

Marine Turtle Newsletter

Issue Number 143

October 2014



Loggerhead sea turtle incidentally captured in Ceará, Brazil and later seen nesting in Quintana Roo, Mexico (see page 16). Photo credit: Banco de Imagens, Projeto TAMAR/ICMBIO_CE.

Editorial

Guest Editorial: Interruption of the Kemp’s Ridley Population’s Pre-2010 Exponential Growth in the Gulf of Mexico and its Aftermath: One Hypothesis.....**CW Caillouet, Jr**

Articles

Two More Cases of Green Turtles (*Chelonia mydas*) in the Italian Waters of the Northwestern Adriatic Sea and an Inorganic Contaminant Investigation.....**C Vallini et al.**

Sea Turtle Strandings and Mortalities on the Southeast Coast of Guatemala.....**R Brittain et al.**

Flying Fish Egg Harvest off Keelung, Taiwan Uncovers Occurrence of Pelagic-Phase Green Turtles.....**K Ng et al.**

Note

Second Record Of Tagged Loggerhead Moving Between South And North Atlantic.....**EHSM Lima et al.**

Meeting Report

Announcement

Recent Publications

Editors:

Kelly R. Stewart
The Ocean Foundation
c/o Marine Mammal and Turtle Division
Southwest Fisheries Science Center, NOAA-NMFS
8901 La Jolla Shores Dr.
La Jolla, California 92037 USA
E-mail: mtn@seaturtle.org
Fax: +1 858-546-7003

Matthew H. Godfrey
NC Sea Turtle Project
NC Wildlife Resources Commission
1507 Ann St.
Beaufort, NC 28516 USA
E-mail: mtn@seaturtle.org

Managing Editor:

Michael S. Coyne
SEATURTLE.ORG
1 Southampton Place
Durham, NC 27705, USA
E-mail: mcoyne@seaturtle.org
Fax: +1 919 684-8741

Founding Editor:

Nicholas Mrosovsky
University of Toronto, Canada

Editorial Assistant:

Natalie C. Williams
University of Florida, USA

On-line Assistant:

ALan F. Rees
University of Exeter in Cornwall, UK

Editorial Board:

Brendan J. Godley & Annette C. Broderick (Editors Emeriti)
University of Exeter in Cornwall, UK

Nicolas J. Pilcher
Marine Research Foundation, Malaysia

George H. Balazs
National Marine Fisheries Service, Hawaii, USA

Manjula Tiwari
National Marine Fisheries Service, La Jolla, USA

Alan B. Bolten
University of Florida, USA

ALan F. Rees
University of Exeter in Cornwall, UK

Robert P. van Dam
Chelonia, Inc. Puerto Rico, USA

Kartik Shanker
Indian Institute of Science, Bangalore, India

Angela Formia
University of Florence, Italy

Oğuz Türkozan
Adnan Menderes University, Turkey

Colin Limpus
Queensland Turtle Research Project, Australia

Jeanette Wyneken
Florida Atlantic University, USA

MTN Online - The *Marine Turtle Newsletter* is available at the MTN web site: <http://www.seaturtle.org/mtn/>.

Subscriptions and Donations - Subscriptions and donations towards the production of the MTN should be made online at <http://www.seaturtle.org/mtn/> or c/o SEATURTLE.ORG (see inside back cover for details).

This issue was produced with assistance from:

Linda Reinhold, Paulo Barata, Bob Prescott and Charles W. Caillouet, Jr.

Contact mtn@seaturtle.org to become a sponsor of the Marine Turtle Newsletter
or visit <http://www.seaturtle.org/mtn/donate.shtml>

The MTN-Online is produced and managed by ALan Rees and Michael Coyne.

© *Marine Turtle Newsletter*

Flying Fish Egg Harvest off Keelung, Taiwan Uncovers Occurrence of Pelagic-Phase Green Turtles

Ka-yan Ng¹, Tien-Hsi Chen² & George H. Balazs³

¹Department of Biology and Chemistry, City University of Hong Kong, Hong Kong Special Administrative Region, People's Republic of China (E-mail: kayng64-c@my.cityu.edu.hk; kayan.ng.connie@gmail.com); ²Institute of Wildlife Conservation, National Pingtung University of Science and Technology, Taiwan (E-mail: chenth@mail.npust.edu.tw); ³Oceania Regional Vice Chair, IUCN SSC Marine Turtle Specialist Group, Honolulu, Hawaii, USA (itsahonuworldinhawaii@hotmail.com)

Fish eggs are considered a nutritionally rich delicacy by humans worldwide and especially in East Asia, including Taiwan. Flying fish eggs that are flavored and colored are known as “tobiko.” Sea turtles are also known to seek out and consume fish eggs in oceanic habitats (Fritts 1981; Richardson & McGillivray 2001; Parker et al. 2005, 2011; Witherington et al. 2012). However, the extent and details of such foraging, like many aspects of sea turtle surface-pelagic ecology, have not been widely documented. In March 2014, we had the unique opportunity to learn about traditional flying fish egg harvest and associated sea turtle foraging habitats from the local Taiwanese fishermen in Keelung (25.131°N, 121.737°E), which is located at the northern end of Taiwan (Fig. 1).

A seasonal harvest for the eggs of flying fish from the family *Exocoetidae* occurs in the offshore waters of Keelung in the Pacific around the time of the Chinese lunar Tuen Ng festival (in Chinese, 端午節), which begins in mid-May and continues to the end of July until the allowable amount of eggs are collected throughout Taiwan is reached (e.g., 350 tons in 2014). The harvest by local fishermen coincides with the occurrence of *Sargassum* drifts, the natural substrate used by flying fish to deposit eggs in masses that hang down into the water column. The fishermen construct artificial rectangular mats or rafts made of rice straw with synthetic foam strips attached along the edges for floatation (Fig. 2A-C). Four strips of rice straw mats 15 cm wide are attached longitudinally along the midline of the rafts and hang down into the water, thereby creating more surface area for egg attachment. These mats, measuring about 2 m by 3 m by 1-2 cm thick, are laid out on the sea surface attached

to one another in areas where floating *Sargassum* mats occur. The location of these artificial mats varies annually and may be up to 50 km offshore, depending on the location of the *Sargassum* drifts. The mats are lifted daily to collect the voluminous quantity of eggs that accumulate on them (Fig. 2D). These mats are used in one season only and replaced with new ones the following year. We learned from the fishermen that during the egg harvest, green turtles (*Chelonia mydas*) of approximate carapace length 20 cm have been observed under the mats, presumably feeding on the fish eggs or other organisms associated with the fishing mats; they may possibly be using the mats as shelter as well. The local fishermen appear not to be bothered by the presence of the green turtles, but instead are more focused on harvesting the fish eggs for their business. We observed that the remains of flying fish eggs were gathered on artificial cotton-like materials, likely ocean debris, during our visit, suggesting that the spawning season of flying fish in this region started as early as March prior to the fishery opening. Such spawning grounds established in floating *Sargassum* or other artificial mats may provide energy-rich food that may be consumed by green turtles.

In the western North Pacific, *Sargassum* drifts that serve as habitats for diversified fish communities are known to occur off the southeast coast of Japan near the Kuroshio Current (Uehara et al. 2006) and in the Tohoku area of northeastern Japan along the Kuroshio Extension (Safran & Omori 1990). Komatsu et al. (2008) also reported that drifting seaweed mats, which were exclusively *Sargassum horneri*, proliferated in March through May and were found in waters off Zhejiang, China between the continental shelf peripheral area and the Kuroshio oceanic front within the eastern East China Sea (Fig. 1). This implies that the seasonal occurrence of *Sargassum* mats in the offshore waters of Keelung that serve as foraging grounds for green turtles may also be affected by the Kuroshio Current.

We highlight the importance of incorporating local people and their knowledge in creating novel opportunities for sea turtle exploratory studies. Such trustful and respectful communication brings insight into what may be the first-documented habitat use of surface-pelagic green turtles in the *Sargassum* drifts and man-made floating mats off Keelung. We intend to visit Keelung again in the future to talk with more fishermen for greater insights into their rich oceanic work life that is shared with sea turtles. In addition, visual surveys by observers on fishing boats should be conducted as far as possible to collect, verify and establish baseline information about sea turtles found in and around the fishing mats. The analyses of genetic composition and oceanographic features may also add insights into the geographic natal origin of these pelagic-phase green turtles.

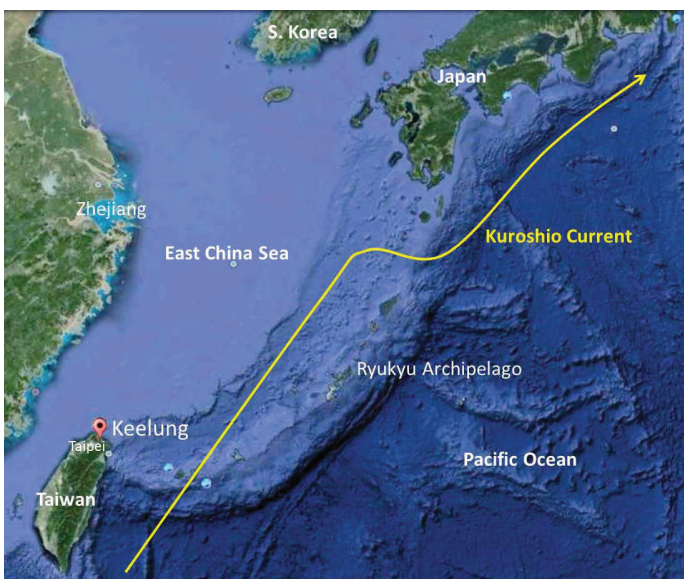


Figure 1. A map showing the locations of Keelung, the East China Sea and the extent of the Kuroshio Current.



Figure 2. Panels A-C: Artificial rectangular mats or rafts made of rice straw with synthetic foam strips used to attract flying fish to deposit eggs. Panel D: Flying fish eggs (roe).

Acknowledgements. Ng and Balazs traveled to Taiwan as tourists at their own expense to visit with friends and experience Taiwanese culture in the Keelung region. Information gathered for this article was incidental to their leisure visit. We express our sincere gratitude to Dr. Peter Chen-Te Tseng of the Fisheries Research Institute in Keelung of Taiwan for his hospitality and the photos used in our article, and to Denise M. Parker, Marine Turtle Research Specialist of JIMAR, NOAA, for her input on the geographic distribution of flying fish species.

FRITTS, T.H. 1981. Pelagic feeding habits of turtles in the Eastern Pacific. *Marine Turtle Newsletter* 17: 4-5.

KOMATSU, T., D. MATSUNAGA, A. MIKAMI, T. SAGAWA, E. BOISNIER, K. TATSUKAWA, M. AOKI, T. AJISAKA, S. UWAI, K. TANAKA, K. ISHIDA, H. TANOUE & T. SUGIMOTO. 2008. Abundance of drifting seaweeds in eastern East China Sea. *Journal of Applied Phycology* 20: 801-809.

PARKER, D.M., COOKE, W.J. & G.H. BALAZS. 2005. Diet of oceanic loggerhead sea turtles (*Caretta caretta*) in the central

North Pacific. *Fisheries Bulletin* 103: 142-152.

PARKER, D.M., P.H. DUTTON & G. H. BALAZS. 2011. Oceanic diet and distribution of haplotypes for the green turtle, *Chelonia mydas*, in the Central North Pacific. *Pacific Science* 65: 419-431.

RICHARDSON, J.I. & P. MCGILLIVARY. 2001. Post-hatchling loggerhead turtles eat insects in *Sargassum* community. *Marine Turtle Newsletter* 55: 2-5.

SAFRAN, P. & M. OMORI. 1990. Some ecological observations on fishes associated with drifting seaweed off Tohoku coast, Japan. *Marine Biology* 105: 395-402.

UEHARA, S., C.T. TAGGART, T. MITANI & I.M. SUTHERS. 2006. The abundance of juvenile yellowtail (*Seriola quinqueradiata*) near the Kuroshio: the roles of drifting seaweed and regional hydrography. *Fisheries Oceanography* 15: 351-362.

WITHERINGTON, B., S. HIRAMA & R. HARDY. 2012. Young sea turtles of the pelagic *Sargassum*-dominated drift community: habitat use, population density, and threats. *Marine Ecology Progress Series* 463: 1-22.