National Fish and Wildlife Foundation
Final Programmatic Report

Project Name and Number: Massachusetts Leatherback Sea Turtle Health Study (2003-0206-014)

Recipient Organization/Agency: Massachusetts Division of Fisheries and Wildlife

Recipient Contact: **Thomas French**

Recipient E-mail: **tom.french@state.ma.us**

Recipient Phone: **508-389-6300**

Recipient Web Address: **http://www.mass.gov/dfwele/dfw**

1) Summary

In four to five sentences, provide a brief, cumulative summary of the project.

This project provided the first opportunity to collect biological samples and perform health assessments on free ranging wild caught leatherback sea turtles. In addition, this project also completed the first comprehensive health assessments, including biological sampling, of entangled and released sea turtles. During the project time frame we collected data from 2 free swimming and 6 entangled leatherback sea turtles. Most importantly, funding for this project highlighted the need for more health data from leatherback turtles. As a result we have secured funding to continue this important research.

2) Introduction

Describe the original conservation need and objectives

This project is the first comprehensive health survey on wild-caught Leatherback sea turtles in the western north Atlantic. While global conservation efforts are underway to save sea turtles, little is known about the diseases and viruses that may afflict them, especially the leatherback. Baseline medical data is currently lacking for leatherback sea turtles, the information gained from this study will provide a foundation for future health related assessments of free-ranging and stranded leatherbacks. Baseline medical data is essential to create health parameters for this species, which will be used as a benchmark for the species. We anticipated that this study would highlight areas where further investigation in the areas of epidemiology, toxicology, immunology, and infectious diseases.

.

3) Methods

Describe all activities and methods. Give a yearly breakdown if this is a multi-year grant.

Turtles for this study were all wild-caught or entangled leatherback turtles brought on board a research vessel and secured for safe sampling or disentanglement and sampling. Behavior and respirations were monitored from capture to release. A full visual exam was performed as soon as the animal was secured on deck, including wound evaluation, behavior, and activity level. Cultures were collected by gently inserting the culture into the nasal passage and the cloaca and rubbing the tip of the culture on the wall of the inner surface. Temperature data was then collected by

inserting a flexible probe into the cloaca. The blood collection site was scrubbed for a minimum of 30 seconds with Betadine prior to sampling. Blood sample were collected from the external jugular or the tail using either a 19 or 20 guage 3" spinal needle or venapuncture via the caudal vertebral artery using a 20 guage 1.5" needle. Urine or feces were collect from the deck of the vessel if deposited on deck by the animal. The animal was cooled throughout the procedure using nature sea water pumped through an on board hosing system. The carapace and rear limbs (when possible) were also covered with a damp white sheet to shade from sun. The sheet was continuously soaked with sea water to keep the animal cool.

Blood gas and electrolyte parameters were evaluated on board the vessel using the Aquarium's I-Stat portable blood analyzer. Remaining blood, as appropriate, was spun immidiately in the portable centrafuge and prepared for laboratory submission to our regional veterinary diagnostic laboratory for complete blood cell count, plasma chemistry panel, and protein electrophoresis. Blood will also be submitted to a veterinary microbiology laboratory for bacterial and fungal cultures, and evaluated for mercury and organophosphate pesticide levels through collaboration with regional environmental toxicology laboratories. Urine, cloacal and nasal cultures were also submitted to a regional veterinary microbiology laboratory. Fecal samples were evaluated by a veterinary parasitologists for the presence of parasites, including the potentially zoonotic pathogens Cryptosporidium and Giardia.

4) Results

a) Outputs

i) *Using the logic framework model presented with your application (Fig. 1), enter in actual values of short-term outputs. Enter in any additional indicators not included in the full proposal used in the analysis. If your application did not include the logic framework, describe project outputs, any realized post-project outcomes and quantify the results using indicators and baselines.*

Quite possibly the most important outcome of this project is the clear understanding that more wok of this nature needs to be done. During our search for funds to continue this work, we received important feedback from a group of reviewers regarding our proposal. The reviewers stated something to the effect that there were no known diseases in leatherback sea turtles. Data on these animals is limited to nesting beach work and largely focuses on nesting activities. Diseases in leatherbacks have been poorly researched and as a result there is little information available. The problem lies in the complex and expensive nature of collecting samples from free-swimming, adult leatherbacks, which can reach over 1,000 pounds. These are extremely difficult animals to work with, especially when collecting samples from free-swimming animals. The importance in collecting from free swimming animals is that it increases the chances of sampling males, which are completely absent from the data set due to the fact that they never come ashore after they enter the water.

ii) *Attach any supplemental graphs, maps, photos and other types of analytical output for the project evaluation.*

iii) *Identify and briefly explain discrepancies between what actually happened compared to what was predicted to happen in the grant proposal using information presented above.*

Unfortunately this study is limited by the small sample size and lack of published data to use for comparison. The complicated nature of catching free-swimming leatherbacks resulted in only two samples from this group. It took us several seasons to figure out how to find the animals and capture them. We have finally mastered the technique and have secured funding from other sources to continue this important work. To date we have caught an additional eight animals which will be combined with the two caught with NFWF funds to increase the sample size.

Fig. 1: Logic framework table with indicators. *For additional guidance and examples, see http://www.nfwf.org/evaluation/* .

Activities	Short-Term Outputs	Long-Term Outcomes	Indicator	Baseline Value	Predicted Value of Project Output	Actual Value of Project Output
Health sampling of wild caught leatherback sea turtles	Increase knowledge of leatherback sea turtle health.	Establish baseline health data for leatherback sea turtles	Evaluation of plasma biochemistry, feces, urine, culture and physical exam results	Establishment of baseline health parameters for this species	Collect health samples to begin to establish normal health values for leatherbacks	Complete suite of health data collected on 2 wild caught animals. This pilot study established the need for more data. To date 8 additional animals have been samples and the study continues.
Health sampling and wound/trauma evaluation of entangled leatherback sea turtles	Evaluate extent of wounds & trauma caused by entanglement	Establish types of injuries Establish severity of potential injuries	Evaluation of the above parameters and assessment of trauma caused by entanglement	Establish types of wounds and assess the impact of these injuries on individual animal health	Determine the types of trauma and extent of injuries from entanglements	Complete suit of health data and wound assessment on 6 entangled leatherbacks. We found that the wound severity in some cases could pose very serious health effects on these turtles. We have begun a new study in this area as well but have yet to collect more data.

b) Post-project Outcomes

i) *The logic framework presented in the full proposal additionally included a final column where predicted values of post-project outcomes were to be provided. If your application did not include a logic framework, please identify any medium- to long-term results that may occur after the project ends.*

This pilot study identified the need for more health data on critically endangered leatherback sea turtles. As a result, we have secured funds from another source to continue this important work. While the sample sets from the two wild-caught animals are important we needed to increase the sample size to achieve statistical relevance. As noted in the chart above, we secured funding to continue this project and have caught eight more free-swimming animals by the time this report was prepared. With time still

left in the season, we hope this number will increase. We also hope to increase the number of health samples and physical exams collected on entangled turtles.

ii) *Describe any progress towards achieving these post-project outcomes at this time*
As noted above, additional funding has been awarded and the project is making significant progress.

iii) *Will there be continued monitoring of post-project outcomes beyond the life of this grant? Are there adequate resources (staff and funding) for continued evaluation and monitoring? If not, briefly describe the additional resources needed.*
Yes, for as long as we can secure funding and as long as our partners are conducting their part of the study. This project was made possible as a result of pairing this project with research being conducted by the University of New Hampshire. Funding from NFWF only provided for the cost of the health sampling and processing. Funding from grants provided by the University covered the cost of capture vessels, spotter pilots, housing, specially designed capture equipment and more. We will continue to collect samples from free -swimming leatherbacks as long as the University study continues. Without the pairing of projects the cost would be in the hundreds of thousands of dollars.

iv) *Describe any revisions in the indicators, methods and data that may be needed for post-project monitoring.*
None to date.

5) Discussion & Adaptive Management

a) Lessons Learned and Transferability

i) *Describe the lessons learned about effective and ineffective conservation practices associated with this project. Which of these key lessons should be shared with other conservation organizations?*
This project raised awareness among biologist, researchers and veterinarians at the New England Aquarium. The project has support from the highest level due to the critically endangered status, and the significant lack of baseline health data on this species. The Aquarium maintains a sizable rescue and rehabilitation program; the main focus of this program is sea turtle health. We have in the past had live leatherback sea turtles strand on our beaches. The difficulty in housing these animals for rehabilitation aside, we realized the serious lack of health data available when we did a literature search to help make clinical decisions for the live stranded leatherbacks. Key lessons include the capture techniques, which will be shared by our research partners at the University of New Hampshire, and health sampling on wild-caught leatherbacks. Information given to us regarding blood sampling successfully used on nesting beaches was ineffective on active, sometimes aggressive free-swimming animals. Sampling techniques will be shared. Once we increase the sample size to statistical relevance, results from the study will be published in a peer review article.

ii) *To what extent did the evaluation and monitoring activities for this project inform your organization about effective conservation practices, and what lessons were learned from an evaluation perspective*
Clinical evaluations of the data are ongoing with the new study adding additional samples. Evaluations have been completed on the two wild-caught animals collected

during this study and will be used in a larger study. The entanglement data provided however is currently being used to identify possible threats to sea turtle health. PI Connie Merigo attended a vertical line workshop as part of a team assembled by the National Marine Fisheries Service to identify issues involved in interactions between sea turtles and vertical line.

iii) *Based on these lessons learned, what are your organization's next steps?*
The New England Aquarium funded this work temporarily until additional funds could be secured. In addition, the Aquarium provided a tremendous amount of resources for this project because we believed in the value and conservation goals. The Aquarium has also recently created a new program titled "Marine Conservation Medicine", this leatherback project will most likely be incorporated in this program, however the details were not available at the time of this report.

b) Dissemination

i) *Describe the extent of information communicated to the general public, key partners, other practitioners, scientific experts. Wherever possible estimate the extent of the outreach using appropriate quantifiable indicators such as meeting attendance, publication circulation figures etc.*

Data from this study was presented at the Northeast Regional Stranding Network conference in April of 2008 in an on oral lecture titled "Health Assessment of Leatherback Sea Turtles (Dermochelys coriacea) at Sea". These data, while not the focus of the talk were discussed during a state report in July 2008 at the Sea Turtle Stranding and Salvage state sea turtle coordinators meeting. Data from animals involved in this pilot project as well as data collected on additional animals will be presented at a veterinary conference in the fall or 2008. It is our intention at the time of this report to present an oral lecture on results of this project at the sea turtle workshop in December of 2008, however it is unknown at this time if travel funds are available. Data from this pilot project combined with additional samples collected through other funding sources will be compiled for subsequent publication.

ii) *Attach any publications, brochures, videos, outreach tools, press releases and other appropriate "products" that resulted from this project.*

c) NFWF Adaptive Management

i) *Offer any suggestions for NFWF to help guide improvement of our project administration.*

6) References

i) Attach a list of secondary references used in conducting the project, including the evaluation.

<u>REFERENCES:</u>

1. Brown, T.J., M.J. Donaghy, E.A. Keys et al. (1999) The viability of Giardia intestinalis and Giardia muris cysts in seawater. International Journal of Environmental Health Research (9) pp. 157-161.

2. Chrisman, C.L., Walsh, M., Meeks. J. C., Zurawka, H., Larock, R., Herbst, L., Schumacher, J., 1997 Neurologic Examination of Sea Turtles, JAVMA 211, Number 8, pp.1043

3. Dalton, L.M., S. Dickerson, D. Wigdahl (2004) A serosurvey for West Nile virus at Seaworld San Antonio, San Antonio, TX. Proceedings of the International Association for Aquatic Animal Medicine, April 4-8, 2004, Galveston TX. p. 148.

4. Dawson, C.E., L.L. Perrett, N.J. Davison, S. Quinney, V. Simpson. (2004a) Brucella species infection in marine mammals off the Cornish coast. Veterinary Record 155, Number 1, pp. 32.

5. Dawson, C.E., L.L. Perrett, N.J. Davison, S. Quinney. (2004b) Brucella infection of lungworms from a harbour porpoise. Veterinary Record 154, Number 25, pp. 800.

6. Foster, G., MacMillian, A.P., Godfroid, J., Howie, F., Ross, H.M., Cloeckaert, A., Reid, R.J., Brew, S. & Patterson, I.A.P. (2002) A review of Brucella sp. infection of sea mammals with particular emphasis on isolates from Scotland. Veterinary Microbiology 90, pp. 563-580.

7. Keller, J.M., Kucklick, J.R., Stamper, M. A., Harms C. A., McClellan-Green, P.D., (2004) Associations between Organochlorine Contaminant Concentrations and clinical Health Parameters in Loggerhead Sea turtles from North Carolina, USA. Environmental Health Perspectives 112, Number 10, pp1074

8. Presti S. M, Hidalgo AR, Sollod AE, Seminoff, JA. 1999. Mercury concentrations in the scutes of black sea turtles, *Chelonia mydas agassizi*, in the Gulf of California. Linnaeus Research Fund Report. Chelonian Conservation and Biology 3(3): 531-533.

9. Leder, K., M.I. Sinclair, J.J. McNeil (2002) Water and the environment: a natural resource or a limited luxury. MJA 177 (11/12): 609-613.

10. Leighfield, T. (2004) Effects of Harmful Algal Blooms and Phycotoxins on Marine Mammals. Keynote Speaker, Northeast Regional Stranding Conference. Portland, ME 4/04.

11. Parmenter, C.A. and M.H. Bothner. (1993). The Distribution of Clostridium perfringens, a Sewage Indicator in Sediments of Coastal Massachusetts. US Geological Survey. Open File Report. 93-8, 43 pp.

12. Thompson, R.C.A. (2000). Giardiasis as a re-emerging infectious disease and its zoonotic potential. International Journal for Parasitology 30:1259-1267.

13. Xiao, L., R. Fayer, U. Ryan and S.J. Upton (2004) Cryptosporidium taxonomy: recent advances and implications for public health. Clinical Microbiology Reviews 17:72-97.

LITERATURE CITED FOR EVALUATION:

1. Deem SL, Dierenfeld ES, Sounguet GP, Alleman AR, Cray C, Poppenga RH, Norton TM, Karesh WB. 2006. Blood values in free-ranging nesting leatherback sea turtles on the coast of the Republic of Gabon. J Zoo Wild Med, 37(4): 464-471.

2. Harms CA, Eckert SA, Kubis SA, Campbell M, Levenson DH, Crognale MA. 2007. Field anaesthesia of leatherback sea turtles (*Dermochelys coriacea*). Vet Rec, 161: 15-21.

3. James MC, Mrosovsky N. 2004. Body temperatures of leatherback turtles (*Dermochelys coriacea*) in temperate waters off Nova Scotia, Canada. Can J Zool, 82: 1302-1306.

4. Paladino FV, Spotila JR, O'Connor MP, Gatten RE Jr. 1996. Respiratory physiology of adult leatherback turtles (*Dermochelys coriacea*) while nesting on land. Chel Cons Bio, 2(2): 223-229.

5. Southwood AL, Andrews RD, Lutcavage ME, Paladino FV, West NH, George RH, Jones DR. 1999. Heart rates and diving behavior of leatherback sea turtles in the eastern Pacific Ocean. J Exp Bio, 202: 1115-1125.

POSTING OF FINAL REPORT: *This report may be shared by the Foundation and any Funding Source for the Project via their respective websites. In the event that the Recipient intends to claim that its Final Report contains material that does not have to be posted on such websites because it is protected from disclosure by statutory or regulatory provisions, the Recipient shall so notify the Foundation and the Funding Source and clearly mark all such potentially protected materials as "PROTECTED," providing an accurate and complete citation to the statutory or regulatory source for such protection.*

Prepared By: CONSTANCE MERIGO_____ Date: AUGUST 22, 2008_____
Signature

CONSTANCE MERIGO
SENIOR BIOLOGIST
STRANDING DEPARTMENT MANAGER

Approved By:

Approved: _Kristin D. McCarthy _____ Date: _____8/25/2008_____
Kristin McCarthy, Federal Aid Coordinator, MDFW

Approved: _Robert D. Deblinger_____ Date: _____8/25/2008_____
Robert D. Deblinger, Deputy Director, MDFW