

# New Sea Turtle Monitoring Methods

Sea Turtle Conservation Bonaire (STCB) has worked tirelessly since 1991 to protect Bonaire's sea turtle population and to ensure a safe, protected environment for them on land and in the sea. Bonaire is home to three of the world's seven species of sea turtles: green turtles (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricata*) are found year-round, while loggerhead turtles (*Caretta caretta*) generally visit the island only during the nesting season. Set up as a non-profit organization, STCB began conducting standardized in-water surveys and tagging programs in 2003 to gather information on sea turtles in the waters surrounding the island. STCB staff and volunteers have tagged approximately 3,000 turtles and collected data on turtle abundance, health status, movement patterns, growth rates and preferred habitats. This invaluable information has helped to improve conservation efforts and build support for sea turtle conservation on the island. For example, monitoring efforts in Lac have highlighted the importance of this area to the green turtle population; green turtles that inhabit Lac have much higher growth rates than have been recorded elsewhere in the Caribbean.

STCB works with Population Ecologist and statistician Dr. Frank Rivera-Milán (US Fish & Wildlife Services) to analyze in-water transect counting, netting, and nesting data that STCB has collected over the years and to optimize their methodology for in-water and netting surveys. Together with Rivera-Milán, Wildconscience has also been contracted to help design an improved field methodology, which will result in more accurate yearly population estimates for Bonaire, critical to ensure well-informed management decision making. Enhanced methods will also help improve STCB's visibility as a premier partner, provide information to enhance research throughout the region through scientific publications and well-recognized scientific journals, and feed the regional pool of information to enhance sea turtle research in the Caribbean and – at the same time – work towards standardization of methods.

## Survey Planning (2018)

1. State measurable objectives
2. Define the target population and sampling frame (list of sampling units)
3. Select a sampling scheme (systematic)
4. Define the parameters to be estimated and desired precision (CV N)
5. Select count methods for parameter estimation and modeling
6. Decide how to allocate resources (cost-effective sampling)

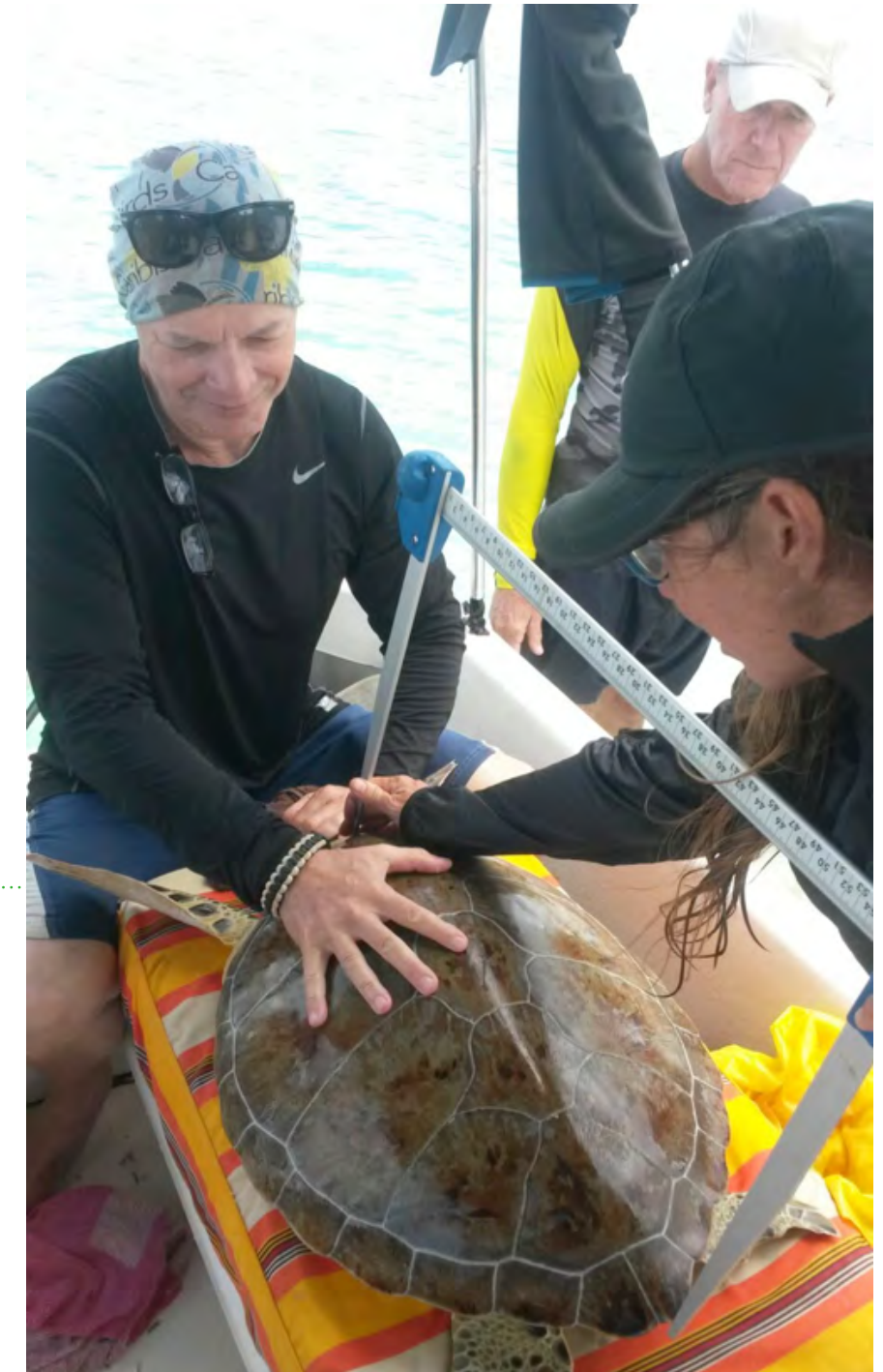


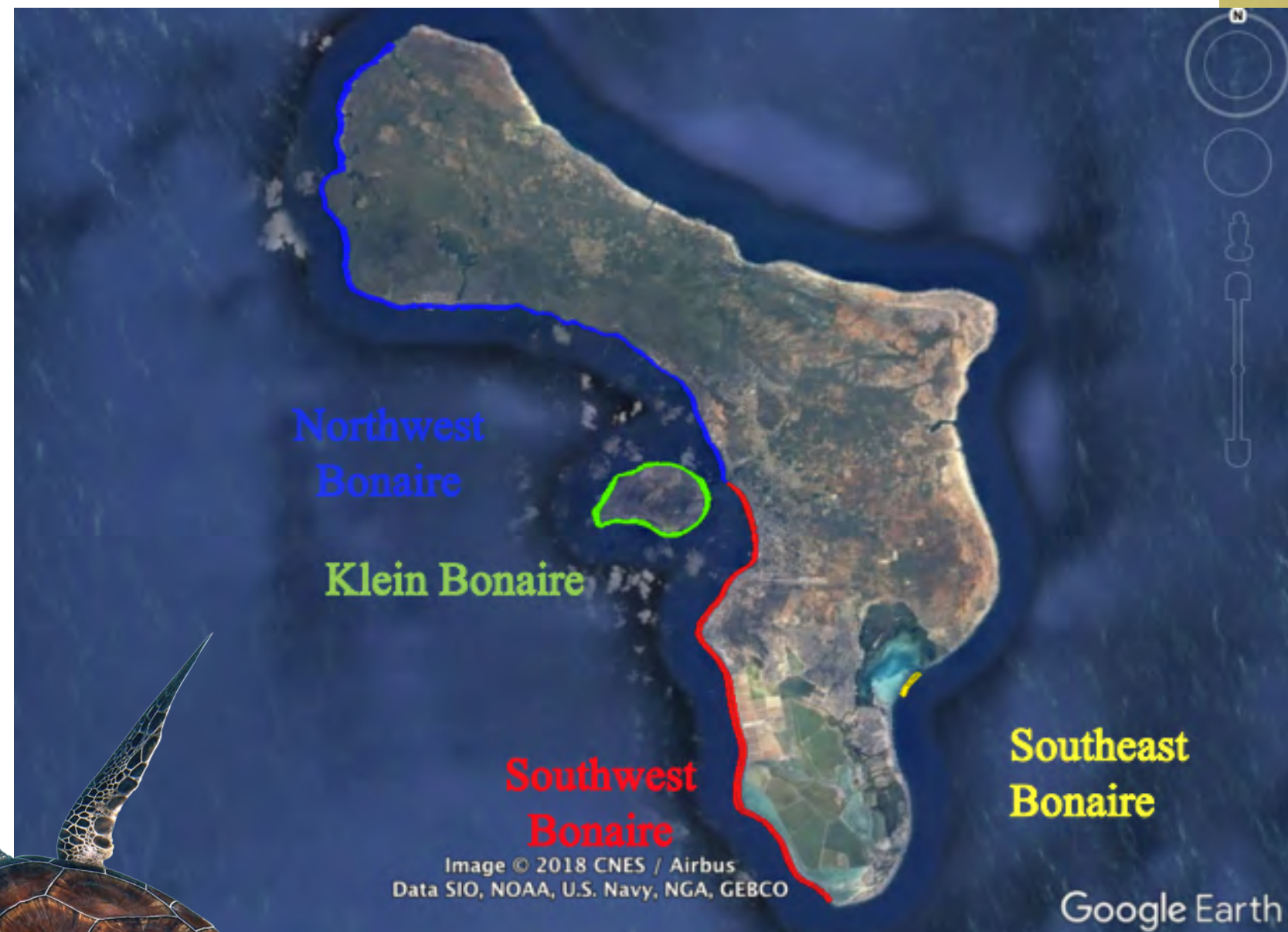
Photo by: © Frank Rivera-Milán, STCB



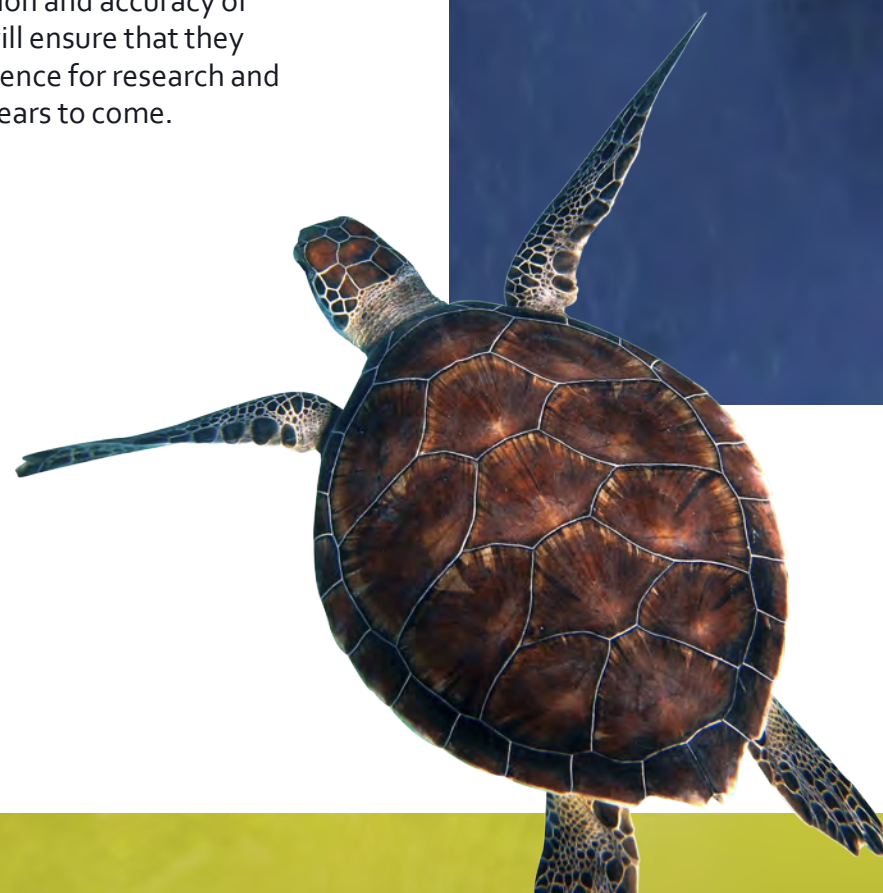
STCB's improved statistical design includes randomized surveys, repeated visits (same area, time and observer power), and the accurate measurement of the survey area and survey region. The four survey regions are Northwest Bonaire, Klein Bonaire, Southwest Bonaire and Southeast Bonaire. Data from the Southeast Bonaire survey region (Lac) will be analyzed separately as surveys there are not randomized but follow one fixed transect. STCB's new survey methodology also means that turtles are no longer caught to be tagged and measured onboard during the count surveys on the West coast. Instead, the "observers" record the species, number of individuals, and estimated length while the turtles are in the water. A number of environmental measurements are now also recorded during each survey to help understand if and how these environmental factors influence sea turtle abundance. Recorded covariates include visibility, wind direction, water temperature, abundance of jellyfish, rugosity,

coral cover, depth, date and time as well as disturbance (boat and human presence in water) and the number of observers and their experience.

A very exciting development is that STCB's in-water surveys now also include the monitoring of a number of other species, notably sharks, barracudas, tarpons and marine mammals. There is some concern over the declining population of barracudas, and monitoring efforts will help gauge whether the population is healthy or not. Additionally, the number of boats as well as fishermen on shore will be tallied to better understand fishing pressure in the waters surrounding Bonaire. STCB has been central to the protection of Bonaire's exceptional biodiversity for close to three decades, and the improvement of their science for higher precision and accuracy of populations estimates will ensure that they remain a model of excellence for research and conservation for many years to come.



Four Survey Regions. Map by © STCB



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