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Although several other frameworks assess marine turtle status at global and sub-global scales, in this chapter we focus on results from the International Union for the Conservation of Nature (IUCN) Red List assessments and the IUCN Marine Turtle Specialist Group's conservation priorities portfolio (Wallace et al., 2011) because these are the most comprehensive and widely recognized assessment frameworks at present. For a comprehensive summary of other assessment frameworks for marine turtles, please see Chapter 35. In this chapter, we provide an overview of the two above-mentioned IUCN assessments with regard to marine turtles, and we also present available information on the conservation status of sea snakes and marine iguanas.

2.1 IUCN Red List

The primary global assessment framework for marine turtle species is the IUCN *Red List of Threatened Species*™ (www.iucnredlist.org). The universally applicable criteria and guidelines of the Red List make it the most widely used and accepted framework for assessing the conservation status of species worldwide.

The IUCN Marine Turtle Specialist Group (MTSG), one of the IUCN/Species Survival Commission's specialist groups, is responsible for conducting regular Red List assessments of each marine turtle species on a global scale. However, because marine turtle population traits and trajectories can vary geographically, the global extinction risk assessment framework represented by the Red List does not adequately assess the conservation status of spatially and biologically distinct marine turtle populations (see Seminoff and Shanker, 2008 for review).

2.2 Subpopulation or regional assessments

To address the challenges presented by the mismatched scales of global Red List assessments and regional/population-level variation in status, the MTSG developed an alternative assessment framework and a new approach to Red List assessments that better characterize variation in status and trends of individual populations (Wallace et al., 2010; Wallace et al., 2011; see next sectiscf4 marine turtle subpopulations, as well as the global population (i.e., species), using Red List guidelines, which results in official Red List categories for subpopulations in addition to the single global listing. This working group first developed regional management units (RMUs) (i.e., spatially explicit population segments defined by biogeographical data of marine turtle species) as the framework for defining biologically meaningful population segments for assessments (Wallace et al., 2010). RMUs are functionally equivalent to IUCN subpopulations, thus providing the appropriate demographic unit for Red List assessments. Next, the group developed a flexible yet robust framework for assessing population viability and degree of threats that could be applied to any subpopulation in any region (Wallace et al., 2011). Population viability criteria included abundance, recent and long-term trends, rookery vulnerability, as well as genetic diversity, and threats included by-catch (i.e., incidental capture in fishing gear), human consumption of turtles or turtle products, coastal development, pollution and pathogens, and climate change. The final product was a “conservation priorities portfolio” for all subpopulations globally. It includes identification of critical data needs, as well as risk and threats criteria by subpopulation, and reflects the wide variety of conservation objectives held by different stakeholders, depending on institutional or regional priorities.

3.1 Mar[illegible]

3.2 MTSG's conservation priorities portfolio

Marine turtle Red List assessments have been and will continue to be informed by the

Hydrophis

three subpopulations range between 1,000-2,000 individuals (Rabida Island), 4,000-10,000 (Marchena Island), and 15,000-30,000 (Santa Fe Island) (Nelson et al. 2004). Due to their restricted distribution and area of occupancy, marine iguanas are classified as Vulnerable according to the IUCN Red List (Nelson et al. 2004).

4.1 Marine Turtles

Dutton and Squires (2011) highlight the need for a holistic conservation approach that addresses all sources of mortality and deals with the trans-boundary nature of these multiple threats. Decades of over-harvest of eggs on nesting beaches have driven historic declines of some breeding populations, rendering them more vulnerable to impacts from fisheries by-catch and other threats. According to Wallace et al. (2011), fisheries by-catch was scored as the highest threat across marine turtle subpopulations, followed by human consumption and coastal development (Table 1). Climate change was scored as Data-Deficient in two-thirds of all RMUs, whereas pollution and pathogens were scored as Data-Deficient in more than half of all RMUs (Table 1).

A recent global assessment of fisheries by-catch impacts documented the Mediterranean Sea, Northwest and Southwest Atlantic, and East Pacific Oceans as regions with particularly high by-catch threats to marine turtle subpopulations (Wallace et al., 2013b). This assessment also highlighted the disproportionately large impact that by-catch in small-scale fisheries in coastal areas can have on marine turtle populations. Efforts to reduce turtle by-catch have included changes in gear configuration and/or fishing method, time-area closures, and enforcement of by-catch quotas, but by-catch reduction has only been successful when tailored to local environmental factors and characteristics of fishing gear and methods (Lewison et al., 2013). ,æTd[(fTJ91)-2(3)-2H]TJumandn 0.063--4(a

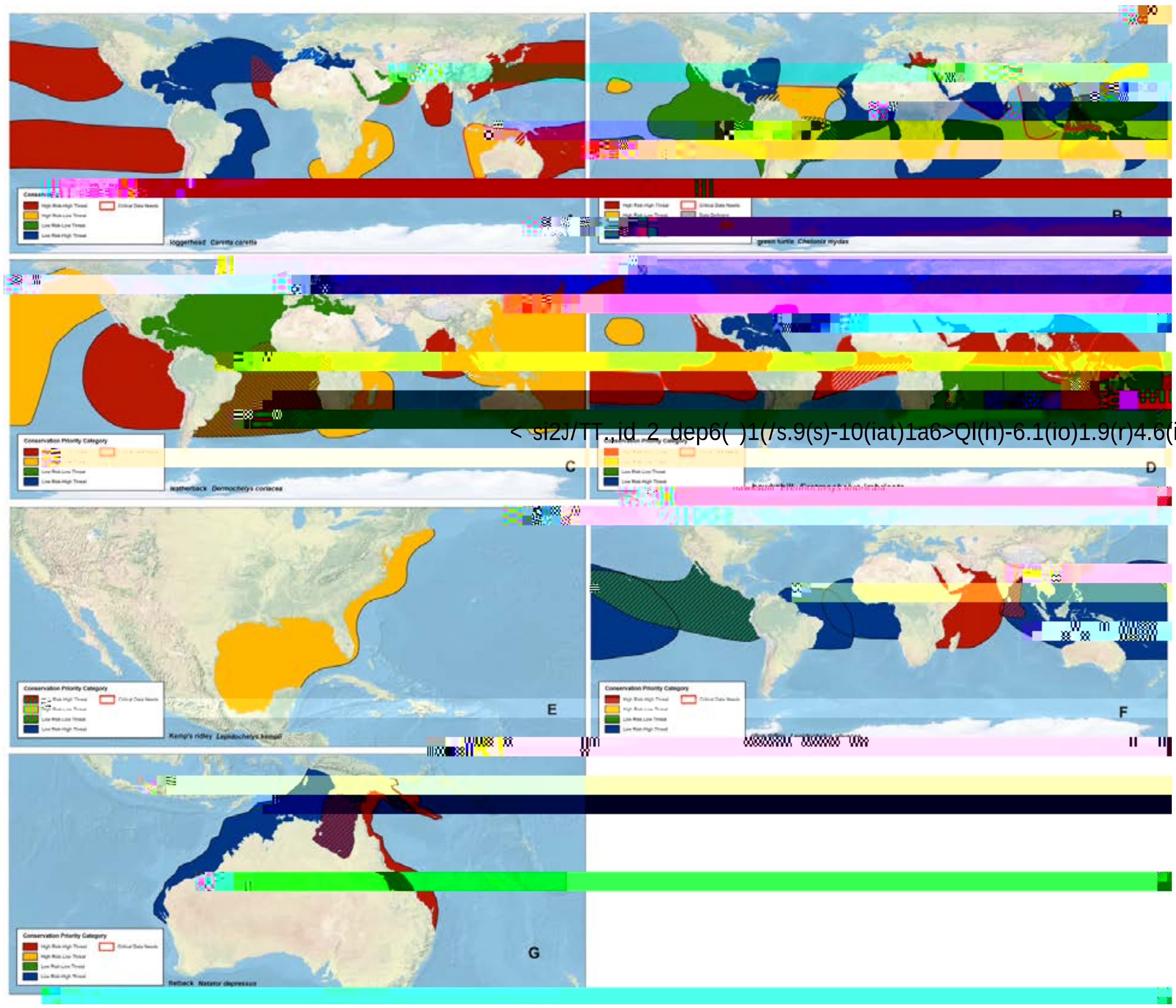
In Southeast Asia, many reptile species are heavily harvested for the commercial food, medicine and leather trades; however, very limited information exists about the extent to which marine snakes are targeted and about potential impacts (Auliya, 2011). To some extent, this lack of information probably reflects the fact that to date no sea snake species has been CITES-listed. One anecdotal account of a tannery in West Malaysia indicates that over 6,000 spine-bellied sea snakes (*Lapemis curtus*) were harvested per month (Auliya, 2011), suggesting that the impact might be high if this account is representative of other locations. Nonetheless, *L. curtus* has a large geographic range, is a voracious generalist predator (feeding on a variety of small fish, eels, squid, crustaceans) and typically occurs in large numbers in many habitat types, so it may be able to sustain heavy harvests (Auliya, 2011).

The three most threatened sea snake species are endemic to coral reefs in the Timor Sea, including Ashmore Reef, a renowned sea snake biodiversity hotspot. Species diversity at Ashmore Reef has declined from at least nine species in 1973 and 1994 to just two species in 2010 (Lukoschek et al., 2013) and abundances have declined > 90 per cent from the estimated standing stock of > 40,000 snakes in the mid-1990s (Guinea and Whiting, 2005; Lukoschek et al., 2013). In addition to the three threatened species from the genus *Aipysurus,* two species that disappeared (*Aipysurus duboisii*, endemic to Australasia, and *Emydocephalus annulatus,* also in the *Aipysurus* group), typically occur on coral reefs, suggesting that their declines might be due to loss or degradation of reef habitats. Reef-associated sea snakes shelter and forage under ledges and within the reef matrix, where they might be affected by reductions in coral cover, diversity and habitat complexity following coral bleaching events. A mass bleaching event in 2003 caused widespread coral mortality at Ashmore Reef; however, the most pronounced sea snake declines occurred between the mid-1990s and 2002 (Lukoschek et al., 2013), preceding the 2003 coral loss. The cause of these declines is unknown (Lukoschek et al., 2013). Widespread bleaching associated with the 1998 El Niño event affected many Australian reefs, including Scott Reef in the Timor Sea, but Ashmore Reef experienced minimal coral loss in 1998 (Lukoschek et al., 2013). Moreover, two additional species that disappeared from Ashmore Reef (*Hydrophis coggeri* and *Acalyptophis peroni*) were predominantly associated with soft-sediment habitats. Illegal harvesting on Timor Sea reefs targets invertebrates and sharks, but there is no evidence that sea snakes have ever been taken (Lukoschek et al., 2013). Moreover, Ashmore Reef was declared a National Nature Reserve (IUCN Category 1a) in 1983 and a National Parks or Customs presence, maintained for much of the year since 1986, has limited illegal fishing at Ashmore Reef (Lukoschek et al., 2013). Similar declines of *Aipysurus* group species have occurred on protected reefs in New Caledonia (Goiran and Shine, 2013) and the southern Great Barrier Reef (Lukoschek et al., 2007a). Possible reasons for these apparently enigmatic declines of sea snakes include reproductive failure due to the sub-lethal or lethal effects of increased sea surface temperatures, disease, and pollution; however, compared with other marine vertebrates, limited research has been conducted quantifying the extent to which these processes affect sea snakes. There has been no research into the effects of ocean acidification on sea snakes.

Sea snakes tend to have highly patchy or aggregated distributions throughout their ranges. Genetics research on species from the *Aipysurus* group (Lukoschek et al.,

Table 1. Average values of p

Table 3. Categories in which RMUs occurred in each basin (including critical data needs RMUs). Categories: HR-HT=High Risk-High Threats; HR-LT=High Risk-Low Threats; LR-LT=Low Risk-Low Threats; LR-HT=Low Risk-High Threats. * One RMU (*C. mydas*, northeast Indian Ocean) was scored critical data needs only.



The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Figure 1. Conservation status of marine turtles: Four conservation priority categories are displayed: (red) high risk – high threat, (yellow) high risk – low threat, (green) low risk – low threat, (blue) low risk – high threat. Panels: (A) loggerheads (*Caretta caretta*)

Abreu-Grobois, F.A., Plotkin, P.T., (assessors) (2007). IUCN Red List Status Assessment of the olive ridley sea turtle (*Lepidochelys olivacea*) IUCN/SSC-Marine Turtle Specialist Group. 39 p.

Auliya, M. (2011).

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