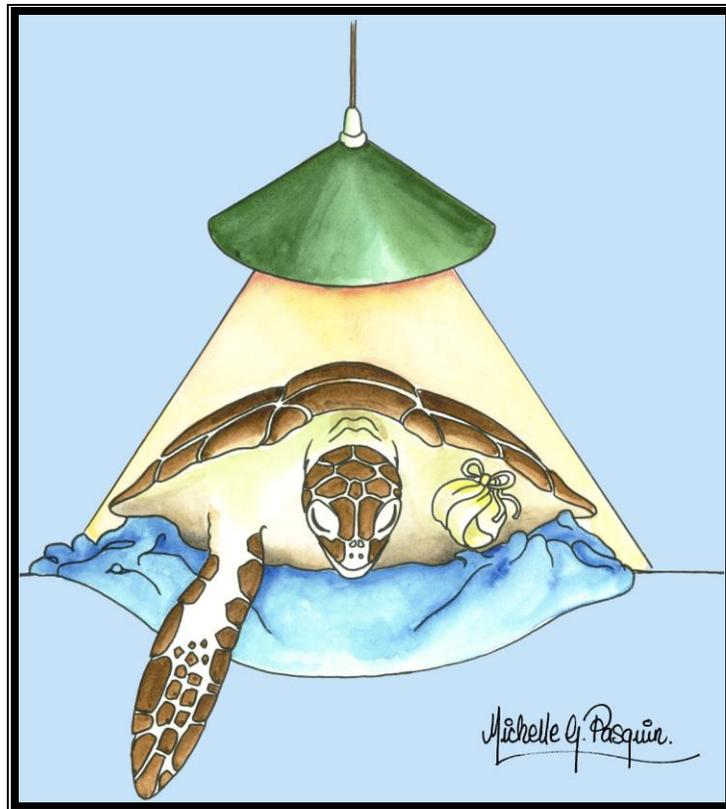


# Marine Turtle Trauma Response Procedures: A Field Guide



Michelle G. Pasquin (c) 1998. Bermuda Aquarium Museum & Zoo

Prepared by the Wider Caribbean Sea Turtle  
Conservation Network (WIDECAST)

Shana M. Phelan and Karen L. Eckert

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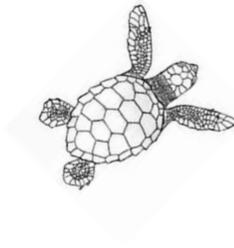
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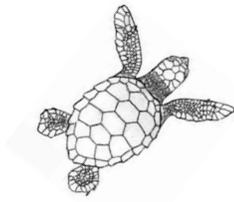
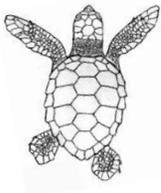
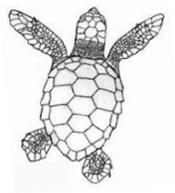
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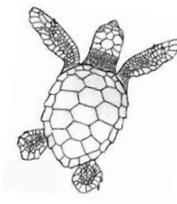


# Marine Turtle Trauma Response Procedures : A Field Guide

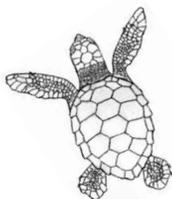


**Shana M. Phelan**  
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**Karen L. Eckert**  
Executive Director, WIDECAST



**2006**



**WIDECAST**

*Wider Caribbean Sea Turtle Conservation Network*



## FOREWARD

More than 15 years ago I became involved in green turtle fibropapilloma research in collaboration with George Balazs, and he and I had profound and detailed discussions about welfare and humane techniques in handling pain in sea turtles. After a long day of necropsies, we would “euthanize” a juvenile green turtle severely affected with tumors with a barbiturate or T-61, now out of the veterinary market. Sometimes we used techniques described in old reptile books, techniques now deemed inhumane, including decapitation, freezing, or exsanguination. We would wait many hours for the animal to die, as it would emit a response of being alive with a pumping heart. After many years of experience we realized that sea turtles are extremely tolerant to pain, a harsh environment and lasting trauma.

Since 1998 I have worked with Wildlife Trust on a diversity of species, and in all instances we have had to deal with animal stress and pain. I have been fortunate to be one of the founders of a new discipline, Conservation Medicine<sup>1</sup>, which is an attempt to define the links between human and animal health with ecosystem health and global environmental change. Conservation Medicine, simply stated, is the science and practice of ecological health. It is especially relevant in today’s human-modified landscapes, where habitat destruction and degradation and episodes of emerging human and wildlife diseases are increasing. The hope is that once armed with the appropriate knowledge, policy-makers and scientists will proactively devise and implement epidemiological strategies to better ensure ecological health. This novel approach in the protection of biological diversity has challenged scientists and practitioners in the health, natural and social sciences to think about new, collaborative ways to address ecological health concerns from the molecular to the global level. At the individual level, stress and welfare are important areas we have considered.

Phelan and Eckert, with the support of dozens of experts in the field including wildlife biologists, veterinarians, and rehabilitators, have made a unique and significant contribution to the emerging field of Conservation Medicine in developing a much-needed practical guide to describe sea turtle illnesses and injuries, and to address the nature of sea turtle mortalities. The guide fills an important gap in providing a comprehensive and readable prescription for diagnosing trauma, alleviating pain, and responding to emergency situations. Fundamental background, reference photos of normal anatomy, and diagrams to guide novice or professional biologists, stranding personnel, and veterinarians are provided for a range of circumstances ranging from buoyancy to entanglement to parasites. Clear and up-to-date information on resuscitation procedures, euthanasia, and carcass disposal provide even the least experienced turtle biologist with the tools to address these unexpected events.

There are no simple solutions to address global environmental problems; a multi-pronged strategy is required. I am confident this new book will enhance the care and professional treatment given to sick and injured sea turtles in the Caribbean Sea – and beyond – and for this I not only commend the authors’ and WIDECAST’s efforts, but sincerely hope that the initiative will inspire other such field guides designed for other imperiled taxa.

A. Alonso Aguirre  
*Vice President for Conservation Medicine  
Wildlife Trust*

*19 October 2006*

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<sup>1</sup> Aguirre, A.A., R.S. Ostfeld, G.M. Tabor, C.A. House and M.C. Pearl (Editors). 2002. Conservation Medicine: Ecological Health in Practice. Oxford University Press, New York. 407pp.

## PREFACE AND INTENT

For more than two decades the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), with Country Coordinators in more than 40 Caribbean States and territories, has linked scientists, conservationists, resource managers, resource users, policy-makers, industry groups, educators, and other stakeholders together in a collective effort to develop a unified management framework, and to promote a regional capacity to design and implement scientifically sound sea turtle management programs.

As a Partner Organization of the UNEP Caribbean Environment Programme and its Regional Programme for Specially Protected Areas and Wildlife (SPA), WIDECAST is designed to address research and management priorities at national and regional levels, both for sea turtles and for the habitats upon which they depend. We focus on bringing the best available science to bear on contemporary management and conservation issues, empowering stakeholders to make effective use of that science in the policy-making process, and providing an operational mechanism and a framework for cooperation at all levels, both within and among nations.

Network participants throughout the region are committed to working collaboratively to develop their collective capacity to manage shared sea turtle resources. By bringing people together, and by encouraging inclusive management planning, WIDECAST is helping to ensure that utilization practices, whether consumptive or non-consumptive, do not undermine sea turtle survival over the long term.

Among these capacity building initiatives is WIDECAST's regional Sea Turtle Trauma Response Corps (STTRC). The aim of the STTRC is to strengthen and coordinate the efforts of people throughout the Wider Caribbean Region to respond to sea turtles in crisis, whether at sea or stranded along the shoreline. Based on recommendations of the 2004 Annual General Meeting of WIDECAST (held in San José, Costa Rica), the initiative will include the development of a variety of standard guidelines and field procedures manuals for STTRC members, as well as standardized reporting forms and database management software.

In addition to peer-reviewed guidelines, Internet-based resources, information management software, and other technical products, the STTRC will feature regular training and internship opportunities for field staff and volunteers, natural resource managers, veterinarians, and animal rescue practitioners. The STTRC will encourage and enable collaboration among range States with regard to sea turtle injury response, rehabilitation and release, and to this end has also established standardized husbandry guidelines for rescue and rehabilitation facilities, as well as guidelines to assist veterinarians in their role as caregivers of sick and injured sea turtles.

This Field Guide is designed to complement STTRC training workshops, and to provide guidance and support to first response efforts. Visit <http://www.widecast.org/What/Regional/Medicine.html> for more information, including how to become involved in your area.

*Karen L. Eckert  
Executive Director  
WIDECAST*

## ACKNOWLEDGEMENTS

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The contributions of Nancy Mettee, DVM (Veterinarian for Marinelifelife Center of Juno Beach, Florida) and Craig Harms, DVM, PhD (Veterinarian for the Karen Beasley Sea Turtle Hospital, North Carolina, and Assistant Professor of Aquatic, Zoo and Wildlife Medicine at NCSU College of Veterinary Medicine) were especially helpful during the early development and final editing of this field guide.

In addition, the authors are deeply indebted to the following individuals for their willingness to review and strengthen earlier drafts: F. Alberto Abreu Grobois, PhD (Instituto de Ciencias del Mar y Limnología, UNAM Mazatlán, México), Alonso Aguirre, DVM, PhD (Vice President for Conservation Medicine, Wildlife Trust), George Balazs (Leader, Marine Turtle Research, NOAA National Marine Fisheries Service-Hawai'i), Jean Beasley (Director, Karen Beasley Sea Turtle Hospital), Flegra Bentivegna, DVM (Director, Naples Aquarium and Marine Turtle Rescue and Rehabilitation Centres, Italy), Janice Blumenthal (Research Officer, Department of Environment, Cayman Islands), Meghan Conti (Environmental Specialist II, FFWCC), Mark Dodd (Sea Turtle Program Coordinator, Georgia Department of Natural Resources), Scott Eckert, PhD (Director of Science, WIDECAST at Duke University), Allen Foley, PhD (Wildlife Biologist, FFWCC), Sandy Fournies (Rehabilitation Assistant, Marinelifelife Center of Juno Beach), Robert George, DVM (Head Veterinarian, Virginia Aquarium and Marine Science Center), Julia Horrocks, PhD (Director, Barbados Sea Turtle Project, University of the West Indies), Charles Innis, VMD (Associate Veterinarian, New England Aquarium), Elliott Jacobson, DVM, PhD (University of Florida College of Veterinary Medicine), Douglas R. Mader, DVM (Consulting Veterinarian, Key West Aquarium and Marathon Sea Turtle Hospital), Charles Manire, DVM (Chief Veterinarian, Mote Marine Laboratory and Aquarium), Richie Moretti (Director, Marathon Sea Turtle Hospital), Ana Cecilia Negrete, DVM (Responsable de Operación Medicina, Depto. Tortugas Marinas, Parque Xcaret, México), Terry Norton, DVM (Wildlife Veterinarian, St. Catherines Island Center), Maria Parga, DVM (Veterinarian, Rescue Centre for Marine Animals: CRAM, Spain), Al Segars, DVM (South Carolina Department of Natural Resources), Lory Scott (Curator, Virginia Living Museum), Sue Shaf (Rehabilitation Specialist, Marathon Sea Turtle Hospital), Donna Shaver, PhD (Chief, Division of Sea Turtle Science and Recovery, Padre Island National Seashore), Andrew Stamper, DVM (Research Biologist/Clinical Veterinarian, Disney's Animal Programs), Raymond Tarpley, DVM, PhD (Director, MARVET), Tony Tucker, PhD (Director, Sea Turtle Research Program, Mote Marine Laboratory and Aquarium), Richard van der Wal, MD (Field Coordinator, Turtugaruba Foundation, Aruba), Michael Walsh, DVM (Director of Veterinary Services, Sea World of Florida), Scott Weber, VMD (Head Veterinarian, New England Aquarium), and Jean Weiner (Director, FoProBiM, Haiti).

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# HAVE YOU EVER WANTED TO HELP?



Photo: P. Miller



Photo: T. Dellinger



Photo: R. Pitman

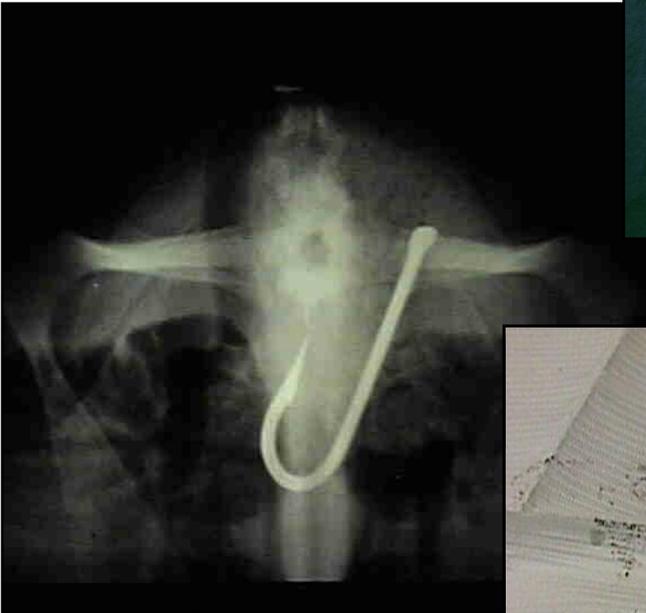


Photo: J. M. Alonso

# READ ON ....



Photo: The Turtle Hospital

## I. OVERVIEW

### Caribbean Sea Turtles

Sea turtles are gentle, ancient reptiles that are adapted to life in the ocean. There are seven species of sea turtles; six of them live in the Wider Caribbean Region. These are, from largest to smallest, the leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*), olive ridley (*Lepidochelys olivacea*), and Kemp's ridley (*Lepidochelys kempii*). Sea turtles range in weight from about 40 kg (adult ridley turtles) to nearly 1,000 kg in the case of an adult male leatherback turtle. Most inhabit tropical or subtropical waters. The leatherback has the widest distribution, with foraging grounds and migratory corridors that include subarctic waters.

No one knows for certain how long sea turtles live, but field studies demonstrate that they generally require 15-40 years or more, depending on the species, to reach adulthood. Sea turtles, like all reptiles, have lungs and must come to the surface regularly to breathe air. With few exceptions, the only time a sea turtle leaves the ocean is to lay eggs. During breeding years, adult sea turtles depart from their feeding grounds and migrate hundreds or thousands of kilometers to mating grounds and nesting beaches.

An adult female may nest for two decades or more under natural circumstances. Eighty to 200 or more eggs are generally laid in each nest. Females typically deposit 2-6 clutches of eggs per year (but as many as 12!) and return to nest at 2-5 year intervals. Sea turtles may produce several thousand eggs in a lifetime, but not all of these will hatch: some will be infertile, some will be lost to erosion or eaten by predators, and others will be collected for human consumption, often illegally. Hatchlings are eaten in large numbers by predators; young juveniles, too, face many oceanic dangers (predators, pollution, fishing nets). Fewer than one egg in 1,000 will produce an adult turtle.

During non-breeding seasons, adult leatherback turtles travel extensively on the high seas in search of jellyfish and related prey. Loggerheads and ridleys are omnivores, consuming mollusks, crabs, jellyfish and other invertebrates; fishes (typically dead as fisheries bycatch) and seaweeds are also eaten. The green turtle is an herbivore, preferring to graze in seagrass meadows in tropical coastal waters. Hawksbills specialize on coral reef sponges and other invertebrates. Because most sea turtles will eat jellyfish, plastic bags pose a widespread and serious threat and can be fatal if ingested.

In general, sea turtle populations throughout the world are severely reduced from historical levels. According to the World Conservation Union (IUCN) *Red List of Threatened Animals*, persistent over-exploitation, especially of adult females on nesting beaches, and the widespread collection of eggs are largely responsible for the "Vulnerable", "Endangered" or "Critically Endangered" status of all six Caribbean species. Some of the largest breeding colonies the world has ever known have all but vanished, including some in the Caribbean Sea.

In addition to a broadly regulated but largely unmanaged harvest that has spanned centuries, sea turtles are accidentally captured in active or abandoned fishing gear, resulting in death to tens (if not hundreds) of thousands of turtles each year. Coral reef and seagrass degradation, chemical pollution and marine debris, high density coastal development, and an increase in ocean-based tourism are among the many factors that have damaged or eliminated important nesting beaches and feeding areas throughout the Caribbean Sea. International trade in turtle products has also contributed to the demise of some species.

Threats accumulate over long periods of time and can occur anywhere in a population's range; thus, declines often result from a combination of factors, both domestic and foreign. Because sea turtles are migratory throughout their long lives, what appears as a localized decline may be a direct consequence of the activities of peoples many hundreds or thousands of kilometers away. Therefore it is very important that management and conservation, as well as rescue and reporting efforts be coordinated on a regional scale.

The Wider Caribbean Sea Turtle Conservation Network (WIDECAS), with Country Coordinators in more than 40 States and territories, is uniquely designed to address national and regional research, conservation, and management priorities, both for sea turtles and for the variety of habitats upon which they depend. One such priority is to reduce the negative consequences of human interactions with sea turtles, as well as to facilitate the rescue and rehabilitation of injured and traumatized turtles.

### **WIDECAS Sea Turtle Trauma Response Corps (STTRC)**

Delegates from more than 30 Caribbean States and territories unanimously agreed at the 2004 Annual General Meeting of WIDECAS that a "Sea Turtle Trauma Response Corps" (STTRC) be created to strengthen and coordinate the efforts of people throughout the Wider Caribbean Region to respond to sea turtles in crisis, whether at sea or stranded on the shoreline. The Meeting envisioned that the STTRC would embrace interested sea turtle project staff and volunteers; veterinarians; zoos, aquaria and "animal rescue" center staff; divers, fishermen and coastal residents; and park and natural resource managers.

Specifically, the Meeting recommended the following:

#### Structure

- Each WIDECAS Country Coordinator will identify a National STTRC Coordinator to organize and maintain a national Trauma Response Network (TRN), and to link members of the TRN with the resources of the regional STTRC.
- Each National STTRC Coordinator will identify local experts, and relevant facilities, equipment and resources, to contribute to the national TRN.
- Each National STTRC Coordinator will identify a mechanism (such as an e-newsletter or listserv) to keep TRN members informed of current events, updated information and resources, training, etc.
- Each National STTRC Coordinator will identify a sponsor for a 24-hour national "Sea Turtle Hotline" (e.g., phone/fax, email, website) to facilitate emergency assistance and to invite citizen reports.
- Each National STTRC Coordinator will identify a Lead Organization to whom stranding events and information will be reported, and the information archived, in each country.
- Each National STTRC Coordinator will ensure that the TRN operates in full compliance with national permit requirements relative to conducting necropsies, collecting and storing tissue samples, holding sea turtles captive for the purposes of rehabilitation, etc.
- WIDECAS will serve as a national and regional clearinghouse for data collected from stranding events and related incidents, with the intent of using such data to assess national and regional trends in mortality and to inform management.
- WIDECAS will maintain <http://www.widecast.org/What/Regional/Medicine.html> to feature photos of common injuries; a region-wide roster of experts; National STTRC Coordinators and Lead Organizations; field procedure manuals and veterinary guides;

data forms and reporting protocols; rehabilitation centers located in the Caribbean region; training opportunities and internships; and other relevant contacts and resources.

## Training

- WIDECAST, in partnership with experts, will provide professional training to STTRC members, including workshops/seminars on stranding response procedures, standardized data collection and analysis, necropsy techniques, animal transport guidelines, sample/tissue collection and storage, and maintenance of portable trauma response field kits.
- Workshop graduates will receive a certificate or plaque that identifies them as a member of the STTRC.
- WIDECAST will create partnerships with existing sea turtle hospitals and rescue centers in the Wider Caribbean Region to facilitate regular internships and mentoring opportunities, as well as liaisons with veterinarians to ensure that all STTRC materials reflect current veterinary standards and best practices.
- WIDECAST will develop (or endorse existing) communication tools, such as listservs, websites, professional task forces/working groups and/or newsletters, to facilitate information exchange between local veterinarians and more experienced “sea turtle vets”; these venues could also be used to share experiences associated with stranding and trauma events, first response, rehabilitation and release, etc.

## Best Practices

- WIDECAST will prepare and distribute standard reporting forms and database management software.
- In partnership with experts, WIDECAST will develop (or endorse existing) the following essential materials:
  - A field guide or manual to assist with first response, including photos and illustrations of common injuries (e.g., boat strikes, predator attacks, entanglement, hook ingestion, encounters with poachers, oiling, harpoon injuries, fibropapillomatosis, parasite infestation) and a description of how to help on the scene (e.g., basic procedures for resuscitation, hook removal, transporting animals, euthanasia), including what not to do.
  - A best practices manual for facility-based rescue and rehabilitation, including physical plant, basic husbandry and veterinary procedures, health and recovery monitoring, screening and release protocols, etc.
  - A necropsy manual that emphasizes proper technique (including human health and safety), explains what can be learned (e.g., health status, reproductive condition, cause of death), and provides guidelines for tissue sample collection, analysis, inventory and storage.

## Purpose of this Field Guide

The purpose of this field guide is to establish basic guidelines and procedures for individuals who respond to sea turtle trauma and stranding events. Designed as a first response tool, it includes data forms (Appendix A), a species identification guide (Appendix B), and photos and descriptions, written in layperson’s terms, of options and procedures for treatment of trauma-related strandings and injuries

at the point of contact. It is the first such resource in the Wider Caribbean Region, and is intended to meet the needs of the STTRC.

It is important to note that, even with this field guide in hand, there will be times when, lacking a formalized rescue/rehabilitation center and/or a willing veterinarian or other clinical expert, the recommendation will be to release the injured or debilitated sea turtle back to the sea. There is a chance that the animal will not survive. But neither is survival inevitable in a captive setting that has not been designed for this purpose and cannot offer clean seawater, proper food, and trained care.

Sea turtles can sustain remarkable injuries and return, seemingly undiminished, to their daily routine. Anyone who has spent any appreciable time with sea turtles in the wild has seen adults nesting with tattered or missing flippers, large chunks torn from their shells, and so on. While the chance of a predator attack or other mishap is likely to increase during periods of natural healing, experience tells us that sea turtles can and do enjoy physical rehabilitation and recovery if left alone.

That said, we are not unaware of the emotional difficulty (on the part of the rescuers) of releasing an injured animal back to the wild, even after all that can be done has been done. The instinct will be to want to keep the animal, monitor its progress, and release it only when there is assurance of its recovery and survival. But in the absence of any reasonable ability to care for the animal, a rescuer will, at some point, be faced with the decision to release an animal to its fate.

We encourage you to use such experiences as impetus to rally support for the creation of a short-term care facility. It need not be a complex veterinary facility, but simply a suitable location near the sea (perhaps a public aquarium, an animal quarantine station, or a fisheries facility) with the capacity to maintain running saltwater tanks of suitable size, provide adequate shelter and diet, ensure clean and healthy surroundings, and guarantee a dedicated staff of care-givers and security personnel.

The survival of every sea turtle is important in today's world, and we look forward to your feedback on how to improve the usefulness of this manual by providing more detailed (or different) information, or more clarity regarding the subjects covered. Soon, comprehensive guidelines specifically designed for veterinarians will also be available at <http://www.widecast.org/What/Regional/Medicine.html>.

## **Want to Know More?**

While this guide is designed to provide first-responders with the information needed to respond effectively to a sick or injured sea turtle, the triage, transport and treatment of injured wildlife are difficult and oftentimes risky undertakings. It is useful to have as much information at your disposal as possible. In developing this field guide the authors have drawn heavily from the cumulative expertise of published literature, personal interviews with veterinarians and other professionals, and peer-review by Caribbean sea turtle experts. In addition, many documents are freely available on the Internet (see boxed insert). We encourage you to become familiar with them, to include them in your permanent reference library, and to share them with partners and colleagues. Complete bibliographic references for these and other cited material are provided in the Literature Cited section of this field guide.

Finally, comprehensive training is available through MARVET (<http://www.marvet.org/>), which offers veterinary students and veterinarians a "hands-on wet lab" and lecture workshop with a primary focus on the biology, clinical care and rehabilitation of sea turtles. MARVET also provides an introductory course in marine mammal medicine, including health-related conservation issues. Another excellent training and networking opportunity is provided at The Turtle Hospital (<http://www.turtlehospital.org/>), which hosts an annual workshop for veterinarians and sea turtle rescue and rehabilitation experts to share experiences and learn from one another.

## INTERNET RESOURCES TO HELP YOU RESPOND TO AN INJURED SEA TURTLE

Blue Ocean Institute, "Catch Fish Not Turtles Using Longlines" (Gilman 2004):  
[http://www.ioseaturtles.org/Features/turtlebook\\_eng.pdf](http://www.ioseaturtles.org/Features/turtlebook_eng.pdf)

Florida Fish and Wildlife Conservation Commission, "Sea Turtle Conservation Guidelines" (FFWCC 2002a): <http://myfwc.com/wildlifehabitats/managed/sea-turtles/conservation-guidelines/>

Herpetological Animal Care & Use Committee, "Guidelines for the Use of Live Amphibians and Reptiles in Field and Laboratory Research, second edition" (HACC 2004): American Society of Ichthyologists and Herpetologists: <http://www.asih.org/files/hacc-final.pdf>

IUCN/SSC Marine Turtle Specialist Group, "Research and Management Techniques for the Conservation of Sea Turtles" (Eckert *et al.* 1999): <http://iucn-mtsg.org/publications/techniques-manual-en/>

Especially the following chapters: "Taxonomy, external morphology, and species identification" (Pritchard and Mortimer 1999), "Factors to consider in the tagging of sea turtles" (Balazs 1999), "Measuring sea turtles" (Bolten 1999), "Stranding and salvage networks" (Shaver and Teas 1999), "Rehabilitation of sea turtles" (Walsh 1999), "Infectious diseases of marine turtles" (Herbst 1999), "Tissue sampling and necropsy techniques" (Jacobson 1999), and "Forensic aspects" (Colbert *et al.* 1999)

UNEP Mediterranean Action Plan, "Guidelines to Improve the Involvement of Marine Rescue Centres for Marine Turtles" (RAC/SPA 2004): <http://www.rac-spa.org/node/62>

UNEP Mediterranean Action Plan, "Interaction of Marine Turtles with Fisheries in the Mediterranean" (Gerosa and Casale 1999): <http://www.rac-spa.org/node/62>

UNEP Mediterranean Action Plan, "Sea Turtle Handling Guidebook for Fishermen" (Gerosa and Aureggi 2001): <http://www.rac-spa.org/node/62>

US Geological Survey, "Sea Turtle Necropsy Manual for Biologists in Remote Refuges" (Work 2000): [http://www.nwhc.usgs.gov/publications/necropsy\\_manuals/index.jsp](http://www.nwhc.usgs.gov/publications/necropsy_manuals/index.jsp)

US NOAA NMFS, "The Anatomy of Sea Turtles" (Wyneken 2001):  
[http://www.sefsc.noaa.gov/turtles/TM\\_470\\_Wyneken.pdf](http://www.sefsc.noaa.gov/turtles/TM_470_Wyneken.pdf)

US NOAA NMFS, "Sea Turtle Handling/Release Guidelines – Quick Reference for Atlantic Shark Gillnet Gear": [http://www.nmfs.noaa.gov/sfa/hms/workshops/Gillnet\\_Placard\\_w\\_ID\\_final.pdf](http://www.nmfs.noaa.gov/sfa/hms/workshops/Gillnet_Placard_w_ID_final.pdf)

US NOAA NMFS, "Careful Release Protocols for Sea Turtle Release with Minimal Injury" (Epperly *et al.* 2004): [http://www.sefsc.noaa.gov/turtles/TM\\_524\\_Epperly\\_etal.pdf](http://www.sefsc.noaa.gov/turtles/TM_524_Epperly_etal.pdf)

US NOAA National Ocean Service, "Oil and Sea Turtles: Biology, Planning, and Response" (Shigenaka 2003): [http://response.restoration.noaa.gov/sites/default/files/Oil\\_Sea\\_Turtles.pdf](http://response.restoration.noaa.gov/sites/default/files/Oil_Sea_Turtles.pdf)

WIDECAST / UNEP Caribbean Environment Programme, "Sea Turtle Recovery Action Plans":  
<http://www.widecast.org/Resources/STRAPs.html>

## II. GETTING STARTED

- Contact the Authorities
- Emphasize Human Health and Safety
- Keep Accurate Records (see Appendix A)
- Make an Initial Assessment
- Follow Injury-specific Instructions (see “Trauma and Response”)

### Contact the Authorities

***Contacting the authorities is an important first step. In most countries the handling of protected or endangered species, including sea turtles, is illegal without a permit. Do not attempt to keep an injured or sick sea turtle in your possession.***

As with any sick or injured wildlife, sick or injured sea turtles recovered from the beach or found floating near shore should be transported immediately to a rescue center. Such facilities offer the best chance of survival for incapacitated or otherwise seriously injured sea turtles. For information on the location of rescue or rehabilitation facilities, trained veterinarians, and/or the responsible wildlife authorities in your area, please contact your local fisheries or wildlife office, or visit <http://www.widecast.org/What/Regional/Medicine.html>. For information on how best to transport the animal to a rescue center, veterinarian, or other designated facility, see Appendix C. In the absence of local expertise, an Emergency Contact List of experienced sea turtle veterinarians willing to answer your questions has been included in Appendix D. As Caribbean experience grows through the efforts of the STTRC, more and more experts will be resident in Caribbean countries!

### Emphasize Human Health and Safety

Responding promptly, compassionately and appropriately to an injured sea turtle is important, and in many cases an informed response may be sufficient to enable the animal's quick release. That said, it's equally important to remember that responding to an injured animal carries risk. A rescue worker may be cut or bitten, slapped or knocked down by a flailing flipper, suffer sunstroke, aches, strains and bruises, or catch a face full of sand. Additionally, sea turtles, particularly critically ill sea turtles, can harbor a variety of bacteria, viruses, and parasites. Care should always be taken to minimize all categories of risk, both to the already traumatized turtle and to the rescue workers. The following preventive measures are recommended by Geraci and Lounsbury (1993) for marine mammals and should be applied to turtles:

- Wear latex gloves when handling sea turtles, carcasses, tissues or fluids
- Wear waterproof outerwear to protect clothing from contamination
- Cover surface wounds with protective dressings
- Wash exposed skin and clothing after handling sea turtles
- Seek medical attention for bites, cuts, and other injuries, and inform medical attendants of the injury's source
- Protect yourself with latex gloves and a face covering, whenever possible

## Keep Accurate Records

The collection of information on sea turtles found dead or debilitated is important. Carefully and accurately complete a Stranding Form in each case, even if the turtle does not require treatment and is released immediately. We encourage use of the form provided in Appendix A, as it is compatible with WIDECAST's database management software. Submit the completed form to your National STTRC Coordinator (call your local fisheries or wildlife office or visit <http://www.widecast.org/What/Regional/Medicine.html> to contact the STTRC Coordinator in your area). In addition, please note:

1. A photograph is the single most important piece of information you can provide from a stranding. If possible, submit at least three photographs of each stranded turtle when you mail the original copy of the Stranding Report to your National STTRC Coordinator. Take one close-up photo of the turtle's head, one of the dorsal (upper) surface of the turtle, and one of the ventral (lower) surface of the turtle. Document the dorsal and ventral scute patterns, as well as any apparent injuries or unusual or diagnostic markings; try to provide a size reference in the photograph (e.g., tape measure, clipboard). If entangling materials are present, take photos of the turtle before these materials are removed and take extra photos of the entangling material itself, especially any hooks or identification markings (FFWCC 2002b). Do not dispose of any entangling materials until asked to do so by the National STTRC Coordinator or other authority.
2. Do not dispose of any turtle carcass that has a tag or tag scars until you are asked to do so by the National STTRC Coordinator or other authority (in some nations you may not be authorized to handle or dispose of a protected species). Metal flipper-tags removed from dead turtles or tag numbers recorded from live turtles should be sent by mail to the return address on the underside of the tag. A functional tag should **never** be removed from a live turtle. A "living tag" might also be present – look for a contrasting spot of pigment created by the surgical exchange of small pieces of tissue between the carapace and plastron. These marks can easily be seen as the animal grows (see photo insert).
3. If photographs have not been taken, do not dispose of a carcass that has not been positively identified to species. Contact the National STTRC Coordinator or other authority for help in identifying the turtle (see also Appendix B).
4. Note that while sea turtles are most readily identified by a "typical" arrangement of scutes on the carapace, scute anomalies do occur (e.g., a green turtle, which normally has 4 pairs of lateral scutes might, on occasion, be observed to have 5 pairs on one or even both sides). Sometimes these anomalies can indicate hybridization. If you see an apparent mix of characteristics, increased effort should be made to photograph the turtle and to save a small piece of frozen muscle (if the turtle is dead). A blood sample (or muscle sample if the turtle dies) of all potential hybrids that are taken to rescue/rehabilitation facilities should be obtained.



## Make an Initial Assessment

The initial diagnostic assessment of a sick or injured sea turtle typically involves some type of physical examination. Use the following evaluation techniques to classify the turtle as being: Healthy, Injured, Not Active, or Dead (adapted from Gerosa and Aureggi 2001). See Appendix A for the Data Form.

## SEA TURTLE FIRST-RESPONSE: INITIAL ASSESSMENT CHECK-LIST

### Healthy



**Response:** Return the turtle to the sea, preferably at the site of capture

- The turtle lifts its head strongly when breathing.
- When a flipper is gently pulled, there is a strong withdrawal reaction.
- When placed on solid ground, the turtle would generally attempt to make crawling movements.
- When the turtle is lifted, it moves as if swimming and it holds its limbs and head above the plane of the ventral surface of the body.

### Injured/Sick



**Response:** See Section III “Trauma and Response”

- Movements are very erratic or spasmodic and non-directional, appearing uncontrolled.
- The turtle shows a weak localized flinch response by closing its eyes when you lightly touch the eye or the upper eyelid with your finger.
- The turtle shows only a weak withdrawal, or no response, when a flipper is gently pulled or when light pressure is applied to the neck.
- When the turtle is lifted it does not move, and its limbs and head are held below the plane of the ventral (lower) surface of the body.
- There are visual signs of trauma, such as deep cuts, shell breakage, fishing gear (line, net, hook) entanglement or ingestion, oil/tar contamination, or wounds from blunt force.
- The turtle is covered in parasites or shows signs of dehydration, e.g., sunken eyes and skin, soft shell, unnaturally thin (neck or shoulders shrunken away from the shell).

### Inactive



**Response:** See Section IV “Resuscitation Procedures”

- There is no response, or no detectable response, when you lightly touch the eye or upper eyelid with your finger.
- There is no withdrawal reaction when a flipper is gently pulled or light pressure is applied to the neck.
- The turtle makes no attempt to move on solid ground.

### Dead



**Response:** See Section V “Necropsy” and/or Section VI “Carcass Disposal”

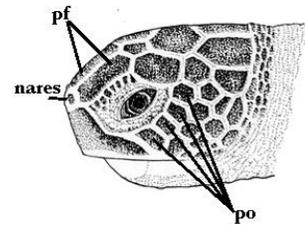
- The turtle does not respond to any physical stimulus.
- The turtle’s flesh has begun to decompose (rot) and there is a foul odor.
- Rigor mortis* is apparent.

**A note about ‘cold-stunned’ sea turtles:** Because this guide has been designed specifically for use in the (warm!) Caribbean Sea, the decision was made not to address the symptoms of hypothermia. Hypothermia, or ‘cold-stunning’, is a phenomenon seen only when water temperature suddenly drops below 10°C (50°F). At such times, sea turtles lose their ability to swim and dive; they become buoyant and float to the surface where they are vulnerable to predators and illness (Norton 2005). The only Wider Caribbean nation where this condition is observed with any regularity is the US, where it is well-known to authorities.

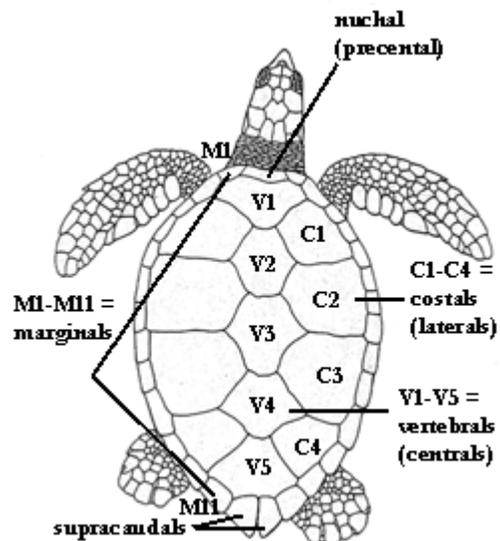
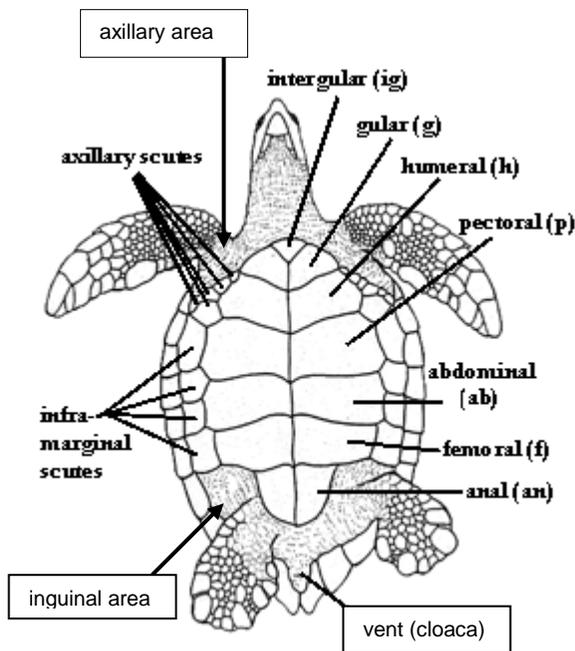
Why is this important to know? Because while a cold-stunned sea turtle may appear to the layman to be dead, these animals may, with proper care, survive. They can be rehabilitated and ultimately released, especially if detected prior to prolonged exposure to cold water temperatures. Again we emphasize the importance of contacting local authorities immediately, as it is vital that these animals receive care as quickly as possible. **Do not assume they are dead** (see “Resuscitation Procedures”).

### Sea Turtle Anatomy Guide

The identification of sea turtles to species (see Appendix B) relies on a combination of factors, mainly the scute pattern on the carapace (i.e. the number of laterals/costals and vertebrals) and the scale pattern between the eyes; e.g., green turtles have two large scales between the eyes (pf: “prefrontal scales”, see insert), whereas hawksbills have four.



The assessment and treatment of injured sea turtles may call for a measurement of the *carapace* (that’s the top shell) from *nuchal* notch to the *supracaudals*, recording the distance between the edge of the *plastron* (that’s the lower, or belly shell) and the *vent*, examination of the *inguinal* area for leeches, examination of the *axillary* area for fibropapilloma tumors, and so on. We have tried to keep the use of technical jargon to a minimum, but sometimes it is unavoidable. The following diagrams provide a simple overview. For more detailed descriptions, see Work (2000) and Wyneken (2001).



Source: Pritchard and Mortimer (1999)

### III. TRAUMA AND RESPONSE

#### Overview

This is a field manual, a guide for first responders. It's not a veterinary guide, nor do we mean to encourage procedures – either in a field setting or by untrained personnel – that should more appropriately be done in a clinical setting and by trained personnel. ***The first priority should always be to contact an authority to report the sick or injured sea turtle***, and then to make an initial assessment, attempt to stabilize the animal, and/or transport the animal to a rescue or rehabilitation facility or the office of a willing veterinarian.

If contact with an authority or other expert, or the transport of a sick or injured animal to a care facility, is impossible, such as might be the case if a turtle were encountered by a fisher or a yachter at sea, note the location of the animal and contact a fisheries or wildlife officer immediately upon entering territorial waters or making landfall. If it seems a reasonable option, bring the turtle onboard (or tow it slowly alongside), follow the relevant instructions in this field guide, and contact the authorities as soon as possible. If you encounter a comatose or unresponsive sea turtle, do not assume it is dead; see Section IV “Resuscitation Procedures” for advice.

Through the efforts of WIDECAST's Sea Turtle Trauma Response Corps, most Caribbean nations will be establishing a national Trauma Response Network (TRN) and some already maintain a 24-hour “Sea Turtle Hotline” for the reporting of sick or injured sea turtles. The Corps offers training to Fisheries, Forestry, Coast Guard, and Marine Park officers, as well as interested veterinarians, throughout the region. An increasing number of facilities are available to provide urgent short-term care and rehabilitation. In cases where there is no local veterinary expert, an Emergency Contact List of experienced sea turtle veterinarians is provided in Appendix D. For updated contact information, visit <http://www.widecast.org/What/Regional/Medicine.html>.

***Please do not bring sea turtles home with the intent of caring for them yourself. In every Caribbean country it is illegal to capture, transport and/or possess an endangered sea turtle during a legally enforced closed season, which for some countries is year-round.***

The following injuries and maladies, along with recommended *in situ* response options, are featured in this section:

- Boat Strikes
- Buoyancy Problems
- Deformities and Amputees
- Emaciation
- Entanglement
- Fibropapillomatosis
- Fishing Hooks
- Hunting, including Spearfishing Injuries
- Mating Wounds
- Oil Contamination
- Parasites and Epibiota
- Predator Attacks (Shark, Dog)
- Trash and Debris Ingestion

## Preparing a Sea Turtle Field Kit

A prompt and effective first-response to the needs of a sick or injured sea turtle can mean the difference between life and death to the animal. Actions taken quickly in a field setting can stabilize the animal for transport, cleanse a wound, reduce blood loss, remove entangling or constricting materials, or extract a fishing hook. In many cases the turtle may be ready for release on the spot! (*Note: Remember to tag the turtle before release; cf. Eckert and Beggs 2004*).

Be prepared to perform simple but potentially life-saving actions by organizing a Sea Turtle Field Kit. Experience will help you fine-tune the perfect field kit, but the following items, kept handy in a backpack (and including a copy of this field guide), will get you started:

### SEA TURTLE FIRST-RESPONSE: FIELD KIT CHECK-LIST

- Clipboard *Note: For supplies specific to petroleum spills,*
- Data Sheets and pencils *refer to the section on "Oil Contamination".*
- Waterproof paper
- Cell phone
- Disposable camera
- Measuring device (e.g., ruler, flexible tape, calipers)
- Rubber gloves
- Field knife; *optional*: scalpel (handle, blades)
- Scissors (with sharpener)
- Toothed forceps
- Screwdriver and/or dull wood chisel
- Large syringe (no needle)
- Assortment of plastic bags and bottles
- Indelible marker (for labeling bags, bottles)
- Flipper tags, tag applicator (wire cutters to remove fouled tags are helpful)
- Mouth block (gag)
- Clean gauze or cloth
- Clean towel(s)
- Tarp (to carry/drag an animal, as needed)
- Clotting powder (a styptic powder such as Kwik-Stop®)
- Antibiotic cream (e.g., a silver sulfadiazine cream such as Silvadine®, Thermazine® or SSD®)
- Broad-based topical microbicide such as a povidine-iodine antiseptic solution (e.g., Betadine®)
- Saline

## Cleansing a Wound

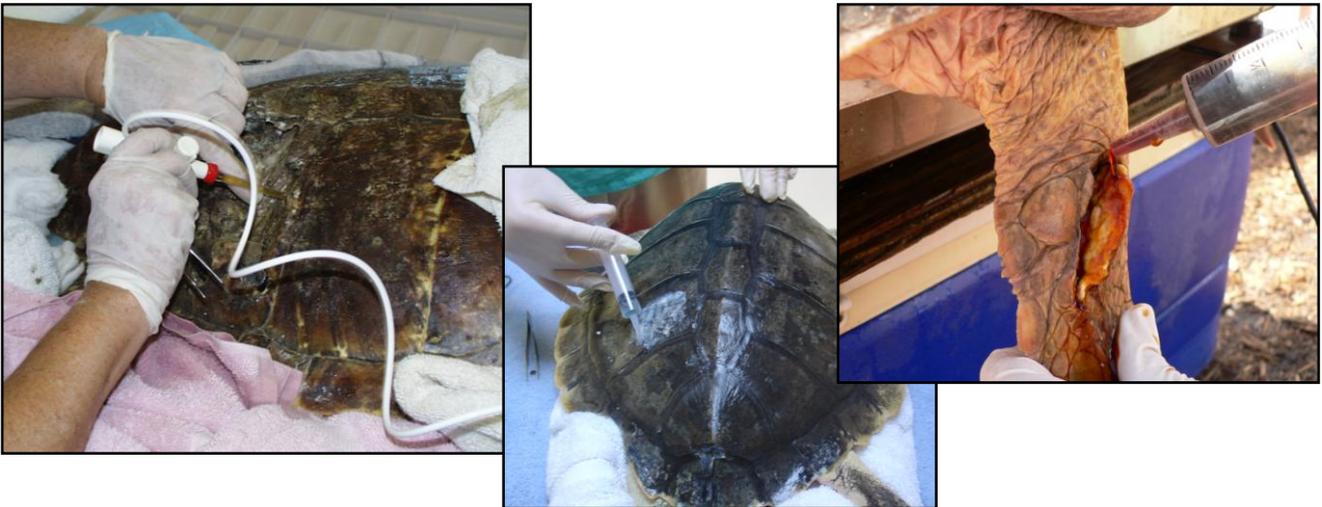
In several of the following sections, you will be directed to “gently cleanse the wound [and to] debride (remove) any dead tissue and foreign material that comes loose with minimal resistance.” What does this mean, exactly?

Wounds are best cleansed with a broad-based topical microbicide, such as a povidine-iodine antiseptic solution like Betadine®. The Betadine® solution should be “weak tea strength”. In the absence of an antiseptic solution, clean water will do. *Note:* Excessively strong Betadine® solution can irritate tissues, so be mindful of the concentration used.

With regard to removing dead tissue and foreign material, do not encourage aggressive debridement by untrained personnel. Directing a medium-pressure flow of water or a weak Betadine® solution (e.g., through a large syringe with no needle, or water-pick) is safer than actually touching the wounds with instruments and gloved fingers. The water technique is also less likely to cause excessive bleeding by removal of foreign material. *Note:* Some blood oozing is a good sign for tissue viability.

You will also be directed to “apply clotting powder sparingly and direct pressure with clean gauze or cloth if heavy bleeding is occurring.” Styptic powders, such as Kwik-Stop®, contain ferric subsulfate and are preferred. *Note:* Clotting powder is unlikely to be effective in stemming a life-threatening hemorrhage. Care should be taken to avoid applying clotting powder into wounds that might enter the coelomic (body) cavity.

Finally, you will be directed to “pack the wound full of antibiotic cream, ideally a silver sulfadiazine cream such as Silvadine®, Thermazine®, or SSD®.” Any of these is generally preferred over a triple antibiotic (e.g., Neosporin® or equivalent), but the triple antibiotic ointments are acceptable if that is what you have on hand. *Note:* Triple antibiotic ointments have the advantage in some circumstances in that they help seal water out of a wound because of the petroleum jelly base. Wear gloves!



In the photos above, a technician uses a water-pick with dilute Betadine® to gently cleanse a shell wound at Topsail Turtle Hospital (© C. Harms); a stream of sterile saline solution from the syringe flushes away loose debris and dead tissue on a superficial carapace wound coated with antimicrobial silver sulfadiazene cream (© New England Aquarium); and a rescue worker cleanses a flipper wound with dilute Betadine®, administered through a plastic syringe (© MarineLife Center: MLC).

**A note about photos:** All uncredited photos were taken by the authors. All photos credited to the MarineLife Center of Juno Beach, Florida, are credited as “MLC”.

## Boat Strikes

### Problem

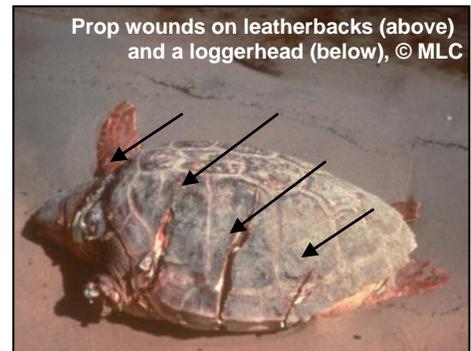
Traumatic injury to sea turtles can occur from watercraft. Boat propellers may slice into the turtle, impact (by a boat, personal watercraft [e.g., Jetski®], or windsurfer) can result in internal injury, and damage can also occur in association with fishing activities when turtles are caught in nets or dropped onto boat decks. Blunt trauma can be life threatening, and even an active and alert animal may have suffered serious internal injuries.



### Possible Field Treatments / On-Site Remedies

Treat external wounds on sea turtles as open wounds, and proceed as follows (see “Cleansing a Wound” for further details):

1. Gently cleanse the wound (wear gloves!). Debride (remove) any dead tissue and foreign material that comes loose with minimal resistance.
2. Apply clotting powder sparingly (a styptic powder, such as Kwik-Stop®, is preferred); control heavy bleeding by digital pressure or packing the wound with clean gauze or a towel.
3. Pack the wound full of antibiotic cream, ideally a silver sulfadiazine cream such as Silvazine®, Thermazine®, or SSD®.
4. If a rescue/rehabilitation center or willing veterinarian is available, transport the turtle immediately (Appendix C); if not, release the turtle back to the sea.



*Note:* Wounds on the soft skin of the neck, limbs, and tail are treated in a similar manner as those on the harder surfaces.

### Concerns and Warnings

Clotting powder is unlikely to be effective in stemming a life-threatening hemorrhage. Care should be taken to avoid applying clotting powder into wounds that might enter the coelomic cavity. If the coelomic cavity is exposed, do not flush the wounds – just protect the wounds and transport.

Do not epoxy, fiberglass, or bandage the wound closed. Bacteria caught underneath the epoxy, fiberglass, or bandage can cause the turtle’s interior tissues to rot. Exception: Bandages may be used to simply hold the carapace (or skull) in place during transport, and to avoid wound contamination from airborne dirt, etc.

Note: Crescent shaped bite-marks distinguish shark attacks from boat injuries. If a crescent shaped wound is present, proceed to “Predator Attacks”.

**No matter how dramatic the wound, if the animal shows signs of life, get help immediately. Remarkable results are possible with current methods of shell repair and reconstruction!**

## Buoyancy Problems

### Problem

Sea turtles sometimes develop buoyancy disorders, meaning that they are unable to float normally at the surface, or to submerge.

Generally an afflicted turtle will float with the caudal aspect of the carapace (its rear end) out of the water, but may also list to one side (see photo). The condition is sometimes accompanied by noticeable scars or scabs on the superoccipital bone (the back of the head) and/or on the soft tissue of the back of the neck, from trying to bring its head up to breathe while in the floating position.



The disorder may result from air that has leaked out of the respiratory tract and become trapped in the coelomic cavity, or as a result of gaseous distention of the gastrointestinal tract due to an intestinal obstruction (Campbell 1996). An afflicted turtle floats on the surface and cannot dive, increasing its chance of being struck by a boat and decreasing its ability to dive to feed or to avoid predators.

### Possible Field Treatments / On-site Remedies

1. There are no field remedies. If the turtle can be transported to the care of a veterinarian there are clinical procedures, such as a coelomic tap to remove excessive air from the coelomic cavity, which can be very effective.

A companion to this field guide – entitled “Marine Turtle Trauma Response Procedures: A Veterinary Resource Guide” – is currently under development by WIDECAST to serve as a reference point for veterinary professionals in the Caribbean who may be working with sea turtles; it will provide additional detail on this and many other procedures that cannot be addressed under field conditions. See <http://www.widecast.org/What/Regional/Medicine.html>.

2. If no rehabilitation center or willing veterinarian is available, release the turtle back to the sea.

### Concerns and Warnings

Do not attach any type of weight to the turtle (with the intention of forcing it to submerge).

A note about rescuing turtles from the water: If you can approach and touch a sea turtle in the water, there is probably something wrong with the turtle. Sea turtles should quickly dive to evade being closely approached or touched. There are two exceptions to this, when you can approach and possibly touch a turtle that does not need to be rescued. One is when you encounter a post-hatchling, resting at the surface, and the other is when you encounter a juvenile or adult turtle that has been basking at the surface (often the carapace is dry). As the boat approaches the basking turtle, it tries frantically to dive but is unable to do so. It may take the turtle up to 20 minutes to regain neutral buoyancy and then finally dive. In neither case does the turtle need to be handled or “rescued”.

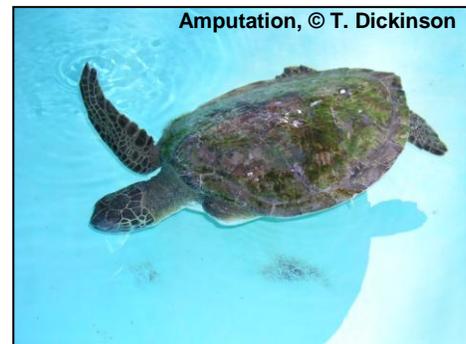
## Deformities and Amputees

### Problem

Sea turtles can exhibit shell deformities that form during early development and may even be present at birth. Deformities may also result from a predator attack or a man-induced injury, such as flipper loss due to entanglement in fishing line or a boat strike.

### Possible Field Treatments / On-site Remedies

1. Deformities occur in nature, and sea turtles adjust to them. Unless the turtle has a fresh injury, release the turtle back to the sea.
2. Turtles can survive amputated flippers, and continue normal swimming and foraging patterns. Mating can be difficult or impossible for a male missing a front flipper, and nesting can be difficult or impossible for a female missing a rear flipper; but on the whole a well-healed amputation does not necessarily mean death in the wild.
3. If the flipper is in the process of amputation due to constricting debris (such as fishing line or cargo netting), refer to “Entanglement”.
4. If the flipper amputation is still fresh (bloody, open wound), refer to “Boat Strikes” and/or “Predator Attack” for additional detail on possible treatments and on-site remedies.



### Concerns and Warnings

If the turtle's ability to swim and/or maneuver has clearly and significantly been compromised, such as with the loss of three or four flippers (or the loss of two flippers on the same side: e.g., both left, both front), humane euthanasia under the supervision of a veterinarian may need to be considered (see Appendix E).

## Emaciation

### Problem

Severely emaciated turtles have sunken eyes and plastron (belly) and reduction of the muscle masses on the head and neck, creating a prominent appearance to the supraoccipital crest (the back of the head). These turtles are likely to be covered with barnacles, worms, crabs and other epibiota and parasites. Barnacles can even settle inside the mouth, where high densities may indicate that the turtle has not eaten in quite some time. The presence of leeches on the skin, eyes, mouth, and cloaca can be further signs of a state of debilitation (Laukner 1985 *in* RAC/SPA 2004, Campbell 1996).



Free-ranging animals found in a weak and emaciated condition generally have a physical or medical problem that inhibits their ability to feed. Such problems can include damage to flippers, mouth parts, eyes, or gastro-intestinal tract. Turtles suffering from a variety of chronic diseases and/or carrying a heavy parasite burden may stop feeding for long periods of time and eventually waste away (George 1997).



*Note:* Small numbers of barnacles and other epibiota, even in the mouth (especially of loggerheads), are normal.

### Possible Field Treatments / On-site Remedies

1. Place the emaciated turtle in a tank of freshwater for 24 hours (see also “Parasites”). The water should be tepid (room temperature) and deep enough to cover the animal. The freshwater will kill many of the epibiota and also help to hydrate the turtle. Clean or replace the water, as necessary, to remove sloughed epibiota (barnacles and such), feces, etc. *Note:* Turtles too debilitated to raise their heads should never be placed in water above the nostrils, but rather should be kept in the shade, initially, and covered with freshwater-soaked towels.



2. If a rescue/rehabilitation center or willing veterinarian is available, transport the turtle immediately (Appendix C); if not, little else can be done in the field. In the absence of long-term intensive care, which ideally should continue until the turtle returns to normal patterns of feeding and other activity – and normal body condition – the turtle should be returned to the sea.

### Concerns and Warnings

Before any sea turtle is left in water, the following conditions are to be evaluated. The animal should be able to:

- \* raise its own head to, at least, a 45° angle with respect to its body,
- \* move its flippers in a coordinated manner, and
- \* regulate its position in a water column (Gerosa and Casale 1999).

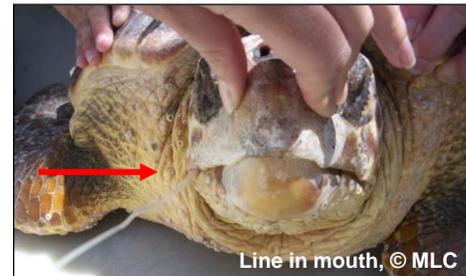
## Entanglement

### Problem

Entanglement in fishing lines and nets, crab and fish traps, and plastic (e.g., plastic rings from beverage containers) can cause injury and death. Turtles entangled in these materials may be unable to feed and will eventually die from starvation, or may be unable to surface for air and will drown. The entangling material may lacerate tissue or constrict the blood supply, resulting in the loss of a limb, or death if constriction occurs around the head or neck. As a priority, the care of a veterinarian should be sought.

### Possible Field Treatments / On-site Remedies

1. If the monofilament or plastic line is loosely wrapped around the turtle – or tightly binding, but not to the point of breaking the skin – carefully cut and remove the line.
2. If the line is tightly wrapped and cutting into tissue, do not remove the line unless it is wrapped around the neck. Monofilament can cause a gradual tourniquet; when removed, the released pressure can cause a blood vessel to rupture and the turtle to bleed excessively. In this case the line should be removed in a clinical setting where the condition can be treated.
3. If the monofilament enters the turtle's mouth and exits the cloaca, trim the line as close to the mouth and cloaca as possible. **Do not** pull on the line!! The turtle may be able to pass the line naturally. Be careful, turtles bite!
4. If the monofilament is entering or exiting the turtle (but not both entering and exiting), apply light tension to the line. If the line *does not slide out easily and readily, do not continue to pull!* Instead, trim the line close to the body and release the animal.



### Concerns and Warnings

If the line is tightly binding a flipper and has penetrated flesh, do not remove it without veterinary assistance. If such assistance is not available, release the turtle back to the sea. It may seem inhumane, but turtles can live with an amputated flipper. Do not risk the animal bleeding to death. *Note:* In the event that the turtle will be transported to the care of a veterinarian, leave all fishing line intact because it will aid in hook removal (see "Fishing Hooks").

If a turtle is encountered at sea, tangled in a net or line, it may not be necessary (or possible) to capture and transport the animal ashore. Do your best to maneuver close to the turtle and evaluate the pattern of entanglement. Do not simply cut the line, because the turtle will most likely swim away still entangled. Attempt to cut or disentangle the line at the point closest to the turtle, so that the line falls away when the turtle is freed. Entangled turtles can be very stressed, and they may have difficulty surfacing to breathe. Treat them with patience and care.

## Fibropapillomatosis

### Problem

Fibropapillomatosis (FP) is a serious disease affecting several species of sea turtles, but mainly the green turtle. The predominant lesions associated with this disease are skin tumors classified as fibromas, papillomas, and fibropapillomas. External growths may impede the ability of the animal to feed or navigate, and internal growths can lead to pneumonia, liver or kidney disease, or intestinal obstruction. Juveniles appear to be most affected; lesions in nesting adults are rare. The number of lesions may vary from single to many. They may be smooth or ulcerated, sessile or pedunculated (stalked), small or large, and cutaneous or systemic. External lesions are commonly found in the conjunctiva, chin, neck, flippers, base of the tail, and axillary and inguinal areas (George 1997).



### Possible Field Treatment / On-site Remedies

1. There is no effective treatment and the disease is often fatal. Currently, treatment is aimed at reducing the tumor burden if it affects the ability of the turtle to function normally. For example, tumors may be surgically removed (by a veterinarian) from the eyes and mouth to allow the animal to see and feed (George 1997). Removal of all tumors on the skin in stages is the treatment of choice; internal tumors carry a poor prognosis.
2. If a papilloma-bearing turtle strands alive, isolate it in a suitable-sized container and transport it (see appendix C) to an appropriate location where biopsies of suspect tissue can be taken for evaluation. *Note:* If possible, the turtle should remain in isolation until the evaluation of the biopsy is complete because there is a risk of contamination to other animals. ("Isolation" is understood to mean separate tanks with independent water supply and filtration; ideally it also implies separate examining tables, and all associated supplies and equipment, as well as separate staff/caregivers. In flow-through situations, place affected turtles in the last tanks before the water exits the facility.)
3. If the affected turtle has a heavy FP burden and is seriously debilitated, euthanasia at the hands of a veterinarian may be the best option. *Note:* Do not assume that every wart or tumor is FP, only a biopsy can confirm the diagnosis.

### Concerns and Warnings

Any time that a suspect turtle is handled, **all** equipment, materials and containers used during handling and necropsy should be cleaned, disinfected (for 20-30 minutes) with 10% Clorox® immediately following their use, and then rinsed thoroughly with freshwater. Gloves must be worn at all times when handling suspect turtles.

See Appendix F for detailed guidelines. Visit <http://www.turtles.org/nmfsbib.htm> for a bibliography on this subject, maintained by the US National Marine Fisheries Service (Murakawa and Balazs 2005).

## Fishing Hooks

### Problem

Fishing hooks can become lodged in a sea turtle's beak, throat, flipper, stomach or intestinal tract. Hooks often cause tears in the intestinal tract or puncture vital organs, and line attached to the hooks can cause entanglement or intestinal obstruction. As a priority, the care of a veterinarian should be sought.

### Possible Field Treatments / On-site Remedies

1. If hooked externally on the body or the beak, and the whole shank of the hook is visible, **carefully** draw the barb of the hook out and cut it with a clipper, then remove the rest of the hook. If the hook is in the mouth area, use a mouth block (e.g., a broom stick) to reduce the chance of being bitten (see Appendix G).
2. If hooked internally in the throat, stomach or intestinal tract, and a rescue/rehabilitation center or willing veterinarian is available, **do not** cut the line; instead, transport the animal immediately to a veterinarian's care (*Hint*: Tape the excess line to the carapace during transport to avoid snags). A turtle may have several (unseen) longline hooks lodged internally and the process of extraction may require anesthetic.
3. If the turtle has ingested the hook(s) and a veterinarian is not available, cut the line as close to the mouth as possible and remove any excess line (if the line is tightly constricting the turtle, see "Entanglement"). Release the turtle back to the sea.



### Concerns and Warnings

Be careful when working near a turtle's mouth and always use a mouth block when evaluating the oral cavity. Handle all fishing line gently; do not forcefully pull on the line. If the turtle can be treated for deep hook ingestion in a clinical setting, do not cut the line attached to the hook; most hook removal techniques are greatly assisted by the presence of the attached line.

If a turtle is encountered at sea, it may not be possible to capture and transport the animal ashore. Do your best to maneuver close to the turtle and evaluate the hooking location. Long-handled tools are available to assist in such situations (see <http://www.dehooker4arc.com>), but the observer is unlikely to have these tools onboard. It is best to attempt to cut or disentangle the line/hook at the point closest to the turtle (without pulling forcibly) and allow the turtle to swim away.

See Gerosa and Aureggi (2001) and Epperly *et al.* (2004) for useful information on hook removal. See Appendix G for a brief guide promoted by US NOAA/NMFS (McNaughton 2004).

Hooked and/or entangled turtles can be very stressed. Treat them with patience and care.

## Hunting, including Spearfishing Injuries

### Problem

Traumatic injury to sea turtles can occur purposefully, such as might result from an interrupted or otherwise unsuccessful attempt to kill a nesting female or to spear a foraging juvenile, or inadvertently when a fisherman attempts to release an entangled turtle from his net. Speared turtles exhibit localized puncture wounds. Spears can cause organ and tissue damage, and create open wounds that become susceptible to infection. Failed hunting/poaching attempts may result in a cracked shell and cut or severed limbs.

### Possible Field Treatments / On-site Remedies

Treatment will depend on the severity of the injury. In most cases these are not injuries that can be field-treated. However, if there is no veterinarian or rehabilitation facility available, there are some useful actions that can be taken:

#### Amputated flipper:

1. If a flipper is gone, place the turtle in the shade, cover with damp cloth, and attempt to curb the bleeding using clotting powder and/or clean gauze or cloth with direct pressure.
2. If two flippers remain (contra-lateral fore and hind; e.g., a left front flipper and a right rear flipper), respond as in #1. Experts tell us that the turtle is likely to survive and thrive in the wild. Another option is to consider taking the animal into captivity as an “Ambassador” or education animal.
3. If three or four flippers are gone, euthanasia may be the most humane option (see Appendix E).

#### Cracked shell:

Treat external wounds on sea turtles as open wounds (see “Cleansing a Wound” for further details):

1. Gently cleanse the wound (wear gloves!). Debride (remove) any dead tissue and foreign material that comes loose with minimal resistance.
2. Apply clotting powder sparingly (a styptic powder, such as Kwik-Stop®, is preferred); control heavy bleeding by digital pressure or packing the wound with clean gauze or a towel.
3. Pack the wound full of antibiotic cream, ideally a silver sulfadiazine cream such as Silvadine®, Thermazine®, or SSD®.



4. If a rehabilitation center or willing veterinarian is available, transport the animal immediately (see Appendix C); if not, release the turtle back to the sea.

Spear wound:

1. Wounds on the soft skin of the neck, limbs, and tail are treated in a similar manner as those on the harder surfaces; that is, cleanse, apply pressure for bleeding, and treat with topical antibiotics prior to release.

2. In the case of a deep wound, make every attempt to have the wound examined by a medical professional. Deep puncture wounds often have severe impacts; e.g., damage to vital organs, anaerobic infections, septicemia.



Spear injury to the neck, © R. Byrne

**Concerns and Warnings**

Clotting powder is unlikely to be effective in stemming a life-threatening hemorrhage. Care should be taken to avoid applying clotting powder into wounds that might enter the coelomic cavity. If the coelomic cavity is exposed, do not flush the wounds – just protect the wounds and transport.

Do not epoxy, fiberglass or bandage the wound shut. Bacteria caught underneath the epoxy, fiberglass, or bandage can cause the turtle's interior tissues to rot.

Exception: Bandages may be used to simply hold the carapace (or skull) in place during transport, and to avoid wound contamination from airborne dirt, etc.

**Mating Wounds**

**Problem**

During mating season, both male and female sea turtles can exhibit open wounds related to mating practices. Females may have bite marks around the head and neck, and/or raw wounds on the shoulders or carapace margin from the male's claws. Males may have bite injuries on front and/or rear flippers.

**Possible Field Treatment / On-site Remedies**

There is no need to treat these wounds, as they occur naturally and will heal in due time.



Green turtles mating, © G. Jones



Green turtle with mating wound on shoulder, © MLC

**Concerns and Warnings**

Pairs of sea turtles may get washed into shallow waters while mating. Do not worry or interfere; this is normal behavior. If the turtles appear to be stranded or in harm's way, contact your National STTRC Coordinator, fisheries or marine officer, or other authority.

## Oil Contamination

### Problem

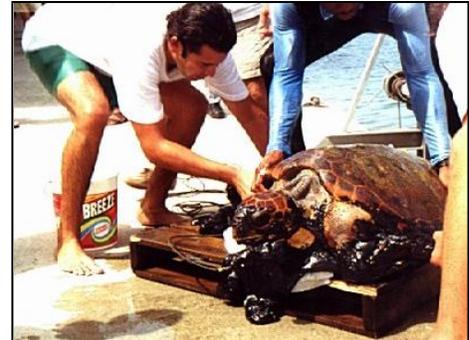
Petroleum products can adversely affect sea turtles at all life stages. The turtle may be covered with oil or tar and may also have ingested this material and suffer from toxicosis. In addition to decreasing mobility due to fouling, skin exposure may result in necrosis and sloughing of tissue (George 1997).



### Possible Field Treatment / On-site Remedies

#### 1. Remove surface oiling

- Plain mayonnaise is very effective in removing surface oil and has the added advantage of being gentle on the animal's eyes; rub mayonnaise on all exposed surfaces.
- Food oils, such as olive, sunflower or soy, are effective in breaking up and removing external oil.
- Dishwashing detergent (e.g., Dawn®) or other mild surfactants can be used, along with copious amounts of warm water.



#### 2. Rinse.

3. Repeat the cleaning cycle until all physical evidence of oil or tar has been removed.



4. Clean the head and oral cavity using clean cloths dampened with food oil. Use a mouth block when working in the oral cavity.

5. If a rescue/rehabilitation center or willing veterinarian is available, transport the turtle immediately (see Appendix C). Keep the animal under observation for 24 hours to ensure that it has full mobility. If no facility is available, release the turtle to the sea once all surface oiling has been removed.



### Concerns and Warnings

When using dishwashing detergent, be careful not to get soap in the turtle's mouth or eyes.

There is no on-site treatment for oil ingestion. The best solution is to refer these animals to a rescue/rehabilitation center or a willing veterinarian.

For more details on the physiological effects of exposure, and additional information on cleansing, see Lutcavage *et al.* (1995, 1997), George (1997), Mignucci-Giannoni (1999), and Shigenaka (2003): [http://response.restoration.noaa.gov/sites/default/files/Oil\\_Sea\\_Turtles.pdf](http://response.restoration.noaa.gov/sites/default/files/Oil_Sea_Turtles.pdf)

## Parasites and Epibiota

### Problem

Sea turtles can host many different types of parasites (e.g., leeches) and epibiota (meaning barnacles and other surface-attaching free-loaders). *Parasites and epibiota are normal and natural for sea creatures, and we do **not** recommend their removal unless there is evidence they are debilitating or harming the turtle in some obvious way.*

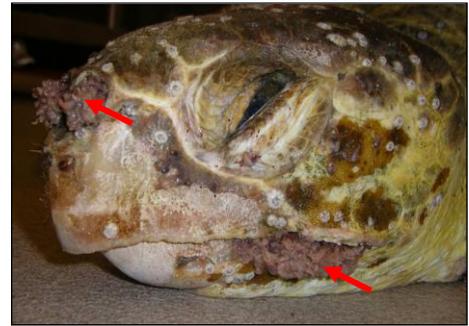
Leeches: Leeches can occur in small or large numbers. They are most often located on the soft tissue surfaces of the axilla and inguinal areas, but can attach around the eyes, mouth, nostrils and cloaca. Aggregations of yellow or brown egg cases may be found on the carapace, plastron, and flippers (George 1997). Animals carrying large numbers of leeches become anemic and can have extensive areas of macerated dermal tissue. Since leeches can complete their life cycle on the host turtle, animals can rapidly develop severe infestations.

Barnacles: Several types of barnacles are found on sea turtles; large numbers may cause stress: some increase surface drag, while others can damage the underlying shell, skin and bone allowing bacterial or fungal pathogens to enter (George 1997). Large numbers of barnacles in the mouth may indicate that the turtle has not eaten in a long while, suggesting an underlying illness or injury that needs treatment.

### Possible Field Treatment / On-site Remedies

Leeches: Give the turtle a 1.5-24 hr freshwater bath (cf. Choy et al. 1989) to remove leeches (eggs may have to be scraped off); release the turtle back to the sea. If the turtle is debilitated, transport it to a rescue/rehabilitation facility where freshwater baths of up to one week (no more) may be part of a comprehensive strategy to remove all external parasites.

Barnacles: Place the turtle in a freshwater bath for at least 24 hr to kill offending barnacles and other organisms. Carefully remove individual barnacles by inserting the tip of the screwdriver into the barnacle opening and prying it off; alternatively, work the tip of the screwdriver or dull chisel between the barnacle and the underlying scute, and then gently twist to detach the barnacle. These tools should be held in the same plane as the carapace or plastron when removing the barnacles to avoid damage to the scutes. After treatment, release the turtle to the sea.



From top to bottom: leech eggs, © C. McClellan; leeches, barnacles, © C. Harms

### Concerns and Warnings

Before placing the turtle in the freshwater, check that the animal can raise its head to breathe. If the removal of a barnacle results in bleeding, apply clotting powder and light pressure with clean gauze or cloth until the bleeding stops; release the animal to the sea. Damage caused during removal of barnacles can provide a pathway for infection. Barnacles deeply imbedded in a scute, or that cannot be removed without damaging the scute, should not be removed.

## Predator Attacks (Shark, Dog)

### Problem

Sea turtles fall prey to sharks and, during nesting, to terrestrial predators (e.g., dogs, jaguars). Non-fatal encounters can still result in damage to skin, shell, and/or internal organs. Shark bites can break through shell, damage skin, and sever limbs, and are characterized by ragged, crescent shaped cuts, missing soft tissue, and generally severe but localized damage to the shell and skin (Campbell 1996). The crescent shaped bite marks distinguish shark attacks from boat injuries, and other predation. Dogs often rip into the neck and other soft tissue, leaving the turtle stunned, bleeding and/or mortally wounded.



### Possible Field Treatments / On-site Remedies

Treat external wounds on sea turtles as open wounds, and proceed along much the same lines as recommended for “Boat Strikes” and “Hunting Injuries” (see “Cleansing a Wound” for further details):

1. Gently cleanse the wound (wear gloves!). Debride (remove) any dead tissue and foreign material that comes loose with minimal resistance.
2. Apply clotting powder (a styptic powder, such as Kwik-Stop®, is preferred) sparingly and direct pressure with clean gauze or cloth if heavy bleeding is occurring.
3. Pack the wound full of antibiotic cream, ideally a silver sulfadiazine cream such as Silvadine®, Thermazine®, or SSD®.
4. If a rescue/rehabilitation center or willing veterinarian is available, transport the sea turtle immediately (see Appendix C); if not, release the turtle back to the sea.

*Note:* Wounds on the soft skin of the neck, limbs and tail are treated in a similar manner as those on the harder surfaces; that is, cleanse, apply pressure for bleeding, and treat with topical antibiotics prior to release.



### Concerns and Warnings

Clotting powder is unlikely to be effective in stemming a life-threatening hemorrhage. Care should be taken to avoid applying clotting powder into wounds that might enter the coelomic cavity. If the coelomic cavity is exposed, do not flush the wounds – just protect the wounds and transport.

Do not epoxy, fiberglass, or bandage the wound shut. Bacteria caught underneath the epoxy, fiberglass, or bandage can cause the turtle's interior tissues to rot. Exception: Bandages may be used to simply hold the carapace (or skull) in place during transport, and to avoid wound contamination from airborne dirt, etc.

## Trash and Debris Ingestion

### Problem

Gastrointestinal obstruction (impaction or blockage of the gut) can result when sea turtles eat non-biodegradable trash such as plastic, glass, and metal that is mistaken for food. Plastics in particular, including bags and packaging material, are widespread in the oceans and cause considerable trouble to sea turtles and other marine life (Balazs 1985, Witzell and Teas 1994, Bjorndal *et al.* 1994).

### Possible Field Treatments / On-Site Remedies

If a rescue/rehabilitation center or willing veterinarian is available, transport the turtle immediately (see Appendix C) so that it can be kept for observation until the material passes from the body, or be treated for hook ingestion (see “Fishing Hooks”). If no veterinarian is available, the following responses are recommended under field conditions.

*Note:* Impacted turtles do not feed, they become dehydrated, and their intestinal motility shuts down. Hydration can encourage passage of foreign materials, eliminating the need for surgery.

#### Plastic Bags:

1. *Gently pull* on the plastic bag. If you meet with resistance, STOP. Trim the bag as close to the turtle as possible and release it to the sea. The debris may pass from the body in due time.

#### Monofilament fishing line:

1. If monofilament is hanging from the turtle’s mouth or the cloaca, *gently pull* on the line. If you meet with resistance, STOP. Trim the line as close to the turtle as possible and release it. The line may pass from the body in due time.

2. If the monofilament is protruding from both the mouth and the cloaca, DO NOT PULL on the line. Trim the line as close to the mouth and the cloaca as possible; release the turtle to the sea.

Plastic found inside a hawksbill sea turtle’s gut, © Bermuda Turtle Project



Turtle with plastic straw in mouth, © Centro Ecológico Akumal



### Concerns and Warnings

Be careful when working near a turtle’s mouth. Turtles will bite! Always use a mouth block when evaluating the oral cavity.

Follow-up: Every year, volunteers in dozens of countries around the world participate in The Ocean Conservancy’s “International Coastal Cleanup”. Please visit <http://www.oceanconservancy.org/our-work/marine-debris/international-coastal-cleanup-11.html> for the name of an ICC Coordinator in your area, including contacts in several Wider Caribbean States and territories. *Get involved!*

## Special Considerations: Hatchlings

### Problem

Hatchlings can be disoriented by beachfront lighting and wander inland (Witherington and Martin 2003). Alternatively, hatchlings are occasionally removed illegally from the nesting beach and kept as pets in home aquaria, where they are often housed in freshwater, fed inappropriately, and fail to thrive.



### Possible Field Treatment / On-site Remedies

If hatchlings are rescued, such as after being disoriented by lighting, they should be released immediately. If rescued during the heat of the day, they should be kept until late afternoon or evening in a lightly covered plastic cooler or bucket.



1. Place a few inches of damp beach sand in the cooler. If the sand is too dry, the young turtles may desiccate (dry out); if too wet, energy will be wasted in swimming, and weak hatchlings may be unable to hold their heads above the water to breathe.

2. Cover the cooler or box and place it in the shade until late afternoon or nightfall. Supervise the container to avoid the unwanted attention of predators (e.g., dogs) and onlookers.

3. At the time of release, keep predators (e.g., dogs, birds, crabs) away from the hatchlings as they cross the beach. Select an unlit stretch of beach (preferably the beach where the eggs were laid) to release the hatchlings; if the beach is well lit, ask the landowner/ hotelier to turn off the lights briefly as the hatchlings make their way to the sea. To encourage natural sea-finding, use minimum light and prohibit flash photography during hatchling releases.

### Concerns and Warnings

Never toss newborn hatchlings directly into the sea, or “ferry” them into deeper water. It is important that the hatching process be as undisturbed as possible, so as not to interrupt the natural progression of the hatchling from the nest, across the beach, through the coastal zone, and into the open sea where it will spend the first several years of life.

Exception: Sometimes hatchlings successfully leave the nest, enter the sea, and wash ashore weeks later (e.g., by storms) as “post-hatchlings”. Depending on its size, the young animal may have to be ferried out to an oceanic convergence where fishermen would normally encounter that life stage. Note: If the hatchling is injured or oiled, refer to the relevant section of this field guide.

It is **illegal to possess sea turtles** during the nesting/ hatching season in many Caribbean countries. Unless clearly sick/debilitated, newborn hatchlings should be released to the sea as soon as possible. They have limited internal yolk stores, which provide sufficient “fuel” for their swim frenzy into open ocean systems immediately after departing the nesting beach. Each day a hatchling is held captive, drawing on its internal food stores, makes it more likely that it will deplete its yolk and be forced to stop, prematurely, to feed in predator-rich coastal waters.

## IV. RESUSCITATION PROCEDURES

A traumatized sea turtle may be in an anoxic state (deficient of oxygen) and comatose. The casual observer may not notice a very occasional shallow breath. The brain has biochemical adaptations that allow sea turtles to withstand lengthy periods of anoxia; this normal response to anoxia may provide some level of protection to the sea turtle, enabling it to fully recover, with proper care, without experiencing any negative consequences (George 1997).

If possible, seek veterinary attention immediately. Many of these animals can be intubated and placed on a ventilator, which greatly facilitates recovery. There is much that can be done, however, even under field conditions (e.g., Stabenau *et al.* 2001), and turtles that have become comatose from anoxic submergence (such as by an exhausting struggle when trapped underwater in a net) can often be successfully resuscitated. Comatose turtles should be maintained at an optimum temperature of 25°-30°C (77°-86°F). Even if no life signs are noted, the animal should be placed protected in the shade and monitored for several hours for any signs of revival.

1. Place the turtle in the shade and raise its hindquarters a few degrees (15-20%) off the ground, the objective is simply to drain water without putting excess pressure on the lungs. *Hint:* Tires, boat cushions (see photo), and life-boat rings can be used to raise the turtle's hindquarters.



2. A water-soaked towel draped over the still-gently-inclined turtle may help to prevent over-heating. Do not place the towel over the turtle's head and do not place the turtle in a container holding water!

3. Check for eye reflex (lightly touch the eye or upper eyelid with your finger, and look for the turtle to close its eye or flinch) every couple of hours (up to 24 hr) until the turtle responds (see Appendix G).

4. If the turtle responds, let it revive for a few more hours (until it moves normally and can raise its head to breathe) and then release it to the sea. As the turtle starts to revive, it may move its front flippers; shortly after voluntary movement begins, the turtle will generally breathe on its own. If possible, always tag a sea turtle prior to its release (see Eckert and Beggs 2004).

5. Gerosa and Aureggi (2001) also suggest (i) holding the turtle firmly about 10 cm off the ground and gently rocking it from side-to-side (see also NOAA 2001), or (ii) lightly pinching the cloaca, at which point a live animal will contract the cloaca or move its tail sideways.

6. If there is no response to any of the above, or if the response is undetectable, after 24 hours the turtle can be considered dead. Refer to Section V, "Necropsy".

### Concerns and Warnings

Do not place turtles in any container holding water.

In addition to the above techniques, "turtle CPR" can be administered every few hours to promote the movement of air through the lungs: **replicate swimming or flying motions** by *gently* pulling the front flippers forward (in front of the turtle) and then back to the sides. Repeat the process. When there is a response, treat the turtle as conscious.

## V. NECROPSY

A necropsy (the animal equivalent of an autopsy) is one of the basic tools used to determine why an animal dies. It involves the thorough examination of a carcass externally and internally for any indications of causes of death. A good necropsy involves careful observations of lesions or abnormalities and procurement, labeling, and storage of tissue samples. Laboratory tests on properly preserved tissues allow wildlife disease specialists to systematically evaluate potential causes of wildlife mortality (Work 2000).

The external examination involves close inspection of the turtle and emphasizes the collection of standardized data, including measurements. The minimum measurements to be obtained are: body weight, head length and width, carapace length (straight line and curved, if possible) and width, plastron length and width, distance between plastron and vent, and distance between plastron and tip of tail. Look for any sign of injury, such as that caused by an encounter with a water craft (e.g., propeller cuts), line entanglement, rope burns, shark bites, etc. Severely emaciated turtles have sunken eyes and plastron and reduction of the muscle masses on the head and neck, creating a prominent appearance to the supraoccipital crest at the back of the head. Flippers should be examined for holes or scars from lost flipper tags. Any masses, swellings, discolorations, and scars should also be noted (Campbell 1996).



### Why do a necropsy?

A necropsy yields general information useful to management, including diet and reproductive condition. Never discard an opportunity to learn as much as possible from a dead animal. Necropsies of turtles caught by pelagic longline vessels, for example, can provide unique insight into the ecology of elusive pelagic-stage turtles (Work and Balazs 2002).

### How to conduct a necropsy

This field guide is not designed as a necropsy manual. The most user-friendly reference, in our view, is Work (2000). Presented in a full-color format, and available in several languages, it was written for biologists who have “little or no background in necropsy techniques.” The photographs and illustrations are very helpful in recognizing various organs, obtaining samples, etc.

Work (2000) and Wyneken (2001) both provide information on how to take standard measurements; guidance on measuring sea turtles is also available in Bolten (1999). Additional detail on various aspects of sea turtle anatomy can be found in Wyneken (2003) and Bartol and Musick (2003). Jacobson (1999) is another excellent resource, as is a related Internet-based guide provided by the University of Florida College of Veterinary Medicine: “Sea Turtle Biopsy and Necropsy Techniques” <http://labs.vetmed.ufl.edu/sample-requirements/microbiology-parasitology-serology/zoo-med-infections/>

## SEA TURTLE NECROPSY MANUALS AND RELATED RESOURCES

IUCN/SSC Marine Turtle Specialist Group "Research and Management Techniques for the Conservation of Sea Turtles" (Eckert *et al.* 1999): <http://iucn-mts.org/publications/techniques-manual-en/>; see, in particular, "Tissue sampling and necropsy techniques" (Jacobson 1999)

University of Florida College of Veterinary Medicine "Sea Turtle Biopsy and Necropsy Techniques": <http://labs.vetmed.ufl.edu/sample-requirements/microbiology-parasitology-serology/zoo-med-infections/>

US Geological Survey "Sea Turtle Necropsy Manual for Biologists in Remote Refuges" (Work 2000): [http://www.nwhc.usgs.gov/publications/necropsy\\_manuals/index.jsp](http://www.nwhc.usgs.gov/publications/necropsy_manuals/index.jsp)

US NOAA National Marine Fisheries Service "The Anatomy of Sea Turtles" (Wyneken 2001): [http://www.sefsc.noaa.gov/turtles/TM\\_470\\_Wyneken.pdf](http://www.sefsc.noaa.gov/turtles/TM_470_Wyneken.pdf); see, in particular, the section entitled, "Methods on Dissection."

## Concerns and Warnings

Remember that you may need a permit to conduct a necropsy.

Dead turtles should not be lifted by the head or flippers. Ideally they should be lifted by the carapace, with one person on each side of the turtle holding the carapace at the nuchal notch and suprapygals (i.e. one hand on the shell just behind the head, the other at the posterior tip). On land, there is never a reason to lift a turtle by its flippers (the bones in the flipper or shoulder may be fractured or dislocated this way). When hefting a turtle onto a boat, the flippers can be used to help lift the turtle out of the water as long as those lifting the turtle *hold the base of the flipper and not the tip*. Even in this situation, those lifting the turtle should work to avoid as much stress on a single flipper as possible.

Dead and decaying sea turtle tissues harbor a variety of potentially harmful organisms, some of which can infect humans. Potentially dangerous consequences that may result from exposure can be reduced by wearing appropriate clothing (protective overalls and rubber gloves), eye protection (safety glasses or sun glasses), and by being careful when handling tissue. You should protect any open wounds with dressings, and avoid contact with fluids or airborne droplets. Always keep disinfectant solutions at hand (Geraci and Lounsbury 1993).

Any cuts suffered by people while conducting a necropsy should be thoroughly cleaned and treated. Any wound, however minor, needs to be carefully monitored for signs of infection. Infection under these circumstances can occur, and can become dangerous very quickly.

The carcass must be properly disposed after conducting a necropsy (see "Carcass Disposal").

## VI. CARCASS DISPOSAL

After documenting a beach stranding, or conducting a necropsy, the carcass must be properly disposed as follows:

**Let It Lie:** Leave the carcass where it is, paint a large, bright “X” on the shell (to reduce the chance of recording the same turtle more than once), and let weather, tide, and scavengers do the work. This is common practice in uninhabited areas where there is no concern about a smelly mess or public health hazard. The decomposition process is remarkably fast, and can be quickened by opening the abdomen to invite scavengers and to prevent bloating in the hot sun. Moreover, in the event that the carcass is washed back to sea, an open carcass more readily sinks, reducing confusion associated with re-sightings and redundant data collection.

**Bury It:** Conventional wisdom suggests that a quick way to conceal a carcass and to encourage decomposition is to bury it. If this is the preferred option, select a place high on the beach where surf and tide are unlikely to expose the carcass and wash it away. Bury the carcass under at least 1 meter of sand. Paint a large, bright “X” across the shell before burying the carcass in a prepared hole. If it reappears later, you will know it was previously identified and cataloged. *Note:* Make every attempt to avoid both heavily trafficked areas, and the disfiguring of native vegetation and dune areas.

**Move it:** When a carcass is a nuisance, hazard, or public health risk, it may be desirable to move it to a more appropriate disposal site. Permission at one or more levels of government may be required for the transfer. As in the case of *in situ* burial, the carcass should be interned under at least 1 meter of soil to discourage scavengers and reduce foul odor.

**Incinerate it:** When possible and where available, in urban settings, incinerate the carcass.



Stranded, paint-marked loggerhead, © M. Godfrey



Stranded leatherback, prepared for transport (below), © R. van der Wal



### Concerns and Warnings

Dead and decaying sea turtle tissues harbor a variety of potentially harmful organisms, some of which can infect humans. Potentially dangerous consequences that may result from exposure can be reduced by wearing appropriate clothing (protective overalls and rubber gloves), eye protection (safety glasses or sun glasses), and by being careful when handling tissue. Persons should protect open wounds with dressings, and avoid contact with fluids or airborne droplets. Always keep disinfectant solutions at hand (Geraci and Lounsbury 1993).

Animals containing administered toxic substances or drugs must not be disposed of in areas where they may become part of the natural food web (HACC 2004).

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## APPENDIX A

### STTRC DATA FORMS

- FIRST RESPONSE FORM

In this appendix we have included a very simple “First Response Form”, based on the check-list featured in Section II “Getting Started: Making an Initial Assessment”. If the animal is dead, indicate that on the First Response Form and attach the Form to the completed Stranding Data Form. If the animal is alive, you should use the First Response Form, or something like it, to document the condition of the animal when you first encountered it. If the animal is released on-site, indicate that on the First Response Form and submit the Form to your national STTRC Coordinator or other authority. If the animal is transported for additional care, make sure the First Response Form accompanies the animal and that the Observer can be contacted again, if necessary.

- STRANDING DATA FORM

In this appendix we have reprinted WIDECAS<sup>T</sup>’s standard “Stranding Event Data Form”, with data entry fields designed to be integrated directly into WIDECAS<sup>T</sup>’s Regional Marine Turtle Tagging Database (see Eckert and Sammy 2005).

WIDECASST SEA TURTLE TRAUMA RESPONSE CORPS: FIRST-RESPONSE DATA FORM

Observer (name/ tel #): \_\_\_\_\_

Location: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_ AM PM

Species (if known): \_\_\_\_\_ Condition: LIVE DEAD

**Instructions:** check all that apply, and use the back of the form for notes. If the animal is dead, attach the form to the completed STRANDING DATA FORM. If the animal is alive, use this form to document any first response action. If the animal is released on-site, submit this form to your national STTRC Coordinator or other authority. If the animal is transported for additional care, make sure that this form stays with the animal (your initial observations are important to the veterinarian) and that the Observer can be contacted again if necessary.

**Healthy**

- The turtle lifts its head strongly when breathing.
- When a flipper is gently pulled, there is a strong withdrawal reaction.
- When placed on solid ground, the turtle attempts to make crawling movements.
- When the turtle is lifted, it moves as if swimming and it holds its limbs and head above the plane of the ventral surface of the body. → Released to the sea:  YES  NO

**Injured/Sick**

- Movements are very erratic or spasmodic and non-directional, appearing uncontrolled.
- The turtle shows a weak localized flinch response by closing its eyes when you lightly touch the eye or the upper eyelid with your finger.
- The turtle shows only a weak withdrawal, or no response, when a flipper is gently pulled or when light pressure is applied to the neck.
- When the turtle is lifted it does not move, and its limbs and head are held below the plane of the ventral (lower) surface of the body.
- There are visual signs of trauma, such as deep cuts, shell breakage, fishing gear (line, net, hook) entanglement or ingestion, oil/tar contamination, or the results of blunt force.
- The turtle is covered in parasites or shows signs of dehydration, e.g., sunken eyes and skin, soft shell, unnaturally thin (neck or shoulders shrunken away from the shell).

**Inactive**

- No response, or an undetectable response, when you lightly touch the eye or upper eyelid with your finger.
- No withdrawal reaction when a flipper is gently pulled or light pressure is applied to the neck.
- The turtle makes no attempt to move on solid ground.

**Dead**

- The turtle does not respond to any physical stimulus.
- The turtle's flesh has begun to decompose (rot) and there is a foul odor.
- Rigor mortis* is apparent.

## Stranding Event Data Sheet

**Species**  **Gender**  **Project**

**Date**  **Time**  **Project ID**  **Weather**  **Page #**

**Location**  **Observers**

**Location Name**   **Flipper**

**Zone Name**   **Flipper**

**Longitude**   **Flipper**

**Latitude**   **Flipper**

**Flipper**

**Flipper**

**PIT**

**PIT**

**Turtle Condition**

Alive
Fresh Dead
Moderately Decomposed
Unknown
Very Decomposed

**Weather**

Broken Clouds
Clear
Overcast
Rain
Stormy/Strong Wind
Unknown

**Landmark Name / Number**  **Dist. from Landmark**

**A**

**B**

**C**

**Turtle Condition**

**Necropsy Report**

**Notes**

**Physical Description**

	NT	NN	
<b>CCL (cm)</b>	<input type="text"/>	<input type="text"/>	
<b>SCL (cm)</b>	<input type="text"/>	<input type="text"/>	
<b>CCW (cm)</b>	<input type="text"/>		
<b>SCW (cm)</b>	<input type="text"/>		

Does carapace damage affect measurement ?

**Weight (kg):**

**Diagnostic Injuries**

**Parasites and Ectobiota**

**Tag Scars**

Left Front

Right Front

Left Rear

Right Rear

Stranding Event Reporting Form designed by the Wider Caribbean Sea Turtle Conservation Network - [www.widecast.org](http://www.widecast.org)

**Source:** Eckert & Sammy (2005); for a full-size form, visit <http://www.widecast.org/What/Regional/Tagging.html>

## STRANDING DATA FORM INSTRUCTIONS

### Species

Enter the species: green turtle (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), olive ridley (*Lepidochelys olivacea*), loggerhead (*Caretta caretta*), or leatherback (*Dermochelys coriacea*).

### Gender

Enter gender (male/female), if known.

*Note:* The sex of a juvenile turtle cannot be distinguished using any external characteristics. In breeding age adults, males have a long, prehensile tail extending well beyond the posterior (rear) edge of the carapace.

### Project

If the turtle was documented as part of an ongoing field project, enter the project's name.

### Date

Enter the date when the turtle was found, not the date when you think it may have washed ashore (that information, if available, can be entered in "Notes").

### Time

Enter the time when the turtle was found, not the time when you think it may have washed ashore (that information, if available, can be entered in "Notes"). Time is entered in 12 hour format, with the designator AM or PM (e.g., 11:30 AM).

### Weather

Weather, at the time you found the turtle, should be described as follows (choose one):

*Clear*  
*Overcast*  
*Rain*  
*Stormy/Strong Wind* (\*)  
*Broken Clouds*  
*Unknown*

(\*) It can be useful, when evaluating the pattern of strandings, to know whether the winds were onshore or offshore; these and other details can be included at the end under "Notes"

### Location

Document exactly where the sea turtle washed ashore. Include the **Location Name** (e.g., the name of beach), the **Zone Name** (zones represent geographic subsets of Location; e.g., the coastline might be divided into distinct named or numbered sections), the **Latitude** (enter as degrees (E) minutes and decimal minutes: e.g., 13E22.5672), and the **Longitude** (enter as degrees (E) minutes and decimal minutes: e.g., 102E59.4549).

### Distance to Landmark

Measuring from two permanent landmarks to the location of the stranding (referred to as “triangulation”) is the most accurate means to determine its exact location. Accuracy can be within a few centimeters, depending on the quality of the Landmark. This can be very important later, for example if authorities want to analyze the spatial pattern of strandings along a coastline.

### Observers

The Observers are the person(s) reporting the stranding. Please provide their full name(s) and, in “Notes” (see below), include a contact address including telephone number or email address for the person responsible for completing the data form.

### Tag Numbers

Examine the turtle carefully – especially the trailing edges of the front flippers and the inside edges (up near the tail) of the rear flippers – for any metal or plastic tags. The tag will have an alpha-numeric engraving on one side and a return address on the other.

CAREFULLY record all information, but do not remove a tag from a live turtle. If the turtle is clearly dead, remove each tag and mail it to the return address on the tag, or submit it to a local fisheries or forestry officer so that it can be returned to the address given. If the turtle is alive and you tag it prior to release, CAREFULLY record the new tag number(s) on the data form. [See the note about ‘Living Tags’ at the end of this section.]

*Note:* “PIT” refers to a Passive Integrated Transponder tag: a small, inert microprocessor sealed in glass that can transmit a unique identification number to a hand-held reader when the reader briefly activates the tag with a low frequency radio signal at close range (Balazs 1999, Eckert and Beggs 2004). This tag is inserted under the skin and is not visible to the eye. If a PIT tag scanner is available and a PIT tag is detected, record the number here.



The first two photos illustrate the proper placement of metal tags on the front flipper of a young green sea turtle (© Jennifer Gray, Bermuda Sea Turtle Project); however, because the animal (and thus the flipper) is so small, there is a bit too much gap between the flipper edge and the curve of the tag. The third photo illustrates the proper placement of metal tags to the rear flippers (© NMFS-SEFSC).

### Physical Description

Provide a physical description of the turtle in this section; for example size, weight, unusual markings, and an inventory of barnacles, leeches, etc.

#### Size

Enter the measurement (metric units) in the appropriate box.

*Note:* Typically turtles are measured “over the curve” with a flexible measuring tape; this is recorded as “curved carapace length” (CCL) and “curved carapace width” (CCW). If a caliper is available, the observer might also document “straight carapace length” (SCL) and “straight carapace width” (SCW). One measurement type (curved or straight) is sufficient, as long as both length and width are recorded.

If the turtle has a distinct notch between the supracaudal scutes, the descriptors “NN” (notch-to-notch) and “NT” (notch-to-tip) refer to whether the carapace was measured to the inside of the posterior notch or to the farthest tip, respectively.

**Does carapace damage or deformity affect measurement?**

If measurement of the length may have been affected (usually shortened) by a damaged carapace, check this box. *Note:* Unnatural carapace dimensions will corrupt any subsequent population-level analyses of turtle size.

**Weight**

Enter the turtle’s weight (in kilograms), if known. *Note:* Only enter this information if the turtle was weighed, a guess is not useful.

**Diagnostic Injuries**

Enter notes describing injuries or other diagnostic characteristics of the stranded turtle. In particular, make note of any injuries, scarring patterns, etc. that could be used to identify this individual at a later time.

**Parasites and Epibiota**

Enter notes associated with parasites (e.g., leeches) or epibiota (e.g., barnacles) found on the stranded turtle.

**Tag Scar Location**

Tag scars are the residual scars left in the flipper once a tag has been removed or has fallen out. Evaluating tag scars is always difficult, and particularly so in leatherback turtles. If the observer is trained in identifying such evidence, it can be entered here.

**Turtle Condition**

The condition of the stranded turtle should be described as follows (choose one):

- Alive*
- Fresh Dead*
- Moderately Decomposed*
- Very Decomposed*
- Unknown*

**Necropsy Report**

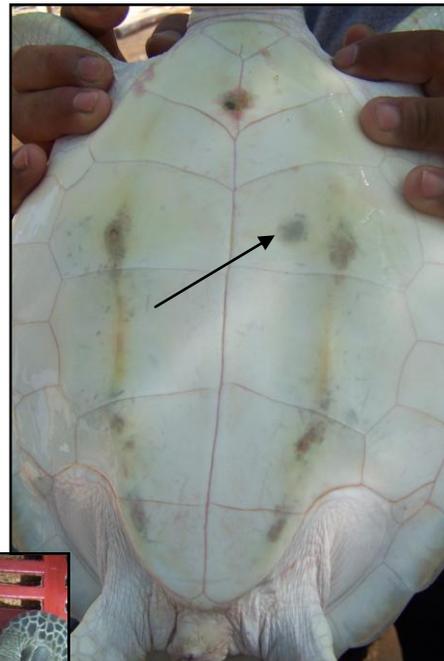
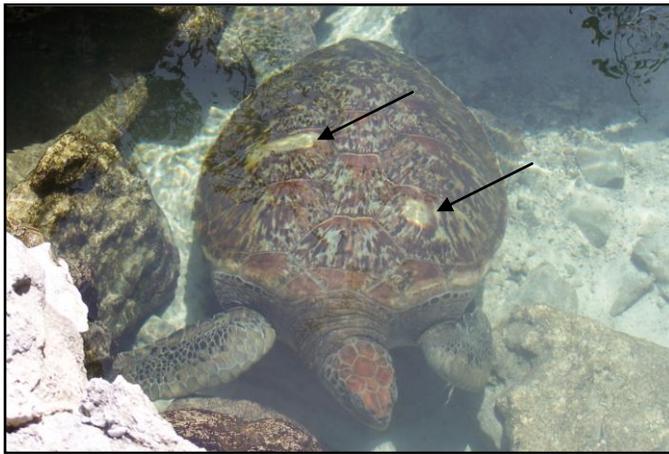
This section is used to document a necropsy, the animal equivalent of an autopsy. If a necropsy was conducted, the results can be described here, or you may attach a complete necropsy report to the data form.

**Notes**

Enter any other information not included elsewhere on the data form. INDICATE WHETHER PHOTOGRAPHS WERE TAKEN, and attach these to the data form.

### A note about 'Living Tags'

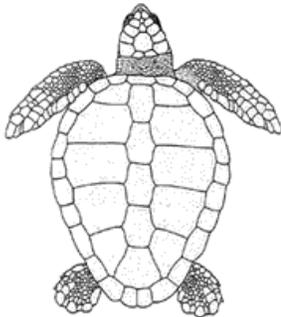
Remember that turtles can be "tagged" with living tissue! 'Living Tags' provide a permanent marking method, particularly for programs seeking to mark post-hatchlings and small juveniles that cannot be marked using traditional tagging methods. The "tag" is simply a living tissue strip, removed from the plastron and transplanted into the carapace (or *vice versa*), that leaves a permanent, identifiable light spot that grows with the animal on the contrasting surface. The US National Marine Fisheries Service "Sea Turtle Research Techniques Manual" (NMFS-SFSC 2008) includes an excellent description of this technique. For the purposes of this Field Guide, just remember to clearly photograph any marking that may represent a living tag. The following are some examples (photos courtesy of the Parque Xcaret Living Tag Program, México). All are green turtles, *Chelonia mydas*, with the exception of the hawksbill, *Eretmochelys imbricata*, on the lower right.



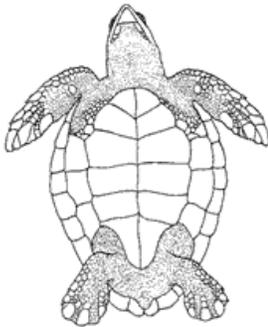
## APPENDIX B

### SPECIES IDENTIFICATION

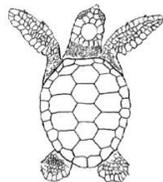
#### ***Caretta caretta*: Loggerhead (Eng), Caguama (Sp), Caouanne (Fr)**



**Adult (top)**



**Adult (bottom)**



**Hatchling**



**Head**

#### ***Physical Characteristics***

- Named for: Relatively large head (up to 10 inches [25 cm] in width)
- Length-adult: Carapace (upper shell) length of 3-4 feet (ca. 1-1.2 m)
- Length-hatchling: Carapace length of 1.7-1.8 in (ca. 44-48 mm)
- Weight-adult: to 400 lb (ca. 100-180 kg)
- Color-adult: Carapace is reddish-brown; plastron (belly) is light yellow to light brown
- Color-hatchling: Uniform in color, red-brown to grey-black

#### ***Caribbean Reproduction/Nesting***

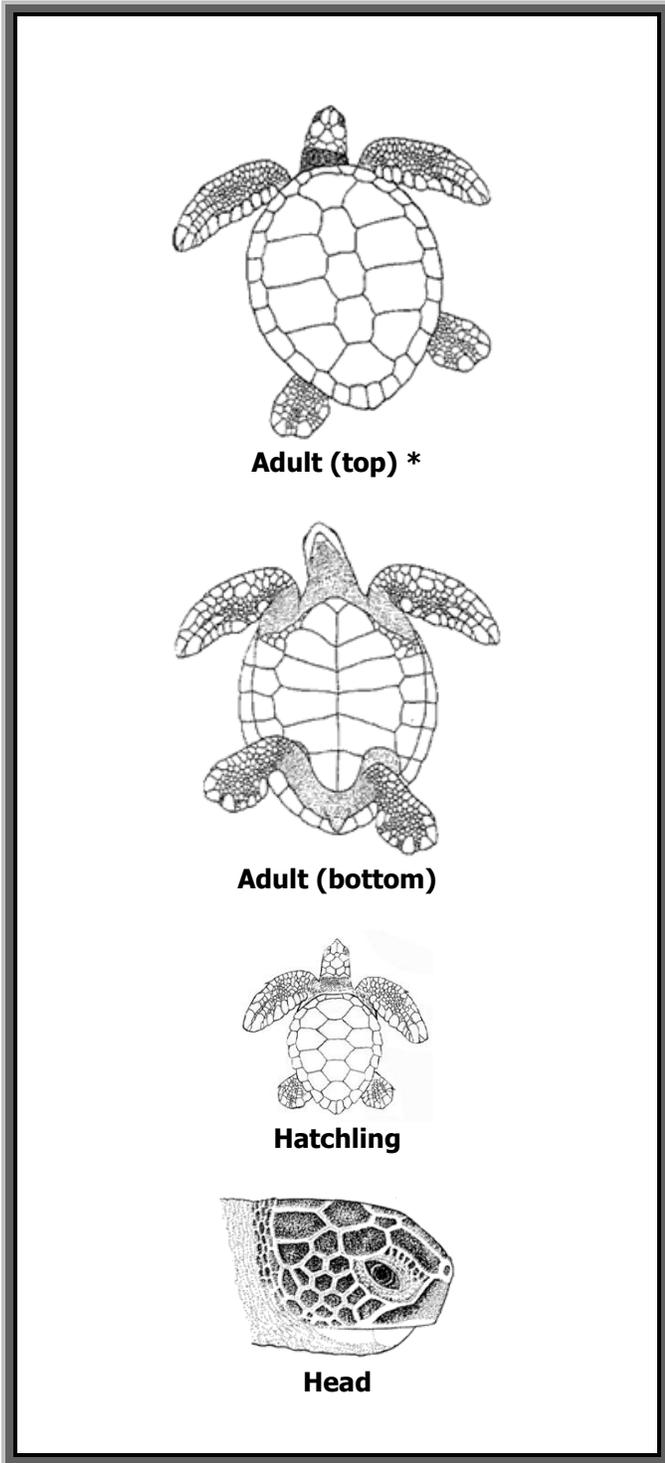
- Peak nesting: May-July
- Number of nests: On average, 3-4 per season at 13-15-day intervals
- Average "clutch size" (=eggs per nest): 100-120 eggs
- Incubation time: ca. 50-75 days

#### ***Global Status***

- Endangered (World Conservation Union: IUCN); international trade prohibited by CITES; protected under the Protocol concerning Specially Protected Areas and Wildlife (SPA) to the UNEP Cartagena Convention; protected under the Inter-American Convention for the Protection and Conservation of Sea Turtles



***Chelonia mydas*: Green Turtle (Eng), Tortuga verde (Sp), Tortue verte (Fr)**



***Physical Characteristics***

- Named for: Color of body fat (tinted from a diet of seagrass)
- Length-adult: Carapace (upper shell) length of 3-4 feet (ca. 1-1.2 m)
- Length-hatchling: Carapace length of 1.9 in (ca. 49 mm)
- Weight-adult: to 400 lb (ca. 120-180 kg)
- Color-adult: Carapace is mottled gray, green, brown and black; plastron (belly) is pale yellow
- Color-hatchling: black carapace, white plastron

***Caribbean Reproduction/Nesting***

- Peak nesting: May-September
- Number of nests: On average, 3-5 per season at 12-14 day intervals
- Average "clutch size" (=eggs per nest): 110-140 eggs
- Incubation time: 50-70 days

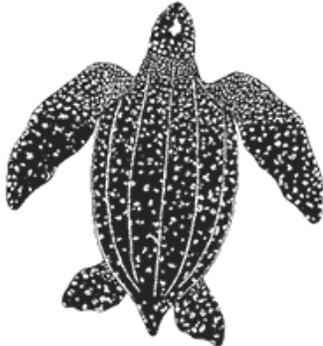
***Global Status***

- Endangered (World Conservation Union: IUCN); international trade prohibited by CITES; protected under the Protocol concerning Specially Protected Areas and Wildlife (SPA) to the UNEP Cartagena Convention; protected under the Inter-American Convention for the Protection and Conservation of Sea Turtles

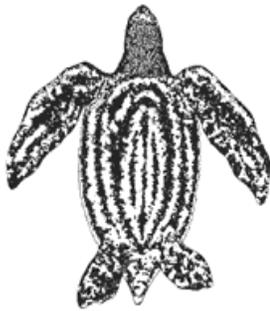


(\*) drawings are not to scale with respect to size differences among species

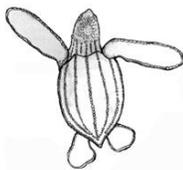
***Dermochelys coriacea*: Leatherback (Eng), Tortuga Laúd (Sp), Tortue luth (Fr)**



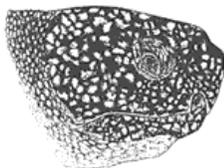
**Adult (top)**



**Adult (bottom)**



**Hatchling**



**Head**

***Physical Characteristics***

- Named for: Lack of a bony carapace (upper shell); leathery skin
- Length-adult (female): Carapace length of 4.5-6 feet (ca. 1.4-1.8 m), with 7 prominent ridges
- Length-hatchling: Carapace length of 2.4-2.6 in (ca. 60-65 mm)
- Weight-adult (female): 550-1400 lb (ca. 250-650 kg) [males to 2000 lb (920 kg)]
- Color-adult: Carapace and plastron (belly) both gray/black with white or pale spots
- Color-hatchling: Carapace is black with white spots, plastron is mottled black and white

***Caribbean Reproduction/Nesting***

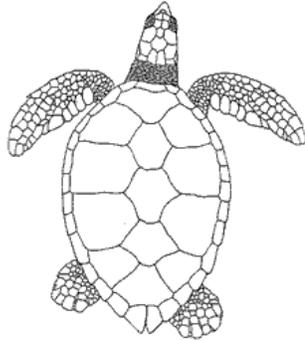
- Peak nesting: March-July
- Number of nests: On average, 6-9 times per season at 9-11 day intervals
- Average "clutch size" (=eggs per nest): 80-90 [yolked] eggs
- Incubation time: 50-75 days

***Global Status***

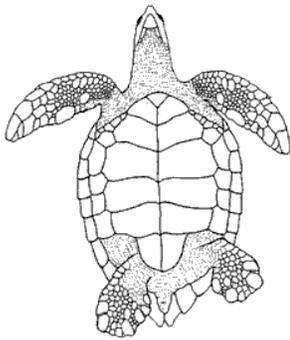
- Critically Endangered (World Conservation Union: IUCN); international trade prohibited by CITES; protected under the Protocol concerning Specially Protected Areas and Wildlife (SPA) to the UNEP Cartagena Convention; protected under the Inter-American Convention for the Protection and Conservation of Sea Turtles



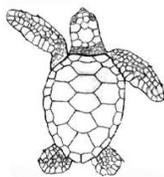
***Eretmochelys imbricata*: Hawksbill (Eng), Tortuga Carey (Sp), Tortue imbriquée (Fr)**



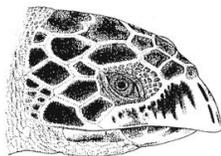
**Adult (top)**



**Adult (bottom)**



**Hatchling**



**Head**

***Physical Characteristics***

- Named for: Hawk-like beak
- Length-adult: Carapace (upper shell) length of 2-3 feet (ca. 60-90 cm)
- Length-hatchling: Carapace length of 1.6-1.8 in (ca. 40-45 mm)
- Weight-adult: 132-176 lb (ca. 60-80 kg)
- Color-adult: Carapace is brown, black, and amber; Plastron (belly) is yellow
- Color-hatchling: Uniform in color, grey or brown

***Caribbean Reproduction/Nesting***

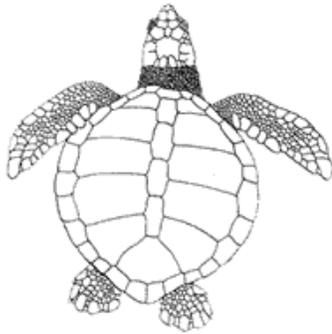
- Peak nesting: April-November
- Number of nests: On average, 4-5 times per season at 14-15 day intervals
- Average "clutch size" (=eggs per nest): about 160 eggs
- Incubation time: 50-75 days

***Global Status***

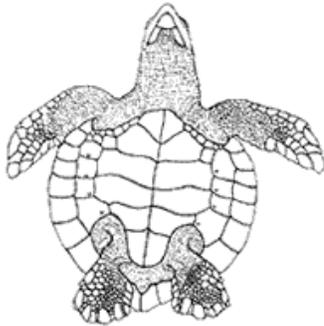
- Critically Endangered (World Conservation Union: IUCN); international trade prohibited by CITES; protected under the Protocol concerning Specially Protected Areas and Wildlife (SPAW) to the UNEP Cartagena Convention; protected under the Inter-American Convention for the Protection and Conservation of Sea Turtles



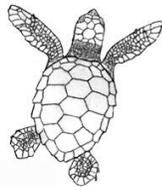
***Lepidochelys kempii*: Kemp's ridley (Eng), Tortuga Lora (Sp), Tortue de Kemp (Fr)**



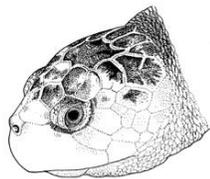
**Adult (top)**



**Adult (bottom)**



**Hatchling**



**Head**

***Physical Characteristics***

- **Length-adult:** Carapace (upper shell) length of 2-2.5 feet (ca. 60-75 cm), smallest sea turtle
- **Length-hatchling:** Carapace length of 1.6-1.8 in (ca. 40-47 mm)
- **Weight:** 75-110 lb (ca. 35-50 kg)
- **Color-adult:** Carapace is grey or black; Plastron (belly) is pale yellow (a single pore is evident in each inframarginal scute)
- **Color-hatchling:** Uniform in color; grayish black.

***Caribbean [Gulf of Mexico] Reproduction/ Nesting***

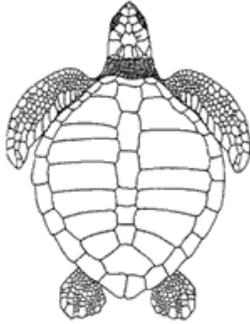
- **Peak nesting:** April-July, nests only in the Gulf of Mexico
- **Number of nests:** On average, 2-3 times per season; daytime nester
- **Average "clutch size"** (=eggs per nest): 100-105 eggs
- **Incubation time:** about 45-55 days

***Global Status***

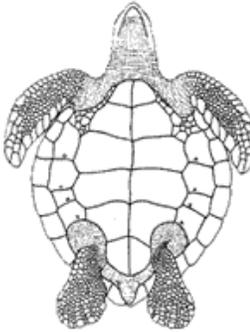
- **Critically Endangered** (World Conservation Union: IUCN); international trade prohibited by CITES; protected under the Protocol concerning Specially Protected Areas and Wildlife (SPA) to the UNEP Cartagena Convention; protected under the Inter-American Convention for the Protection and Conservation of Sea Turtles



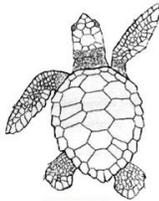
***Lepidochelys olivacea*: Olive ridley (Eng), Golfina (Sp), Tortue olivâtre (Fr)**



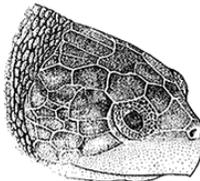
**Adult (top)**



**Adult (bottom)**



**Hatchling**



**Head**

***Physical Characteristics***

- Length-adult: Carapace (upper shell) length of 2-2.5 ft (ca. 60-75 cm)
- Length-hatchling: Carapace length of 1.5-2 in (ca. 38-50 mm)
- Weight: 75-110 lb (ca. 35-50 kg)
- Color-adult: Carapace is dark grey/green; Plastron (belly) is yellowish-white (a single pore is evident in each inframarginal scute)
- Color-hatchling: Uniform in color, grayish black

***Caribbean Reproduction/Nesting***

- Peak nesting: April-August
- Number of nests: On average, 1-2 times per season at 17-30 day intervals
- Average "clutch size" (=eggs per nest): 105-115 eggs
- Incubation time: about 55 days

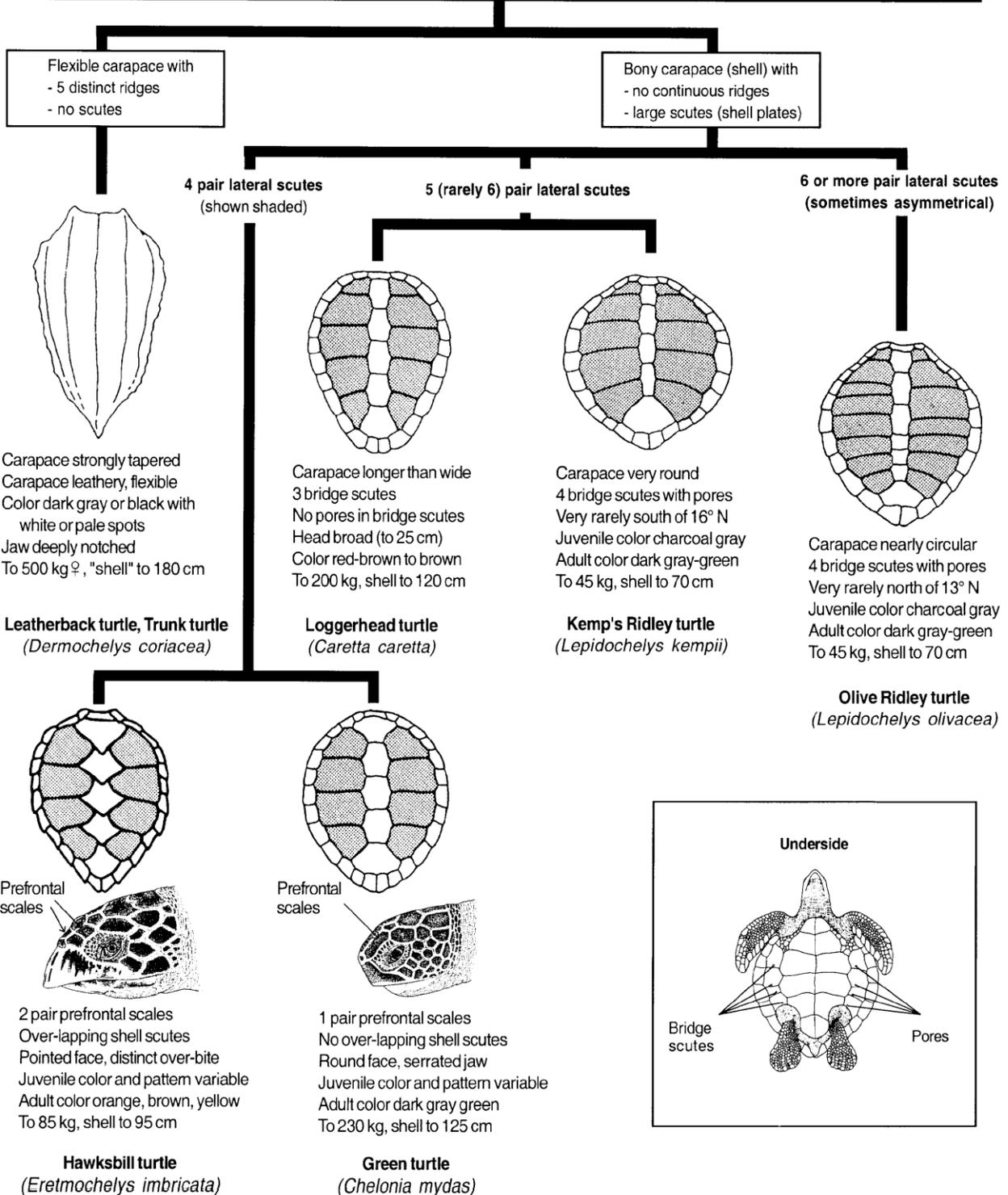
***Global Status***

- Vulnerable (World Conservation Union: IUCN); international trade prohibited by CITES; protected under the Protocol concerning Specially Protected Areas and Wildlife (SPA) to the UNEP Cartagena Convention; protected under the Inter-American Convention for the Protection and Conservation of Sea Turtles



# Wider Caribbean Sea Turtles

## IDENTIFICATION KEY



## APPENDIX C

### TRANSPORTING A SICK OR INJURED SEA TURTLE

#### Live Turtle Transport

If you need to transport a sick or injured sea turtle, make every effort to keep the animal in the shade (that is, keep it from over-heating) while waiting for the vehicle to arrive. Provide a smooth ride, do your best to keep the animal moist, and protect the animal from extremes of heat and cold.

The following guidelines are intended for local ground transport, typically from the point of encounter to a rescue/rehabilitation center or veterinary clinic. They are not intended to be comprehensive with regard to shipment by air. Remember that in any international shipment will require permits, including CITES permits (see <http://www.cites.org/eng/resources/transport/index.shtml>).

1. Always place the sea turtle in a container (e.g., wooden crate, large cooler, animal kennel) for transport. Container dimensions should allow normal flipper position and head extension (including raising the head to breathe); the turtle should *not* be able to turn around. Containers should be handled and secured during transport in an upright position; the top should be clearly marked. Containers should be ventilated and padded (at least on the bottom), must not contain any material that could be accidentally ingested, and should accommodate the fact that turtles must be kept moist. The best range of temperature for transport is between 21°C and 27°C (70°-80°F) (FWS 2000).
2. Apply a very thin layer of lubricating jelly (such as KY®, which has the advantage of being water-soluble, or Vaseline®) – except around the eyes, nose, and mouth and avoiding any open wounds – to keep the turtle from drying out during long-distance transport. *Note:* Wet towels can also be used, but then care must be taken to prevent the turtle from becoming too cold (because of evaporative cooling). ***Turtles covered with wet towels must not be kept in an air-conditioned environment*** (FFWCC 2002b).

#### Live Hatchling Transport

Container size for turtles should be large enough to comfortably hold the turtle, but small enough to prevent excessive motion and turning. Modified milk crates or appropriately-sized buckets or coolers can be used (Higgins 2003). In the case of hatchlings:

1. Place a few inches of damp beach sand in the transport container. If the sand is too dry, the young turtles may desiccate (dry out); if too wet, energy will be wasted in swimming and weak hatchlings may be unable to hold their heads above the water to breathe. *Never* transport sea turtles, including hatchlings, in water.
2. Avoid excessive heat or cold during transport: aim for ambient nighttime temperature in your area. Check moisture levels regularly; moisture can be added using a fine mist from a spray bottle.

#### Concerns and Warnings

Make sure that containers are secured during transport, such that they do not slide around or tip over.

## APPENDIX D

### EMERGENCY ASSISTANCE

The following facilities have veterinarians on staff with experience with all or most Caribbean sea turtle species, with all or most life stages (hatchlings, small oceanic-stage juveniles, larger juveniles, adults), and with all or most of the conditions addresses in this field manual: including blunt trauma, entanglement, oiling and pollution, loss of limbs, and infectious disease (including fibropapillomatosis). Urgent assistance on topics ranging from anesthesia and surgery to rehabilitation and release is available upon request. *Note:* Veterinarians associated with The Turtle Hospital [Marathon, Florida] and Mote Marine Laboratory and Aquarium [Sarasota, Florida] are likely to have the most experience with the serious condition of fibropapillomatosis.

The Turtle Hospital  
Attn: **Douglas R. Mader, MS, DVM, DABVP**  
Consulting Veterinarian  
2396 Overseas Hwy  
Marathon, Florida 33050 USA  
Tel/Fax: (305) 743-6509  
Email: [Turtlehosp@aol.com](mailto:Turtlehosp@aol.com)  
<http://www.turtlehospital.org/>

Disney's Animal Programs  
Attn: **M. Andrew Stamper, DVM, Dipl. ACZM**  
Research Biologist/Clinical Veterinarian  
Department of Education and Science  
Walt Disney World Resorts - EC Trl. W-251  
2016 North Avenue of the Stars  
Lake Buena Vista, Florida 32830 USA  
Tel: (407) 560-5576 / Fax: (407) 560-5750  
Email: [Andy.M.Stamper@disney.com](mailto:Andy.M.Stamper@disney.com)  
[www.Environmentality.com](http://www.Environmentality.com)

North Carolina State University  
College of Veterinary Medicine  
Attn: **Craig A. Harms, DVM, PhD, Dipl. ACZM**  
Department of Clinical Sciences  
Center for Marine Sciences and Technology  
303 College Circle, Morehead City  
North Carolina 28557 USA  
Tel: (252) 222-6339 / Fax: (252) 222-6311  
Email: [craig\\_harms@ncsu.edu](mailto:craig_harms@ncsu.edu)  
<http://www.seaturtlehospital.org/>

Virginia Aquarium and Marine Science Center,  
and Gloucester Veterinary Hospital  
(Aquatic Animal Medicine Consultants)  
Attn: **Robert George, DVM**  
Head Veterinarian  
717 General Booth Blvd.  
Virginia Beach, Virginia 23451 USA  
Tel: (804) 693-3030 / Cell: (804) 815-1917  
Email: [rgeorge@vims.edu](mailto:rgeorge@vims.edu)

Georgia Sea Turtle Center  
Attn: **Terry M. Norton, DVM, Dipl. ACZM**  
Director and Head of Veterinary Services  
214 Stable Road  
Jekyll Island, Georgia 31527 USA  
Tel: (912) 230-9229  
Email: [tnorton@jekyllisland.com](mailto:tnorton@jekyllisland.com)  
[www.georgiaseaturtlecenter.org](http://www.georgiaseaturtlecenter.org)

Loggerhead Marinelife Center  
Attn: **Nancy Mettee, DVM**  
Consulting Veterinarian  
14200 U.S. Hwy. #1  
Loggerhead Park  
Juno Beach  
Florida 33408 USA  
Tel: (561) 627-8280  
Fax: (561) 627-8305  
Email: [Nmettee@marinelife.org](mailto:Nmettee@marinelife.org)  
<http://marinelife.org/>

University of Florida  
College of Veterinary Medicine  
Attn: **Mike Walsh, DVM**  
Clinical Associate Professor  
Assistant Director, Aquatic Animal Health Program  
Large Animal Clinical Sciences  
2015 SW 16th Ave (POB 100136)  
Gainesville, Florida 32608 USA  
Tel: (352) 294-4199  
Fax: (352) 392-8289  
Email: [walshm@ufl.edu](mailto:walshm@ufl.edu)

University of Florida  
College of Veterinary Medicine  
Attn: **Elliot Jacobson, DVM, PhD, Dipl. ACZM**  
Professor  
Department of Small Animal Clinical Sciences  
2015 SW 16th Ave (POB 100126)  
Gainesville, Florida  
32610 USA  
Tel: (352) 392-2226  
Fax: (352) 392-6125  
Email: [jacobsonsone@ufl.edu](mailto:jacobsonsone@ufl.edu)

New England Aquarium  
Attn: **Charles J. Innis, VMD**  
Associate Veterinarian  
Central Wharf  
Boston, Massachusetts  
02110 USA  
Tel: (617) 226-2151  
Email: [cinnis@neaq.org](mailto:cinnis@neaq.org)  
<http://www.neaq.org>

Ross University School of Veterinary Medicine  
Attn: **Kimberly Stewart, MS, DVM**  
Coordinator  
St. Kitts Sea Turtle Monitoring Network  
P. O. Box 334, Basseterre  
Saint Kitts & Nevis, Eastern Caribbean  
Tel: (869) 465-4161 ext. 199  
Cell: (869) 669-4268  
Email: [stewartk7@hotmail.com](mailto:stewartk7@hotmail.com)  
<http://www.stkittsturtles.org/www.stkittsturtles.org/Welcome.html>

Parque X'caret  
Attn: **Ana Cecilia Negrete, DMV**  
**Biol. Rodolfo Raigoza Figueras**  
Responsable de Operación Medicina  
Departamento de Tortugas Marinas  
Parque X'caret Km. 282  
Carretera Chetumal-Pto. Juarez  
Municipio de Solidaridad, Playa del Carmen  
Quintana Roo, México  
Tel: (984) 8715-270, -266  
Email: [anegrete@gxcaret.com.mx](mailto:anegrete@gxcaret.com.mx)

## APPENDIX E

### EUTHANASIA IN SEA TURTLES

Sea turtles are highly adaptive. They can survive unthinkable traumas, and continue to live productive lives. Euthanasia should only be considered in the worst of cases; for example, when an interrupted poaching event has resulted in the amputation of all four flippers or a blunt trauma renders the turtle comatose and unresponsive (see “Resuscitation”). The unique ectothermic physiology of reptiles and their ability to maintain brain function under long periods of anoxia make humane euthanasia of this group a challenge. For example, even when the cranial nerves and brain are deprived of a blood supply, certain reflexes such as limb withdrawal can persist for some time.

Euthanasia is defined 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” (Geraci and Lounsbury 1993). Death should come without signs of panic, pain or distress; with minimum time to loss of consciousness; and under conditions that are safe for the personnel involved (CCAC 1993).

Euthanasia is an option when:

- It is necessary to end the suffering of an animal in irreversibly poor condition,
- The decision can be made and the action directed by an experienced, qualified person,
- Essential materials and equipment are available,
- The procedure can be carried out humanely,
- No rehabilitation facility is available, and/or
- Rescue is impossible and no care facility is available.

**The most humane and least traumatic euthanasia technique is to have a veterinarian administer a lethal dose of an anesthetic or euthanasia drug.**

If (and only if) a veterinarian is **not** available, we recommend destroying the brain by penetrating the skull, in the middle and just posterior to the eyes (see Figures 1-4), with a captive bolt.

A penetrating captive bolt pistol (used to kill livestock) is an effective, but expensive, tool powered by gunpowder charges or compressed air that drives a metal rod through the animal’s skull into its brain. The same result can be achieved under field conditions with a metal rod and a hammer. Proper placement of the bolt on the head is crucial, so the animal (and particularly the head) must be either immobile or securely restrained, and with the chin and neck on a hard surface (e.g., board, rock) (NYS/CCE 2005). **Be prepared** for the animal to thrash. *Note:* An approach with a bolt from the top of the head can result in the fracture of the skull, often exposing brain-like tissue. This is actually salt gland tissue (see Figure 4). The brain is located in a boney chamber beneath the muscles underlying the skull.

To ensure complete destruction of the brain, the captive bolt technique should be followed by “pithing”: a sharp, pointed probe is inserted through the skin between the skull and the atlas, then pushed forward through the foramen magnum into the cranial cavity using a twisting motion. If the neurocranium is fractured, pithing can be performed through that opening. *Note:* Pithing requires

considerable skill; it can be bloody and traumatic. Professionals caution that it should only be attempted after acquiring knowledge of anatomy using skeletons, and after a period of training including practice on dead animals, because this method can cause pain and suffering if the proper regions of the brain are not completely destroyed (CCAC 1993).

### Concerns and Warnings

A powerful blow, designed to penetrate the skull into the brain, is **not** equivalent to bludgeoning the animal to death. Nor is it appropriate to use any blunt object that happens to be at hand. Consider carefully the bolt (metal rod) that will be used, the location of its placement, and the hammer that will deliver the blow. Keep in mind that the target – the brain – is both small and deep within the skull.

**Never** attempt to kill a sea turtle by freezing it, this method is ineffective and inhumane. Do not decapitate a sea turtle – this is not a humane option for turtles larger than very young juveniles. Exsanguination (rapidly draining blood from the body after severing major blood vessels, usually those in the neck) is never recommended for sea turtles, nor is shooting with an ordinary gun recommended under field conditions unless the gun is in the hands of a trained and skilled shooter.

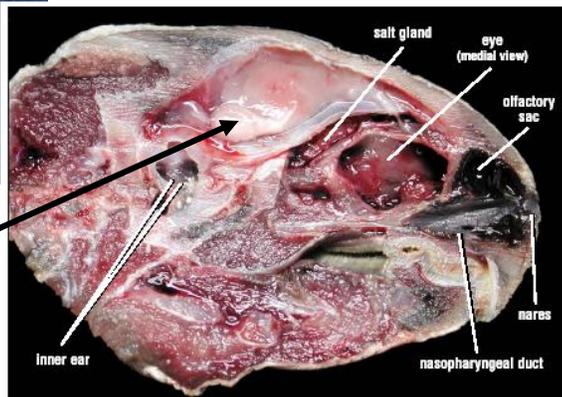
Terminating a sea turtle, a protected animal in many countries, may carry legal consequences. Always contact the authorities, and make every attempt to have a veterinarian or medical technician present. Never consider euthanasia unless it is clear to all concerned that no other humane course of treatment is feasible.

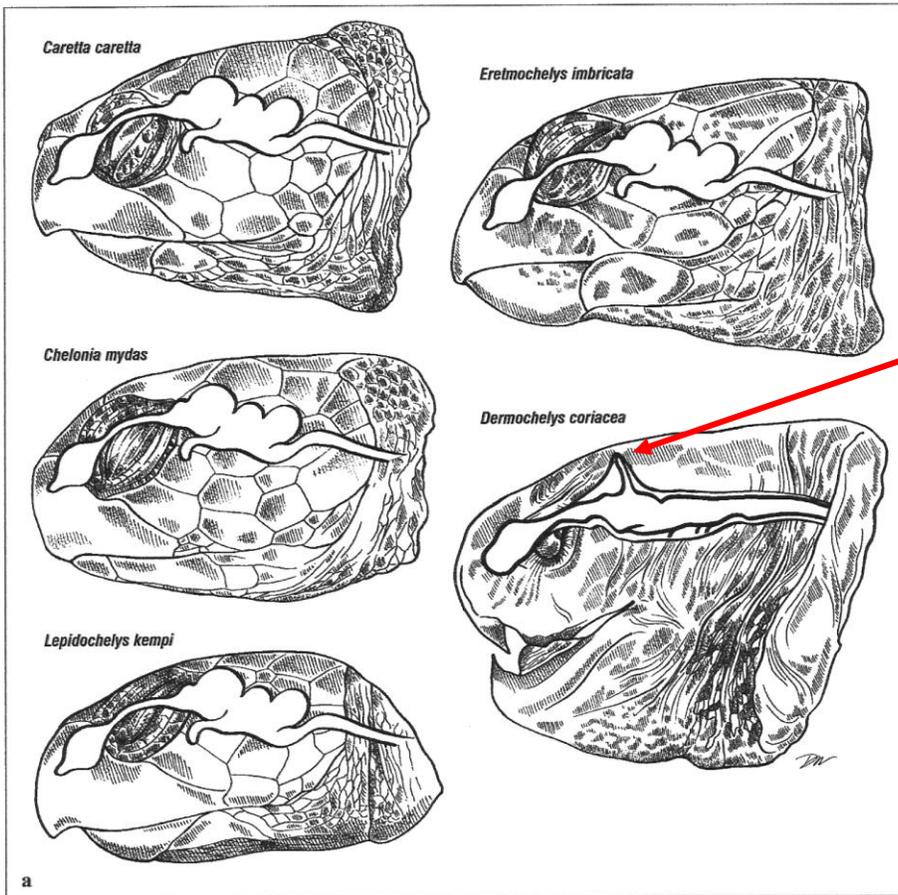
Animals containing administered toxic substances or drugs (including euthanasia agents) must not be disposed of in areas where they may become part of the natural food web (HACC 2004).



**Figure 1.** The skull of a green sea turtle (L), with cutaway (R) revealing the sense organs. The arrow indicates the location of the brain – the target for penetration of the captive bolt – deep within the skull and posterior to the eyes. Sources: <http://www.skulls-skeletons.com> (L); Wyneken 2001 (R).

Brain





**Fig. 192.** Brain landmarks for marine turtles. Overlays of brain positions are shown for 5 species. The position of the head scales, the eye, and the ear provide some reference points for identifying the position of the brain, which varies in dorsal-ventral position with species. The brain position of the

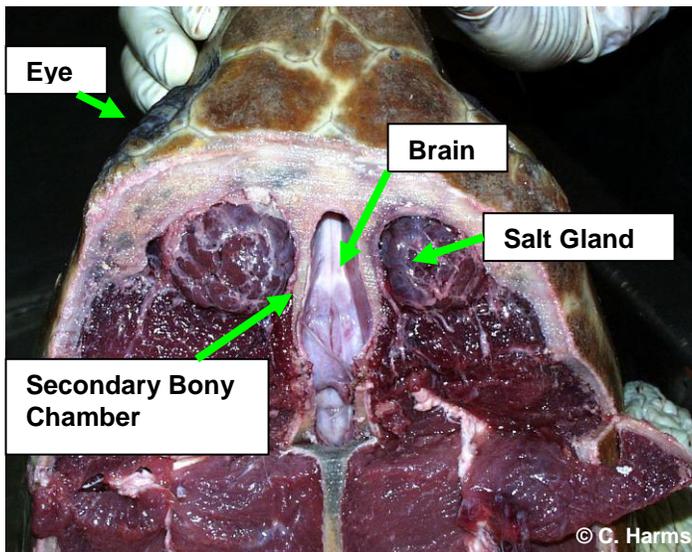
leatherback, in this drawing, is based more upon the shape of the braincase because of the poor condition of all leatherback brains examined. The landmarks shown are accurate for large turtles, however the brains of hatchlings and juveniles are disproportionately larger.

**Figure 3.** The location of the brain in sea turtles. Note the spatial relationship of the brain mass to the eyes. In the leatherback, the brain is effectively targeted through the characteristic “pink spot” on the crown of the head. Source: Wyneken, 2001.



**Figure 4.** In hard-shelled sea turtles the captive bolt should be placed along the midline of the skull, posterior to the eyes. A dorsal cut-away (L) reveals the brain protected by a secondary bony chamber, presenting a comparatively long but narrow target.

Target area for the captive bolt



**Source:** *excerpted from* American Veterinary Medical Association. 2001. Report of the AVMA Panel on Euthanasia. JAVMA 218(5):669-696. [http://www.avma.org/issues/animal\\_welfare/euthanasia.pdf](http://www.avma.org/issues/animal_welfare/euthanasia.pdf)

## WILDLIFE

For wild and feral animals, many recommended means of euthanasia for captive animals are not feasible. The panel recognizes there are situations involving free-ranging wildlife when euthanasia is not possible from the animal or human safety standpoint, and killing may be necessary. Conditions found in the field, although more challenging than those that are controlled, do not in any way reduce or minimize the ethical obligation of the responsible individual to reduce pain and distress to the greatest extent possible during the taking of an animal's life. Because euthanasia of wildlife is often performed by lay personnel in remote settings, guidelines are needed to assist veterinarians, wildlife biologists, and wildlife health professionals in developing humane protocols for euthanasia of wildlife.

In the case of free-ranging wildlife, personnel may not be trained in the proper use of remote anesthesia, proper delivery equipment may not be available, personnel may be working alone in remote areas where accidental exposure to potent anesthetic medications used in wildlife capture would present a risk to human safety, or approaching the animal within a practical darting distance may not be possible. In these cases, the only practical means of animal collection may be gunshot and kill trapping.<sup>13,180-184</sup>

Under these conditions, specific methods chosen must be as age-, species-, or taxonomic/ class-specific as possible. The firearm and ammunition should be appropriate for the species and purpose. Personnel should be sufficiently skilled to be accurate, and they should be experienced in the proper and safe use of firearms, complying with laws and regulations governing their possession and use.

Behavioral responses of wildlife or captive non-traditional species (zoo) in close human contact are very different from those of domestic animals. These animals are usually frightened and distressed. Thus, minimizing the amount, degree, and/or cognition of human contact during procedures

that require handling is of utmost importance. Handling these animals often requires general anesthesia, which provides loss of consciousness and which relieves distress, anxiety, apprehension, and perception of pain. Even though the animal is under general anesthesia, minimizing auditory, visual, and tactile stimulation will help ensure the most stress-free euthanasia possible. With use of general anesthesia, there are more methods for euthanasia available.

A 2-stage euthanasia process involving general anesthesia, tranquilization, or use of analgesics, followed by intravenous injectable pharmaceuticals, although preferred, is often not practical. Injectable anesthetics are not always legally or readily available to those working in nuisance animal control, and the distress to the animal induced by live capture, transport to a veterinary facility, and confinement in a veterinary hospital prior to euthanasia must be considered in choosing the most humane technique for the situation at hand. Veterinarians providing support to those working with injured or live-trapped, free-ranging animals should take capture, transport, handling distress, and possible carcass consumption into consideration when asked to assist with euthanasia.

Alternatives to 2-stage euthanasia using anesthesia include a squeeze cage with intraperitoneal injection of sodium pentobarbital, inhalant agents (CO<sub>2</sub> chamber, CO chamber), and gunshot. In cases where pre-euthanasia anesthetics are not available, intraperitoneal injections of sodium pentobarbital, although slower in producing loss of consciousness, should be considered preferable over intravenous injection, if restraint will cause increased distress to the animal or danger to the operator.

Wildlife species may be encountered under a variety of situations. Euthanasia of the same species under different conditions may require different techniques. Even in a controlled setting, an extremely fractious large animal may threaten the safety of the practitioner, bystanders, and itself. When safety is in question and the fractious large animal, whether wild, feral, or domestic, is in close confinement, neuromuscular blocking agents may be used immediately prior to the use of an acceptable form of euthanasia. For this technique to be humane, the operator must ensure they will gain control over the animal and perform euthanasia before distress develops.

## AMPHIBIANS, FISH, AND REPTILES

Euthanasia of ectothermic animals must take into account differences in their metabolism, respiration, and tolerance to cerebral hypoxia. In addition, it is often more difficult to ascertain when an animal is dead. Some unique aspects of euthanasia of amphibians, fishes, and reptiles have been described.<sup>13,51,186,187</sup>

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## APPENDIX F

### FIBROPAPILLOMA DISEASE: WHAT TO DO WITH A FIBROPAPILLOMA-BEARING SEA TURTLE

#### SAMPLE PROTOCOL: BERMUDA TURTLE PROJECT

Sea turtle fibropapilloma disease (FP) is a debilitating and sometimes fatal disease of sea turtles. It is seen most often in green turtles but is also known to occur in loggerheads and ridleys. It is currently unknown from Bermuda. However, because so little is known about the natural routes of transmission of FP, it is best at this time to work on the assumption that it is highly communicable and take appropriate precautions. **Researchers should make every attempt to keep the disease out of populations where it does not occur.** The following protocol has been developed to reduce the possibility of fibropapilloma becoming established in Bermuda, and is set forward to guide the handling of potentially infected turtle onboard the research vessel *Calamus*. Note: There is no nesting in Bermuda; thus, sea turtles are only handled following capture during organized offshore research expeditions.

*Recognizing fibropapilloma disease*: Fibropapilloma disease is most easily recognized by the external tumor-like growths that it produces. These can occur on any of the soft tissues of the turtle but are most commonly seen on the softest areas of the head and neck, especially around the eyes, and at the base of the fore and hind flippers. They will appear as pea-sized to grapefruit-sized growths, variable in color but usually pink to red, or gray to black. They often have a floral appearance, with a surface texture like a head of cauliflower, but may also be smooth. These tumors are well vascularized and will bleed readily when cut or abraded by the capture net.

*Preventing the spread of fibropapilloma disease*: Healthy turtles with no evidence of the external tumor-like growths can carry the virus that apparently causes FP, as well as other pathogenic agents of sea turtles. Turtles can also carry a tumor burden internally, with or without any external signs of infection. Thus, we must always use extreme caution with the body fluids of the sea turtles we handle. The tagging punch must be cleared of tissue and the punch and tag applicators disinfected (for 20 minutes) with mild bleach solution after every turtle. Blood or other body fluids from one turtle should not be allowed to get on another turtle during sampling or at any other time. Do not use syringe needles or other instruments that break the skin (e.g., PIT tag applicators, tagging punch) on multiple animals without disinfecting them thoroughly between animals. Use of exam gloves when performing various procedures on turtles is important; it is difficult to keep your hands clean under field conditions. When gloves are not available, frequent hand wiping with sanitizing hand wipes is mandatory. Note: Be aware of possible contamination to clothing or skin, and not only to hands.

*Capture of a papilloma-bearing turtle in the entrapment net*: A turtle with obvious FP should not be placed directly in the catch boat, especially with other turtles. The turtle should be handled with gloves and placed (along with the used gloves) into the equipment bucket (removing the GPS and other equipment first) in order to isolate it from other turtles and to avoid contamination of the deck surface. The bucket should be scrubbed thoroughly with a 10% Clorox solution (for 20 minutes) and rinsed thoroughly with freshwater before being used again.

Turtles with obvious FP should not be taken on board *Calamus* or to the Aquarium. The virus that is associated with the disease may survive for long periods outside of the host, especially if it is kept wet

or moist. Thus, thorough treatment of all possibly infected surfaces with detergents, disinfectants, or prolonged drying would be required to make certain that the disease would not be transmitted. With this in mind, all turtles suspected to be infected with FP virus should be kept away from all areas where turtles are kept, including the decks of the catch-boat and *Calamus*, and the Aquarium, its tanks, and its water system.

A live turtle with FP should not be tagged, weighed or measured. It should be photo-documented, appropriate samples of the tumors should be taken and preserved directly in 10% buffered formalin (1:10 tissue:formalin; maximum width of tissue is 1 cm for appropriate fixation) without being frozen, and the animal should be removed from contact with all other sea turtles and kept out of any facility that houses sea turtles. If the affected turtle has a heavy tumor burden that seems clearly to be FP and the animal is very seriously debilitated, euthanization should be considered by the government veterinarian. Samples of several tumors should be preserved in 10% buffered formalin. If the tumor burden is small or there is suspicion that the tumor is not FP, the animal should be isolated and appropriate samples taken for assessment. If found to have FP, the diseased animal could be sent to an appropriate facility, such as The Turtle Hospital in Marathon Key, Florida, for further observation and possible rehabilitation.

It is very important to confirm any possible cases of FP. This can best be done by collecting biopsies for complete pathological evaluation. Thus, a biopsy kit with gloves, 10% buffered formalin, appropriate-sized vials, scalpels, a small plastic ruler, and Clorox for clean up, should be assembled. This could be used for taking samples from a badly infected individual after it was euthanized, a mildly affected individual that will remain in isolation until the samples can be examined, or a dead stranded animal with suspicious tumors.

*Stranding of a papilloma-bearing turtle:* If a papilloma-bearing turtle is dead when it strands, it should be photo-documented at the stranding site. Photographs should be made of all surfaces, and a description recorded of the tumors, including measurements. If the turtle is fresh, a necropsy should be performed provided that the necropsy can be done under isolation conditions to avoid contaminating facilities where turtles are kept. If a complete necropsy cannot be performed, then a sample of the suspect tumor should be preserved in formalin for pathologic evaluation and the carcass disposed of (incinerated or buried on land). Even if the carcass is too poor to necropsy, get a sample of suspect tissue and dispose of the rest.

Any time that a suspect turtle is handled, all equipment used during handling and necropsy should be disinfected with 10% Clorox (for 20 minutes) and rinsed thoroughly in freshwater before being returned to the Aquarium. Gloves must be worn at all times. Do not transport the carcass using Aquarium vehicles and do not transport to the Aquarium for necropsy or freezing.

If a papilloma-bearing turtle strands alive, isolate it in a suitable-sized container at an appropriate location and take biopsies of suspect tissue for evaluation. The turtle should remain in isolation until the evaluation of the biopsy is complete. Based on the biopsies and the extent of any infection, a decision will be made as to whether the turtle should be euthanized or sent to an outside facility for rehabilitation.

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**Source:** modified from Meylan, P., A. Meylan and J. Gray. 2003. Procedures Manual for the Bermuda Turtle Project. Bermuda Aquarium, Museum and Zoo. 37 pp. *Used with permission.*

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**Author notes:** The Bermuda protocol is cautious and has been written for an area that does not have FP present; but, if the disease is already documented in the local area, there are options other than euthanasia. These turtles can be treated and cared for, but every effort should be made to create a containment area completely separate from other turtles, whether healthy resident turtles or other sea turtles undergoing periods of rehabilitation. The most important thing, as noted above, is not to use shared water (or anything else), meaning that every effort should be made to maintain a separate water supply and filtration system and, ideally, separate personnel. The only persons dealing with both groups of turtles should be the veterinary staff, and every effort should be made to separate those as much as possible. For example, routine procedures at Mote Marine Laboratory and Aquarium, a Florida-based sea turtle rescue center designated to care for FP turtles, require that once a veterinary staff member has handled an FP turtle, s/he will not handle a non-FP turtle for at least 72 hours (in practice, this means that the designated veterinarian handles an FP turtle just before beginning a weekend off). Also important are the following: gloves are mandatory for veterinary staff when handling FP turtles; all laundry, water supply, and equipment are entirely separate between FP and non-FP turtles; and everything is disinfected with 10% bleach solution (and rinsed thoroughly with fresh water) after having been exposed to FP turtles. At the Loggerhead Marinelife Center in Juno Beach, Florida, plastic bins and other plastic materials used with FP turtles are disposed of, as plastic is porous and, therefore, unsterilizable. Experience in Florida with rehabilitation suggests that all FP turtles under-going rehabilitation should remain at the rehabilitation facility for a period of one year following removal of the last tumor to insure that re-growth does not take place.

While there are no documented cases of water-borne transmission of FP, or transmission resulting from direct contact with an infected animal, we recommend that until researchers have a better understanding of this oft-fatal disease, for which there is no known cure, strict precautions be emphasized at all levels. One strategy is to always work on non-afflicted turtles first, then FP turtles followed by decontamination.

Advice from the facilities most active in the treatment and care of FP turtles in the Wider Caribbean Region is available from the following:

The Turtle Hospital  
Attn: **Douglas R. Mader, DVM**  
Consulting Veterinarian  
2396 Overseas Hwy  
Marathon, Florida 33050 USA  
Tel/Fax: (305) 743-6509  
Email: [Turtlehosp@aol.com](mailto:Turtlehosp@aol.com)  
<http://www.turtlehospital.org/>

Mote Marine Laboratory and Aquarium  
Attn: **M. Andrew Stamper, DVM, Dipl. ACZM**  
Consulting Veterinarian  
1600 Ken Thompson Pkwy  
Sarasota, Florida 34236 USA  
Tel: (941) 388-4441 x458

Fax: (941) 388-4512  
Email: [astamper@mote.org](mailto:astamper@mote.org)  
<http://www.mote.org>

Loggerhead Marinelife Center  
Attn: **Nancy Mettee, DVM**  
Consulting Veterinarian  
14200 U.S. Hwy. #1  
Loggerhead Park  
Juno Beach  
Florida 33408 USA  
Tel: (561) 627-8280  
Fax: (561) 627-8305  
Email: [Nmettee@marinelife.org](mailto:Nmettee@marinelife.org)  
<http://marinelife.org/>

## APPENDIX G

### U.S. NOAA/NATIONAL MARINE FISHERIES SERVICE “CAREFUL HANDLING AND RELEASE PROTOCOLS FOR HOOKED OR ENTANGLED SEA TURTLES”

**Source:** excerpted from McNaughton, L. 2004. Protected Species Handling Guide. Prepared by JIMAR (University of Hawai'i) for NOAA / NMFS Pacific Islands Regional Office, Honolulu, Hawai'i. U.S. Department of Commerce.

## 1. Determine if turtle is small enough to bring on board

### A) Turtle small enough to bring aboard

If the turtle is small enough, and if conditions are such that it can be brought aboard the vessel safely, a dip net should be used to carefully bring the turtle aboard. The net should be placed under the turtle and safely lifted out of the water and onto the deck.



Remove Hooks	Do Not Remove Hooks
<input checked="" type="checkbox"/> All externally embedded hooks	<input checked="" type="checkbox"/> Hooks that if removed, causes further damage
<input checked="" type="checkbox"/> Hooks in the mouth that are visible in part or whole	<input checked="" type="checkbox"/> Hooks in the braincase, glottis, or deeply embedded
<input checked="" type="checkbox"/> Hooks in the esophagus if insertion point of the barb is clearly visible	<input checked="" type="checkbox"/> Hooks deeply ingested by the turtle in which the barb is no longer visible

#### Tools used when removing hooks:

Embedded hooks may be removed with either long nose pliers (lightly hooked, external), bolt cutters (cut off the eye or barb of hook) or a short handle dehooker (see page 4).

The immediate steps once the turtle has been boated are, access the situation, identify if the turtle has been hooked or entangled and record the findings. Finally, determine if removing the hook will cause further injury and chose the proper means of retrieving the hook.

#### Tools used when NOT removing hooks

Hooks that are swallowed and the insertion point is not visible, monofilament cutters are used to cut the line as close to the eye of the hook as possible. If part of the hook is exposed, use bolt cutters to remove visible parts of the hook.

#### Important things NOT TO DO:

•**DO NOT** use a gaff •**DO NOT** pull on the leader line •**DO NOT** grasp the eyes to board turtle

### B) Turtle too big to bring aboard

If the turtle is determined to be too large to board without causing further injury to the turtle, or if conditions are such that the turtle cannot be safely brought aboard, leave it in the water and remove the gear as quickly as possible.



#### Tools used for ENTANGLED turtles

A long handled line cutter/clipper (left) is designed to cut through monofilament line, in order to assist in freeing entangled turtles.



#### Tools used for HOOKED turtles

If the turtle is hooked internally (mouth or esophagus), use the long handled pigtail dehooking device (right) to retrieve the hook. This device, if used properly, ensures that once the barb is secured within the loop, the hook may be removed without re-engaging or further damage to the turtle.

Externally hooked turtles (beaks, flippers), use the long handled pigtail dehooker as well as the long handled "J" style dehooker. The J style dehooker is similar to the pigtail dehooker in that you follow the leader all the way to the hook and with a slight twist and shake the hook should disengage. Be careful not to re-engage the hook upon removal.

**It is VERY IMPORTANT to record biological data for sea turtles that are both, boarded and not boarded. Such information includes, species identification, location captured and released, was it tagged, any injuries, hook location, hook removed, pictures taken, etc.**

## 2. Determine if turtle is lightly or deeply hooked



Before you begin trying to remove any hooks, it is easier to open and gag the mouth first. An example of this would be to use the rope loop or avian speculum as an opener and then place a gag, either a hank of rope, a PVC splice coupling or a canine mouth gag, to maintain access inside the turtle's mouth so it cannot bite or further ingest the hook and you can remove the hook.



### A) Lightly hooked in the mouth or beak

All external and internal hooks, that are easily visible (jaw, flippers etc.) and thus easily removable are considered "lightly hooked" and should be removed immediately in order to reduce further injury. For example, if the hook is in the mouth area (below) and the hook barb is visible, first place a mouth gag (broom stick) into the turtles mouth so that it cannot bite then use bolt cutters to remove hook barb, which will facilitate the hooks removal.



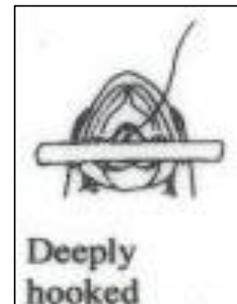
### B) Deeply hooked in the esophagus or swallowed

All internally ingested hooks which are either fully ingested (glottis, hook no longer visible) or partially ingested (hook barb visible), and all externally embedded hooks (braincase) are all considered "deeply hooked" and should be dealt with separately.



If the hook is not visible (deeply ingested) and removing the hook would cause further injury, cut the monofilament line as close to the hook barb as possible.

If only the hook barb is visible, use the pigtail dehooker or the "J" style dehooker (below – center) to remove the hook. Both dehooking devices involves looping/sliding the line through the center/side of the pigtail/J-shape and following the leader until you reach the hook. Next, release the "bite block" (below –green) so that it falls to the bottom of the dehooker and give the dehooker a sharp jab downwards. After the hook is dislodged, keeping the leader tight and the bite blocker securing the hook barb, slowly pull the dehooker out.



### 3. Determine if turtle is unconscious (comatose) or conscious

#### A) CONSCIOUS

Once the turtle is brought on board and the hook is safely removed (if possible), check to see if the turtle is conscious. It is important to monitor the turtles behavior for as long as possible in order to allow the built up toxins (caused by stress) to dissipate from the body before release.

Ensure that the turtle is in a safe area of the boat at all times and that the turtle is kept in relatively shaded area. Keep the turtles skin and eyes moist while on deck by either covering the turtle with wet towels or by applying petroleum jelly to its skin and carapace.



#### B) UNCONSCIOUS

If a turtle appears to be comatose, you should attempt to revive it. If the turtle is sluggish or not active when lifted on board, it may have water in its lungs. In this case, the rear flippers should be raised and kept around 20 cm off the deck while it is recovering.



An unconscious turtle may show some evidence of eyelid or tail movement when touched. Perform a reflex test every few hours, by gently touching the eye (bottom), or gently pulling on the tail. If there is a response, begin to treat turtle as conscious.



#### C) RETURN TURTLE TO THE OCEAN

After monitoring the turtle's behavior and progress for as long as possible (up to 24hours), carefully return the turtle to the water, while the vessel is STOPPED and the engine is OUT OF GEAR. Ensure that the turtle is clear from the vessel before motoring off.

A turtle that has no sign of life after 24 hours on deck (held in shade, kept moist and body temperature maintained above 60°F) may safely be considered dead.



### RETURN DEAD TURTLES TO THE OCEAN

Prepared by Lianne McNaughton, JIMAR, University of Hawaii, USA

For more information, contact Yonat Swimmer, NOAA Fisheries, PIFSC, Hawaii, USA, [Yonat.Swimmer@noaa.gov](mailto:Yonat.Swimmer@noaa.gov)



## NOTES

## NOTES



# WIDECAST

*Wider Caribbean Sea Turtle Conservation Network*

**“Working together to build a future where all inhabitants of the Wider Caribbean Region, human and sea turtle alike, can live together in balance.”**

The Wider Caribbean Sea Turtle Conservation Network (WIDECAST) is a volunteer expert network and Partner Organization to the U.N. Environment Programme’s Caribbean Environment Programme. WIDECAST was founded in 1981 in response to a recommendation by the IUCN/CCA *Meeting of Non-Governmental Caribbean Organizations on Living Resources Conservation for Sustainable Development in the Wider Caribbean* (Santo Domingo, 26-29 August 1981) that a “Wider Caribbean Sea Turtle Recovery Action Plan should be prepared ... consistent with the Action Plan for the Caribbean Environment Programme.”

WIDECAST’s vision for achieving a regional recovery action plan has focused on bringing the best available science to bear on sea turtle management and conservation, empowering people to make effective use of that science in the policy-making process, and providing a mechanism and a framework for cooperation within and among nations. By involving stakeholders at all levels and encouraging policy-oriented research, WIDECAST puts science to practical use in conserving biodiversity and advocates for grassroots involvement in decision-making and project leadership.

Emphasizing initiatives that strengthen capacity within participating countries and institutions, the network develops and replicates pilot projects, provides technical assistance, enables coordination in the collection, sharing and use of information and data, and promotes strong linkages between science, policy, and public participation in the design and implementation of conservation actions. Working closely with local communities and resource managers, the network has also developed standard management guidelines and criteria that emphasize best practices and sustainability, ensuring that current utilization practices, whether consumptive or non-consumptive, do not undermine sea turtle survival over the long term.

With Country Coordinators in more than 40 Caribbean States and territories, WIDECAST is uniquely able to facilitate complementary conservation action across range States, strengthening and harmonizing legislation, encouraging community involvement, and raising public awareness of the endangered status of the region’s six species of migratory sea turtles. As a result, most Caribbean nations have adopted a national sea turtle management plan, poaching and illegal product sales have been reduced or eliminated at key sites, many of the region’s largest breeding colonies are monitored on an annual basis, alternative livelihood models are increasingly available for rural areas, and citizens are mobilized in support of conservation action. You can join us! Visit [www.widecast.org](http://www.widecast.org) for more information.

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