Getting our Priorities Straight

By RODERIC MAST

Nobel chemist Paul Crutzen regards the influence of humans on the biosphere at this moment in Earth's history to be so systemic and widespread as to constitute a new geological era: the *Anthropocene epoch*. To succeed in the Anthropocene, sea turtle conservationists must view our goals at the global, as well as local, scales. We must recognize the relative threat and risk factors that influence our decisions, and we must have our eyes open to both present and future priorities simultaneously.

The mission of our movement, in a nutshell, is to prevent extinctions and to safeguard healthy populations of sea turtles. But where do we start? How can we be certain that the limited amounts of money and personnel at our disposal are being invested most wisely to ensure long-term success? Setting priorities that take into account the best available science, expert knowledge, and lessons learned from past successes and failures is critically important so that our conservation actions use the *most* effective techniques to achieve our goals. Beyond keeping a keen eye on urgencies such as preventing extinctions, conservation priority-setters must aim to sustain healthy populations and habitats as insurance policies for the future, so they do not become tomorrow's urgencies.

To achieve this mission, we need to reconcile the ways in which we have done assessments and conservation priority-setting with the complicated realities of sea turtle biology and conservation. For example, let's consider the mighty leatherback, largest of all living turtles on land or sea. Leatherback turtles are among the most migratory of all animals and are found in the territorial waters of virtually every coastal and island nation. In each of those nations, they face different threats and are subject to disparate policy and regulatory regimes. Environmental conditions in different ocean basins also make some leatherback populations naturally smaller, less fecund, and more vulnerable to human threats. However, the International Union for Conservation of Nature (IUCN) Red List—the only globally recognized system for assessing conservation status of species—categorizes *all* leatherbacks, *everywhere* they occur, as Critically Endangered, which is the highest threatened category available.

Given the aforementioned regional variations among populations around the world, there can be no plausible, global-scale strategy that conserves leatherbacks while accurately identifying all the appropriate local interventions necessary to prevent extinctions of individual populations. Furthermore, a strategy that seeks only to conserve the species at the global scale does not consider the inherent and irreplaceable ecological importance of the regional populations: the loss of leatherbacks in the Pacific Ocean would have significant and irreversible ecological consequences even if at the global scale the species continued to exist because populations remained in the Atlantic and Indian Oceans.

Since 2003, the Burning Issues (BI) Working Group of the IUCN Marine Turtle Specialist Group (MTSG) has directed its efforts at addressing the complicated yet critical issues illustrated in the preceding leatherback example. The BI process has developed priority-setting tools to help our movement ensure that no species of sea turtle goes extinct on our watch. The global SWOT Team has laid the groundwork for the MTSG's analyses by building the most comprehensive global data set on sea turtle biogeography in existence and by sharing BI results in *SWOT Report* since 2005. Two seminal papers describing the BI Working Group's priority-setting efforts were recently published and made publicly accessible. The first of those outlined a framework for delineating sea

AT RIGHT: A green turtle glides over seagrass off the coast of Brazil. Brazilian green turtles rank among the world's healthiest sea turtle populations thanks to long-term conservation efforts in the region. © LUCIANO CANDISANI
PREVIOUS SPREAD: The track from a turtle's aborted nesting attempt in Florida, U.S.A., provides stark evidence of the impacts of coastal development on sea turtles' natural behaviors. © MARK CONLIN / SEAPICS.COM

turtle populations globally (Regional Management Units, or RMUs), and the second described an effort that evaluates, compares, and organizes sea turtle RMUs within the context of a conservation "priorities portfolio." Together, those achievements have vast potential for focusing the sea turtle conservation movement on its most important tasks.

The RMU framework breaks down globally distributed, widely migrating sea turtle species into smaller, biogeographically defined units above the level of a single nesting beach yet below the level of species. RMUs are functionally independent subpopulations that include breeding adults, as well as juveniles. RMUs vary in their levels of risk and threat, as well as their conservation status, and thus provide a more suitable scale for developing strategies for research and conservation than do global-level species assessments.

Defining RMUs for sea turtles has been no easy task. Over the past few years, MTSG scientists amassed and georeferenced data from more than 1,200 studies, including (a) information from more than 4,200 nesting beaches from the SWOT database, (b) population genetics, (c) movement and habitat use patterns from mark-recapture and satellite telemetry, and (d) other biogeographical parameters to delineate the RMUs. Global experts then reviewed and improved RMU maps and metadata during deliberations at BI workshops in 2008 and 2009. The U.S. National Fish and Wildlife Foundation generously backed this effort, and the maps and descriptions of 58 RMUs were subsequently published in *PLoS ONE* as "Regional Management Units for Marine Turtles: A Novel Framework for Prioritizing Conservation and Research across Multiple Scales" (www.plosone.org).

The next challenge was to devise a method that would allow conservationists to characterize the nuanced conservation needs of each RMU, to define the relative urgency and opportunities for intervention, and to identify where information gaps exist. The BI team developed a robust yet flexible "conservation portfolio" approach that assesses all RMUs in a way that allows conservationists to identify

priorities that best suit their respective goals and mandates. This conservation priorities portfolio method and the results were published in *PLoS ONE* as "Global Conservation Priorities for Marine Turtles" (www.plosone.org) and received a good deal of attention from global media and conservationists alike.

The framework described in the 2011 paper plots each RMU's risk (i.e., population viability) against threats (a score derived by quantifying the impacts of the "five hazards" to sea turtles: fisheries bycatch, human consumption of turtles and eggs, coastal development, pollution and pathogens, and climate change [see *SWOT Report, Vol. I*, 5]). This task also required an exhaustive review of the literature (more than 1,300 references) and lengthy discussions among experts to best define terms and to apply them in a consistent manner across RMUs, some of which are poorly known with respect to others. To reflect this lack of information, a "data uncertainty index" was applied to every criterion score, which highlighted places where more and better research was needed to strengthen assessments (in fact, one RMU was not included in analyses because of its high levels of data uncertainty). Ultimately, consensus among the BI Working Group experts was achieved; indeed, the results were reviewed by the full membership of the IUCN MTSG, representing about 230 experts from more than 70 countries.

A speared olive ridley is hauled aboard by a local fisherman in Kei Islands, Maluku, Indonesia. Although direct take of sea turtles has been reduced substantially at the global level, it remains a significant threat to some regional populations.

The risk and threat scores, when plotted, placed each RMU roughly in one of four categories:

1. High Risk and High Threats (19 of 58 RMUs)
2. High Risk and Low Threats (9 of 58 RMUs)
3. Low Risk and Low Threats (12 of 58 RMUs)
4. Low Risk and High Threats (17 of 58 RMUs)

RMU scores were then mapped in a variety of ways to analyze the results by species, ocean basins, MTSG regions, and international management regimes (i.e., regional fisheries management organizations). In the pages that follow, the lists of the world's *most* and *least* threatened RMUs are presented, allowing the reader to draw some broad conclusions about the status of the world's sea turtles from a quick glance at this information.

For instance, when considering the seven species, we begin to immediately see what the most urgent conservation priorities are. Only 4 (leatherback, hawksbill, olive ridley, and loggerhead) of the 7 sea turtle species have populations among the world's 11 most threatened; among all those ranked "high risk" and "high threat," we find 40 percent of loggerhead and leatherback RMUs, as well as more than half of hawksbill RMUs.

As we look across regions, we see that 5 of the 11 most threatened RMUs are in the northern Indian Ocean, specifically on nesting beaches and in waters within the Exclusive Economic Zones of countries like India, Sri Lanka, and Bangladesh. Turtles in this region are severely affected by a combination of depleted populations, weak or poorly enforced regulations, unsustainable mortality caused by fisheries bycatch and human consumption, and extensive coastal development. The high data uncertainty associated with those RMUs may further contribute to their high risks and threats. Other areas that proved to be risky for sea turtles are the East Pacific Ocean (from the United States to South America) and the East Atlantic Ocean (off the coast of West Africa).

But not all results were negative; the conservation priorities portfolio also highlights the world's healthiest sea turtle populations. Australia, Brazil, and the Pacific Islands region appear to be pretty good places to be a sea turtle, generally because of relatively large populations, long-term monitoring and protection, and low or reduced threats. The results also show some within-region patterns that are confusing at first glance but that may reveal interesting stories about conservation efforts. For example, several RMUs (leatherbacks, hawksbills, loggerheads) that occur in the East Pacific Ocean were assessed as high risk and high threat, but East Pacific olive ridleys (arribadas) and green turtles in that region were ranked among the world's healthiest populations. Those variations in status within regions suggest that threats or biological factors might influence certain populations differently, or perhaps that conservation interventions directed toward particular RMUs have not resulted in similar recovery trajectories for all. Such variations further highlight the value of the RMU framework in developing conservation strategies across RMUs under similar jurisdictions and may offer insights into which conservation efforts work (or do not work), which factors contribute to a population's vulnerability, or which RMUs are most affected by specific threats.

Certain threats were more pervasive than others in all RMUs, in particular fisheries bycatch, as well as human consumption of turtles and their products. Commonalities were also present with respect to data quality; specifically, effects of climate change, as well as pollution and pathogens, were data deficient so frequently that they were considered critical data needs at the global scale.

Together, the RMUs and conservation priorities portfolio are a noteworthy advancement that helps set a global agenda for sea turtle conservation; indeed, they provide the most well-rounded and appropriately scaled conservation status assessments for marine turtles ever produced. Yet those efforts are just a first step in what must become a dynamic, long-term process of regular reviews to ensure that our collective conservation priorities take into account all that they ought to. For example, a logical next step in the BI process will be the development of a "conservation capacity" overview that, when combined with the existing risk and threat assessments, will consider the legal, political, and social factors that contribute to conservation success. The BI Working Group is committed to improving data quality and innovating new ways to fine-tune assessments. Our work as conservationists must continue to be driven by a sense of urgency and characterized by the highest possible efficiency and precaution. ■