

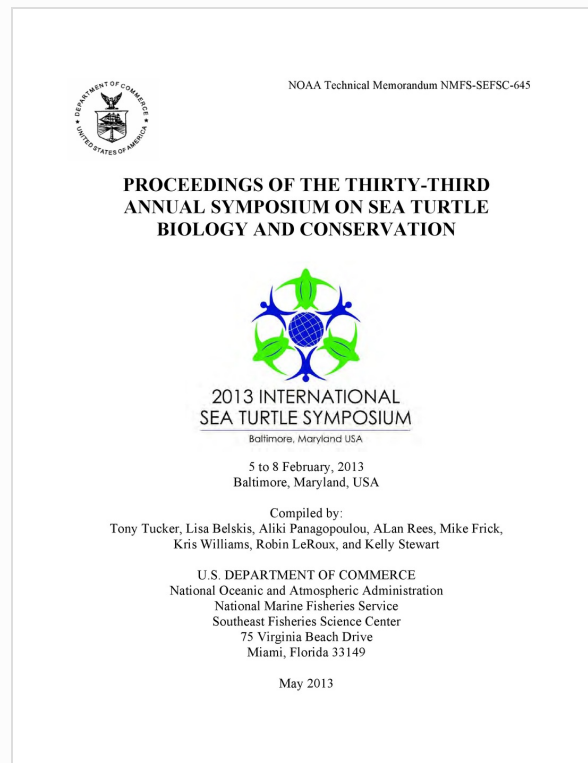


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Page count: 16
Word count: 4,574
Character count: 27,111
Submission date: 22-May-2019 04:46PM (UTC+1200)
Submission ID: 1134237189



VARIATION IN REMIGRATION INTERVAL IS LINKED TO FORAGING DESTINATION OF WESTERN PACIFIC LEATHERBACK TURTLE

by Deasy Lontoh

Submission date: 22-May-2019 04:46PM (UTC+1200)

Submission ID: 1134237189

File name: PIP4_Variation.pdf (168.5K)

Word count: 4574

Character count: 27111



NOAA Technical Memorandum NMFS-SEFSC-645

PROCEEDINGS OF THE THIRTY-THIRD ANNUAL SYMPOSIUM ON SEA TURTLE BIOLOGY AND CONSERVATION



2013 INTERNATIONAL SEA TURTLE SYMPOSIUM

Baltimore, Maryland USA

5 to 8 February, 2013
Baltimore, Maryland, USA

Compiled by:

Tony Tucker, Lisa Belskis, Aliko Panagopoulou, Alan Rees, Mike Frick,
Kris Williams, Robin LeRoux, and Kelly Stewart

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, Florida 33149

May 2013





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Dr. Rebecca Blank, Acting Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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May 2013

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For bibliographic purposes, this document should be cited as follows:

Tucker, T., Belskis, L., Panagopoulou, A., Rees, A., Frick, M., Williams, K., LeRoux, R., and Stewart, K. compilers. 2013. Proceedings of the Thirty-Third Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NOAA NMFS-SEFSC-645: 263 p.

Technical Editor:
Lisa Belskis

Copies of this report can be obtained from:

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2013 INTERNATIONAL
SEA TURTLE SYMPOSIUM

Baltimore, Maryland USA

PRESIDENT'S REPORT (abridged*)

33rd Annual Symposium on Sea Turtle Biology and Conservation

"Connections"

2-8 February 2013, Baltimore, Maryland, USA

Raymond R. Carthy, President, ISTS

The 33rd Annual Symposium on Sea Turtle Biology and Conservation was held on February 2-8, 2013 in Baltimore, Maryland, USA. Baltimore is within the National Capital Region which is a hub for important scientific research, policy and decision-making by the nation's government and many leading conservation organizations. The pioneering 1st World Conference on Sea Turtle Conservation was held in Washington, D.C., 26-30 November 1979, and having this year's meeting in the National Capital Region just over 33 years later provided an inspirational link through time and location.

"Connections" was the theme for the Baltimore Symposium, and our focus for the meeting was to explore the biological and ecological linkages that sea turtles share with their environments, while also examining and celebrating the connections that they impose on us as we try to learn about and conserve them. The theme was evident in the attendance, the program, the special sessions and activities, and the partnerships that made the meeting a success. There were 1016 registrants, representing 67 countries, and an additional 130 local students and educators attended particular sessions. The program included 7 regional meetings, 5 workshops, 4 special sessions, and a Video Night. There were 144 oral presentations and 248 posters- an additional 53 talks were given during a three-day Terrapin, Tortoise and Freshwater Turtle Meeting preceding the main Symposium. Forty-three Vendors and Exhibitors, including many that were new to the event, contributed to an engaging venue. The National Aquarium in Baltimore was a key partner in hosting the Symposium, providing volunteer personnel and access to their facilities, and the Virginia Aquarium and Marine Science Center were strong partners in our education efforts.

The Symposium was held at the Baltimore Marriott Waterfront in Baltimore's Inner Harbor. The venue provided ample meeting and lodging space for the participants. The convenient facilities and the very accommodating staff were conducive to both intellectual and social interactions.

Educational Outreach: Positive local impact has become a strong tradition in hosting ISTS Symposia. In Baltimore we enjoyed proximity to Washington, D.C. and increased participation by government agencies and NGOs, but the primary outreach effort was a multi-faceted educational program. In cooperation with the Virginia Aquarium and Marine Science Center and the National Aquarium, a Teachers and Educators Workshop was held on February 2nd. Twenty-five local teachers and five Symposium participants learned techniques and received materials that will aid them in incorporating marine science, sea turtles, and the Chesapeake Bay into their curricula. Local schools (St. Demetrius Bilingual Day School, Poolesville H.S., South River High School, Furman Templeton Prep, Dr. Rayner Browne Academy, and Friends Meeting School) participated in a "Threats to Sea Turtles" Art Contest sponsored by ISTS, and the winning artwork was displayed at the Symposium. The opening session on Tuesday was followed by an early highlight- the "Sea Turtles Revealed" plenary was attended by 80 students and teachers from Baltimore middle and high schools (St. Demetrius Bilingual Day School, Dr. Rayner Browne Academy, Western High School, and Augusta Fells Savage Institute of Visual

February 2013 Baltimore, Maryland, USA

Arts). The students engaged a panel of renowned sea turtle biologists and conservationists with a question and answer session where the panel was surprised to find themselves not only answering the usual “how big “ and “how old” queries, but pondering some of the same difficult ecological questions that drive their own work. The students and teachers that attended the Symposium’s morning session had lunch with various biologists, graduate students and others in the sea turtle community as an opportunity for more personal “connections” between participants and students. Their lunch was followed by a trip to the National Aquarium. The “Sea Turtles Revealed” session and the “Sea Turtle Success Story” sessions on Tuesday afternoon were made available as a live webcast to 250 web sharepoints that were provided to schools, colleges, and universities.

ISTS Awards 2013: The 2013 ISTS Awards Committee was chaired by Sally Murphy and the members were Kimberley Maison, Stephen Dunbar, Jim Spotila, Dean Bagley, Ana Barragan, Ray Carthy, and Roldan Valverde. The Committee did an excellent job and presented this year’s meeting with an incredible group of awardees. The ISTS Lifetime Achievement Award was presented to Jack Woody for a career dedicated to sea turtle conservation, including establishment of the sea turtle program in the U.S. Fish and Wildlife Service, focusing attention on critical sea turtle conservation issues in Mexico and Central America, garnering international protection for Kemp’s and olive ridley turtles, and advocacy for TEDs. Hoyt Peckham received the ISTS Champions Award for his tireless work in tackling difficult and pressing conservation issues for North Pacific loggerhead sea turtles, and communicating effectively with stakeholders at all levels. There were two recipients of the Ed Drane Award for Volunteerism. Betsy Brabson was recognized as an outstanding volunteer Project Leader for the South Carolina Department of Natural Resources and for her role as a catalyst in protecting nesting beaches against invasive flora and fauna. Daniela Freggi was honored for her pioneering volunteer work in sea turtle veterinary care in Italy and as a dedicated promoter of national and international cooperation and skill exchange in the Mediterranean. The ISTS President’s Award was presented to Marydele Donnelly for over twenty-five years of profound involvement in global sea turtle conservation efforts, including successful support of the TED requirement for U.S. shrimpers, the InterAmerican Convention for the Protection and Conservation of Sea Turtles, and the U.S. Marine Turtle Conservation Act.

Archie Carr Student Awards: There were 50 oral presentations and 89 poster presentations submitted by students for consideration in the Archie Carr Awards. The winner for Best Biology Poster was Vanessa Bezy and Runners Up were Deasy Lontoh, Tomoko Hamabata, and Jake Lasala. Best Conservation Poster went to Nicole Reintsma. The Best Biology Oral was won by J. Roger Brothers. Nicole Mazouchova won the Best Biology Field-based Oral and Justin Perrault was Runner Up. The Conservation Oral winner was Elizabeth Bevan, and Francese Domenech and Monette Schwoerer received Runners Up honors in Conservation Field-based Oral and Conservation Experimental Oral respectively.

(The full text of the 2013 President’s Report can be found in the Marine Turtle Newsletter.)*

COMMITTEES, CHAIRS, AND KEY ORGANIZERS

Symposium Coordinator	Donna Broadbent
Internet Communications Coordinator	Michael Coyne
Baltimore Symposium Registrar	Rick Herren
Public Relations	Wallace J. Nichols
Fundraising	Elena Finkbeiner, Ingrid Yañez
Nominations Committee	Andres Estrades, Frank Paladino, Mario Mota, Mariana Fuentes, Marydele Donnelly
Program Chairs	Kelly Stewart, Michael Jensen, Kristen Hart
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Program Committee	Sarah Milton, Brian Stacy, Heather Harris, Mike James, Kim Reich, Larry Wood, Catherine McClellan, Cynthia Lagueux, Stephen Dunbar, Sara Maxwell, Angela Formia, Rhema Bjorkland, Sheila Miller, Becca Lewison, Andy Coleman, Kartick Shanker, Meg Lamont, Erik Martin, Jason Van deMerwe, J Nichols, Joanna Alfaro, Mariana Fuentes, George Shillinger, Donna Shaver, Suzanne Livingstone, David Waayers, Andrea Phillott, Brian Shamblin, Nancy FitzSimons, Bill Kendall, Mike Frick, Hoyt Peckham, Lekelia Jenkins, Blair Witherington
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Poster Session Chairs	Jane Provancha, Barbara Schroeder
Student Judge Committee	Matthew Godfrey, Andrea Phillott
Student Judges	Marc Girondot, Jen Keller, Manjula Tiwari, Craig Harms, Yakup Kaska, Erin Seney, Mike James, Dave Owens, Jesus Tomas, Amanda Williard, Catherine McClellan, Emma Harrison, Cynthia Lageux, Cathi Campbell, Ana Barragan, Kate Mansfield, Paolo Casale, Sheryan Epperly, Mark Dodd, Sally Murphy, Stephen Dunbar, Kim Maison, Dean Bagley, Jim Spotila
ISTS Awards Committee	Cathi Campbell
Video Chair	Janet Hochella
Exhibitor/Vendor Chair	Jennifer Homcy, Marina Zucchini
Auction Co-Chairs	Emma Harrison
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Student Committee	Tony Tucker, Lisa Belskis, Aliko Panagopoulou, Alan Rees, Mike Frick, Kris Williams, Robin LeRoux, Kelly Stewart
Proceedings Coordinators	Kelly Stewart, Michael Jensen
Printed Program	

February 2013 Baltimore, Maryland, USA

Africa Regional Meeting	Manjula Tiwari, Jacques Fretey, Angela Formia
Indian Ocean & Southeast Asia Regional Meeting RETOMALA (Latin American Meeting)	Lalith Ekanayake, Nadia Swidan Juan Manuel Rodriguez, Nineve Espinosa, Rocio Alvarez
WIDECAST (Caribbean) Regional Meeting Mediterranean Regional Meeting Pacific Island Meeting	Karen Eckert Paolo Casale Irene Kinan Kelly
Terrapin, Tortoise & Freshwater Turtle Meeting Statistics & Data Analysis Workshop Dive Behavior Workshop Sea Turtle Medicine Workshop NMFS Permit Workshop Cultivating Resilience: Processes and Skills Workshop IUCN Marine Turtle Specialist Group	Chuck Schaffer Tomo Eguchi Elizabeth Whitman, Junichi Okuyama Daniela Freggi, Leigh Clayton Amy Hapeman Elena Mustakova-Possardt Brian Hutchinson

EXECUTIVE COMMITTEE

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Roldan Valverde	2015
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Aliki Panagopoulou	2016
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Alejandro Fallabrino	2017
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Jeff Seminoff (past president 2011)	2014
Ana Baragan (past president 2012)	2015

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Karumbe	Wildlife Computers
Loggerhead Instruments	Wildlife Rescue & Conservation Association
Nature Conservation Egypt	World Society for the Protection of animals
Pentair Aquatic Eco-Systems	WWF
Sea Turtle Conservancy	

STUDENT AWARDS

There were 139 student presentations in the Archie Carr Prize Competition - 50 oral presentations and 89 posters. Award amounts: Winners = US \$300 each, Runners-up = US \$150 each. Grand total for all student awards = US \$2400.

ORAL PRESENTATIONS

Winner- Biology Experimental: J. Roger Brothers, UNC-Chapel Hill, USA.

A mathematical model consistent with geomagnetic imprinting hypothesis of natal homing.

Winner- Biology Field-Based: Nicole Mazouchova, Temple University, USA.

Effects of granular incline angle on the locomotion of loggerhead sea turtle hatchlings in the field.

Runner Up- Biology Field-Based: Justin Perrault, Florida Atlantic University, USA.

Bioaccumulation and biomagnification of mercury and selenium in leatherback sea turtles: a cause for concern in this species.

Winner- Conservation: Elizabeth Bevan, University of Alabama-Birmingham, USA.

Implications of hatchling sex ratios and survival in the recovery program for the endangered Kemp's ridley sea turtle.

Runner Up- Conservation Field-based: Francesc Domenech, University of Valencia, Spain.

Incidental catch of the loggerhead turtle (*Caretta caretta*) by bottom trawling in the Valencian community.

Runner Up- Conservation Experimental: Monette Schwoerer, University of Central Florida, USA.

Shading in situ marine turtle nests: a potential practice to mitigate nest temperatures in response to climate change.

POSTER PRESENTATIONS

Winner- Biology: Vanessa Bezy, College of Charleston, USA.

Preliminary results: olive ridley sea turtle embryo mortality as a function of the nest microbial community at Ostional, Costa Rica.

Runner Up- Biology: Deasy Lontoh, Mos Landing Marine Laboratories, USA.

Variation in remigration interval is linked to the foraging destination of Western Pacific leatherback turtles.

Runner Up- Biology: Tomoko Hamabata, Kyoto University, Japan.

Genetic structure of green turtles nesting in Northwestern Pacific Ocean.

Runner Up- Biology: Jake Lasala, Georgia Southern University, USA.

New microsatellite DNA analyses may confound current population models for loggerhead sea turtles (*Caretta caretta*).

Winner- Conservation: Nicole Reintsma, Florida Atlantic University, USA.

Assessing a potential lighting problem for loggerhead hatchlings near the brightest lighthouse in the world: Arena assays at Hillsboro Beach, Florida, USA

ISTS AWARDS 2013

Chair- **Sally Murphy**

Members: Kimberly Maison, Stephen Dunbar, Jim Spotila, Dean Bagley, Ana Barragan, Ray Carthy, and Roldan Valverde.

President's Award

Marydele Donnelly

Ed Drane Award for Volunteerism

Betsy Brabson

Daniela Freggi

Life Time Achievement Award

Jack Woody

Champions Award

Hoyt Peckham

PLENARY AND SPECIAL SESSIONS

SEA TURTLES REVEALED: MARVELS, MYSTERIES, AND NEWS YOU CAN USE

Chair- **Blair Witherington**-Florida Fish and Wildlife Research Institute

Panel Members: **Bryan Wallace**-Oceanic Society, **Jeanette Wyneken**- Florida Atlantic University, **David Godfrey**- Sea Turtle Conservancy, **Kiki Jenkins**-University of Washington, **Pam Plotkin**- Texas Sea Grant, **Thane Wibbels**- University of Alabama-Birmingham, Baltimore middle and high schools.

SEA TURTLE CONSERVATION SUCCESS STORIES

Chairs- **Hoyt Peckham**- Center for Ocean Solutions and SmartFish, **Lekelia Jenkins**-University of Washington

Moderator- **Juliet Eilperin**- Washington Post

Invited Speakers:

THE SUCCESS OF THE US MARINE TURTLE CONSERVATION ACT AND ITS UNCERTAIN FUTURE
Marydele Donnelly, Sea Turtle Conservancy

CONSERVING SEA TURTLES BY LAND AND BY SEA IN PERU
Joanna Alfaro, ProDelphinus and University of Exeter

BUILDING SUSTAINABLE TED PROGRAMS WORLDWIDE
Marlene Menard, US Department of State/Office of Marine Conservation

THE GOOD, THE BAD, AND THE UGLY: CONSERVING SEA TURTLES IN NICARAGUA
Jose Urteaga, Fauna and Flora International

THE DECLINE AND RISE OF A SEA TURTLE: HOW KEMP'S RIDLEYS ARE RECOVERING IN THE GULF OF MEXICO
Larry Crowder, Center for Ocean Solutions

BRAZIL'S SEA TURTLES ARE NOW WORTH MORE ALIVE: TAMAR'S SOCIAL PRODUCTION CHAIN
Neca Marcovaldi, Projecto TAMAR

February 2013 Baltimore, Maryland, USA

UNDERSTANDING RESILIENCE: CORE CONNECTIONS THAT SUSTAIN

Speaker- **Elena Mustakova-Possardt** Spoke as special session and workshop

SATELLITE TELEMETRY (PRESENTATIONS ARCHIVED ON SEATURTLE.ORG)

Chairs: **Brian Stacy and Kristen Hart**

ECOLOGICAL IMPLICATIONS OF BIOTELEMETRY DRAG IN MARINE TURTLES

T. Todd Jones, NMFS

OVERVIEW OF TAG TECHNOLOGIES: A MANUFACTURER'S PERSPECTIVE

Thomas Gray, Desert Star

TAG SELECTION AND TECHNIQUES FOR SATELLITE TRACKING SMALL HARD-SHELLED SEA TURTLES

Kate Mansfield, Florida Atlantic University and **Erin Seney**, Erin Seney Consulting

TAG SELECTION AND TECHNIQUES FOR SATELLITE TRACKING LARGE HARD-SHELL SEA TURTLES

Kristen Hart, USGS

USE OF SATELLITE TELEMETRY TO DETERMINE SEA TURTLE MORTALITY

Yonat Swimmer, NMFS

AN UPDATE ON LEATHERBACK TURTLE SATELLITE TRACKING TECHNIQUES

Sabrina Fossette, NMFS

VIDEO PRESENTATIONS

Les Amis de la Nature (Friends of Nature), Epidosde 2: Mayumba

Aimee Sanders, Gabon Sea Turtle Partnership & Wildlife Conservation Society

3M Project

Anfani Msoili, Association for the Social-Economic Development of Itsamia

Europa: 40 Years of Scientific Adventure

Jerôme Bourjea, Alefa Production and Kélonia

Ulithi Marine Turtle Project

Jennifer Cruce & JR Rulmal, Ulithi Marine Turtle Program & Oceanic Society

Tracking the Nicaraguan Eastern Pacific Hawksbills

Jose Urteaga, Eastern Pacific Hawksbill Initiative & Flora & Fauna International

Moochula- Giving Hawksbill Sea Turtles Hope

Barry Erdeljon & Sarah Gulick, Marymount University

A Non-Invasive Approach to Documenting Human Interactions with Nesting Sea Turtles

Ray Mojica & David Godfrey, Barrier Island Ecosystem Center & Sea Turtle Conservancy

Verde Salaje

Veronica de los Llanos & Belen Orsin, CNAC, Morocota Films & Xenon Films

Our Dreams Don't Age

Neca Marcovaldi, Proyecto TAMAR

Karumbé, Tortugas Marinas del Uruguay

Daniel Gonzalez-Paredes, Karumbé

Los Amigos De Las Tortugas (Turtle's Friends)

Augustin Balestini, Programa Regional de Investigación y Conservación de Tortugas Marinas de Argentina & Reserva Natural Bahía Blanca, Bahía Falsa, Bahía Verde

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Yakup Kaska, Eyup Başkale, Yusuf Katırmış, Meryem Tekin, Çiğdem Fak, Mücahit Seçme, Çisem Sezgin, Fulvio Mafucci, Sandra Hochscheid, and Flegra Bentivegna
145. LONG-DISTANCE TRAVEL DURING INTER-NESTING: UNIQUE AND DEVIANT MOVEMENTS OF LOGGERHEAD NESTERS IN THE NORTHER GULF OF MEXICO
Margaret M. Lamont, Kristen M. Hart, Ikuko Fujisaki, Autumn R. Sartain, Brail Stephens, Jackie Isaacs, and Dianne Ingram
146. VARIATION IN REMIGRATION INTERVAL IS LINKED TO FORAGING DESTINATION OF WESTERN PACIFIC LEATHERBACK TURTLES
Deasy N. Lontoh, Jeffrey A. Seminoff, Ricardo F. Tapilatu, James T. Harvey, and Scott R. Benson
147. FIRST SATELLITE TRACKS OF NEONATE GREEN (*CHELONIA MYDAS*) TURTLES USING A NEW TAG ATTACHMENT METHOD
Kate L. Mansfield and Jeanette Wyneken
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Mabel Nava and Robert van Dam
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Lídia Nicolau, Ana Marçalo, Catarina Eira, and José Vingada
150. AN ENERGY STRATEGY OF FEMALE GREEN TURTLES DURING INTER-NESTING PERIOD IN ISHIGAKI ISLANDS, JAPAN
Yuka Obe, Junichi Okuyama, Hideaki Nishizawa, Tohya Yasuda, Masato Kobayashi, and Nobuaki Arai
151. FIRST SATELLITE TRACK OF A HEAD-STARTED HAWKSBILL (FOUR YEARS OLD) IN THE COLOMBIAN CARIBBEAN
Karen A. Pabón-Aldana, Carmen L. Noriega-Hoyos, and Guiomar A. Jaúregui
151. IDENTIFYING BEHAVIORAL STATES IN LOGGERHEAD TURTLES USING SATELLITE TELEMETRY DATA
Samir H. Patel, Aliko Panagopoulou, Helen Bailey, Stephen J. Morreale, Frank V. Paladino, Dimitris Margaritoulis, and James R. Spotila

VARIATION IN REMIGRATION INTERVAL IS LINKED TO FORAGING DESTINATION OF WESTERN PACIFIC LEATHERBACK TURTLES

Deasy N. Lontoh¹, Jeffrey A. Seminoff², Ricardo F. Tapilatu³, James T. Harvey¹, and Scott R. Benson⁴

¹ Moss Landing Marine Laboratories, Moss Landing, CA, USA

² NOAA-National Marine Fisheries Services, Southwest Fisheries Science Center, Protected Resource Division, La Jolla, CA, USA

³ University of Alabama at Birmingham, AL, USA, and Marine Laboratory, Department of the State University of Papua, Manokwari, West Papua, Indonesia

⁴ NOAA-National Marine Fisheries Services, Southwest Fisheries Science Center, Protected Resource Division, Moss Landing, CA, USA

Timing of reproduction and productivity of migratory species reflect ecological conditions of their foraging regions. Non-breeding habitat quality has been linked to arrival time to breeding areas, reproductive performance and breeding population abundance. Leatherback turtles (*Dermochelys coriacea*) obtain resources for reproduction from distant foraging regions, and they do not typically breed every year. The number of years separating successive nesting seasons or remigration interval includes the amount of time to complete migration and to accumulate enough reserve for reproduction in the foraging region. In this study, we compared remigration intervals of leatherback turtles that foraged in distinct regions of the Pacific. The largest remaining nesting aggregation of western Pacific leatherback turtles is in the Bird's Head peninsula on the northwest coast of Papua, Indonesia. Turtles that nest during April to September migrate to temperate (Northeast Pacific and North Pacific Transition Zone) and tropical (South China Sea) foraging regions, which vary in the distance from nesting beach, latitude, biogeochemical process, and productivity. To infer foraging regions of nesting turtles, we used stable nitrogen and carbon ratios ($\delta^{15}\text{N}$ and $\delta^{13}\text{C}$) of satellite-tracked turtles as predictors of foraging region in a linear discriminant analysis. The resulting functions were then used to classify turtles sampled in 2010 and 2011. Remigration intervals of assigned turtles were calculated from historic tagging data, and compared among the three groups using analysis of variance. As predicted, turtles that foraged in the Northeast Pacific had greater $\delta^{15}\text{N}$. Turtles that foraged in the North Pacific Transition Zone were distinguished from those that foraged in the South China Sea by their lesser (more negative) $\delta^{13}\text{C}$. Means of $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ were 15.04‰ (95% CI from 14.04 to 16.04‰) and -17.14‰ (-17.66 to -16.63‰) for turtles that foraged in the Northeast Pacific, 12.69‰ (11.42 to 13.97‰) and -18.21‰ (-18.86 to -17.56‰) for turtles that foraged in the North Pacific Transition Zone, and 11.03‰ (9.89 to 12.17‰) and -16.82‰ (-17.41 to -16.24‰) for turtles that foraged in the South China Sea. The discriminant functions correctly classified 74.2% of satellite-tracked turtles. Turtles that foraged in the Northeast Pacific had a longer remigration interval (>3 years) than turtles that foraged in the North Pacific Transition Zone and South China Sea (2 and 3 years). Variable remigration intervals may explain fluctuations in the number of turtles nesting annually and has implications for estimating population size. We thank the International Sea Turtle Society, U.S. Fish and Wildlife Service, U.S. National Marine Fisheries Service, Ecoteach, Defenders of Wildlife, Sea Turtle Conservancy, Defenders of Wildlife, Lotek, Sirtrack, Telonics, and CLS America for providing a generous travel grant award. Funding and logistical support for this study were provided by the Bird's Head Leatherback Program of State University of Papua, U.S. National Oceanic and Atmospheric Administration – National Marine Fisheries Service, Dr. Earl H. Myers and Ethel M. Myers Oceanographic and Marine Biology Trust, PADI Foundation, and Friend's of Moss Landing Marine Laboratories' Signe Memorial Scholarship.

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