# TRASHING TURTLES: QUANTIFYING GARBAGE ON THREE SEA TURTLE NESTING BEACHES IN COSTA RICA

**Kari Gehrke[1], Emily Kuzmick[1], Lauren Piorkowski[1], Katherine Comer Santos[1], Chris Pincetich[2], Catalina Gonzalez[3], Manuel Sanchez[4], Lotti Adams[5], Emma Harrison[3], Randall Arauz[6], and Beth Whitman[7]**

[1] The Science Exchange Sea Turtle Internship Program, San Diego, CA, USA
[2] Sea Turtle Restoration Project, Forest Knolls, CA, USA
[3] Sea Turtle Conservancy, Tortuguero, Costa Rica
[4] Osa Conservation, Puerto Jimenez, Costa Rica
[5] PRETOMA, Guanacaste, Costa Rica
[6] PRETOMA, San Jose, Costa Rica
[7] Florida International University, North Miami, FL, USA

The authors tested new methods for investigating the relationship between beach trash and sea turtle activity in a country-wide study in Costa Rica. Costa Rica contains important nesting beaches for green turtles, olive ridleys, hawksbills, and leatherbacks. Beach trash is among the many threats to these endangered species; it can be an obstacle to nesting female turtles and hatchlings traversing the beach, and in near shore waters turtles can ingest or become entangled in floating trash. Our research goal was to determine if beach trash and turtles are spatially and temporally correlated. The study sites were Pejeperro Beach on the Osa Peninsula, Tortuguero on the Caribbean, and San Miguel Beach in Guanacaste. Trash density was measured using methods described in the NOAA Marine Debris protocol during July and August of 2012. The Science Exchange Interns mapped three 100-meter zones on each beach. Each zone consisted of 20 five-meter wide transects from the mid-tide line to the back of the beach. Four transects per zone were randomly chosen for weekly garbage observations using predefined size categories and type categories such as plastics, glass, fabrics, metals, processed wood, rubber, etc. One of our modifications to the NOAA protocol is that while collecting trash density data, we simultaneously recorded evidence of turtle activity within the transect. Crawls and nest pits were tallied as separate activities. Successful nests were counted the same as false nests. Trash was not collected until the end of the study. Ninety-one percent of the observed trash items in the 252 transects sampled in Costa Rica fell in the macro category (2.5 to 30 cm), with 36 large debris items recorded ranging in size from 0.3 m to 1.10 m. Our new methods also added a micro size category (5mm to 2.5 cm) that could affect the nest chamber. The mean macro trash density from all sites was 0.2436 items/$m^2$ and the mean turtle density was 0.0084 activities/$m^2$. Tortuguero beach had the highest average macro trash density, with 0.4287 items/$m^2$, and also the highest turtle activity density at 0.0202 activities/$m^2$. Plastics accounted for 93% of all items recorded at our study sites with rubber products coming in second. To determine the spatial and temporal relationship between macro trash (in our case small plastic items) and turtles we used a non-parametric two-tailed Spearman's rho correlation test. There was a moderately strong positive significant relationship ($r = 0.449$; $p <= 0.001$) indicating that as plastic densities increased and decreased, turtle activity densities followed. However, we cannot infer cause and effect from a correlative relationship; many factors influence where turtles choose to crawl onto the beach and dig nest pits, for example natal homing and the presence of artificial lights. The three beaches' trash densities in several notable categories will be compared to each other and to other sites from the literature. Recommendations to managers of sea turtle nesting beaches are increased beach cleanups, community awareness campaigns, and more trashcans on the beaches with regular disposal.