

LEATHERBACK TURTLE MOVEMENTS AND BEHAVIOR IN THE PACIFIC OCEAN: ITS APPLICATION IN PREDICTING INTERACTIONS WITH FISHERIES

Helen Bailey¹, Scott R. Benson², George L. Shillinger³, Steven J. Bograd⁴, Peter H. Dutton², Scott A. Eckert⁵, Stephen J. Morreale⁶, Frank V. Paladino⁷, Tomoharu Eguchi², David G. Foley^{4,8}, Barbara A. Block⁹, Rotney Piedra¹⁰, Creusa Hitipeuw¹¹, Ricardo F. Tapilatu¹², John H. Roe¹³, Evan Howell¹⁴, and James R. Spotila¹⁵

¹ University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory, Solomons, MD 20688, USA

² NOAA/NMFS/SWFSC/Protected Resources Division, 3333 N. Torrey Pines Court, La Jolla, CA 92037, USA

³ The Tag-A-Giant Foundation, P.O. Box 52074, Pacific Grove, CA 93950, USA

⁴ NOAA/NMFS/SWFSC/Environmental Research Division, 1352 Lighthouse Avenue, Pacific Grove, CA 93950, USA

⁵ Department of Biology and Natural Resources, Principia College, Elmhurst, IL 60120, USA

⁶ Department of Natural Resources, Cornell University, Ithaca, NY 14853, USA

⁷ Department of Biology, Indiana-Purdue University, Fort Wayne, IN 46805, USA

⁸ Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu, HI 96822, USA

⁹ Hopkins Marine Station of Stanford University, 120 Oceanview Boulevard, Pacific Grove, CA 93950, USA

¹⁰ Parque Nacional Marino Las Baulas, Ministerio de Ambiente, Energía y Telecomunicaciones Apartado 473-3000, Heredia, Costa Rica

¹¹ World Wildlife Fund for Nature – Indonesia, Jl. Mega Kuningan Lot 8-9/A9, Mega Kuningan Jakarta, Indonesia

¹² Marine Laboratory, The State University of Papua (UNIPA), Manokwari (98314), Papua Barat Province, Indonesia

¹³ Department of Biology, University of North Carolina, Pembroke, North Carolina, NC 28372, USA

¹⁴ NOAA/NMFS Pacific Islands Fisheries Science Center, 2570 Dole Street, Honolulu, HI 96822, USA

¹⁵ Department of Biology, Drexel University, Philadelphia, PA 19104, USA

Interactions with fisheries are believed to be a major cause of mortality for adult leatherback turtles (*Dermochelys coriacea*), which is of particular concern in the Pacific Ocean, where they have been rapidly declining. In order to identify where these interactions are occurring and how they may be reduced, it is essential first to understand the movements and behavior of leatherback turtles. There are two regional nesting populations in the East Pacific (EP) and West Pacific (WP), comprised of multiple nesting sites. We synthesized tracking data from both populations and compared their movement patterns. A switching state-space model was applied to 135 Argos satellite tracks to account for observation error, and to distinguish between migratory and area-restricted search behaviors. Area-restricted search behavior, indicative of foraging, mainly occurred in the southeast Pacific for the EP leatherbacks, whereas the WP leatherbacks had several different search areas in the California Current, central North Pacific, South China Sea, off eastern Indonesia, and off southeastern Australia. We also extracted remotely sensed oceanographic data and applied a generalized linear mixed model to determine if there were difference between the two populations in their response to oceanic conditions. For the WP population, the probability of area-restricted search behavior was positively correlated with chlorophyll-a concentration. This response was less strong in the EP population, but they had a higher probability of search behavior where there was greater Ekman upwelling, which may increase the transport of nutrients and consequently prey availability. The occurrence of leatherback turtles within both coastal and offshore areas means they have a high risk of exposure to many different fisheries, which may be very distant from their nesting sites. Their movement patterns were integrated with data on broad-scale longline fishing effort in the Pacific Ocean to estimate relative bycatch risk over space and time. Areas of relatively high bycatch risk were predicted to occur in the Western and Central Tropical Pacific, the Central North and Northeast Pacific, Southwest Pacific

adjacent to Australia, as well as in the Eastern Tropical Pacific and the South Pacific Subtropical Gyre. Leatherback turtle bycatch has been of particular concern in the Hawaii-based longline fishery, which was closed in early 2011 in response to the number of leatherbacks in the bycatch. Examination of the timing and location of this fishery, turtle bycatch and leatherback turtle movements indicated that there had been an increase in fishery effort in the fourth quarter of the year and to the northeast from 2005 to 2011. This increased the spatio-temporal overlap between the fishery and leatherback turtles, and hence resulted in higher bycatch. Based on this analysis, the NOAA TurtleWatch tool is being modified to help reduce interactions between the Hawaii-based longline fishery and leatherbacks.

GHOST NETS: A NEW HAZARD TO SEA TURTLES IN THE GULF OF VENEZUELA

Hector Barrios-Garrido^{1,2,3,4}, Maria Jose Petit-Rodriguez^{1,2}, Efrain Moreno¹, and Natalie Wildermann^{1,2,3}

¹ Grupo de Trabajo en Tortugas Marinas del Golfo de Venezuela (GTTM-GV).

² Laboratorio de Ecología General, Departamento de Biología. La Universidad del Zulia (LUZ).

³ Centro de Modelado Científico (CMC-LUZ).

⁴ MTSG-IUCN

There are many natural problems threatening the survival of sea turtles worldwide; however, it is well known that anthropogenic factors impact the most on reptile populations. The principal threat is ocean pollution, affecting mainly the migratory pathways and feeding grounds. Until recent years, the Gulf of Venezuela was considered as an important feeding ground for sea turtles with ideal conditions for their development during several stages of their life cycles; although these bio-ecological conditions remain present, we have recently evidenced an increase in problems such as contamination. Impact by hydrocarbons, plastic intake and ghost nets are the main new hazards that are affecting this important zone of northwestern Venezuela. During a in-water fieldtrip in the indigenous community of Kazuzain (mid-Guajira) we observed and recorded the information of a juvenile green turtle (*Chelonia mydas*) found dead entangled in a monofilament net (4" mesh size and 15 m long) in advanced decomposition state. Through this report we account a new anthropic threat within this feeding ground; the low incidence of this kind of events could be due to the high costs of the fishing nets for the fishermen (Wayúu indigenous communities) in this area, who tend to reuse the fishing nets, discarding few fishing gears. In addition, we presume that due to the characteristics of the net, it could proceed from bigger fishing ships of the southern communities Gulf of Venezuela, a non-indigenous territory. In this sense, it is necessary to develop systematic assessments in order to evaluate the impact of ghost nets in the study area, extended to all fishing communities connected by the waters of the Gulf of Venezuela, as the consequences could induce not only environmental, but also social problems.



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75 Virginia Beach Drive
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