

Section 4

Subchapter 4F

Marine reptiles

Writing team: Vinay Udyawer (coordinating author), Mariana Fuentes, Ian Butler (co-lead member), Maximilian Hirschfeld, Yaniv Levy, Carmen Mifsud (lead member), Andrea Phillott, Arne Rasmussen, Gabriel Hoinsoude Segniagbeto, Ruchira Somaweera and Bryan Wallace.

Key points

- Updates were identified across various marine reptile taxa, with some species maintaining their global conservation status, while others (e.g. green turtles) have new classifications ranging from Least Concern to Endangered.
- The present *Assessment* includes saltwater crocodiles, classified as Least Concern due to stable global populations resulting from effective regional management in the species' range.
- Ongoing threats, such as incidental fisheries by-catch, remain significant, and additional challenges, such as habitat degradation, marine pollution and climate change, require more comprehensive conservation strategies.
- Gaps remain in long-term monitoring and the gathering of population trend data for marine reptiles, particularly sea snakes and marine iguanas.

1. Introduction

The present subchapter contains an update on the global and regional statuses of the four major marine reptile groups: marine turtles (7 species), sea snakes (71 species), marine iguanas (1 species) and saltwater crocodiles (1 species). These species range from widely distributed (e.g. sea snakes) to highly localized (e.g., marine iguanas in the Galapagos Islands) and inhabit environments ranging from the open ocean (e.g. marine turtles) to coastal and estuarine habitats (e.g. saltwater crocodile). The chapters on marine reptiles in the first *World Oceans Assessment* (Wallace and others, 2016) and the second *World Ocean Assessment* (Schuyler and others, 2001) contained an outline of the baselines and trends for these groups (except saltwater crocodiles) up to 2018. The second *World Ocean Assessment* highlighted variable changes in marine turtle populations, showing some recovering (e.g. loggerhead sea turtle), others stable (green sea turtle) and some declining (Kemp's ridley sea turtle). It highlighted the reclassification of two Critically Endangered sea snake species (short-nosed and leaf-scaled sea snakes) to Data Deficient, added three new species (mosaic, Shark Bay and rough-scaled) assessed as Data Deficient, and highlighted subspecies reclassification in marine iguana without altering their overall status (MacLeod and others, 2020a; Miralles and others, 2017). This will be the first *Assessment* to include saltwater crocodiles.

2. Overall status of marine reptiles

Marine turtles

There have been no updates to the global status of any of the seven marine turtle species since the publication of the second *World Ocean Assessment*, but green turtle (*Chelonia mydas*) subpopulations

were newly assessed. Four subpopulations were classified as Least Concern (south-west Indian Ocean), Near Threatened (Mediterranean), Vulnerable (East Pacific) and Endangered (Central South Pacific). Loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*) and olive ridley (*Lepidochelys olivacea*) turtles remain Vulnerable (Casale and Tucker, 2017; Abreu-Grobois and Plotkin, 2008). Hawksbill (*Eretmochelys imbricata*) and Kemp's ridley (*Lepidochelys kempii*) turtles are still Critically Endangered (Mortimer and Donnelly, 2008; Wibbels and Bevan, 2019), and flatback turtles (*Natator depressus*) remain Data Deficient, with no updates since 1996. The Marine Turtle Specialist Group has revised regional management units to define biologically meaningful populations (Wallace and others, 2023) and has updated conservation priorities for all species and regional management units (Wallace and others, 2025).

Sea snakes

Since the publication of the second *World Ocean Assessment*, the status has not been updated, but a newly described subspecies, the yellow sea snake (*Hydrophis platurus xanthos*), has been assessed as Endangered under the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (Bessesen and others, 2024). Among the 71 species and one subspecies currently recognized, one species (*Aipysurus fuscus*) and one subspecies (*Hydrophis platurus xanthos*) are Endangered, three are Vulnerable (*Hydrophis semperi*, *Laticauda crockeri* and *Laticauda schistorhynchus*), four are Near Threatened (*Hydrophis pacificus*, *Laticauda semifasciata*, *Laticauda frontalis* and *Laticauda guineai*) and 35 are Least Concern, while the remaining 27 species are either Data Deficient or have yet to be assessed. Marine surveys in north-western Australia have in deep waters documented populations of *Aipysurus apraefrontalis*, which had been previously presumed to be locally extinct as a result of surveys done in shallower waters (Somaweera and others, 2021).

Marine iguanas

The conservation status of the marine iguana (*Amblyrhynchus cristatus*) was updated in 2019, with the global status remaining Vulnerable (MacLeod and others, 2020a). The Fernandina Island subspecies was assessed as Vulnerable (MacLeod and others, 2020b); six subspecies from Santiago, Española, San Cristóbal, Wolf, Marchena and Santa Cruz islands as Endangered (MacLeod and Steinfartz, 2016); and the four remaining subspecies from Isla Santa Fé, Pinta, Genovesa and Punta Pitt are Critically Endangered (MacLeod and others, 2020a).

Saltwater crocodiles

The saltwater crocodile (*Crocodylus porosus*) was last assessed in 2019 in the IUCN Red List, retaining its Least Concern global status with a stable global population exceeding 400,000 non-hatchlings (Webb and others, 2021). This species breeds mainly in rivers and swamps, undertaking long sea journeys associated with foraging and mate-searching (Manolis, 2005). The species is widely distributed across South and South-East Asia, Australia and Melanesia; however, its population is now extinct in the wild in Seychelles, and possibly extinct in Cambodia, Thailand and Viet Nam (Webb and others, 2018).

3. Regional trends

Regional trends in nesting and foraging marine turtle populations have shown positive developments since the publication of the second *World Ocean Assessment*. A review by the Marine Turtle Specialist

Group assessed population status between the years 2011 and 2024, scoring risk factors and threats within regional management units (Wallace and others, 2025). While 74% of regional management units had improved since 2011, with notable increases in hawksbill and green turtle populations in the Chagos Archipelago (Mortimer and others, 2020) and the Red Sea (Shimada and others, 2021), 26% of regional management units worsened in both risk and threat categories (see table 1). Fisheries by-catch remains the highest-ranked threat (Wallace and others, 2025). A meta-analysis of 61 long-term nesting surveys showed increasing or stable trends for most populations, while highlighting declines in leatherback and loggerhead populations (Hays and others, 2024).

For sea snakes, decreasing population trends have been identified in locations where data are available (including the Gulf of Thailand, India and New Caledonia), while several other locations lacked sufficient data to define trends (see table 2). Overall population trend information is lacking for marine iguanas, with some subpopulations undergoing extreme fluctuations (MacLeod and others, 2020a). Indicative subspecies trends were identified in 2019 with either decreasing or unknown trends in population abundance (see table 2). Saltwater crocodile populations have stabilized since historical exploitation, with the species' global status improving from Endangered status in 1982 to Least Concern in 2019 (Webb and others, 2021). This is largely due to their effective regional management in Australia, Papua New Guinea and Indonesia. Regional assessments highlight a trend towards increase in the Solomon Islands and in the states of Sarawak and Sabah in Malaysia due to effective protection measures, but declines in Myanmar and the Philippines (table 2).

Table 1

Summary of marine turtle regional population trends (2018–2023) by regional management unit, with references

Region	Green	Loggerhead	Hawksbill	Olive ridley	Kemp's ridley	Leatherback
North Atlantic Ocean, Caribbean Sea and Mediterranean Sea	<i>Increasing:</i>	<i>Stable:</i>	<i>Increasing:</i>	<i>No updates</i>	<i>Stable:</i>	<i>Decreasing:</i>
	North-West Atlantic Ocean, Caribbean [1]	North-West Atlantic Ocean [4]	Gulf of Mexico [1]		Gulf of Mexico [6]	North-West Atlantic Ocean, Caribbean [7]
	Mediterranean Sea [2]		<i>Stable:</i>			
	<i>Decreasing:</i>		Caribbean, Saint Croix [5]			
	Costa Rica [3]		<i>Decreasing:</i>			
			Caribbean, Saint Croix [5]			
South Atlantic Ocean	<i>Stable:</i>	<i>No updates</i>	<i>No updates</i>	<i>Increasing:</i>	<i>Stable:</i>	<i>Increasing:</i>
	Sao Tome and Principe [8]			West Africa [7]	Gulf of Mexico [6]	Brazil [10]
				<i>Stable:</i>		<i>Decreasing:</i>
				French Guiana [9]		Brazil [7]
Indian Ocean, Red Sea, Arabian Sea and Persian Gulf	<i>Increasing:</i>	<i>Increasing:</i>	<i>Increasing:</i>	<i>Increasing:</i>	<i>Outside range</i>	<i>Stable:</i>
	Saudi Arabia [11]	South-West Indian Ocean [12]	Maldives, Saudi Arabia [11]	Bangladesh [11]		India [11]
	<i>Stable:</i>	<i>Stable:</i>	Bangladesh [11]	<i>Stable:</i>		South-West Indian Ocean [12]

	Egypt, Islamic Republic of Iran, Kuwait, Pakistan [11]	South-West Indian Ocean [12] Maldives [13]	<i>Stable:</i> North-West Indian Ocean [11]	North-East Indian Ocean, West Indian Ocean [11]		<i>Decreasing:</i> Bangladesh [11]
	South-west Indian Ocean [12]	<i>Decreasing:</i> Oman [11]				
	Maldives [13]					
	North-west Indian Ocean [11]					
	<i>Decreasing:</i> Bangladesh, Maldives [11]					
North Pacific Ocean	<i>Increasing:</i> North-central Pacific Ocean regional management unit [14] North Mariana Islands [15]	<i>No updates</i>	<i>No updates</i>	<i>Stable:</i> Costa Rica, Mexico [7]	<i>Outside range</i>	<i>Decreasing:</i> Costa Rica [17]
	<i>No trend:</i> Guam [16]					

South Pacific Ocean	<i>Increasing:</i>	<i>No updates</i>	<i>Decreasing:</i>	<i>No updates</i>	<i>Outside range</i>	<i>No updates</i>
	French Polynesia [18]		Great Barrier Reef (Australia) [21]			
	New Caledonia [19]					
	<i>Stable:</i>					
	Australia [7]					
	<i>Decreasing:</i>					
	Raine Island (Australia) [20]					

Source: Prepared by the writing team.

References: [1] López-Castro and others, 2022a; [2] Casale and others, 2018; [3] Restrepo and others, 2023; [4] Ceriani and others, 2019; [5] Gulick and others, 2022; [6] Arendt and others, 2023; [7] Hays and others, 2024; [8] Ferreira-Airaud and others, 2022; [9] Nalovic and others, 2018; [10] Colman and others, 2019; [11] Phillott and Rees, 2021; [12] Dalleau and others, 2020; [13] Hudgins and others, 2023; [14] Chaloupka and Pilcher, 2019; [15] Summers and others, 2018; [16] Valdivia and others, 2019; [17] Eastern Pacific Leatherback Conservation (Laúd OPO) Network, 2020; [18] Touron and others, 2018; [19] Fretey and others, 2023; [20] Dunstan and others, 2020; [21] Bell and others, 2020.

Note: Metrics include nesting counts and individual observations across five major regions.

Table 2

Summary of regional population trends for sea snakes, marine iguanas and saltwater crocodiles (2018-2023), categorized as increasing, stable, decreasing or unknown, with references

Region	Sea snake	Marine iguana	Saltwater crocodile
Indian Ocean, Red Sea, Arabian Sea and Persian Gulf	<p><i>Decreasing:</i></p> <p>Gulf of Thailand^a</p> <p>India^b</p> <p><i>Unknown trend:</i></p> <p>Western Australia^c</p> <p>Persian Gulf^d</p>	<i>Outside range</i>	<p><i>Increasing:</i></p> <p>Western Australia^e</p> <p>India^f</p> <p>Peninsular Malaysia^g</p> <p><i>Decreasing:</i></p> <p>Myanmar^{h, i}</p> <p><i>Unknown trend:</i></p> <p>Bangladesh^j</p> <p>Indonesia^k</p> <p>Sri Lanka^l</p>
North Pacific Ocean	<p><i>Unknown trend:</i></p> <p>Costa Rica^m</p>	<i>Outside range</i>	<p><i>Increasing:</i></p> <p>Malaysian Borneo, Bruneiⁿ</p> <p>Philippines^o</p> <p><i>Stable:</i></p> <p>Palau^p</p> <p>Singapore^v</p>

South Pacific Ocean	<i>Decreasing:</i>	<i>Decreasing:</i>	<i>Increasing:</i>
	New Caledonia ^o	Isla Punta Pitt, Genovesa, Pinta and Santa Fé subspecies ^q	Northern Australia ^s
	Eastern Australia ^p	<i>Unknown trend:</i>	Papua New Guinea ^t
		Fernandina Island, Santa Cruz, Marchena, Wolf, San Cristóbal, Española, Santiago subspecies ^r	Solomon Islands ^u
			Timor-Leste ^v
			Vanuatu ⁿ
			<i>Unknown trend:</i>
			Indonesia ^x

Source: Prepared by the writing team.

References: ^a Cao and others, 2014; ^b Rao and others, 2021; ^c Speed and others, 2022; ^d Yaghmour and others, 2022; ^e Parke, 2015, and Wildlife Management International, 2018; ^f Kar, 2024; ^g Kwan, 2017; ^h Platt and others, 2015; ⁱ Than and others, 2024; ^j Somaweera, personal communication; ^k Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1994; ^l Amarasinghe and others, 2015; ^m Bessesen and others, 2022; ⁿ Webb and others, 2021; ^o Shine and others, 2021; ^p Edgar and others, 2020; ^q MacLeod and others, 2020a; ^r MacLeod and others, 2020b; ^s Saalfeld and others, 2016; ^t Solmu and others, 2014; ^u Van der Ploeg and others, 2019; ^v Crocodile Task Force, 2017; ^w CITES, 2022; ^x Saragih and others, 2020; ^y Figueroa and others, 2023.

4. Changes in key threats

Key threats to marine reptiles, such as by-catch and targeted harvest, remain significant, with emerging threats such as light pollution, habitat modification and climate change also becoming increasingly impactful (Senko and others, 2022; Fukuda and others, 2022).

Targeted harvest and by-catch

Fisheries by-catch remains the greatest threat to marine turtles, with large numbers caught annually across multiple gear types (Lewison and others, 2014; Wallace and others, 2013). Data gaps in regions such as West Africa (de la Hoz Schilling and others, 2023; Segniabeto and others, 2017), the Eastern Pacific (Griffiths and others, 2024), continental Europe (Marco and others, 2020; Casale and others, 2018) and North America (Savoca and others, 2020) limit effective management. The Secretariat of the Convention on the Conservation of Migratory Species of Wild Animals has adopted several region- and species-specific action plans for marine turtles for West Africa, South-East Asia and the western Pacific. Sea snake populations in the Gulf of Thailand and India have declined due to increased fishing and unregulated fishing practices (Rao and others, 2021). Including sea snakes and marine turtles in the Marine Stewardship Council certification process could help to limit fisheries impacts on these populations (Good and others, 2024. See also subsect. 5A, subchap. 1A). Saltwater crocodiles still face legal and illegal take (Webb and others, 2021), and while egg harvesting has minimal impact, adult harvesting (Fukuda and others, 2020) and drowning as by-catch in fishing nets remains concerning. Legal hunting for meat poses a comparatively smaller and localized threat to the species (Brackhane and others, 2019). At the fourteenth Conference of the Parties to the Convention on the Conservation of Migratory Species of Wild Animals (2024), the Action Plan on Aquatic Wild Meat Harvests in West Africa was adopted, which addressed species including reptiles and was aimed at bringing policy and scientific attention to these regional harvests and promoting sustainable management.

Habitat degradation, marine pollution and coastal modification

Marine debris, particularly plastics, affects marine turtle reproductive ecology, although the population-level impacts remain unclear (Duncan and others, 2021; Fuentes and others, 2023). Habitat loss due to oil and gas developments (Nelms and others, 2016), renewable energy technologies (Maxwell and others, 2022) and seabed mining (Williams and others, 2022) continues to threaten marine turtles. Coastal artificial lighting disorients marine turtle hatchlings and deters nesting females (Leader and others, 2024); however, species-specific guidelines to mitigate these impacts have been developed (e.g. the International Light Pollution Guidelines for Migratory Species, prepared by the Secretariat of the Convention on Migratory Species). Oil spills have caused mass mortalities of sea snakes in the Gulf of Oman (Yaghmour and others, 2022). Marine iguanas face threats from habitat degradation (Pizzitutti and others, 2017; Walsh and Mena, 2016), oil spills (Wikelski and others, 2002), alien species (Wikelski and Nelson, 2004) and tourism-induced stress (French and others, 2010; see also subsect. 5A, chap. 4). Plastic pollution has emerged as a serious threat to marine iguana populations through ingestion and entanglement (Muñoz-Pérez and others, 2023). Saltwater crocodile nesting habitats are increasingly threatened by urban encroachment, sand mining, aquaculture and coastal agriculture (Fukuda and others, 2022).

Climate change associated impacts

Climate change threatens marine turtles by reducing nesting habitat and reproductive success, with warmer nest temperatures leading to more female hatchlings than males (Patrício and others, 2021). Impacts from altered reproductive periodicity, reduced foraging quality, and range shifts are also anticipated (Fuentes and others, 2023). However, nesting populations farther from the equator show greater resilience to temperature increases (Laloë and Hays, 2023). Sea level rise poses a major threat to saltwater crocodiles, particularly coastal mound-nesting populations (Fukuda and others, 2022). Marine iguanas are vulnerable to climate fluctuations, especially during strong El Niño years, when increased water temperatures reduce the abundance of marine algae, their primary food source (Dueñas and others, 2021). The frequency of climate fluctuation events is predicted to increase due to climate change, further threatening marine iguana survival and reproductive success (Cai and others, 2014; MacLeod and others, 2020a).

5. Key knowledge and capacity gaps

Marine turtles

Data gaps persist for loggerhead, green, leatherback, hawksbill, and olive ridley turtles across various regional management units (Wallace and others, 2025). Variability in subpopulation status and threats require ongoing species and regional assessments. Stock assessment models are needed to understand the levels of mortality that the population can sustain without declines (Putman and others, 2020). Greater understanding is needed of the effects of climate change on migratory patterns, cumulative impacts and the effectiveness of conservation strategies.¹ Standardized methods for plastic impact studies and for measuring the sociocultural aspects of traditional turtle harvesting are also necessary (Poti and others, 2021). Further studies are needed to understand the benefits of by-catch management (Arlidge and others, 2020; Gilman and others, 2023), fishery closures, nesting beach management (e.g. nest shading) and hatchery practices (Phillott and others, 2021) for population recovery.

Sea snakes

As most sea snake populations lack long-term monitoring, data on trends and distribution, as well as threats such as by-catch, habitat degradation, and climate change, is scarce (Udyawer and others, 2018). Rising ocean temperatures will affect sea snake physiology, reducing diving capacity and increasing mortality during incidental by-catch in trawl nets (Udyawer and others, 2016). Research shows shifts in sea snake assemblages due to unregulated fishing (Rao and others, 2021), but there are gaps in the tracking of population trends. A better understanding of national and international regulations on the trade in sea snakes is needed for assessing actual global harvesting levels (Báez and others, 2024).

Marine iguanas

The lack of long-term monitoring and the collection of census data for marine iguanas hinders the evaluation of population trends and threats (Alava and others, 2023). Knowledge is still lacking on plastic pollution impacts on population health (Jones and others, 2021; Muñoz-Pérez and others, 2023). The

¹ The Conference of Parties to the Convention on Migratory Species has adopted resolution 12.21 (Rev.COP14) on climate change and migratory species, including a list of priority actions to address this issue.

Galapagos Islands experienced El Niño events in 2015/16 and 2023/24 (National Oceanic and Atmospheric Administration (NOAA), 2022), climatic phenomena known to significantly impact iguana population health by increasing metabolic stress and reducing food availability (Varela-Jaramillo and others, 2023). While no census data exists for the 2015/16 event, drone-based surveys established before the 2023/24 El Niño event will allow for the future assessment of population trends in response to El Niño events (Varela-Jaramillo and others, 2023).

Saltwater crocodiles

Assessments of wild saltwater crocodile populations are lacking across much of their range, with basic population estimates absent in countries such as Brunei Darussalam, Cambodia, Timor-Leste and Indonesia. A growing number of human-crocodile conflicts (Baker and others, 2024) highlights the need for locally tailored management programmes (Webb and others, 2021). The close link between the production and trade of crocodylian products in South-East Asia underscores the need for coordinated management, conservation and regulatory efforts. Captive breeding programmes exist, but lack survival assessments, which would require reviews of restocking practices and release-site protocols (Corey and others, 2018).

References

Abreu-Grobois, A. and P. Plotkin (2008). *Lepidochelys olivacea*. The IUCN Red List of Threatened Species. e.T11534A3292503. <https://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T11534A3292503.en>.

Alava, J.J., and others (2023). Multiple anthropogenic stressors in the Galápagos Islands' complex social-ecological system: Interactions of marine pollution, fishing pressure, and climate change with management recommendations. *Integrated Environmental Assessment and Management*, 19(4), 870–95. <https://doi.org/10.1002/ieam.4661>.

Amarasinghe, T.A.A., and others (2015). Human-crocodile conflict and conservation implications of Saltwater Crocodiles *Crocodylus porosus* (Reptilia: Crocodylia: Crocodylidae) in Sri Lanka. *Journal of Threatened Taxa*, 7(5), 7111–7130.

Arendt, M.D., and others (2023). Climate-mediated population dynamics for the world's most endangered sea turtle species. *Science Reports*, 13, 14444. <https://doi.org/10.1038/s41598-023-41647-8>.

Arlidge, W.N.S., and others (2020). A mitigation hierarchy approach for managing sea turtle captures in small-scale fisheries. *Frontiers in Marine Science*, 7, 49. <https://doi.org/10.3389/fmars.2020.00049>.

Báez, J.C., and others (2024). Specific marine policies are needed to prevent the extinction of marine reptiles. *Frontiers in Marine Science*, 11, 1416178. <https://doi.org/fmars.2024.1416178>

Baker, C.J., and others (2024). The influence of crocodile density on the prevalence of human attacks. *People and Nature*, 6, 1922–1932. <https://doi.org/10.1002/pan3.10693>.

Bell, I.P., and others (2020). Twenty-eight years of decline: Nesting population demographics and trajectory of the north-east Queensland endangered hawksbill turtle (*Eretmochelys imbricata*). *Biological Conservation*, 241, 108376. <https://doi.org/10.1016/j.biocon.2019.108376>.

- Bessesen, B.L., and others (2022). Population abundance and density estimates for Costa Rica's endemic sea snake, *Hydrophis platurus xanthos*. *Frontiers in Marine Science*, 9, 924966. <https://doi.org/10.3389/fmars.2022.924966>.
- Bessesen, B.L., and others (2024). *Hydrophis platurus* ssp. *xanthos*. The IUCN Red List of Threatened Species. e.T239753560A239753681. <https://www.iucnredlist.org/species/239753560/239753681>.
- Brackhane, S., and others (2019). Crocodile management in Timor-Leste: Drawing upon traditional ecological knowledge and cultural beliefs. *Human Dimensions of Wildlife*, 24(4), 314–331. <https://doi.org/10.1080/10871209.2019.1614240>.
- Cai, W., and others (2014). Increasing frequency of extreme El Niño events due to greenhouse warming. *Nature Climate Change*, 4, 111–116. <https://doi.org/10.1038/nclimate2100>.
- Cao, N.V., and others (2014). Sea snake harvest in the Gulf of Thailand. *Conservation Biology*, 28, 1677–1687. <https://doi.org/10.1111/cobi.12387>.
- Casale, P. and A. D. Tucker (2017). *Caretta caretta* (amended version of 2015 assessment). The IUCN Red List of Threatened Species. e.T3897A119333622. <https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T3897A119333622.en>.
- Casale, P., and others (2018). Mediterranean sea turtles: Current knowledge and priorities for conservation and research. *Endangered Species Research*, 36, 229–267. <https://doi.org/10.3354/esr00901>.
- Ceriani, S.A., and others (2019). Conservation implications of sea turtle nesting trends: Elusive recovery of a globally important loggerhead population. *Ecosphere*, 10(11), e02936. <http://doi.org/10.1002/ecs2.2936>.
- Chaloupka, M.Y. and N.L. Pilcher (2019). *Chelonia mydas* (Hawaiian subpopulation). The IUCN Red List of Threatened Species. e.T16285718A142098300. <https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T16285718A142098300.en>.
- Colman, L.P., and others (2019). Thirty years of leatherback turtle *Dermochelys coriacea* nesting in Espírito Santo, Brazil, 1988–2017: reproductive biology and conservation. *Endangered Species Research*, 39, 147–158. <https://doi.org/10.3354/esr00961>.
- Corey, B., and others (2018). Commercial harvests of saltwater crocodile *Crocodylus porosus* eggs by Indigenous people in northern Australia: Lessons for long-term viability and management. *Oryx*, 52(4), 697–708. <http://doi.org/10.1017/S0030605317000217>.
- CITES (1994). Maintenance of the Indonesian population of Saltwater Crocodiles (*Crocodylus porosus*) on Appendix II of CITES pursuant to Resolution Conf. 3.15 throughout Indonesia. Ninth meeting of the Conference of the Parties, Fort Lauderdale, USA, 7–18 November 1994.
- CITES (2022). CoP19 Proposition 12 – transfer of the Philippine population of saltwater crocodiles (*Crocodylus porosus*) in Palawan Islands, Philippines from Appendix I to Appendix II, with a zero export quota for wild specimens, in accordance with Conference Resolution 9.24 (Rev. CoP17). Nineteenth meeting of the Conference of the Parties, Panama City, Panama, 14–25 November 2022.

- Dalleau, M., and others, eds. (2020). Sea Turtles in the East Africa and the West Indian Ocean Region: MTSG Annual Regional Report 2020. Report of the IUCN-SSC Marine Turtle Specialist Group. https://static1.squarespace.com/static/5e4c290978d00820618e0944/t/5fc53511fa04221c71c8fca4/1606759713452/MTSG+Regional+Report_East+Africa+%26+West+Indian+Ocean_2020.pdf.
- De la Hoz Schilling, C. and others (2023). Nowhere to hide: Sea turtle bycatch in Northwest Africa. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 33(10), 1131–1153. <https://doi.org/10.1002/aqc.3983>.
- Dueñas, A., and others (2021). The effects of climate change on wildlife biodiversity of the Galapagos Islands. *Climate Change Ecology*, 2, 100026. <https://doi.org/10.1016/j.ecochg.2021.100026>.
- Duncan, E.M., and others (2021). Plastic pollution and small juvenile marine turtles: A potential evolutionary trap. *Frontiers in Marine Science*, 8, 699521. <https://doi.org/10.3389/fmars.2021.699521>.
- Dunstan, A., and others (2020). Use of unmanned aerial vehicles for mark-resight nesting population estimation of adult female green sea turtles at Raine Island. *PLOS One*, 15(6), e0228524. <https://doi.org/10.1371/journal.pone.0228524>.
- Edgar, G.J., and others (2020). Establishing the ecological basis for conservation of shallow marine life using Reef Life Survey. *Biological Conservation*, 252, 108855. <https://doi.org/10.1016/j.biocon.2020.108855>.
- Ferreira-Airaud, B., and others (2022). The sea turtles of São Tomé and Príncipe: Diversity, distribution, and conservation status. In: *Biodiversity of the Gulf of Guinea Oceanic Islands: Science and Conservation*, L.M.P Ceriaco, R.F. de Lima, M. Melo, and R.C., eds. Bell. Springer Nature, Switzerland, pp 535–553.
- Figueroa, A., and others (2023). Singapore's herpetofauna: updated and annotated checklist, history, conservation, and distribution. *Zootaxa*, 5287(1), 1–378. <https://doi.org/10.11646/zootaxa.5287.1.1>.
- French, S.S., and others (2010). Human disturbance alters endocrine and immune responses in the Galapagos marine iguana (*Amblyrhynchus cristatus*). *Hormones and Behaviour*, 58(5), 792–799. <https://doi.org/10.1016/j.yhbeh.2010.08.001>.
- Fretey, J., and others (2023). From terra incognita to hotspot: The largest South Pacific green turtle nesting population in the forgotten reefs of New Caledonia. *Oryx*, 57(5), 626–636. <https://dx.doi.org/10.1017/S0030605323000108>.
- Fuentes, M.M.P.B., and others (2023). Key issues in assessing threats to sea turtles: Knowledge gaps and future directions. *Endangered Species Research*, 52, 303–341. <https://doi.org/10.3354/esr01278>.
- Fukuda, Y., and others (2020). Harvesting predators: Simulation of population recovery and controlled harvest of Saltwater Crocodiles *Crocodylus porosus*. *Wildlife Research*, 48(3), 252–263. <https://doi.org/10.1071/WR20033>.
- Fukuda, Y., and others (2022). Lost to the sea: Predicted climate change threats to Saltwater Crocodile nesting habitat. *Frontiers in Ecology and Evolution*, 10, 839423. <https://doi.org/10.3389/fevo.2022.839423>.

- Gilman, E., and others (2023). Bycatch-neutral fisheries through a sequential mitigation hierarchy. *Marine Policy*, 150, 105522. <https://doi.org/10.1016/j.marpol.2023.105522>.
- Good, S.D., and others (2024). Adapting the Marine Stewardship Council risk-based framework to estimate impacts on seabirds, marine mammals, marine turtles and sea snakes. *Marine Policy*, 163, 106118. <https://doi.org/10.1016/j.marpol.2024.106118>.
- Griffiths, S.P., and others (2024). Vulnerability of the Critically Endangered leatherback turtle to fisheries bycatch in the eastern Pacific Ocean. II. Assessment of mitigation measures. *Endangered Species Research*, 53, 295–326. <https://doi.org/10.3354/esr01305>.
- Gulick, A.G., and others (2022). Trends in abundance and reproductive success of the hawksbill turtle nesting population at Buck Island Reef National Monument, St. Croix, US Virgin Islands. *Endangered Species Research*, 48, 191–198. <https://doi.org/10.3354/esr01199>.
- Hays, G.C., and others (2024). A pulse check for trends in sea turtle numbers across the globe. *iScience*, 27, 109071. <https://doi.org/10.3389/fevo.2022.839423>.
- Hudgins, J.A., and others (2023). A brighter future? Stable and growing sea turtle populations in the Republic of Maldives. *PLoS One*, 18, e0283973. <https://doi.org/10.1371/journal.pone.0283973>.
- Jones, J.S., and others (2021). Plastic contamination of a Galapagos Island (Ecuador) and the relative risks to native marine species. *Science of The Total Environment*, 789, 147704. <https://doi.org/10.1016/j.scitotenv.2021.147704>.
- Kar, S. (2024). Fifty years of successful implementation of estuarine crocodile conservation and research programme in Bhitarkanika National Park, Odisha, India: An analysis. *Crocodile Specialist Group Newsletter*, 43(3), 10–17.
- Kwan, L. (2017). Crocodile spotted in Klang River. Retrieved from <http://www.worldofbuzz.com/crocodile-spotted-klang-river/>.
- Laloë, J.-O., and G.C. Hays (2023). Can a present-day thermal niche be preserved in a warming climate by a shift in phenology? A case study with sea turtles. *Royal Society Open Science*, 10(2), 221002. <https://doi.org/10.1098/rsos.221002>.
- Leader, N., and others (2024). Artificial light at night on nesting beaches of the green turtle, *Chelonia mydas*, in the eastern Mediterranean and its possible effect on populations. *Turkish Journal of Zoology*, 48(4), 203–210. <https://doi.org/10.55730/1300-0179.3176>.
- Lewis, R. L., and others (2014). Global patterns of marine mammal, seabird, and sea turtle bycatch reveal taxa-specific and cumulative megafauna hotspots. *Proceedings of the National Academy of Sciences*, 111:5271–5276. <https://doi.org/10.1073/pnas.131896011>.
- López-Castro, M.C., and others (2022). Trends in reproductive indicators of green and hawksbill sea turtles over a 30-Year monitoring period in the southern Gulf of Mexico and their conservation implications. *Animals*, 12, 3280. <https://doi.org/10.3390/ani12233280>.

- MacLeod, A., and S. Steinfartz (2016). The conservation status of the Galápagos marine iguanas, *Amblyrhynchus cristatus*: A molecular perspective. *Amphibia-Reptilia*, 37(1), 91–109. <https://doi.org/10.1163/15685381-00003035>.
- MacLeod, A., and others (2020a). *Amblyrhynchus cristatus* (errata version published in 2020). The IUCN Red List of Threatened Species 2020: e.T1086A177552193. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T1086A177552193.en>.
- MacLeod, A., and others (2020b). *Amblyrhynchus cristatus* ssp. *cristatus* (errata version published in 2020). The IUCN Red List of Threatened Species 2020: e.T152328291A177563889. <https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T152328291A177563889.en>.
- Manolis, C. (2005). Long-distance movement by a Saltwater Crocodile. *Crocodile Specialist Group Newsletter*, 24(4), 18.
- Marco, A., and others (2020). Sea turtle bycatch by different types of fisheries in southern Spain. *Basic and Applied Herpetology*, 34, 33–45. <https://doi.org/10.11160/bah.187>.
- Maxwell S.M., and others (2022). Potential impacts of floating wind turbine technology for marine species and habitats. *Journal of Environmental Management*, 307, 114577. <https://doi.org/10.1016/j.jenvman.2022.114577>.
- Miralles, A., and others (2017). Shedding light on the Imps of Darkness: An integrative taxonomic revision of the Galápagos marine iguanas (genus *Amblyrhynchus*). *Zoological Journal of the Linnean Society*, 181(3), 678–710. <https://doi.org/10.1093/zoolinnean/zlx007>.
- Mortimer, J.A., and M. Donnelly, eds. (2008). *Eretmochelys imbricata*. The IUCN Red List of Threatened Species 2008. e.T8005A12881238. <https://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T8005A12881238.en>.
- Mortimer, J.A., and others (2020). Estimates of marine turtle nesting populations in the south-west Indian Ocean indicate the importance of the Chagos Archipelago. *Oryx*, 54, 332–343. <https://doi.org/10.1017/S0030605319001108>.
- Muñoz-Pérez J.P., and others (2023). Galápagos and the plastic problem. *Frontiers in Sustainability*, 4, 1091516. <https://doi.org/10.3389/frsus.2023.1091516>.
- Nalovic, M., and others, eds. (2018). Sea Turtles in the North-West Atlantic & Caribbean Region MTSG Regional Report. Report of the IUCN-SSC Marine Turtle Specialist Group. https://static1.squarespace.com/static/5e4c290978d00820618e0944/t/5e4d93350c9a2e591ab353df/1582142262640/mtsg-annual-regional-report-2018_nw-atlantic-caribbean.pdf.
- Nelms, S. E., and others (2016). Seismic surveys and marine turtles: An underestimated global threat? *Biological Conservation*, 193, 49–65. <https://doi.org/10.1016/j.biocon.2015.10.020>.
- NOAA (2022). Climate Prediction Centre. Retrieved from https://origin.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php.

- Parke, E. (2015). Kimberley crocodile numbers triple in biggest survey in three decades. Retrieved from <http://www.abc.net.au/news/2015-08-16/biggest-croc-survey-in-30-years-shows-numbers-havetripled/6699532>.
- Patrício, A.R., and others (2021). Climate change and marine turtles: recent advances and future directions. *Endangered Species Research*, 44, 363–395. <https://doi.org/10.3354/esr01110>.
- Phillott, A.D., and A.F. Rees, eds. (2021). Sea Turtles in the Middle East and South Asia Region: MTSG Annual Regional Report 2021. Report of the IUCN-SSC Marine Turtle Specialist Group. https://static1.squarespace.com/static/5e4c290978d00820618e0944/t/6202b7a3558d77165b8d82f1/1644345273467/MTSG-RR_Middle-East-South-Asia_2021.pdf.
- Phillott, A.D., and others (2021). Are sea turtle hatcheries in India following best practices? *Herpetological Conservation and Biology*, 16, 652–670. https://www.herpconbio.org/Volume_16/Issue_3/Phillott_etal_2021.pdf.
- Pizzitutti, F., and others (2017). Scenario planning for tourism management: A participatory and system dynamics model applied to the Galapagos Islands of Ecuador. *Journal of Sustainable Tourism*, 25, 1117–1137. <https://doi.org/10.1080/09669582.2016.1257011>.
- Platt, S.G., and others (2015). Marine turtles and estuarine crocodiles in Lampi Marine National Park, Myanmar: A conservation and threat assessment with recommendations. *Herpetological Review*, 46, 319–327.
- Poti, M., and others (2021). Changing trends and perceptions of sea turtle egg consumption in Redang Island, Malaysia. *Ecology and Society*, 26, 14. <https://doi.org/10.5751/ES-12717-260414>.
- Putman, N.F., and others (2020). Managing fisheries in a world with more sea turtles. *Proceedings of the Royal Society B*, 287, 20200220. <http://dx.doi.org/10.1098/rspb.2020.0220>.
- Rao, C., and others (2021). Fisheries induced shift in sea snake community assemblages along the Konkan coast, India. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 31, 2402–2411. <https://doi.org/10.1002/aqc.3658>.
- Restrepo, J., and others (2023). Recent decline of green turtle *Chelonia mydas* nesting trend at Tortuguero, Costa Rica. *Endangered Species Research*, 51, 59–72. <https://doi.org/10.3354/esr01237>.
- Saalfeld, K., and others (2016). Management Program for the Saltwater Crocodile (*Crocodylus porosus*) in the Northern Territory of Australia, 2016–2020. Northern Territory Department of Environment and Natural Resources: Darwin.
- Saragih, G., and others (2020). A preliminary study on the population and habitat of Saltwater Crocodile (*Crocodylus porosus*) in Timor Island, East Nusa Tenggara. IOP Publishing, p. 012044.
- Savoca, M. S., and others (2020). Comprehensive bycatch assessment in US fisheries for prioritizing management. *Nature Sustainability*, 3(6), 472–480. <https://doi.org/10.1038/s41893-020-0506-9>
- Schuyler, Q., and others (2021). Chapter 6E Marine Reptiles. In *The Second World Ocean Assessment: World Ocean Assessment II (Volume 1)*. United Nations, New York. pp 198–209. <https://www.un.org/regularprocess/sites/www.un.org/regularprocess/files/2011859-e-woa-ii-vol-i.pdf>.

- Segniagbeto G.H., and others (2017). Sea turtle bycatch analysis revealed that site influenced mortality more than net types along the coast of Togo. *Vie et Milieu – Lide and Environment*, 67(3–4), 227–234.
- Senko, J.F., and others (2022). Global patterns of illegal marine turtle exploitation. *Global Change Biology*, 28, 6509–6523. <https://doi.org/10.1111/gcb.16378>.
- Shimada, T., and others (2021). Distribution and temporal trends in the abundance of nesting sea turtles in the Red Sea. *Biological Conservation*, 261, 109235. <https://doi.org/10.1016/j.biocon.2021.109235>.
- Shine, R., and others (2021). Population dynamics of the sea snake *Emydocephalus annulatus* (Elapidae, Hydrophiinae). *Scientific Reports*, 11, 20701. <https://doi.org/10.1038/s41598-021-00245-2>.
- Solmu, G., and others (2014). The ecological status of the *C. porosus* and *C. novaeguineae* wild populations trends in Papua New Guinea, 1981-2014. In *Proceedings of the 23rd Working Meeting of the IUCN-SSC Crocodile Specialist Group* (pp. 317–324). IUCN: Gland, Switzerland.
- Somaweera, R., and others (2021). Pinpointing drivers of extirpation in sea snakes: A synthesis of evidence from Ashmore Reef. *Frontiers in Marine Science*, 8(559), 658756. <https://doi.org/10.3389/fmars.2021.658756>.
- Speed, C. W., and others (2022). Video surveys of sea snakes in the mesophotic zone shed light on trends in populations. *Frontiers in Marine Science*, 9, 921542. <https://doi.org/10.3389/fmars.2022.921542>.
- Summers, T.M., and others (2018). Endangered green turtles (*Chelonia mydas*) of the Northern Mariana Islands: Nesting ecology, poaching, and climate concerns. *Frontiers in Marine Science*, 4, 428. <https://doi.org/10.3389/fmars.2017.00428>.
- Than, K.Z., and others (2024). Biodiversity conservation in Myanmar's coastal wetlands: Focusing on Saltwater Crocodile habitats and connectivity. *Biological Conservation*, 289, 110396. <https://doi.org/10.1016/j.biocon.2023.110396>.
- The Laúd OPO Network (2020). Enhanced, coordinated conservation efforts required to avoid extinction of critically endangered Eastern Pacific leatherback turtle. *Scientific Reports*, 10, 4772. <https://doi.org/10.1038/s41598-020-60581-7>.
- Touron, M., and others (2018). Final report on the green sea turtle egg-laying season of 2017-2018 (*Chelonia mydas*) on the atoll of Tetiaroa, French Polynesia. Te mana o te moana. p. 54. https://www.temanaotemoana.org/wp-content/uploads/2019/03/EN_2017_2018S_Green_sea_turtles_nesting_sites_Tetiaroa_FINAL_REPORT.pdf.
- Udyawer, V., and others (2016). Coming up for air: thermal-dependence of dive behaviours and metabolism in sea snakes. *The Journal of Experimental Biology*, 219, 3447–3454. <https://doi.org/10.1242/jeb.146571>.
- Udyawer, V., and others (2018). Future directions in the research and management of marine snakes. *Frontiers in Marine Science*, 5, 399. <https://doi.org/10.3389/fmars.2018.00399>.
- Valdivia, A., and others (2019). Marine mammals and sea turtles listed under the US Endangered Species Act are recovering. *PloS One*, 14(1), e0210164. <https://doi.org/10.1371/journal.pone.0210164>.

- Van der Ploeg, J., and others (2019). Human-crocodile conflict in Solomon Islands. Penang, Malaysia: WorldFish. Program Report: 2019-02.
- Varela-Jaramillo, A., and others (2023). A pilot study to estimate the population size of endangered Galápagos marine iguanas using drones. *Frontiers in Zoology*, 20, 4. <https://doi.org/10.1186/s12983-022-00478-5>.
- Wallace, B.P., and others (2013). Impacts of fisheries bycatch on marine turtle populations worldwide: toward conservation and research priorities. *Ecosphere*, 4(3), 40. <http://dx.doi.org/10.1890/ES12-00388.1>.
- Wallace B.P, and others (2016). Chapter 39 Marine Reptiles In *The First Global Integrated Marine Assessment: World Ocean Assessment I*. United Nations, New York. pp 14. https://www.un.org/depts/los/global_reporting/WOA_RPROC/Chapter_39.pdf.
- Wallace, B.P., and others (2023). Marine turtle regional management units 2.0: An updated framework for conservation and research of wide-ranging megafauna species. *Endangered Species Research*, 52, 209–223. <https://doi.org/10.3354/esr01243>.
- Wallace, B.P. and others (2025). Updated global conservation status and priorities for marine turtles. *Endangered Species Research*, 56, 247–276. <https://doi.org/10.3354/esr01385>.
- Walsh, S.J., and C.F. Mena (2016). Interactions of social, terrestrial, and marine sub-systems in the Galapagos Islands, Ecuador. *Proceedings of the National Academy of Sciences*, 113, 14536–14543. <https://doi.org/10.1073/pnas.1604990113>.
- Webb, G.J.W., and others (2018). Saltwater Crocodile *Crocodylus porosus*. In Manolis, S.C. and Stevenson, C., eds., *Crocodiles*. Status Survey and Conservation Action Plan, Fourth Edition, pp. 20. Crocodile Specialist Group: Darwin.
- Webb, G.J.W., and others (2021). *Crocodylus porosus*. The IUCN Red List of Threatened Species. e.T5668A3047556. <https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T5668A3047556.en>.
- Wibbels, T., and E. Bevan (2019). *Lepidochelys kempii* (errata version published in 2019). The IUCN Red List of Threatened Species. e.T11533A155057916. <https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T11533A155057916.en>.
- Wikelski, M., and others (2002). Marine iguanas die from trace oil pollution. *Nature*, 417, 607–608. <https://doi.org/10.1038/417607a>.
- Wikelski, M. and K. Nelson (2004). Conservation of Galápagos Marine Iguanas (*Amblyrhynchus cristatus*). *Iguana*, 11(4), 190–197. <https://journals.ku.edu/iguana/article/view/17148>.
- Wildlife Management International (2018). Results of Spotlight and Helicopter Surveys of Crocodiles in Cambridge Gulf, Lake Argyle and Lake Kunnunurra, 2008. Unpublished report to WA Department of Environment and Conservation, Perth.
- Williams, and others, (2022). Noise from deep-sea mining may span vast ocean areas. *Science* 377,157–158. <https://doi.org/10.1126/science.abo2804>.

Yaghmour, F., and others (2022). Oil spill causes mass mortality of sea snakes in the Gulf of Oman. *Science of The Total Environment*, 825, 154072. <https://doi.org/10.1016/j.scitotenv.2022.154072>.