _____
11. Flipper length, anterior to tip _____
12. Flipper length, axilla to tip _____
13. Maximum width of flipper _____
14. Perpendicular length of teat (both sides) _____
15. Base of fluke to posterior tip _____
16. Maximum width of fluke _____
17. Girth at fluke base _____
18. Girth at anus _____
19. Girth at umbilicus _____
20. Girth at axilla _____
21.Thickness of skin / blubber: dorsal_____
22.Thickness of skin / blubber: lateral_____
21.Thickness of skin / blubber: ventral_____

Internal Examination and Sample Collection

A complete internal examination of the carcass is the most meticulous part of a necropsy. Blubber and skeletal structure will be examined (ie. color and texture) and organs carefully removed and examined and samples taken.

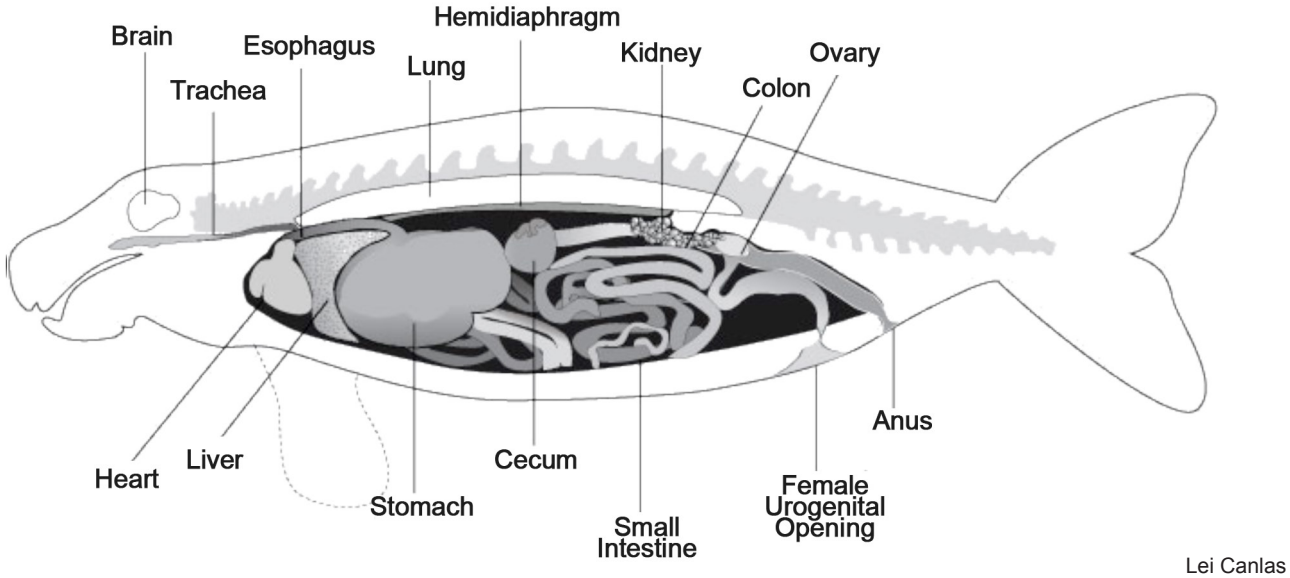
The thoracic cavity consists of the heart and lungs. This cavity is found at approximately the same level as where the pectoral fins connect to the body. Separating the thoracic cavity from the abdominal cavity is the diaphragm, a sheet of muscles extending across the bottom of the ribcage. Caudal to the diaphragm are the liver, stomach, intestines and uro-genital organs.

Figure 4: Diagram of cetacean anatomy



Lei Canlas

Figure 5: Diagram of dugong anatomy



Lei Canlas

There are different samples to be collected in each necropsy depending on the condition of the carcass and what diagnostic tests are possible. Samples should always be handled with care and be free from contaminants as much as possible. The following are the types of samples that will be collected, and their various purposes.

1. Swabs samples – to determine what kind of micro-organisms (bacterial, fungal or viral), if any, are present in a lesion of an organ. These are collected in-situ as soon as the organs are exposed to minimize contamination. These should be sent to the laboratory within six hours after collection.
2. Tissues samples – collected for histopathology, toxicology or DNA testing. Samples may be

stored in containers with 10% formalin (histopathology), alcohol (DNA) or frozen (toxicology, DNA)

3. Blood sample (only through Code 2) - may be useful in finding viral antibodies as long as several days after death.
4. Impression smears – collected for a quick cytological evaluation of an organ or lesion.
5. Parasites – collected and stored in 75% ethanol for identification and scientific purposes.
6. Fluid material present in body spaces (thoracic and abdominal cavity) should be collected, measured and stored for microscopic examination and bacteriology.

Record Keeping and Reporting

To ensure that the necropsy is done thoroughly, a Necropsy Report Form is provided in Appendix C. This will serve as a guide and the format of PMMSN in reporting necropsies. Additionally, sections F, G, H, and I of the Stranding Response Form should be completed for filing and reporting.

Proper Storage of Specimens

The Stranding Team should have a standard protocol for packaging and storing collected samples and access to hospitals, universities, or diagnostic laboratories where the samples can be sent and processed. The samples should have individual labels that indicate the species, tissue/sample type being sent, and date collected. It is advisable to keep all samples from the same animal in one properly labeled box. (See Table 2)

CARCASS DISPOSAL

There are many ways to dispose of a marine mammal carcass depending on the size, location, level of decomposition, and resources available.

Table 2. Example of a tissue sample label

Animal ID code:	Lh01reg3071807
Date of death:	July 18, 2005
Genus / Species:	*Lagenodelphis hosei*
Carcass condition code:	Code 1
Location of stranding:	Crystal beach San Narcisso Zambales
Tissue / organ:	Liver
Sample intended for:	Histopathology

Leave in place

Leaving the carcass where it lies and allowing the scavengers to do the rest is the easiest solution. However, this option is only applicable in remote and unpopulated areas where the smell of decaying carcass and public health risks are not a concern. The carcass should be opened to increase the rate of decomposition and eliminate gas build up.

Bury in sand or dirt

A quick way to conceal a carcass and allow it to decompose without odor and public health risks is to bury it. The grave should be deep enough to ensure that at least two feet of soil covers the carcass to prevent animals or humans from digging it up. Choosing a burial site needs several considerations. The grave should be well above the tide and storm surge line. The procedure of burying the carcass

Digging of a hole for carcass disposal


What is left of a cetacean carcass that was left to decompose on the beach

should cause no destruction to the beach, vegetation, dunes and other wildlife. Note that soil or sand near the beach may erode and cause the carcass to re-appear at some future time. Permission from local authorities should be obtained, especially if a public landfill is used.

Transfer to another location

When a carcass becomes a nuisance and public health risk it may be necessary to move or transfer it to a more remote and unpopulated site where it can be left to decompose or be buried. Permission from one or more levels of local government may be required if the transport is done from one municipality / city / province to another. The size of the animal greatly affects the logistical feasibility of a transfer and necessary equipment requirement. Small carcasses can be moved as a whole in varying size trucks, while large carcasses may need heavy equipment. An exceptionally large carcass may have to be cut and moved in pieces. Carcasses can also be transferred to willing universities and museums for further study and/or preservation for educational purposes.

Towing to sea

A large carcass can be towed out to sea and released far off shore so that currents and wind will not bring it back into shallow waters. The location of release should also be cleared from shipping and fishing lanes to avoid collision with boats. Attaching a heavy sinker to the carcass (cement blocks) will help accelerate its sinking to the bottom. Opening the carcass will also increase rate of decomposition and prevent gas build up that will cause it to float.

References

Dierauf L.A and Gulland F.M.D, CRC Handbook of Marine Mammal Medicine 2nd Edition. pp.136

Geraci JR, Lounsbury VJ. 1998. Marine Mammals Ashore: A Field Guide for Strandings (CD ROM). National Aquarium in Baltimore.

Jones TC and Gleicer CA. (editors) 1954. Veterinary necropsy procedures. The Armed Forces Institute Of Pathology, JB Lippincot Co. pp136.

Moore, M.J., A.R. Knowlton, S.D Krauss, W.A. Mclellan and R.K Bonde. (in press). Morphometry, gross morphology and available histopathology in the north Atlantic Right Whale (Eubalena glacialis) mortalities (1970 – 2002). Journal of Cetacean Research and Management.

Pugliares KR, Bogomolni A, Touhey KM, Herzig SM, Harry CT, and Moore MJ. 2007. Marine Mammal Necropsy: An introductory guide for stranding responders and field biologists (Technical Report). WHOI-2006-09

Chapter 9

Cetacean Stranding Case Studies

The purpose of this chapter is to examine three examples of a well executed marine mammal stranding response. These case studies illustrate the step-by-step process from the initial phone call by the first responder, to the Stranding Team response, on site care, transport, rehabilitation, and two very different final outcomes. The first case study involves a mass stranding of three male Pantropical spotted dolphins *(Stennela attenuata),* the second involves a single female Risso's Dolphin *(Grampus griseus),* and the third a single Pygmy Killer Whale *(Feresa attenuata).*

CASE REPORT of a STRANDED PANTROPICAL SPOTTED DOLPHIN (*Stenella attenuata*)

Richard Encomienda and Christopher Torno

Initial report by First Responder

Around 9:00 AM of September 14, 2004 Ocean Adventure received information by telephone from the office of the SBMA chairman that the provincial agriculturist of Bataan (Mr. Julito Velasco) asked for help in rescuing three stranded dolphins in Brgy. Tabing Ilog Samal, Bataan. We immediately called the Provincial Agricultural Officer (PAO) to ask the status of the dolphins. At that time, the PAO informed us that one dolphin was already dead and the other one swam away. The PAO gave us the name of our main contact person (Mr. Crisostomo Mira) for this stranding who then gave us directions on how to get to the municipal hall of Samal, Bataan.

Dispatch of Stranding Team

At Ocean Adventure, the Stranding Team was assembled, essential medical supplies and transport equipments prepared and the Team left for the municipal hall to meet with the local contacts. Along the way, our main contact person reported that the three dolphins were originally sighted early in the morning by Mr. Jason Lucero, a local young fisherman, swimming near the fish traps in the shallow waters. Mr. Lucero was said to have driven the three marine mammals into a fish corral ("baklad") where the animals got trapped. Mr Lucero was able to capture the dolphins with the help of other fisherfolk.

Arrival on site

The Stranding Team arrived on site two and a half hours later(11:30AM). We saw only one live dolphin, which was being kept in shallow water in a polluted estuary and being handled by four people (including Mr. Lucero). Because of the relatively small size of the animal, the Stranding Team estimated the live animal to be a juvenile and suspected that it might have stranded with its mother. OA veterinarian, Dr. Torno called Mr. Edwyn Alesna of BFAR main office in Quezon City (who is BFAR's point person on marine wildlife) to inform him of the situation and gained permission to assist in the rescue efforts.

Crowd control

With the assistance of Mr. Manolito Batan (Barangay Councilor) and Ms. Nora Medina (Municipal Agricultural Officer), the OA Stranding Team took over the handling of the animal. The Team attempted to determine the location of the dead dolphin in order to help determine the species and age of the live animal. One bystander mentioned that it already had been transported to the province of Bulacan to be sold as meat, and claimed that once a dolphin is dead, it becomes the property of those who caught it. Dr. Torno explained to the crowd the importance of getting information from the dead specimen. Mr Batan and Ms Medina volunteered to retrieve the dead animal. After approximately one hour, they returned with not just one carcass, but two.

Decision making

The decision was then made by the Stranding Team to transport the animal off-site for treatment and rehabilitation because of the stressful situation and poor environmental conditions. With permission from the local authorities and BFAR main office, all three dolphins, 1 live and 2 dead, were transported to OA.

Rehabilitation / Quarantine

The live dolphin was kept isolated in a quarantine pen approximately one (1) km away from the Ocean Adventure pen system and its resident animals. Multiple staff members were assigned to feed and monitor him every day. For the first 45 days, all keepers and materials brought to the quarantine area were disinfected at the entry and exit point of the quarantine pen. His health status was assessed by physical examinations, behavioral observations, and laboratory diagnostic procedures.

Necropsy and carcass disposal

The two (2) dolphin carcasses were initially frozen (at -40°C). The animals where then transported and necropsies performed at a later date at the UPLB animal disease diagnostic laboratory College of Veterinary Medicine Los Banos, Laguna. The gross findings did not reveal any signs of illness. Cause of death was drowning.

Long-term care

The rescued dolphin was rehabilitated over several months. His health and strength were restored and the only remaining unresolved condition was a permanent injury to the left eye. The decision then had to be made whether he was fit for release back to the wild, or whether he was a candidate for permanent residence in captivity.

The factors carefully considered were the following:

- He was a young animal who had lost the rest of his social group. He would not survive in the wild on his own.
- The ability to locate another group of spotted dolphins and then transport the animal to the site and release in a reasonable time frame was unlikely, logistically difficult, and prohibitively expensive. Even if a pod was located, there was no guarantee they would accept him as a member of the group.
- He was compromised to an undetermined degree by his permanently injured eye.
- He had now been in rehabilitation for several months and was quite comfortable with humans. This could be detrimental to a wild animal, but positive for a captive animal.
- Ocean Adventure had the facilities, staff, expertise, and social environment to provide permanent quality care for the animal.

Based on these factors, the decision was made to deem him unreleasable, and to introduce him to the captive population of cetaceans at OA. His introduction and integration with the resident animals went very well and he is now a healthy, well adjusted member of the cetacean group at OA.

The rescued spotted dolphin, named Sam, is now a healthy and well adjusted animal at OA.

CASE REPORT of a STRANDED RISSO'S DOLPHIN (*Grampus griseus*)

Bianca G. Espinos, Mariel B. Flores, and Francis E. Maniago

Initial report and information gathering

On June 20, 2008, at approximately 10:30 am, Ocean Adventure received a call from Mr. Ronaldo Bernandino that a dolphin had stranded within the jurisdiction of Malolos City, Bulacan. Mr. Bernandino, an Aquaculturist II officer of the Provincial Agriculturist Office of Bulacan, had recently attended the Cetacean Stranding Response Workshop in February of this year and received training as a First Responder. As such, he was critical in ensuring that the dolphin was handled with as little stress as possible. He also coordinated and mobilized the various local government units and became the vital link between the stranding site and the Ocean Adventure Stranding Team.

Mr. Bernandino's description identified the dolphin as a Risso's Dolphin (*Grampus griseus*). The dolphin was reportedly found in the shallow waters of a local oyster farm or "talabahan" by some local fishermen. Attempts were made to push her back into deeper water, but the dolphin returned to shore. The provincial DENR-CENRO office was contacted at that time, and the dolphin was "dragged" to the nearest fish port in Baranggay Pamarawan.

First Responders and crowd control

The animal appeared weak and needed some help to hold herself upright, so Mr. Bernandino elicited the support of local fishermen to assist. These people became part of the First Responders team. Length and girth measurements were provided to OA, which helped in preparing specific equipment for the rescue response.

The volunteers were very eager and proud to help, and a large crowd quickly gathered around the dolphin. Mr. Bernandino and the LGU officials set up a rope about 5 meters around the animal to keep the crowd contained. Although the waters surrounding the fish port were busy and quite polluted, the stranding site was very accessible and provided an acceptable short term location to stabilize and assess the animal's condition.

Dispatch of Stranding Team

Meanwhile, the OA Stranding Team was split into 3 groups, each with its own specific task. The advance party consisted of 2 marine mammal care specialists and the resident marine mammal veterinarian. They left immediately to assess the situation, coordinate with the LGU, and provide medical first aid to the stranded dolphin. The second group consisting of experienced animal transport staff prepared all the necessary transport equipment and then proceeded to the site. The third group remained at Ocean Adventure and prepared the rehabilitation facility and served as the first shift to care for the dolphin through the night.

Arrival on site and decision-making

When the Standing Team arrived at the site, the situation was secure and the dolphin in stable condition. The First Responders did their job well! The animal was emaciated and lethargic when it was initially examined by the veterinarian, Dr. Mariel Flores. There were old white scars around the body which were typical of the species. A small half-circular wound was seen on its belly, likely from a cookie-cutter shark bite. A blood sample was taken for diagnostic purposes. City veterinarian Dr. Jeorge Crisostomo observed the medical procedures so he could be exposed to such an experience. Initial treatment consisted of injections of corticosteroids and antibiotics.

The Stranding Team then assessed the condition of the animal, and the environmental conditions of the stranding site and it was decided to transport Rissa to Ocean Adventure for rehabilitation.

While everyone waited for the transport team to arrive, an impromptu community education process unfolded. The GMA news network sent a crew to explore the story which provided the opportunity to publicize the issue of stranded dolphins to the entire country. That night the story of Rissa appeared on the early evening news.

Transport to the rehabilitation facility at Ocean Adventure

By the time the transport team arrived, the crowd had grown. The first step was to fill the dolphin transport box with water. This took more than an hour, as there was no available hose and water had to be brought pail by pail. It was laborious and frustrating. Finally a local police officer suggested bringing in a fire truck to fill the box. It was a great idea and illustrated the level of support of the LGU.

To transport Rissa, she had to be lifted and placed in a stretcher, then carried to the truck, and then the stretcher lowered into the transport box. All volunteers and LGU officers were briefed on how to move a dolphin. Rissa was given an injection of Diazepam to reduce stress and anxiety during the transport. She was then carefully lifted into the stretcher. However, when she was being carried in the stretcher to the truck, the crowd became very excited as they tried to get a closer look. It was a test of patience for the Stranding Team and the LGU officers. But it proved one thing - stranding events draw large crowds of interested and curious people. As such, they are opportunities to educate the public, and gain their support in protecting and saving stranded marine mammals.

Rissa was safely placed in the transport box and transported to Ocean Adventure via truck. LGU provided a local police car escort for a substantial portion of the trip. Using back roads with less traffic made the ride smoother and the trip quicker and less stressful for the animal. The animal's skin was kept moist during the transport and respirations recorded periodically. She was generally calm and with good respirations during the transport. At 8:00 pm, after a journey of nearly 3 hours, Rissa arrived safely at Ocean Adventure.

Rehabilitation effort

Upon Rissa's arrival at the quarantine area adjacent to OA, a large inflatable pool was already filled with sea water and would serve as her rehabilitation pool for the next 8 days. Once she was stabilized in the pool, water with dextrose solution was administered through intubation to address dehydration and emaciation. A 24-hour watch was already organized.

For the next 8 days, Rissa lived in the inflatable rehabilitation pool. Good water quality was maintained by pumping water directly from the bay and then creating water circulation through a continuous water inflow and outflow. Vacuum sweeping was done daily to remove feces and fish particles from the water. Since the rehabilitation area is also a quarantine area, the pool perimeter was cordoned off and entry restricted to animal care staff and volunteers on each shift. A disinfection tub with Virkon solution bath was prepared and everyone leaving the quarantine area was required to immerse in the bath first. This practice was strictly adhered to in order to eliminate the risk of any disease transfer from the rehabilitation site to other areas of the park, or to resident animals. Rissa required 24 hour a day monitoring and care. A lighting system was set up for the night shift. A small shelter for the staff was provided with electricity for lighting, simple cooking, and communication needs. Each shift had an experienced animal care person in charge. Volunteers from OA as well as local residents provided the manpower in 8 hour shifts. Tasks were assigned to each individual. Pool cleaning, physical support to the animal, record keeping, animal restraint, and constant monitoring were the major duties carried out by members of the rehabilitation team.

Medical Management

Rissa was estimated to weigh about 275 kg upon arrival at the rehabilitation site. It was apparent that the animal had not eaten for some time prior to stranding. The dipping epaxial muscles and the peanut-shaped head were indications of emaciation. Therefore, getting food to the animal was imperative. When offered fish during the first day of rehabilitation, the animal did not eat at all. Different species of fish and squid were offered and attempts made to gently force food into her without success. Rissa did not eat anything voluntarily for the entire 8 days. Observation of clinical signs, physical examination and blood results indicated a combination of interrelated health problems. These issues were diagnosed and addressed in the following ways during the rehabilitation attempt.

Emaciation, Malnutrition, and Dehydration

On the advice of the OA consulting veterinarian, a diet was established for the animal that was designed to get as much nutrition to the animal as she could handle, both in quantity and quality. Because she would not eat voluntarily, up to 1.5 kilograms of fish was delivered to her through force-feeding 3 times a day (see Chapter 8 for detailed description of force-feeding method). Considering her size, it required 6 experienced staff to do the involuntary procedure. Her jaws were carefully forced open with towels. Individual fish were slipped into her mouth and pushed far enough down her throat to insure that each was swallowed.

The force feeding was conducted with minimal stress to the animal. However, by the fifth day she began to vomit shortly after the feeds. It was then decided to go to intubation with fish gruel to aid in easy digestion and to increase the feeds to 4 per day. The gruel consisted of fish and water put in a blender and then nutritional supplements added including multivitamins formulated for marine mammals with extra Vitamin B-complex, Vitamin E, Selenium and Iron. Physical restraint for this procedure was the same as force-feeding, except that a tube was inserted through the mouth to the stomach. The drugs and gruel were then poured into a funnel on the other end of the tube. Because of the potential risk of inserting the tube into the trachea instead of the esophagus, only highly experienced animal care staff performed the procedure. Although this was also achieved with minimal stress, she would still vomit the gruel periodically. On a positive note, the dehydration was corrected with the intubation of water and gruel and the early attempts to force-feed with whole fish.

Rissa was able to stay afloat on her own throughout, although she was moving minimally. It was noted after a few days of inactivity that her peduncle was bending to the left and it appeared she could not straighten it out. Physical therapy was then initiated to prevent permanent damage to the area that may result in scoliosis.

Possible obstruction

On the third day of rehabilitation, Rissa vomited a couple pieces of plastic. With the possibility of an obstruction in the stomach being the cause of her condition, it was decided to induce vomiting once by intubating a large amount of water into her stomach. Only a few tidbits of trash came out. On subsequent days when she vomited on her own, no further trash was seen. It was still suspected that there may be an obstruction, therefore plans were made to introduce an endoscope into the stomach and retrieve the obstructing materials with graspers when the animal's condition stabilized. Sadly, her condition continued to decline and she died before an endoscopy could be conducted.

Blood loss anemia

With regular diagnostic testing of the animal's blood, it was determined that she was continuing to lose blood, although it was difficult to pinpoint the cause. Fecal and gastric samples revealed red blood cells in the gastrointestinal tract, which is not normal. On Day 3 the animal was given Yunnan Paiyao to stop the bleeding (a Chinese herbal medicine proven to be effective in controlling bleeding) and iron supplements to address the anemia. Yunan Paiyao has been used successfully with marine mammals by many facilities, and in this difficult case it was fairly effective.

Inflammation
A severe and likely generalized inflammation was indicated by a blood test called erythrocyte sedimentation rate (ESR). Along with the clinical signs and plastics vomited, it was suspected that the inflammation was gastrointestinal in origin. Sucralfate was given as a protectant to the gastrointestinal lining.

Bacterial and fungal infection
An increased white blood cell count indicated a bacterial infection. With the administration of antibiotics, the white blood cell count came down indicating that the infection was being controlled. Fecal and gastric samples revealed yeast and fungus present. Therefore, an antifungal was added to the treatment regimen.

Pneumonia
In the last few days of rehabilitation, abnormal breath sounds were heard and a foul smell from the blow hole during exhale was noted, indicating the onset of pneumonia. This is a common secondary condition developed in critically ill cetaceans whose immune systems have been compromised. The animal was already on antibiotics so there was little more that could be done to address the worsening condition.

Elevated liver enymes
Elevated liver enzymes in the animal's blood profile indicated a problem of unknown origin. The Vitamin B-complex supplementation was added to the gruel to address this.

As the animal's condition declined in the latter part of the rehabilitation process, serious consideration was given to euthanasia. After much discussion, the decision was made to put an end to her suffering. The animal died before euthanasia could be carried out.

Necropsy results
A complete necropsy was immediately conducted, which confirmed our suspicion of gastric impaction. The normal passage of food was stopped by the large amount of trash obstructing the first stomach. Approximately 2 kilograms of different types of plastics and other organic materials were found in her stomach. The cause of the blood loss diagnosed and treated during the rehabilitation effort was found to be ulcerations on the stomach lining caused by the impacted trash. The bleeding was likely controlled by the treatment but the animal was unable to recover from the severe anemia which can starve different organs of oxygen and eventually cause death.

Conclusions
The message from the dead is a sobering one. Dolphins and other marine animals mistake plastics for food. Plastics do not break down, are not digested, and will eventually cause death. Rissa's suffering and ultimate death was the direct result of human behavior. It was a death that was preventable.

Volunteers keep Rissa afloat.


Plastic found inside Rissa's stomach

CASE REPORT of a Pygym Killer Whale (*Feresa attenuata*) euthanized in Malolos, Bulacan

Leo Jonathan A. Suarez

Initial Report

At around 8AM of April 29, 2011, Rafael de Guzman, a fisherman from Bgy. Pamawaran, Malolos, Bulacan found a pygmy killer whale *(Feresa attenuata)* swimming towards his outrigger boat while he was fishing out in the sea in Manila Bay. Several attempts were made by him to bring the animal to deeper waters but it repeatedly swam back towards his boat. Concerned that other fishermen in the area would slaughter the animal, de Guzman tied a rope around the neck and slowly dragged it with his boat inside a river. The incident was reported to the BFAR Management Council (BFARMC) of Brgy. Pamarawan then relayed to the Provincial Agricultural Office (PAO). PAO personnel Ronaldo Bernandino was tasked to assess the animal and stranding site.

First Responders' Action

Initial assessment of the animal by Mr. Bernandino was that it was able to stay afloat upright, swim on his own, and respirations were normal. No wounds were noted. The animal was being supported by Mr. de Guzman and other volunteers in the polluted waters of the river. Mr. Bernandino contacted Ocean Adventure (OA) to relay his assessment and seek professional advice. It was deemed best to move the animal to cleaner waters and continue the supportive care there. The whale was then transported to a "cleaner" part of the river by using a tarp to support its body then slowly moved it using two outrigger boats that supported the corners of the tarp. The animal was brought in the Nipa area across the Pamarawan fish port away from the crowd. The chosen site had natural shade and was easily accessible for the stranding response team.

Stranding Response Team Plan and Dispatch

With the initial assessment of the First Responder that the animal's condition appeared to be stable and the knowledge of how polluted and crowded the port of Pamarawan is, a plan to transport the animal to the rehabilitatin facility at Ocean Adventure was made and logistics were mobilized both at OA and at Pamarawan. Police assistance for crowd control and escort of the transport vehicle, as well as a fire truck of the provincial government to fill the transport box with water were also requested.

Arrival on-site and Decision-Making

The Stranding Team from OA arrived at the stranding site at 4:30PM and assessed the condition of the animal. A very poor prognosis was given by the experienced attending veterinarian. The severe emaciation, resulting from a prolonged inability to forage; the numerous skin lesions and secondary infections having arisen during the stranding; weakness as well as worsening inability to maintain normal buoyancy gave cause for the grave prognosis. In addition to the very poor prognosis, there was concern over the level of stress the animal was experiencing, and the increased stress if treatment was attempted. Therefore it was determined that the most appropriate and humane course of action was euthanasia. A meeting with relevant officials from the City Agricultural Office, PAO, PNP, and mayor's office was held on site to explain the recommendation of the Stranding Team. The decision to euthanize the animal was then approved and authorized by the city mayor and BFAR office.

Euthanasia

To minimize disturbance to the animal and abet concerns from the large crowd in the area, the Stranding Team decided to transport the animal away from public view to a secluded location. Diazepam was administered intramuscularly at 0.15mg/kg to sedate the animal for the move. The animal was transported via a large outrigger boat further down the river into small mangrove area. With the help of local police,

the whale was euthanized with a single bullet through the blowhole and into the skull, killing the animal instantly.

Necropsy and Carcass Disposal

Necropsy was done immediately after euthanasia. Apart from severe emaciation, lobomycosis-like lesions around the body were noted. Internally, the proximal portions of both lungs were collapsed. A final diagnosis on the cause of the illness could not be determined. However, the necropsy results suggested a compromised immune system that predisposed the animal to an infectious disease that eventually resulted in the severely debilitated condition. The whale was buried in the same area after the necropsy.

Conclusion

There are cases where a stranded animal is found in such poor condition that successful treatment is unlikely, transport to an appropriate holding too risky, and the size of the animal impractical for available resources. The most appropriate and humane course of action is euthanasia.

Volunteers supporting the whale above the water

Lobomycosis-like lesion

Chapter 10

Managing Community Response to Stranding

Lemnuel V. Aragones, Noreen G. Follosco, and Micaela C. Ledesma-Trebol

Factors influencing public attitudes

A stranded marine mammal is a big event in any coastal community in the Philippines. Such an event often attracts many spectators that can be an issue for responders and stranded animals alike. There are several factors that influence the public's attitudes towards a stranding situation. It is an event where different, and sometimes opposing, perspectives come together. Education level is one factor that may influence how an individual responds to a stranding. For instance, local fisherfolk in some areas believe that it is their right to eat the meat of the stranded animal. They argue that the idea of rescuing the individual is a waste of time, effort, and money. On the opposite side, other community members choose to save the life of a stranded individual, or properly dispose of the carcass if the animal dies. These people recognize that a stranding effort requires significant resources, but consider it a worthwhile investment. The trend is that those who have had at least a secondary school education may be more likely to support intervention as opposed to slaughter.

Direct experience with cetaceans also influences the way stranding events are perceived. Some fisherfolk have anecdotal accounts of dolphins or even sea turtles saving them when their boats capsized. These individuals express more empathy for stranded animals than others with no personal experience. Similarly, people living in coastal communities are more likely to be familiar with cetaceans and/or dugongs, and to have experienced a stranding at some time, especially in areas where stranding events occur more than once. These experiences, in general, tend to make people more supportive of the animals' welfare. Historically, whales and dolphins have been hunted for food and trade and caught opportunistically as by-catch. Some fishermen also regard dolphins as competitors for the limited resources of the sea, or as pests that sometimes damage their fishing nets and steal their fish, referred to as 'depredation' (e.g. Read 2005). With experiences like these, fisherfolk may take retaliatory action towards a dolphin or whale they encounter.

Still, there are those members of the community who view these animals with interest and curiosity. Whales and dolphins are charismatic animals who garner empathy from a substantial segment of the general public. This emotional attachment to cetaceans, and the inherent drive to help another living being, are among the primary reasons stranding events attract such large crowds, as well as the heated debates that sometimes accompany such events. We may also assume that those who have connections with other animals like dogs and cats or even livestock, experience greater empathy for stranded animals.

In the Philippines, regional differences in value systems may also play a role in the way stranded animals are treated. In some remote areas where marine mammals are revered or honored through important roles in local myths or legends, most of the residents still have strong beliefs in these myths, which may motivate them to make an effort to save and protect whales, dolphins, and dugongs. In some areas where the modern beliefs have taken over the local myths, the practical justification of eating the meat of a stranded marine mammal "so it will not be wasted" is often the collective outlook. In some cases, religious beliefs strongly influence value systems. For instance, early coastal inhabitants in Mindanao where Muslim beliefs predominate have been ignoring the dugong since they refer to them as sea pigs. However, this has changed through time as the Christians, who referred to dugongs as sea cows, increased in numbers and settled in some areas formerly dominated by Muslims.

The poor state of the economy and the resulting poverty in the coastal areas of our country also influence public attitudes. Dwindling conventional aquatic resources drive members of coastal communities to turn to alternative or non-conventional sources of food. Rescuing a stranded animal or saving a carcass for scientific purposes has little or no relevance to subsistence fishermen. They are much more concerned with their own survival, so taking the meat for their family's consumption is viewed as both acceptable and prudent.

Sometimes the voice of a respected community leader may impact such views. A leader who believes in the value of rescuing a stranded marine mammal and understands the scientific benefits of preserving a carcass, can influence opinions, or use his or her authority to override the views of the local population. On a regional level, a strong commitment to the conservation of marine mammals by certain Directors of BFAR has raised awareness in these communities and led to a significant increase in the number of strandings being reported to the authorities, and subsequently responded to..

The media is a prolific shaper of public perceptions. The rapid spread and availability of information has made it possible for the general populace to learn about marine mammals and strandings. TV shows and movies, like Dolphin Tale, generate interest about stranded dolphins, building on their charisma and promoting them as lovable creatures. The media can also be a valuable tool in promoting public education about marine mammals and their conservation. Unfortunately, in the Philippines most of the TV channels airing educational shows about marine mammals are only available through cable, a luxury afforded to those with higher incomes. However, the media can also be a source of misinformation about marine mammals or project a negative image. This can be divisive for a curious community. In one case, the dugong was made a villain character in a Philippine TV soap show. Only through the protests of some concerned groups who wrote the TV station was the character of the dugong eventually converted into a "good guy". The use of local radio stations for reporting stranding events and educating the public about marine mammal conservation is another tool in shaping positive public attitudes, particularly targeting the coastal inhabitants in remote areas.

Community Education

In recent years, perceptions regarding marine mammal strandings in the Philippines have begun to change. There are now laws in place that protect these animals (see Chapter 11). Though numerous locals still view a stranded animal as food, many are also displaying a genuine concern to help the animal recover and return to the sea. Community education can contribute greatly to shifting attitudes toward helping a stranded animal rather than killing it. Community education should focus on the importance of these animals, the threats that they face, their basic biology, laws that protect them,

and the specific techniques and methods to use during a stranding event. Each of these topics is covered in depth in this manual and further in the Cetacean Stranding Response Workshop. However, it is critical to develop educational materials that get this information directly to the communities in a language and format they can understand and relate to.

Specific information and education are also needed to teach potential rescuers how to correctly help a stranded animal. This has been exemplified by reports of communities and groups trying to help stranded animals, and, due to their lack of training, actually doing more harm than good. In several incidents, rescuers unfamiliar with cetacean anatomy were actually pouring water into the blowhole of a stranded cetacean, drowning the animal. A classic example of good intentions gone bad. Willingness to help is not enough. Proper training is necessary to allow good intentions to become real successes.

A stranding is a golden opportunity to educate the public. Providing residents with materials regarding Philippine marine mammals and stranding events in a language appropriate to the area, and with as many pictures and visual aids as possible, maximizes that opportunity. Also, the presence of the local media can be of great help in disseminating appropriate information to the public (see section below). Be on the lookout for chances to share information about cetaceans in general, the specific species that has stranded, and how human behaviour effects marine mammals. Encourage empathy for these animals. Sharing personal stories of encounters with dolphins or experiences in other stranding events can be very helpful.

The very motions of a stranding response can also be informative for onlookers. Seeing the effort and time spent on a distressed marine mammal is testament to the value placed on these animals. The struggles of a rescue team may inspire members of the general populace to care more deeply, and to participate in the event and in the stranding network as a whole.

Below are some key points that community education should focus on in a simple and engaging fashion:

1. What is a marine mammal?
A very basic understanding of marine mammal biology is valuable. Marine mammals are warm-blooded animals that spend their lives in or near the sea. They breathe air and give birth to live young and nurse them with milk, just like we do. Dolphins, whales, seals, sea lions, sea cows, otters and polar bears are all marine mammals. In the Philippines, our marine mammals include dolphins, whales and the sea cows (dugongs).

2. Why are marine mammals important?
The answer to this question varies depending on ones general level of education, specific knowledge of marine mammals, and personal attitudes towards them (Aragones, *et al.*). It will be different for a subsistence fisherman as opposed to a marine biologist or local government official. Compelling arguments must be presented that are relevant to your audience and engender respect and compassion for marine mammals and the motivation to protect them. The fact that these animals play important roles in the marine ecosystem should always be highlighted. They keep the marine ecosystem in balance since most are top predators while the dugong is a megaherbivore influencing the structure and function of tropical seagrasses. The presence of marine mammals in particular areas indicates a productive ecosystem. In some cases, and when carefully implemented and regulated, direct encounters with cetaceans can contribute to livelihoods for coastal communities through ecotourism programs (e.g. dolphin or whale watching).

3. Why do marine mammals strand?
It is important to take the mystery out of strandings and put an explanation in practical terms that people can understand and relate to. For many years, the popular notion of why marine mammals strand was "suicide". Now we know these animals strand because they are injured, sick, starving or lost. In the case of mass strandings, many scientists feel that the strong social bond shared by cetaceans is one of the possible causes. When one animal is sick and dying (especially if it is the group leader), the pod will not leave it, even if it means endangering themselves as well. This is referred to as altruism, i.e. selfless concern for others.

4. What do we do if we find a stranded animal?
Simple instructions on what to do in the case of a stranded cetacean are necessary to empower would-be rescuers with the ability to truly help the animal. Basic information on how to give supportive care to stabilize a stranded cetacean until help arrives is foremost. What to do (i.e. protect the blowhole at all costs) and what not to do (i.e. surround and stress the animal by several people touching it) should be put in simple language. Safety of would-be rescuers is also of utmost importance as dolphins can bite and their powerful tail can cause considerable damage if the animal is not properly handled (see Chapter 5).

Included in this manual is a brochure designed to provide information about marine mammals, why they strand, and specific instructions on what to do to help (see Appendix H). Materials like this are the first steps in community education. Also, informing community members of the hotline or contact details (e.g. cellphone numbers) of people to contact when strandings occur (see Chapter 1).

Enlisting public support at a stranding event

When an actual stranding event occurs, it is important to enlist the support of the local community. The presence of a stranded animal on an inhabited beach will attract a group of interested and curious bystanders. Stranding Team members should survey the scene and attempt to locate a barangay official or other community leader. An official from the local BFAR office should be contacted, or the Philippine National Police (see Chapter 1). In some cases, an "unofficial" leader may emerge who can be enlisted to assist in establishing a rapport with the public and maintaining control of the crowd until officials arrive. We at the PMMSN also suggest that the local chief executive (i.e. mayor) be informed to ensure that immediate logistical support is given and the stranding effort supported.

The response team should also try to get some idea of the general attitude of the crowd and determine whether or not the people support the rescue effort. Do people feel compassion towards the stranded animal, see it as a potential source of food, or simply view it as an item of curiosity? In any case, a reasonable explanation from an authority figure on what is going on, why the animal may have stranded, and why a rescue is being attempted is important to managing the community response to a stranding. It is recommended that a member of the Stranding Team be designated as acting information officer to interact with and inform the community in this regard.

The Stranding Team and its core of trained volunteers may need to enlist additional help, especially if the animal is going to be rehabilitated in the local area or held at the stranding site for a period of time until other arrangments are made. Those bystanders that are willing to help and to follow instructions are great resources. Of course the Team must also be considerate of those who are supportive but do not wish to be directly involved. On-site volunteers should be appointed to a specific group and given

specific tasks by a point person from the Team. The number of volunteers directly involved must be kept to a number that is practical and safe.

A crowd gathers to witness a rare stranding of a Risso's dolphin in Bulacan

Managing the stranding site

The primary objectives of controlling the crowd and managing the stranding site are to keep the animal(s) and people safe. Attention is focused on reducing disruptive noise and chaos, preventing accidents and injuries, avoiding further stress and harm to the animal, and allowing the Team to proceed with their work. It is also important to establish sufficient boundaries for the Stranding Team to operate safely and efficiently. For instance, a rope, net, or any form of structure can be placed between the crowd and the stranded animal (and its responders) to create a "no entry beyond this line" zone. The public should be allowed to move freely outside the perimeter. Local law enforcement, PNP, BFAR officials, or other community leaders may be designated to assist in maintaining the perimeter of the work area.

The crowd should also be informed of the procedures being employed in the stranding response. An explanation for how and why animals are being handled, given medications, or moved is very useful. If the difficult decision is made to euthanize an animal, ideally only the key officers of the local area are informed and the procedure is carried out in a remote location away from the crowd. If that is not possible, it is critical that the actions of the team be explained to avoid misinterpretation or protests from the crowd. Note that euthanasia in the Philippines is still a very touchy subject. Most people, including some PMMSN members, may not be familiar with euthanasia techniques and may react negatively. Some people do not approve of the procedure, while others realize that it is a humane way to end pain and suffering when no other options are available. And there are several laws that provide legal bases for such a procedure to be conducted. A well informed spokesperson should be assigned to clearly explain why this action is necessary, how it will be carried out, and the possible complications. Observers should be informed that the procedure may be visually unsettling, and that they may not want to watch. Respect their concerns and be sensitive to their emotions. After the animal has been euthanized, note the educational advantage in speaking to the crowd again to answer any further queries.

Media coordination

As mentioned earlier, the media is a powerful tool, and affects a large percentage of the population. For many it may be the primary source of information about strandings. The sharing of reliable information will lead to more accurate coverage and a better informed public, which is beneficial to the stranding network.

The PMMSN encourages each chapter to have a media coordinator assigned to each stranding event. This is an individual who is fluent in the local language, confident, and quick-thinking. In some cases, it may be the media coordinator who serves as the spokesperson and acting information officer. This

person can answer questions so the members of the Stranding Team are not distracted. With proper training, local members of the media can act as media coordinator. Press kits to give to reporters and other media personnel should be assembled ahead of time and brought along to any stranding event.

After a stranding event, it is most important to always acknowledge the effort and support of volunteers, local community members, and the media. Showing genuine gratitude is essential in creating and maintaining good public relations, and in developing and strengthening the local and national stranding network.

Stranded dolphin gets national media attention. Locals are interviewed by local media.

Reference

Aragones, L.V., M.Marmontel, S. Kendall, D. Kwan. (In Press). Working with communities for sirenian conservation. In E. Hines, .J.E. Reynolds, L.V. Aragones, et al. (eds), Sirenian conservation: Issues and strategies in developing countries. University Press of Florida. Gainesville, FL, USA.

Read, A.J. 2005. Bycatch and depredation. In J.E. Reynolds III, W.F. Perrin, R.R. Reeves, et al. (eds), Marine mammal research: conservation beyond crisis, pp 5-17.

Chapter 11

Relevant Philippine Laws and International Agreements Regarding Marine Mammals

Lemnuel V. Aragones, Maria Inez C. Togle-Vasquez, and Ariel T. Torres

Wildlife conservation necessarily involves the implementation of laws, rules, regulations, and international treaties that provide wildlife protection. Below is a guide regarding Philippine laws and international treaties pertinent to marine mammal protection and their conservation. This is far from a comprehensive compilation, but is meant to aid and educate responders and rescuers regarding the role of the Philippine legal system in marine mammal protection and conservation. The dissemination of this information to the appropriate sectors of society is highly recommended.

The Constitution

The 1987 Constitution is the fundamental law of the land, and all other laws and legal issuances must be in harmony with its provisions. Any law, rule, or regulation found by the Courts to contradict the Constitution is considered invalid. The Constitution also establishes State policies and principles. With regard to the environment, the Constitution provides that the State shall protect and advance the right of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature (Article II, Section 16).

Republic Act No. 9147: Wildlife Resources Conservation and Protection Act

Pursuant to the mandate of the Constitution to protect the environment, the Philippine Government enacted Republic Act No. 9147 (RA 9147), otherwise known as the Wildlife Resources Conservation and Protection Act.

National Policy

Under Section 2 of RA 9147, it shall be the policy of the State to conserve the country's wildlife resources and their habitats for sustainability. In the pursuit of this policy, RA 9147 has the following objectives:

a. to conserve and protect wildlife species and their habitats to promote ecological balance and enhance biological diversity;
b. to regulate the collection and trade of wildlife;
c. to pursue, with due regard to the national interest, the Philippine commitment to international conventions, protection of wildlife and their habitats; and
d. to initiate or support scientific studies on the conservation of biological diversity.

Scope of Application

The provisions of RA 9147 shall be enforceable for all wildlife species found in all areas of the country, including protected areas under Republic Act No. 7586, otherwise known as the National Integrated Protected Areas System (NIPAS) Act, and critical habitats. RA 9147 shall also apply to exotic species which are subject to trade, are cultured, maintained and/or bred in captivity or propagated in the country (Section 3, RA 9147).

Jurisdiction

Both the Department of Environment and Natural Resources and the Department of Agriculture have jurisdiction to implement the provisions of RA 9147. Their specific areas of jurisdiction are:

Department of Environment and Natural Resources (DENR)

- all terrestrial plant and animal species,
- all turtles and tortoises and wetland species, including but not limited to crocodiles, waterbirds and all amphibians and
- dugong

Department of Agriculture (DA)

- all declared aquatic critical habitats,
- all aquatic resources including but not limited to all fishes, aquatic plants, invertebrates and
- all marine mammals, except dugong

Note that in the Province of Palawan, jurisdiction is vested to the Palawan Council for Sustainable Development pursuant to Republic Act No. 7611.

Prohibited Acts

Sections 27 and 28 of RA 9147 define illegal acts pertaining to wildlife and the corresponding penalty for each. Note that except for acts punishable under sections d and e of Section 27, the severity of the penalty in most cases is determined by the conservation status of the wildlife affected (such as critical, endangered, vulnerable, threatened, etc.). For instance, under DENR Administrative Order No. 2004-15, the dugong is listed as critically endangered. Meanwhile all the dolphins and whales in the Philippines have been listed as endangered under the Fisheries Administrative Order No. 208 in 2001. Thus, illegal acts involving the dugong and all dolphins and whales merit the highest penalty.

All wildlife, its derivatives or by-products, and all paraphernalia, tools and conveyances used in connection with violations of RA 9147, shall be ipso facto forfeited in favor of the government; provided, that where the ownership of the aforesaid conveyances belong to third persons who has no participation in or knowledge of the illegal acts, the same may be released to said owner.

The apprehending agency shall immediately cause the transfer of all wildlife that have been seized or recovered to the nearest Wildlife Rescue Center of the Department in the area. If the offender is an alien, he shall be deported after service and payment of fines, without any further proceedings.

Other Important Laws and Regulations

A. Republic Act No. 8485, otherwise known as "The Animal Welfare Act of 1998" was enacted to protect and promote the welfare of all animals in the Philippines by supervising and regulating the establishment and operations of all facilities utilized for breeding, maintaining, keeping, treating or training of all animals either as objects of trade or as household pets.

B. Republic Act No. 8550, known as the "Fisheries Code of 1998". It provides for the development, management, and conservation of the fisheries and aquatic resources, and integrates all laws pertinent thereto. Provisions include:

Chapter II Sec.11. Protection of Rare, Threatened and Endangered Species. The Department shall declare closed seasons and take conservation and rehabilitation measures for rare, threatened and endangered species, as it may determine, and shall ban the fishing and/or taking of rare, threatened and/or endangered species, including their eggs/offspring as identified by existing laws in concurrence with concerned government agencies.

Chapter VI Sec. 97. Fishing or Taking of Rare, Threatened or Endangered Species. It shall be unlawful to fish or take rare, threatened or endangered species as listed in the CITES and as determined by the Department. Violation of the provision of this section shall be punished by imprisonment of twelve {12) years to twenty (20) years and/or a fine of 120,000 pesos and forfeiture of the catch, and cancellation of fishing permit.

Chapter VI Sec. 105. Obstruction of defined migration paths. Obstruction of any defined migration paths of anadromous, catadromous and other migratory species in areas including, but not limited to river mouths and estuaries within a distance determined by the concerned FARMCs shall be punished by imprisonment of seven (7) years to twelve (12)years or a fine from 50,000 pesos to 100,000 pesos or both imprisonment and fine at the discretion of the court, and cancellation of permits/license, if any, and dismantling of obstruction shall be at his own expense and confiscation of same.

C. Fisheries Administrative Order No. 185 Series of 1992 established a ban on the taking or catching, selling, purchasing, possessing, transporting and exporting of dolphins.

D. Fisheries Administrative Order No. 185-1 Series of 1997 amended sections 1 and 2 of FAO No. 185 by adding whales and porpoises to the ban on the taking, catching, selling, purchasing and possessing, transporting and exporting of dolphins.

F. Fisheries Administrative Order No. 208 Series of 2001 provides for the conservation of rare, threatened and endangered fishery/aquatic species.

Relevant International Treaties and Agreements Signed by the Philippine Government

Section 2 of Article II of the 1987 Constitution provides that the Philippines adopts the generally accepted principles of international law as part of the law of the land. Thus, international law is transformed into Philippine law by virtue of the Constitution (Bernas, 2003). However, for specific implementation, such international treaties and agreements are made subject of Republic Acts, Executive Orders, and Administrative issuances. Below are some treaties and international agreements pertinent to marine mammal conservation:

A. CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) - "CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction from the sea of species covered by the convention has to be authorized through a licensing system."

   The species covered by CITES are listed in three (3) Appendices, according to the degree of protection they need:

   Appendix I - includes species which are threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances;

   Appendix II - includes species not necessarily threatened with extinction, but in which trade must be regulated in order to avoid utilization incompatible with their survival;

   Appendix III- this includes species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade for such species.

B. CMS (Convention on Migratory Species or Bonn Convention) - The convention on the conservation of Migratory species of wild animals aims to conserve terrestrial, marine, and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the UNEP.

C. Convention on Biological Diversity - The objectives of this convention is to pursue in accordance with its relevant provisions, the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

D. Agenda 21 (UNEP's Sustainable Development) - Agenda 21 addresses the pressing problems of today and also aims at preparing the world for the challenges of the next century. It reflects a global consensus and political commitment at the highest level on development and environment cooperation. Its successful implementation is first and foremost the responsibility of Governments. The whole world, including the Philippines is enjoined in this agreement.

REFERENCES

Bernas, J. 2003. The 1987 Constitution of the Republic of the Philippines: A Commentary. Philippines, Rex Book Store, Inc.

Environmental Legal Assistance Center. 2008. Mending Nets: A Handbook on the Prosecution of Fishery and Coastal Law Violations, Second ed. The Environmental legal Assistance Center, Cebu City, Philippines.

Mayo-Anda, G. Undated. Local Administrative Adjudication of Fishery Cases (Cant this be an Innovative Alternative to Criminal Prosecution of Fishery Cases?). Available online at <http://oneocean.org/download/db_files/201010AdministratriveAdjudicationOfFisheryCases.pdf> accessed on 28 October 2011.

References

Aragones, L.V. 1994. Observations on dugongs at Calauit Island, Busuanga, Palawan, Philippines. Wildlife Research 21: 709-717.

Aragones, LV, T Jefferson, and H Marsh. 1997. *Marine mammal survey techniques applicable in developing countries*. Asian Marine Biology 14: 15-39.

Aragones, LV. 2001. *Status and conservation of marine mammals in the Philippines*. Unpublsihed report submitted to the University of the Philippines. 78 p.

Barnes, LG. 2002. *Cetacean overview* In W. Perrin et al. (eds), *Encyclopedia of marine mammals*, pp 204-208. Academic Press, New York, USA.

Berta A, Sumich J, and Kovacs K. 2006. *Marine mammals: evolutionary approach*. (2nd ed). Academic Press.

Dieruf LA. 1990 *CRC Handbook of marine mammal medicine: Health, disease and rehabilitation*. CRC Press.

Dieruf LA, Gulland FMD. 2001. *CRC Handbook of marine mammal medicine*. 2nd edition. CRC Press.

Dolar MLL, Perrin WF. 1996. *Preliminary results on the distribution and abundance of cetaceans in the Philippines*. International Marine Biological Research Institute, Kamogawa, Japan, Report No. 6: 9-23.

Dolar MLL, Leatherwood SJ, Wood, CJ, Alava MNR, Hill CL, Aragones LV. 1994. *Directed fisheries for cetaceans in the Philippines*. Reports of the International Whaling Commission, 44: 439-449.

Dolar MLL, Wood CJ. 1993. *Survey of marine mammals in central Visayas and northern Mindanao. Enviroscope*, 7: 1-7.

Frantzis A. 2003. *The first mass stranding that was associated with the use of active sonar (Kyparissiakos Gulf, Greese, 1996)*. Proceedings of the Workshop on Active Sonar and Cetaceans, Gran Canaria.

Geraci, Joseph R. and Lounsbury, Valerie J. 1993. *Marine Mammals Ashore: A Field Guide for Strandings*. Texas A&M University Sea Grant College Program.

Higgins DP, Noad MJ. 2004. Draft issues paper: *Standard protocols for the collection of biological samples from stranded cetaceans*. Uniquest Pty Ltd, Sta Lucia Qld.

Hoetzel AR (ed). 2002. *Marine Mammal Biology.* Blackwell Publishing.

Horacio, Jr., Morales R. 1999. *Breaking the Cycle of Poverty In Coastal Communities*. The Online Magazine for Sustainable Seas June, 1999 Vol. 2 No. 6

Jefferson TA, Leatherwood SJ, Webber MA. 1996. *Marine mammals of the world*. United Nations Environmental Programme and Food and Agriculture Organization of the United Nations, pp 320.

Jones TC, Gleiser CA (eds). 1954. *Veterinary necropsy procedures*. The Armed Forces Institute of Pathology, JB Lippincott Co.

Kooyman, GL. 1985. *Physiology without constraint in diving mammals*. Marine Mammal Science 1: 166-178.
Lacave G. 1993. Diagnostic and therapeutic methods in marine mammal. Zoo Diusburg, Germany.

Leatherwood S, MLL Dolar, CJ Wood, LV Aragones, and CL Hill. 1992. *Marine mammals confirmed from Philippine waters*. Silliman Journal, 36: 65-86.

McBain JF. 1999. *Cetaceans in captivity: A discussion on welfare*. Journal of the American Veterinary Medical Association. Vol. 214, No. 8: 1170-1174.

Perrin WF, RR Reeves, MLL Dolar, TA Jefferson, H Marsh, JY Wang, and J Estacion. (eds). 2005. *Report of the Second Workshop on the Biology and Conservation of Small Cetaceans and Dugongs of Southeast Asia*. CMS

Technical Publication No. 9. Perrin WF, Wursig B, Thewissen JGM (eds). 2002. *Encyclopedia of marine mammals*. Academic Press, New York. 1414 p.

Queensland Parks and Wildlife Service. 2006. *Technical Manual on Marine Wildlife Stranding. Queensland Government - Environmental Protection Agency.*

Reeves R, Stewart B, Clapham P, Powell J. 2002. *Guide to marine mammals of the world*. National Audobon Society. Chanticleer Press Inc., New York.

Reynolds JE III, Rommel SA (eds). 1999. *Biology of marine mammals.* Smithsonian Institute Press.

Twiss, JR, and RR Reeves (eds). 1999. *Conservation and management of marine mammals*. Smithsonian Institute Press.

Marine Mammal Stranding Response Manuals:

Barnett J, Knight A, Stevens M. 2002. *Marine mammal medic handbook, 2nd edition*. British Divers Marine Life Rescue, United Kingdom.

Bossley M. *Contingency plan for stranded, compromised and entangled whales and dolphins.* National Parks and Wildlife, South Australia.

Cape Cod Stranding Network, Inc. 2001. *Advance single and mass stranding cetacean response: Identification, assessment, supportive care, and carcass data collection.*

Geraci JR, Lounsbury VJ. 2005 (2nd Edition). *Marine mammals ashore: A field guide to strandings.* Texas A&M University Sea Grant College Program.

Inter-agency Task Force on Marine Mammal Conservation. 2002. *Discovering marine mammals*. WWF-Philippines.

Queensland Parks and Wildlife Service. 2006. *Technical Manual on Marine Wildlife Stranding*. Queensland Government - Environmental Protection Agency.

Websites:

British Divers Marine Life Rescue: www.bdmlr.org.uk
Environmental Investigation Agency: www.eia-international.org
Marine Animal Lifeline: www.stranding.org
Marine Animal Rescue Society (MARS): www.marineanimalrescue.org
Marine Animal Rescue and Research in Australia: www.orrca.org.au
Marine Mammal Stranding Center: www.marinemammalstrandingcenter.org
Philippine Geography: indexmundi.com/philippines/coastline.html
Project Noah, New Zealand: www.whalerescue.co.nz
Sea World Busch Gardens Conservation Fund: www.swbg_conservationfund.org
Tasmania Parks and Wildlife Service: www.parks.tas.gov.au
Whale and Dolphin Conservation Society, Australia: www.wdcs.org.au

Photo Contributors:
Lemnuel V. Aragones, Micaela C. Ledesma-Trebol, Ronaldo Bernandino, Joshua Villaruel, Leo Jonathan A. Suarez, John Gaps, Carlo Magno, Alan Diddens, Theody Soria, Sonja Luz, Nopphakarn Singkhum, Ming-Chang Liu, and Ocean Adventure

Photo References
Websites:
Bahamas Marine Mammal Research Organizatino: http://www.bahamaswhales.org/
Elsa Nature Conservancy: http://www.elsaenc.net/index_e.htm
NOAA Marine Operations: http://www.moc.noaa.gov/
Northeast Fisheries Science Center: http://nefsc.noaa.gov/
Reef Teach: http://www.reefteach.com.au/
Save the Taiwan Humpback Dolphin: http://taiwanousa.blogspot.com
Save the Whales Again: www.savethewhalesagain.com
Volusia County Government: www.volusia.og
Woods Hole Oceanographic Institution: www.whoi.edu
http://sites.scran.ac.uk/voyage_of_the_scotia/scotia/vs004-076.htm
http://www.freewebs.com/cetaceans/cetaceanprofiles.htm
http://swfsc.noaa.gov/news.aspx?id=18434
http://www.mrwallpaper.com/Sperm-Whale-wallpaper/
http://sosoceanos.blogspot.com/2012/01/los-zifios-bajan-hasta-los-mil-metros.html
http://www.arkive.org/cuviers-beaked-whale/ziphius-cavirostris/
http://mauinow.com/2012/10/09/findings-unveiled-in-study-of-rare-whale-found-on-maui/
http://www.arkive.org/common-minke-whale/balaenoptera-acutorostrata/image-A20924.html
http://www.flickr.com/photos/corkyorca/favorites/page3/?view=lg
http://animalworld.com.ua/news/10-samyh-neobychnyh-jazykov-v-zhivotnom-mire
http://newshopper.sulekha.com/japan-dolphin-hunt_photo_1492670.htm
http://bitterpanda.com/?paged=4&fp_type=news

Appendix A

STRANDING RESPONSE REPORT FORM

CODE NUMBER _____

COMMON NAME: _____ **GENUS:** _____ **SPECIES:** _____

CALL RECEIVED BY: _____ Affiliation: _____

TEAM LEADER _____ Contact nos: _____

A. LOCAL CONTACT INFO

Date of Stranding: _____ Time of stranding: _____

Name of Contact: _____

Tel. Numbers: _____

Observations of local contact:

Approximate size of animal (meters): _____

First observed: ☐ beach/land ☐ floating ☐ swimming

Animal condition ☐ live ☐ fresh dead ☐ decomposing

B. STRANDING SITE ADDRESS AND DESCRIPTION

Region _____ Province _____ City/Municipality _____

Address _____

Weather condition _____

Water condition _____

Stranding site accessible by road? ☐ yes ☐ no

Type of beach: ☐ sand ☐ silt ☐ mangrove ☐ rock

Animal Location:

☐ on the beach ☐ in the water ☐ direct sunlight ☐ under shade

C. OCCURRENCE DETAILS

☐ single stranding ☐ cow and calf

☐ mass stranding how many? _____

D. STRANDING RESULT OF HUMAN ACTIVITY?

☐ yes ☐ no ☐ not determined

If yes, check one or more

☐ boat collision ☐ shot ☐ fishery interaction

Other: _____

E. CONDITION UPON EXAM BY STRANDING TEAM

Time of arrival of stranding team: _____

☐ alive ☐ fresh dead ☐ moderate decomposition ☐ advance decomposition ☐ mummified/skelatal

Comments: _____

F. MORPHOLOGICAL DATA

Sex:

☐ male ☐ female ☐ unknown

Age Class:

☐ adult ☐ subadult ☐ calf ☐ unknown

Straight Length (meters): _____ ☐ actual ☐ estimated

Weight (kilograms): _____ ☐ actual ☐ estimated

Photos or videos taken ☐ yes ☐ no

Who has the photos/videos? _____

G. ANIMAL DISPOSITION

☐ left at site ☐ transferred for rehabilitation

☐ release at site Date: _____

☐ relocated and released Facility: _____

☐ disentangled and released ☐ Other: _____

☐ died

☐ euthanized

Assessment of the animal (*check one or more*)

☐ sick ☐ abandoned/orphaned

☐ injured ☐ unknown

☐ deemed healthy ☐ Other: _____

H. STATUS OF CARCASS

☐ left at site

☐ buried Location: _____

☐ towed/sunk Location: _____

☐ frozen Location: _____

☐ educational/scientific collection

☐ Other: _____

I. NECROPSY DONE?

☐ yes ☐ no

If yes…

Date: _____ Place: _____

Necropsied by: _____

(print name)

Tissue samples collected? ☐ yes ☐ no

Where are the samples stored: _____

Please scan and email the form to lemaragones@gmail.com, lemdva2001@yahoo.com, and strandings@oceanadventure.com.ph.

Appendix B

STRANDING RESPONSE REPORT FORM

CODE NUMBER Sa01m

COMMON NAME: Pantropical Spotted Dolphin **GENUS:** Stenella **SPECIES:** attenuata

CALL RECEIVED BY: Dr. Christopher Torno **CONTACT NOS.** 047-252-9000

TEAM LEADER Wayne F. Phillips **AFFILIATION:** Ocean Adventure

A.LOCAL CONTACT INFO

Date of Stranding: 09-14-2004 Time of stranding: **5:00 AM**

Name of Local Contact: Julito Velasco Tel. Number: 047-7914839

Address: Bataan Provincial Agriculturists office

Observations of local contact:

Approximate size of animal: None (meters)

First observed: [ ] Beach/Land [ ] Floating [X] Swimming

Animal condition [X] Live [ ] Fresh dead [ ] Decomposing

B. STRANDING SITE ADDRESS AND DESCRIPTION

Region 3 Province Bataan City/Municipality Samal

Brgy. Tabing Ilog Address Estuary

Type of beach: [ ] Sand [X] Silt [ ] Mangrove [ ] Rock

Weather condition Sunny Surf/beach condition Calm

Stranding site accesible by road? [X] Yes [ ] No

Animal Location:

Sun [X] Direct sunlight [ ] Shade

Surf [X] In the surf [ ] Above the surf

Beach [ ] On sand [ ] On rock

C. OCCURRENCE DETAILS

[ ] Single stranding [ ] cow and calf

[X] Mass stranding How many? 3

D. IS THE STRANDING POSSIBLY CAUSED BY HUMAN ACTIVITY?

[X] Yes [ ] No [ ] Not Sure

If Yes, Check one or more

[ ] Boat collision [ ] Shot [X] Fishery interaction

Other:

E. CONDITION UPON INSPECTION OF THE STRANDING TEAM

Time of arrival of stranding team: 11:30 AM 09-14-04

[X] 1. Alive [ ] 2. Fresh dead [ ] 3. Moderate decomposition [ ] 4. Advance decomposition [ ] 5. Mummified/Skelatal

Comments: There were two other dolphins which were already dead upon arrival of the stranding team

F. LIVE ANIMAL DISPOSITION *(check one or more)*

[ ] Left at Site

[ ] Release at Site

[ ] Relocated and ReLeased

[ ] Disentangled

[ ] Died

[ ] Euthanized

[X] Transferred for Rehabilitation

Date: **09-14-04**

Facility: **Ocean Adventure**

[ ] Other:

Assessment of the animal *(check one or more)*

[ ] Sick

[ ] Injured

[ ] Deemed Healthy

[ ] Abandoned/Orphaned

[X] Unknown

[ ] Other:

G. MORPHOLOGICAL DATA

SEX *(check one)*

[X] 1. Male

[ ] 2. Female

[ ] 3. Unknown

AGE CLASS *(check one)*

[ ] 1. Adult

[X] 2. Subadult

[ ] 3. Pup/Calf

[ ] 4. Unknown

Straight Length: 150 [X] cm [ ] in [ ] actual [ ] estimated

Weight: 32 [X] kgs [ ] lbs [ ] actual [ ] estimated

PHOTOS/VIDEOS TAKEN [X] Yes [ ] No

Who has the photos/videos? Ocean Adventure Animal Care Laboratory

H. WHOLE CARCASS STATUS *(check one or more)*

[ ] Left on site [ ] Buried (location:)

[ ] Scientific collection (where?)

[ ] Towed/Sunk at:

[ ] Educational collection (where?)

[ ] Frozen for Later Exam

[ ] Other:

Necropsied? [ ] Yes [ ] No

Tissue sample collected? [ ] Yes [ ] No Where are the samples stored?

Date necropsied Place: Necropsied By:

For results see Necropsy Form (Print Name)

Appendix C

Necropsy Report

Common Name: _____ Scientific Name: _____

Given Name/ID: _____ Age (*calf, subadult, adult*): _____ Sex: _____

Date/Time of Death: _____ Date/Time of necropsy: _____

Place of Necropsy: _____

I. Clinical History:

II. Condition of the carcass:

(1) Carcass condition: _____
(2) PM-changes: _____
(3) Nutritional state: _____

III. Morphometric Measurements:

1. Snout to notch of fluke _____
2. Snout to tip of dorsal fin _____
3. Snout to insertion of flipper _____
4. Snout to ear _____
5. Snout to center of blowhole _____
6. Snout to center of eye _____
7. Snout to gape _____
8. Snout to base of beak _____
9. Projection on lower or upper jaw _____
10. Girth behind flipper _____
11. Maximum girth _____
12. Distance from snout _____
13. Anterior length of flipper _____
14. Axillary length of flipper _____
15. Maximum width of flipper _____
16. Length of base of dorsal fin _____
17. Height of dorsal fin _____
18. Span of fluke _____
19. Width of fluke _____
20. Notch of fluke to umbilicus _____
21. Notch of fluke to genital aperture _____
22. Notch of fluke to anus _____
23. Snout to anterior end of throat grooves _____
24. Length of throat grooves _____
25. Weight _____

IV. Description of examination of tissues:

A. Skin:

B. Orifices and dentition:

C. Blubber and Musculoskeletal:

D. Abdominal cavity:

- Stomach
- Intestines
- Liver
- Pancreas
- Spleen
- Kidneys
- Reproductive Organs
- Lymph Nodes
- Adrenal Glands
- Others

E. Thoracic cavity:

- Esophagus
- Lungs and Trachea
- Heart
- Thyroid
- Lymph Nodes
- Others

F. Central Nervous System:

V. Samples collected & Results:

A. Cytology

B. Bacteriology:

C. Histopathology:

VI. Major Macroscopic Findings:

VII. Possible cause of death:

VIII. Carcass Disposition:

Report written by: _____

Appendix D

S.O.A.P. FORM

Date:
Animal Name: Animal ID #:
Staff Name: Veterinarian:

SUBJECTIVE OBSERVATION
APPETITE:
BEHAVIOR:
ATTITUDE/AFFECT:
ACTIVITY:
OTHER:

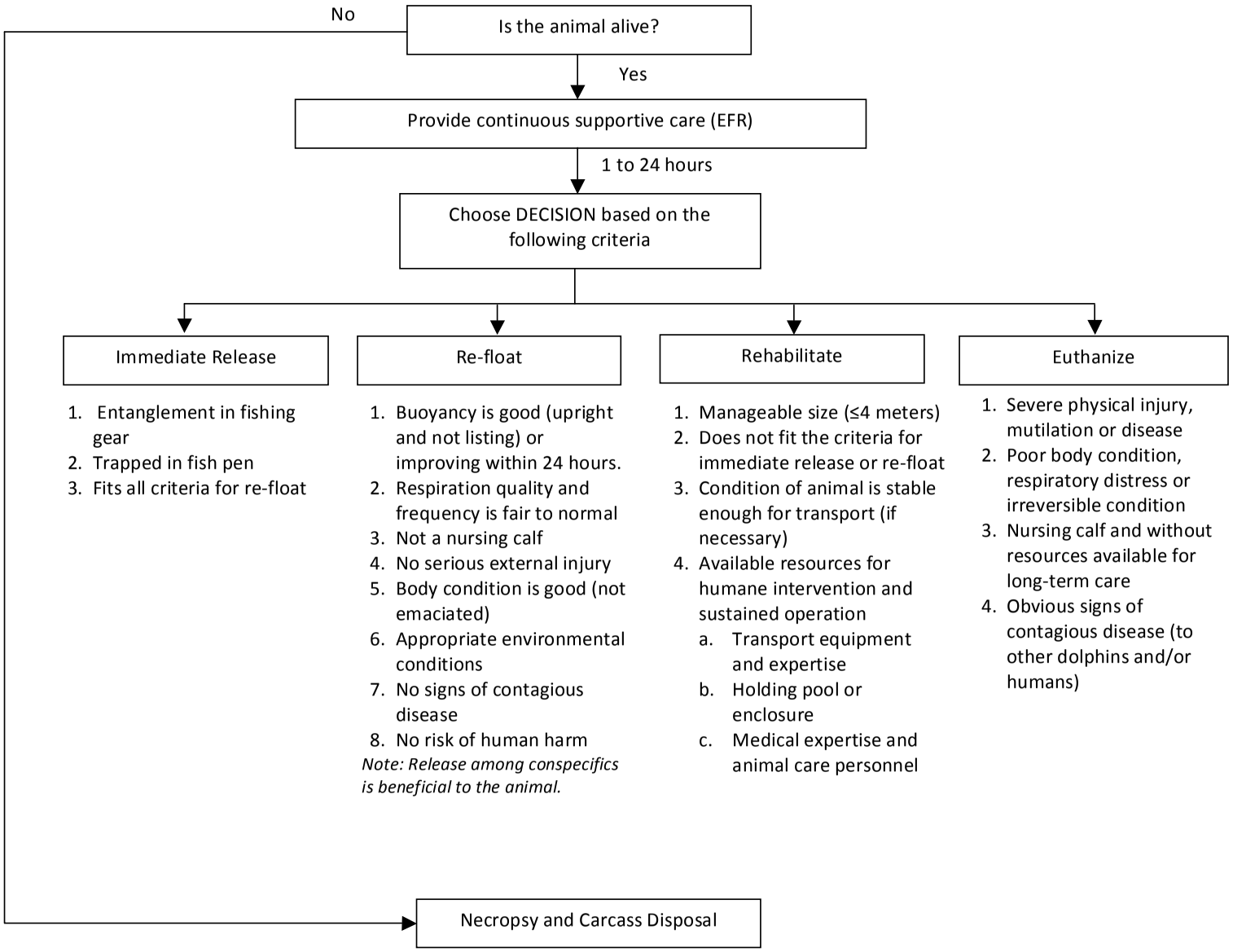
OBJECTIVE INFORMATION
Proposed Diet:
Actual intake:
TYPES of fish:
DATE/TIME OF LAST FEED:
ENVIRONMENTAL FACTORS/CHANGES:
WATER TEMPERATURE:
CURRENT TREATMENT:
PREVIOUS TREATMENT:
PHYSICAL ANOMALIES:
INJURIES**:**
WEIGHT:
OTHERS:

ASSESSMENT
SUMMARY:
DIAGNOSTICS:
WHAT IS BETTER:
WHAT IS WORSE:
DIFFERENTIAL DIAGNOSIS:
OTHERS:
ATTACHMENTS:

PLAN
VETERINARIAN'S comments, interpretations and recommendations
VETERINARIAN:
DIAGNOSTIC INFOMATION INTERPRETATION:
RECOMMENDED ACTIONS:
NEXT DIAGNOSTICS:
OTHER:

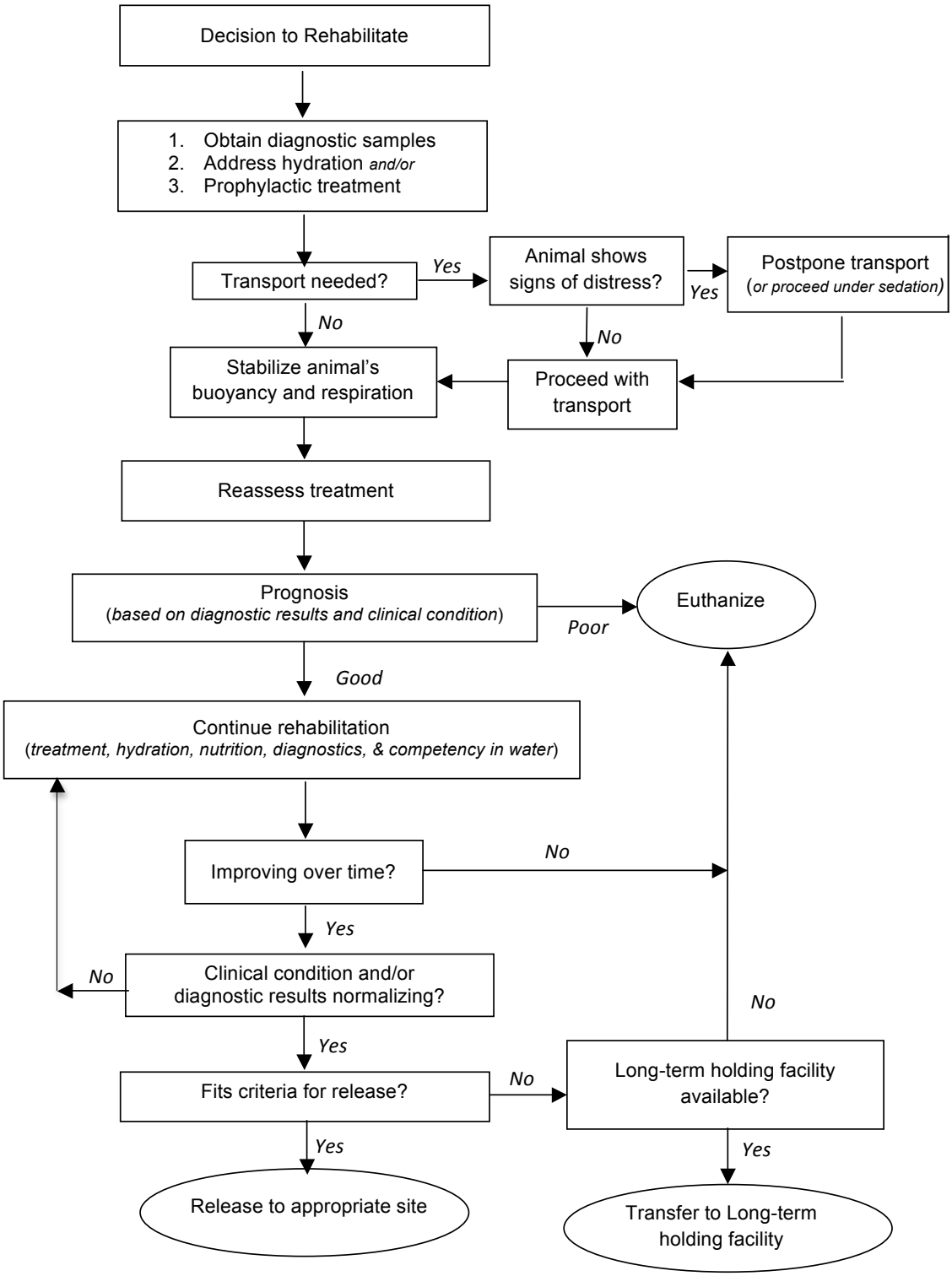
MANAGEMENT PLAN:
ACTIONS TO BE TAKEN:
NEXT DIAGNOSTIC SCHEDULE:
DIETARY ISSUES:
OTHER:

Decision-Making Flowchart



Appendix F

Medical Decision-Making Flowchart



Note: This flowchart serves as a general guideline ONLY. Availability of resources, environmental conditions, and human safety should be put into consideration in all decision making.

Appendix G

MARINE MAMMAL STRANDING RESPONSE EQUIPMENT AND SUPPLIES

The following is a comprehensive list of items that are important for any marine mammal stranding response. It is highly recommended that these items and equipment be assembled and maintained in a safe and convenient location, so that they can be easily accessed and carried with the Stranding Team on every stranding response. With this medical kit the Stranding Team and veterinarian or other medical personnel have the ability to stabilize the animal, conduct a physical examination, collect biological samples and related data, administer medication and supportive therapy, and conduct a necropsy.

GENERAL

- Stranding forms – Stranding Report Form, Necropsy Form
- 2-3 buckets and scoop (for pouring water on animal)
- Zinc oxide to protect skin (from rash and sunburn)
- 3-4 Towels of various sizes
- Tarp or other large item to provide shade
- Flashlight
- Camera
- Resealable plastic bags (ex. Ziplock ®)
- Trash bags
- Rope
- Cordon
- Soap and cleaning materials
- Disinfectant (ex. chlorine bleach)

DATA / INFORMATION COLLECTION AND MONITORING

- Measuring tape
- Ruler
- Data sheets or observation logs
- Clipboard
- Pens/pencils
- Permanent markers
- Watch/timer

MEDICAL KIT

Physical Examination:

- Stethoscope
- Examination gloves
- Face mask
- Gauze pads
- Isopropyl alcohol
- Povidone iodine

Sample collection:

- Butterfly blood collection sets or syringes with appropriate needles, such as 23Gx ¾ needle
- Blood collection containers - Red top Vacutainers ® (no additive) 3-10 mL, Purple top Vacutainer ® (EDTA) 2 mL, Blue top Vacutainer ® (Buffered Na. Citrate) 2.7 mL
- Sample containers (screw cap bottles or film canisters) for feces, gastric, respiratory, urine, and other biological samples

- Thumb forceps or wooden stick applicators to pick up samples
- Ice-chest with ice for transporting samples
- Container for used needles and trash bags designated for biological waste

Medication:

- Broad spectrum antibiotics preferably with preparations that can be given orally and injected intramuscularly (ex. Amoxicillin 5-10 mg/kg IM or PO BID, Enrofloxacin 5 mg/kg IM or PO BID
- Diazepam as sedative (is sedative the right term to use??) prior to transport (this needs a special prescription to procure). – I think this statement can be improved, or put in a different section where it can be explained more thoroughly
- Emergency medicines (ex. Epinephrine, corticosteroids)
- 18-21 G x 1 ½" needles (use spinal needles for larger animals) – what is this needle used for?
- 3, 5, 10 and 15 mL syringes for IM injection

Necropsy:

- Knives
- Forceps
- Scalpel handle with blade
- Saw (for bones)
- Containers for tissue samples
- 10% Formalin solution
- how about surgical scissors?

HANDLING AND TRANSPORT

- STRETCHER for handling and short moves - appropriate material for safely lifting and carrying the animal - strong towels, canvas, tarp, woven mat, etc.
- STRETCHER for long moves (transport) - pre-made stretcher with sleeves
- mattresses
- large towels
- water barrels, buckets, sprayers, and scoops
- Poles for stretcher – metal, heavy bamboo, heavy plastic, etc.
- straps or ropes to make slings or bridles for lifting and for rigging
- Fabricated transport box (if a wet transport) to place stretcher inside
- ice(if available)
- transport vehicle (bed long enough to handle length of animal or transport box)

STRANDING TEAM MEMBER or VOLUNTEER GRAB BAG

- water
- hat
- sunscreen
- insect repellant
- towel
- change of clothes
- wetsuit
- cell phone
- snacks
- wind breaker and/or rain gear
- money

Appendix H

List of Acronyms

BFAR – Bureau of Fisheries and Aquatic Resources

CMS – Convention on Migratory Species

CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora

DA – Department of Agriculture

DENR – Department of Environment and Natural Resources

EFR – Emergency First Response

FARMCs – Fisheries and Aquatic Resources Management Councils

IESM – Institute of Environmental Science and Meteorology

LGUs – Local Government Units

NGOs – Non Governmental Organizations

OA – Ocean Adventure

PAWB – Protected Areas and Wildlife Bureau

PMMSN – Philippine Marine Mammal Stranding Network

SBMA – Subic Bay Metropolitan Authority

SBMEI – Subic Bay Marine Exploratorium Inc

SOAP – Subjective, Objective, Assessment and Plan

SWBG – SeaWorld Busch Gardens

ST – Stranding Team

UNEP – United Nations Environment Program

UP – University of the Philippines

WIN – Wildlife In Need

Glossary of Terms

A
Anterior – Refers to the areas on or toward the front part of the body.

B
Baleen – The keratinous comb-like plates suspended from the upper jaws of the mysticete or baleen whales, used to filter and trap prey inside the mouth.
Beak – The forward-projecting jaws of certain toothed cetaceans, or rostrum.
Beaked whales – Refers to the group of elusive toothed whales with elongated beaks and only one or two pairs of teeth, which erupt like tusks in males of the species.
Biodiversity – Refers to the variety of in this planet.
Blackfish – A colloquial term referring to pilot whales, False Killer Whale, Pygmy Killer Whale and Melon-headed Whale.
Blowhole – The nostril or respiratory opening of cetaceans at the top of their head, which leads directly into the lungs.
Blubber – The layer of fatty tissue beneath the skin of marine mammals that functions as an insulator.
Breach – The behavior of a cetacean in which the animal leaps out of the water and reenters on its side or back, creating a large splash.
Bycatch – Non-target organisms that have been caught accidentally in fishing operations.

C
Calf – An infant cetacean, walrus or sirenian that is still dependent on its mother.
Cetacean – A marine mammal in the order Cetacea, which includes whales, dolphins and porpoises.
Cookie-cutter shark – A small tropical shark with suction-like lips that attach to cetaceans, resulting in bite wounds that appear round with radiating groove patterns.
Countershading – A color pattern wherein the dorsal side of the animal is darker than the ventral side, providing a form of camouflage.
Cow – A female whale, seal or sirenian, especially referring to an adult female accompanied by a calf.

D
Delphinid – A species of cetacean in the family Delphinidae or the toothed whales.
Dimorphism – The occurrence of two distinct morphological forms (body shape, size, color) within a single population.
Distribution – The range of a species or population wherein they occur.
Dolphin – The term applied to small toothed cetaceans with conical teeth.
Dorsal – Referring to the upper surface of the back or other body parts.
Dorsal fin – The fin along the midline of the back of a cetacean.
Drive fishery – A style of fishing in which speedboats are used to corral a school of dolphins into a bay or shallow water.
Dugong – A strictly marine, herbivorous mammal foraging at the bottom, primarily on seagrass, belonging to the order Sirenia and the only species left in its family.

E
Echolocation – The production of high frequency sound waves and reception of echoes used to locate objects and identify the surrounding environment, or sonar.
Ecosystem – A biological community and its environment, functioning as a unit in nature.
Endothermic – Referring to an animal that produces its own body heat for thermoregulation, or warm-blooded.
Extinction – The disappearance of a population, species or higher taxonomic group.

Extralimital – Outside the normal range of the species or a population.

F
Filter feeding – The method by which baleen whales trap prey inside their mouth by straining seawater through their baleen.
Flipper – The paddle-like limbs of a marine mammal.
Fluke – A cetacean's tail.

G
Gape – Refers to the junction of the upper and lower lips.
Gastric – Relating to or located in the stomach.
Gestation – The process of carrying the fetus in the uterus from conception to birth.

H
Habitat – The natural environment or home of any organism.

I
Incidental – Refers to any accidental or unintentional capture of non-target animals.
Inshore – Near the shore.

J
Juvenile – Immature or pre-adult individuals, specifically weaned individuals that are not sexually mature.

K
Krill – Small, shrimp-like marine animals, serving as the primary food source of baleen whales.

L
Lactation – The production of milk by female mammals to nurse their young.
Lobtailing – When a whale or dolphin slaps the water surface with its fluke, usually repeatedly.

M
Mass stranding – The simultaneous stranding of 2 or more cetaceans other than a mother and her calf.
Melon – The fatty tissue that form the "forehead" of a cetacean, thought to play an important role in echolocation.
Mesopelagic – Living in the middle of the water column.
Migration – The process of seasonal movement of individuals or populations between different geographic locations, often between breeding and feeding sites.
Morphology – Refers to the form or physical appearance of an organism.
Mysticete – Whale species belonging to the suborder Mysticeti (baleen whales).

N
Neonate – A newborn.
Nocturnal – Active at night, while resting during the day.
Non-target species – Marine species caught by fisheries, but is not the primary focus of the activity.

O
Oceanic – Refers to the open sea, or in deep water off the continental shelf.
Odontocete – Dolphin and whale species belonging to the suborder Odontoceti (toothed whales).
Offshore – Away from the coast, or pelagic.

Opportunistic – Describes animals that take advantage of whatever prey is available.
Order – The taxon that is a subset of a class and contains one of more families.
Otariid - Pinniped species belonging to the family Otariidae, consisting of eared seals (sea lions and fur seals).

P
Pantropical – Occurring throughout the tropical regions of the world.
Peduncle – The posterior portion of the body bearing the tail, or tail stalk in cetaceans.
Pelagic – Referring to the open sea.
Phocid– Pinniped species belonging to the family Phocidae, consisting of “true” seals (“earless” species).
Pinniped – From the Latin word for “wing-footed” or “fin-footed”, and refers to the group of marine mammal carnivores that have fin-like limbs, including seals, sea lions and walruses.
Plankton – Minute organisms (plant and animal) that drift passively or swim weakly in a body of water.
Pod – The social group of cetaceans.
Population – The group of individuals of the same species occupying a particular area at the same time.
Porpoise – Common name of small cetaceans in the family Phocoenidae, with spatulate or spade-shaped teeth, rather than conical.
Porpoising – Describes the behavior of leaping partially above the surface of the water during rapid swimming.
Posterior – Refers to the back part of the body.
Predator – An animal that hunts and kills others animals for food.
Prey – The animal that is hunted and killed by another (predator).
Pup – The unweaned young of a pinniped.

R
Range – The geographic area used by a species.
Rorqual – Any of six species of baleen whale belonging to the family Balaenopteridae, characterized by pleats running from the chin to the umbilicus.
Rostrum – The beak-like projection at the front of the head of a cetacean.

S
Sea cow – The common term for the species in the order Sirenia (dugong and manatee).
Sexual dimorphism – The presence of a physical difference between the male and female of the same species.
Sexual maturity – The condition in which an individual is physiologically capable of reproducing.
Sirenian – Member of the mammalian order Sirenia (dugong and manatee).
Sonar – see Echolocation.
Species – A subset of a genus, that may contain one or more subspecies.
Spermaceti – The liquid wax found in the spermaceti organ in head of the sperm whale and a few other species.
Spyhopping – When a cetacean raises or bobs its head vertically out of the water, as a means of scanning its surroundings.
Stranding – The situation when a marine mammal has run aground in a helpless situation or has lost the capability to return to its normal habitat. ??

T
Tail stock - Or caudal peduncle, is the part of the body behind the dorsal fin and anterior to the tail flukes.

Territory – An area occupied exclusively by an individual or group and defended by aggressive behavior or displays.
Thermoregulation – The process by which an animal regulates its internal body temperature.
Threatened – A designation for a species that is in danger of becoming extinct in the future.

U
Umbilicus – The round scar on the median line of the abdomen where the fetal umbilical cord was connected.
Upwelling – The process of deep ocean water rising along the continental shelves, bringing nutrient-rich water to the surface.
Uro-genital area – The portion around and near the anal and genital openings.

V
Ventral – Referring to the lower surface of an animal.
Vertebrae – The bones of the spine or backbone of an animal.
Vestigial – Referring to an anatomical structure that is an artifact, or was more developed and functional in an earlier form of the animal.
Vibrissae – The sensory hairs on the upper lip of marine mammals (whiskers).
Vocalization – The sound produced by an animal via its vocal apparatus.

W
Weaning – The process by which juvenile animals change from milk to a solid diet, signifying the end of the lactation period.
Whale – The common term loosely applied for a number of cetaceans, usually large in size, including all of the baleen species and some of the toothed species.

Z
Zoonosis – The process of disease transfer from animals to humans or vice versa.
Zooplankton – The animal form of plankton.