Minimum Data Standards Perform to the Maximum

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An aerial view shows a large number of turtle tracks covering a nesting beach. SWOT's *Minimum Data Standards for Nesting Beach Monitoring* provides guidance for effective nesting beach monitoring under a wide range of circumstances. © Tui De Roy / Roving Tortoise Photos

Having concluded that globally standardized nesting beach data would be critical to any efforts to monitor worldwide trends in sea turtle populations, the State of the World's Sea Turtles (SWOT) Program conducted a study and published a 28-page booklet titled *Minimum Data Standards for Sea Turtle Nesting Beach Monitoring, Version 1.0,* or the *MDS Handbook*, in 2011. The *MDS Handbook* describes a methodology that was synthesized by the SWOT Scientific Advisory Board and numerous volunteers, who surveyed and described best practices for monitoring sea turtle nesting populations under varying beach monitoring conditions. With support from the National Fish and Wildlife Foundation, the booklet was printed in English, French, and Spanish, and thousands of copies were made available for free to sea turtle projects internationally. Ultimately, the booklet was also produced in a number of other languages, including Turkish and Bengali, with the help of SWOT partners.

Now, more than a decade after the *MDS Handbook*'s release, it is interesting to look at how those standards have been used by researchers around the world. An initial literature analysis found no less than 10 peer-reviewed articles that cited the MDS methodology.

To begin, we should note that many methods can be used to estimate population size in sea turtles, as explained in the *MDS Handbook*:

> Counting nesting females and their nesting activities is an important part of generating abundance estimates and assessing trends, but this information alone is insufficient for understanding the underlying, complex processes that drive population status and trends. The reasons for this insufficiency are clear, considering that nesting females account for only a portion of overall population structure and for probably no more than 1 percent of the total population abundance. Therefore, trends in nesting activity may not be reflective of trends in the entire population. Furthermore, a trend in nesting activity may be due to changes in the processes that drive reproduction, rather than a reflection of the actual number of mature females in a population.

Despite those limitations, monitoring female turtles on nesting beaches remains the preferred methodology in most regions, because it is the most practical and easily accessible proxy for elucidating population trends.

The MDS methodology asks researchers to consider (1) how many beaches they should monitor within a given territory and (2) how much they should monitor during a season in order to make viable population estimates for a given beach. Finally, the *MDS Handbook* provides a statistical methodology for analyzing the collected data.

There are two main strategies for determining how many beaches should be monitored. The first strategy is to define index sites of limited extent where researchers can conduct intense beach monitoring and extrapolate trends to determine the population of a broader territory. In doing so, researchers assume that a few monitored index beaches reflect the whole dynamic at the scale of the territory. This approach has great advantages when monitoring large areas is not feasible, but risk is also involved, as the disappearance of an index beach because of geomorphological, climatic, or anthropogenic causes could mean the loss of valuable time series data for an entire region.

The second strategy in the MDS methodology recommends that all beaches within a territory be monitored over the duration of a nesting season to help define the beginning, end, and peaks of the nesting season. This approach allows for the elaboration of a formula that, once established, can then be populated in subsequent years with data gathered at more random points during a season.

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The MDS methodology has now been tested at many sites and in virtually all ocean basins, and it has been widely referenced in published studies. The Wider Caribbean Sea Turtle Conservation Network has advocated for the use of MDS in the Caribbean, as have researchers working with hawksbill nesting and conservation in the eastern Pacific and researchers on the central African Atlantic coast.

The MDS methodology was also cited in publications about the nesting range expansion of loggerhead turtles in the Mediterranean, about the discovery in Angola of the Atlantic's largest olive ridley nesting population, about validating trends in olive ridley nesting in Guatemala, about the identification of secondary nesting beaches for leatherback turtles on the Pacific coast of Costa Rica, and about the largest South Pacific green turtle rookery in New Caledonia's Forgotten Islands. These are just some of the practical applications of MDS that appear in published literature. Although MDS 1.0 has served the sea turtle conservation community admirably since its release in 2011, there is always room for improvement, and there may one day be an MDS 2.0 that addresses gaps in the methodology. For instance, an intra-seasonal model of nesting phenology may help fill missing data for monitored periods during a nesting season, and a new method for the spatial and temporal aggregation of nesting seasons could also make for a natural extension of the SWOT MDS recommendations. Meanwhile, we encourage anyone interested to read the short *MDS Handbook*, which is available at www.seaturtlestatus.org/minimum-data-standards, as you define or review your nest monitoring program's methodology and goals. •