PREMLIMINARY EDITS TO THE:

EXECUTIVE SUMMARY: MARINE TURTLES

Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi

Status of marine turtles in the Indian Ocean

TABLE 1. Marine turtles: IUCN threat status for all marine turtle species reported as caught in fisheries within the IOTC area of competence.

Common name	Scientific name	IUCN threat status[1]
Flatback turtle	*Natator depressus*	Data deficient
Green turtle	*Chelonia mydas*	Endangered
Hawksbill turtle	*Eretmochelys*	Critically Endangered
Leatherback turtle	*Dermochelys coriacea*	Vulnerable
Loggerhead turtle	*Caretta caretta*	Endangered
Olive Ridley turtle	*Lepidochelys olivacea*	Vulnerable

Sources: Marine Turtle Specialist Group 1996, Red List Standards & Petitions Subcommittee 1996, Sarti Martinez (Marine Turtle Specialist Group) 2000, Seminoff 2004, Abreu-Grobois & Plotkin 2008, Mortimer et al. 2008, IUCN 2014, The IUCN Red List of Threatened species. Version 2015.2 <www.iucnredlist.org>. Downloaded on 15 July 2015.

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. No assessment has been undertaken by the IOTC WPEB for marine turtles due to the lack of data being submitted by CPCs. However, the current International Union for Conservation of Nature (IUCN) threat status for each of the marine turtle species reported as caught in IOTC fisheries to date is provided in Table 1. It is important to note that a number of international global environmental accords (e.g. Convention on Migratory Species (CMS), Convention on Biological Diversity (CBD)), as well as numerous fisheries agreements obligate States to provide protection for these species. In particular, there are now 35 Signatories to ~~and that marine turtle are under the Indian Ocean and South East Asia~~ the Memorandum of ~~u~~Understanding ~~for~~on the C~~c~~onservation and Management of M~~m~~arine T~~t~~urtles and their H~~h~~abitats of the Indian Ocean and South-East Asia (IOSEA MoU). Of the 35 Signatories to the IOSEA MoU, 23 are also members of the IOTC. While the status of marine turtles is affected by a range of factors such as degradation of ~~nesting beaches~~marine turtle natural habitats and targeted harvesting of eggs and turtles, the level of mortality of marine turtles due to capture by gillnets is likely to be substantial as shown by the Ecological Risk Assessment undertaken in 2012/13, and an order of magnitude higher than longline and purse seine gears for which mitigation measures are in place.

Outlook. Resolution 12/04 *On the conservation of marine turtles* includes an annual evaluation requirement (para. 17) by the Scientific Committee (SC). However, given the lack of reporting of marine turtle interactions by CPCs to date, such an evaluation cannot ~~not~~ be undertaken. Unless IOTC CPCs become compliant with the data collection and reporting requirements for marine turtles, the WPEB and the SC will continue to be unable to address this issue. Notwithstanding this, it is acknowledged that the impact on marine turtle populations from fishing for tuna and tuna-like species may increase if fishing pressure increases, or if the status of the marine turtle populations worsens due to other factors such as an increase in fishing pressure from other fisheries or anthropological or climatic impacts.

The following should be noted:

- The available evidence indicates considerable risk to marine turtles in the Indian Ocean.
- The primary source of data that drive the ability of the WPEB to determine~~ation~~ a status for the Indian Ocean, total interactions by fishing vessels, is highly uncertain and should be addressed as a matter of priority.
- Current reported interactions are known to be a severe underestimate: 39 interactions reported in 2010 by 3 CPCs.
- ~~The Ecological Risk Assessment conducted by Nel et al. (2013) concluded that,~~ F~~f~~rom the limited data received ~~on longlining and purse seining~~, ~~the former~~ longlining posed the greater apparent risk to marine

[1] The process of the threat assessment from IUCN is independent from the IOTC and is presented for information purpose only

turtles. The ERA estimated that ~3,500 marine turtles are caught by longliners annually, while it was estimated that ~~followed by~~ ~250 turtles p.a. are observed in purse seine operations, 75% being released alive~~d~~ (Bourjea et al. 2014). The Ecological Risk Assessment conducted by Nel et al. (2013) ~~concluded that,~~set out ~~T~~two separate approaches to estimate gillnet impacts on marine turtles, based on very limited data. The first~~,~~ calculated that 52,425 turtles p.a. and the second~~or~~ that 11,400–47,500 turtles p.a. are caught in gillnets (with a mean of the two methods being 29,488 turtles p.a.). Anecdotal/published studies reported values of >5000–16,000 marine turtles p.a. for each of India, Sri Lanka and Madagascar. Of these reports, green turtles are under the greatest pressure from gillnet fishing, constituting 50–88% of catches for Madagascar. Loggerhead, hawksbill and olive Ridley turtles are caught in varying proportions depending on the region.

- Maintaining or increasing fishing effort in the Indian Ocean without appropriate mitigation measures in place, will likely result in further declines in the number of individuals~~biomass~~.
- That appropriate mechanisms are developed by the Compliance Committee to ensure CPCs comply with their data collection and reporting requirements for marine turtles.

APPENDIX I

SUPPORTING INFORMATION

(Information collated from reports of the Working Party on Ecosystems and Bycatch and other sources as cited)

CONSERVATION AND MANAGEMENT MEASURES

Marine turtles in the Indian Ocean are currently subject to a number of Conservation and Management Measures adopted by the Commission:

- Resolution 13/03 *on the recording of catch and effort by fishing vessels in the IOTC area of competence*
- Resolution 12/04 *on the conservation of marine turtles* recognizes the threatened status of the populations of the six marine turtle species found in the Indian Ocean and that some tuna fishing operations carried out in the Indian Ocean can adversely impact marine turtles. This resolution makes mandatory the collection and provision of data on marine turtle interactions and the use of best handling practices to ensure the best chances of survival for any marine turtles returned to the sea after capture.
- Resolution 11/04 *on a Regional Observer Scheme* requires data on marine turtle interactions to be recorded by observers and reported to the IOTC within 150 days. The Regional Observer Scheme (ROS) started on 1st July 2010, and aims to collect scientific observer data on catch and bycatch on, at least, 5% of the fishing operations of vessel over 24 m and vessel under 24 m fishing outside their EEZ. The requirement under Resolution 11/04 in conjunction with the reporting requirements under Resolution 12/04, means that all CPCs should be reporting marine turtle interactions as part of their annual report to the Scientific Committee.

Extracts from Resolutions 11/04 and 12//04

RESOLUTION 11/04 ON A REGIONAL OBSERVER SCHEME

Para. 10. Observers shall:

b) Observe and estimate catches as far as possible with a view to identifying catch composition and monitoring discards, by-catches and size frequency;

RESOLUTION 12/04 ON MARINE TURTLES

Para. 3. CPCs shall collect (including through logbooks and observer programs) and provide to the IOTC Secretariat no later than 30 June of the following year in accordance with Resolution 10/02 (or any subsequent revision), all data on their vessels' interactions with marine turtles. The data shall include the level of logbook or observer coverage and an estimation of total mortality of marine turtles incidentally caught in their fisheries.

Para. 7. CPCs with gillnet vessels that fish for species covered by the IOTC Agreement shall:

a) require that operators of such vessels record all incidents involving marine turtles during fishing operations in their logbooks[1] and report such incidents to the appropriate authorities of the CPC.

Para. 8. CPCs with longline vessels that fish for species covered by the IOTC Agreement shall:

…

c) require that operators of such vessels record all incidents involving marine turtles during fishing operations in their logbooks[1] and report such incidents to the appropriate authorities of the CPC

Para. 9. CPCs with purse seine vessels that fish for species covered by the IOTC Agreement shall:

…

c) require that operators of such vessels record all incidents involving marine turtles during fishing operations in their logbooks[1] and report such incidents to the appropriate authorities of the CPC

[1] This information should include where possible, details on species, location of capture, conditions, actions taken on board and location of release.

INDICATORS

Biology and ecology

Six species of marine turtles inhabit the Indian Ocean and likely interact with the fisheries for tuna and tuna-like species. The following section outlines some key aspects of their biology, distribution and historical exploitation.

Flatback turtle

The flatback turtle (*Natator depressus*) gets its name from its relatively flat, smooth shell, unlike other marine turtles which have a high domed shell. Flatback turtles does not have an oceanic dispersal phase for its small post-hatchlings. It has one of the ~~have the~~ smallest distribution for ~~migratory range of any~~ marine turtles ~~species~~ and ~~th~~is restricted ~~range means that the flatback turtle is vulnerable to habitat loss, especially breeding sites~~to the Australian continental shelf and adjacent countries of Australia, Indonesia and Papua New Guinea~~.~~. Table 2 outlines some of the key life history traits of flatback turtles.

TABLE 2. Biology of the flatback turtle (*Natator depressus*).

Parameter	Description
Range and stock structure	Flatback turtles ~~are found~~ forage ~~in~~ in northern coastal areas, from Western Australia's ~~Kimberley region~~ Ningaloo Coast across Northern Australia through ~~to the~~ Torres Strait ~~extending as far~~and as south to Hervey Bay~~as the Tropic of Capricorn~~ and acros~~so~~s the Arafura Sea to ~~. Feeding grounds also extend to the~~ Indonesia~~n~~ ~~Archipelago~~ and the northern Coral Sea along southern Papua New Guinea ~~Coast~~. Nesting by ~~fF~~latback turtles is only known from Australia with five separate genetic stocks recognised.~~Flatback turtles have the smallest migratory range of any marine turtle species, though they do make long reproductive migrations of up to 1300 km~~. Small post-hatchling flatbacks feed on zooplankton (in cluding *Velella*, lobster larvae, and *Lepas*) at the surface in coastal waters. As large immature and adult turtles they feed~~ing~~ on soft bottom habitats where they feed~~Although flatback turtles do occur in open seas, they are common in inshore waters and bays where they feed on the soft-bottomed seabed.It is carnivorous, feeding mostly~~ on soft-bodied prey such as sea pens, sea cucumbers, soft corals and~~,~~ jellyfish.~~, molluscs and prawns.~~
Longevity	Oldest individuals recorded to at least 50 years of age~~Unknown~~
Maturity (50%)	Unknown
Spawning season	Many females nest every 1 to 5 years, one to four times a season (mean = 2.8), laying clutches of between 30~~50~~ and 8~~6~~0 eggs. Populations nesting in western and eastern Australia breed during the summer while the populations nesting across northern Australia breed predominantly in the winter and spring.~~The flatback turtle nests exclusively along the northern coast of Australia.~~
Size (length and weight)	The flatback turtle is a medium-sized marine turtle, growing to up to 0.9~~one~~ meter long and weighing up to 7~~9~~0 kg.

Sources: Mortimer 1984, FAO 1990; Limpus 2007

Green turtle

The green turtle (*Chelonia mydas*) is the largest of all the hard-shelled marine turtles and is one of the most widely distributed and commonest of the marine turtle species in the Indian Ocean. The Indian Ocean hosts some of the largest nesting populations of green turtles in the world, particularly on oceanic islands in the southwest Indian Ocean and on islands in South East Asia. Many of these populations are now recovering after intense exploitation in the last century that greatly reduced the populations; some populations are however still declining.

~~During the 18th, 19th and 20th centuries intense exploitation of green turtles provided onboard red meat for sustained cruises of sailing vessels before the time of refrigeration, as well as meat and calipee (i.e. yellow glutinous/cartilage part of the turtle found next to the lower shell) for an international market. Several nesting populations in the Indian Ocean were devastated as a result.~~ Table 3 outlines some of the key life history traits of green turtles.

TABLE 3. Biology of the green turtle (*Chelonia mydas*).

Parameter	Description
Range and stock structure	Globally distributed and generally found in tropical and subtropical waters along continental coasts and islands between 30°N and 30°S. Green turtles primarily use three types of habitat: open beaches (for nesting), convergence zones in the open ocean (oceanic stage juveniles and migratory adults for reproduction), and benthic feeding grounds in coastal areas (neritic stage juveniles and adults). Adults migrate from foraging areas to mainland or island nesting beaches and may travel hundreds or thousands of kilomet~~er~~res (up to 3500 km) each way. After emerging from the nest, hatchlings swim offshore, where they are believed to drift~~caught up~~ in major oceanic current systems and live for several years, feeding close to the surface on a variety of pelagic plants and animals. Once the juveniles reach a certain age/size range, they leave the pelagic habitat and travel to nearshore foraging grounds. Adult green turtles are unique among marine turtles in that they are herbivorous, feeding on seagrasses and algae beds.
Longevity	Unknown, but it is believed that they ~~live~~get up to 60-80 years old
Maturity (50%)	Exact age is unknown, it is believed that sexual maturity is reached between 25 and 30+ years
Spawning season	Females return to their natal beaches (i.e. the same beaches where they were born) every 2 to 4 years to nest, laying 3 to 5 ~~several~~ clutches of about 125 eggs at roughly 14-day intervals ~~several times in a~~during one~~a~~ nesting season. Nesting seasons can change throughout the year (i.e. winter vs summer) according to the nesting site locations in the Indian Ocean (e.g. Summer time south of the Mozambique Channel, winter time north of the Mozambique Channel).
Size (length and weight)	The largest of all the hard-shelled marine turtles, with an average ~~size~~length of 110 cm and average weight of 145kg~~growing up to 1.2 m long and weighing 130–160 kg~~.

Sources: Mortimer 1984, FAO 1990, Dalleau et al. 2012, Bourjea, 2015

Hawksbill turtle

The hawksbill turtle (*Eretmochelys imbricata*) is a small to medium-sized ~~compared to other~~ marine turtle ~~species and is although~~ generally ~~not~~ found in ~~large~~ low concentrations, ~~are~~ but widely distributed in the Indian Ocean. The keratinous (horn-like) scales covering the carapace and plastron ~~scutes of the hawksbill~~ are known as "tortoise shell," have been regarded as a semi-precious material for centuries and ~~they were~~ sought after for manufacture of diverse articles on most continents~~in both the Orient and Europe~~. ~~In modern times hawksbill turtles are solitary nesters (although some scientists postulate that before their populations were devastated they may have nested on some beaches in concentrations) and thus, determining population trends or estimates on nesting beaches is difficult.~~ The global trade in hawksbill shell ~~On that way,~~ significantly reduced ~~this species was probably the most impacted of all marine turtle species by human activities and there for present the smallest global~~ populations throughout the range~~, making difficult determining population trends or estimates on nesting beaches.~~ Fortunately, the species responds well to long term protection of nesting females and eggs at the nesting beach, and ~~D~~decades of such ~~long~~ protection ~~programs in some places, particularly~~ at several ~~beaches~~ sites in the Indian Ocean, have resulted in local population recovery. Table 4 outlines some of the key life history traits of hawksbill turtles.

TABLE 4. Biology of the hawksbill turtle (*Eretmochelys imbricata*).

Parameter	**Description**
Range and stock structure	Circumtropical, typically occurring from 2~~3~~0° throughout the range ~~N~~ to 2~~3~~0°S latitude. Adult hawksbill turtles are capable of migrating long distances between nesting beaches and foraging areas, but on average make shorter migrations than do ~~which are generally shorter to migrations of~~ green and loggerhead turtles. Hawksbill turtles use a variety of ~~different~~ habitats depending on the ~~at different~~ stages of their life cycle, but are most commonly associated with coral reefs. Post-hatchlings (oceanic stage juveniles) are believed to occupy the same pelagic environment ~~such~~ as do post-hatchling green turtles ~~post-hatchling~~. After a few years in the pelagic zone, small juveniles (carapace lengths of ~30 cm) recruit to coastal benthic foraging grounds. This shift in habitat also involves a shift in feeding strategies, from benthic ~~feeding~~ opportunistically, primarily at the surface to feeding from a variety of substrates~~below the surface,~~ primarily on sponges, anthozoans, tunicates, other relatively soft-bodied invertebrates and algae~~animals associated with coral reef environments~~. Their narrow, pointed beaks allow them to prey selectively ~~on~~ in crevices~~soft-bodied animals like sponges and soft corals~~.
Longevity	Indo-Pacific hawksbills probably live for a total of about 60 to 70 years.~~Unknown~~
Maturity (50%)	Hawksbills can take 25 to 40 years to reach sexual maturity, and typically reproduce for another 10 to 30 years.~~Unknown~~
Spawning season	Female hawksbills ~~turtles~~ return to their natal beaches to nest at intervals of ~~every~~ 2–3 years in the Western Indian Ocean; but this can vary throughout the range~~to nest~~. A female typically ~~may~~ lays 3-5, egg clutches ~~or more, nests~~ in a season, each with an ~~which contain an~~ average of 70-170 ~~130~~ eggs depending on geographic location. Some of ~~T~~the largest national nesting populations of hawksbill turtles occur in or around the Indian Ocean especially~~(which are among the largest in the world) occur~~ in the Seychelles, Indonesia and Western Australia. Nesting generally takes place during the warmest months of the year.
Size (length and weight)	In the Indian Ocean, adults weigh around 60 kg ~~45 to 70 kg,~~ but can grow to as large as 90 kg for an average size of 90cm.

Sources: Mortimer 1984, FAO 1990, Mortimer & Donnelly 2008,

Leatherback turtle

The leatherback turtle (*Dermochelys coriacea*) is the largest turtle and the most widely distributed living reptile in the world. The leatherback turtle is the only marine turtle that ~~lacks a~~has no hard shell: there are no large external keratinous scutes and the underlying bony shell is composed of a mosaic of hundreds of tiny bones. Table 5 outlines some of the key life history traits of leatherback turtles.

TABLE 5. Biology of the leatherback turtle (*Dermochelys coriacea*).

Parameter	**Description**
Range and stock structure	The leatherback turtle ~~is the most wide-ranging marine turtle species, and~~ regularly migrates enormous distances, e.g. between the Indian and south Atlantic Oceans. They are commonly found in pelagic areas, but they also forage in coastal waters in certain areas. The distribution and developmental habitats of juvenile leatherback turtles are poorly understood. While the leatherback turtle is not as common in the Indian Ocean as other species, important nesting populations are found in and around the Indian Ocean, including in Indonesia, South Africa, South Mozambique, Sri Lanka and India's Andaman and Nicobar Islands. Adults are capable of tolerating water temperatures well below tropical and subtropical conditions, and special physiological adaptations allow them to maintain body temperature above cool water temperatures. They specialise on soft bodied invertebrates found in the water column, particularly jelly fish and other sorts of "jellies."
Longevity	Unknown
Maturity (50%)	Exact age is unknown, it is believed that sexual maturity is reached at around 15 years
Spawning season	Females lay clutches of approximately 100 eggs on sandy, tropical beaches. They nest 6–8 times during a nesting season. Nesting season is during the summer time in South Africa and Mozambique
Size (length and weight)	Mature males and females have an average size of 1.7meters ~~can grow to 2 m and weigh almost 900 kg~~for an average weight of 450 kg (record at 918 kg).

Sources: FAO 1990, Nel 201~~3~~2

Loggerhead turtle

The loggerhead turtle (*Caretta caretta*) is globally distributed and the species is known to be heavily impacted by longline fisheries worldwide. The hatchlings and juveniles are pelagic, living in the open ocean and have the ability to undertake long trans-hemispheric migrations from the S~~s~~outh to the N~~n~~orth Indian Ocean, ~~with suspicious of~~assuming a development cycle ~~at the scale of~~within the entire Indian Ocean. Adults forage in coastal areas, ~~or~~ near shallow sea mounts or in the open sea. Key nesting sites in the Indian Ocean are found in Oman, South Africa and West Australia. The ~~L~~loggerhead turtle is known to be the most impacted by longline fishing~~ing~~ in the world. Table 6 outlines some of the key life history traits of loggerhead turtles.

TABLE 6. Biology of the loggerhead turtle (*Caretta caretta*).

Parameter	Description
Range and stock structure	Circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Studies in the Atlantic and Pacific Oceans show that loggerhead turtles can spend decades living on the high seas, crossing from one side of an ocean basin to another before taking up residence on benthic coastal waters. Adults are capable of migrating long distances between nesting beaches and foraging areas and late stage juveniles have also been shown to undertake extensive migrations. Their enormous heads and powerful jaws enable them to crush large marine molluscs, on which they specialise.
Longevity	Unknown
Maturity (50%)	Exact age is unknown, it is believed that sexual maturity is reached between 12 and 30 years. Age at maturity was estimated at 21.6 years in Tongaland, South Africa, through tagging studies.
Spawning season	Many females nest every 2 to 3 year, three to four times a season, laying clutches of approximately 40 to 190 eggs. Loggerhead turtles nest in relatively few countries in the Indian Ocean and the number of nesting females is generally small, except on Masirah Island (Sultanate of Oman) which supports one of only two loggerhead turtles nesting beaches in the world that have greater than 10,000 females nesting per year.
Size (length and weight)	Mature males and females may grow to over one meter long and weigh around 110 kg or more.

Sources: FAO 1990, Lewison et al., 2004, Rees et al. 2010, Dalleau et al. 2013, Hamann et al. 2013

Olive Ridley turtle

The olive Ridley turtle (*Lepidochelys olivacea*) is considered the most abundant marine turtle in the world, with an estimated 800,000 nesting females annually. The olive Ridley turtle has one of the most extraordinary nesting habits in the natural world. Large groups of turtles gather off-shore of nesting beaches. Then, all at once, vast numbers of turtles come ashore and nest in what is known as an "arribada". During these arribadas, hundreds to thousands of females come ashore to lay their eggs at the same time. In the northern Indian Ocean, arribadas occur on three different beaches along the coast of Orissa, India. Gahirmatha used to be one of the largest arribada nesting sites in the world. However, arribada nesting events have been less frequent there in recent years and the average size of nesting females has been smaller, indicative of a declining population. Declines in solitary nesting of olive Ridley turtles have been recorded in Bangladesh, Myanmar, Malaysia, and Pakistan. In particular, the number of nests in Terengganu, Malaysia has declined from thousands of nests to just a few dozen per year. Solitary nesting also occurs extensively throughout this species' range. Despite the enormous numbers of olive Ridley turtles that nest in Orissa, this species is not generally common throughout much of the Indian Ocean. Table 7 outlines some of the key life history traits of olive Ridley turtles.

TABLE 7. Biology of the olive Ridley turtle (*Lepidochelys olivacea*).

Parameter	Description
Range and stock structure	The olive Ridley turtle is globally distributed in the tropical regions of the South Atlantic, Pacific, and Indian Oceans. It is mainly a pelagic species, but it has been known to inhabit coastal areas, including bays and estuaries. Olive Ridley turtles often migrate great distances between feeding and breeding grounds. They have an annual migration from pelagic foraging, to coastal breeding and nesting grounds, back to pelagic foraging. They can dive to depths of about 150 m to forage.
Longevity	unknown
Maturity (50%)	Reach sexual maturity in around 15 years, a young age compared to some other marine turtle species.
Spawning season	Many females nest every year, once or twice a season, laying clutches of approximately 100 eggs. Arribadas occur at the beginning of each year in India~~n~~, from January to March.
Size (length and weight)	Adults are relatively small, weighing on average around 70~~45~~ kg at~~for~~ an average length~~-size~~ of 90 cm. As with other species of marine turtles, their size and morphology varies from region to region.

Sources: Mortimer 1984, FAO 1990

Availability of information on the interactions between marine turtles and fisheries for tuna and tuna-like species in the Indian Ocean

The IOTC has implemented data collection measures using onboard observers to better understand the nature and extent of the interactions between fisheries for tuna and tuna-like species in the Indian Ocean and marine turtles. Subsequently, IOTC members have implemented a number of national observer programmes that are providing information on the levels of marine turtle bycatch. Observer data from all fleets and gears remains very low with only Australia, China, the EU, Japan, the Republic of Korea and South Africa reporting levels of marine turtle interactions to date (Table 8). Data from other sources and in other regions indicate that threats to marine turtles are highest from gillnets and longline gear, and to a lesser extent purse-seine gear.

TABLE 8. Members and Cooperating non-Contracting Parties reporting of marine turtle interactions for the years 2008–2013 to the IOTC.

CPCs		2008	2009	2010	2011	2012	2013	2014	Sourc
Australia		4	7	1	0	1	0		Observer data:IOTC-
Belize		0	0	0					
China		0	0	0	0	0	0		Observer data: submi 2012,2013) and IOTC NR03_Rev1
Taiwan,China		32	84	4	4	14	7		Observer data: letter t 2013), Report for SC1
Comoros									
European Union*	LL	16 (ESP)	0 (ESP)	0 (ESP)	0 (ESP) 2(PRT) 4(FRA)	0 (ESP) 7(PRT) 4(FRA)	27 (ESP) 17(PRT) 2(UK) 4(FRA)		ESP,PRT(2013),UK: 2014-SC17-NR06) PRT (2011-2012) & F observer data
	PS	250 (SD=157)	250 (SD=157)	250 (SD=157)	250 (SD=157)	3(EU, France)	159		Average number of o extrapolated to total f 2008-2011:EU,France France,OT (~~IOTC-20 35_Rev_1; IOTC-201~~ et al 2014). NB: Approximately 7 released alive. 2012: unextrapolated 2013: extrapolated ob and France,OT (Disc 2014-SC17-NR07 and
Eritrea									
France (territories)[2]		See EU purse seine fleet				4 (OT, France)	as EU PS		See EU Purse Seine
Guinea									
India									
Indonesia		51 & 71 caught during 2 observer trips					6+25		Observer data IOTC-2
Iran, Islamic Republic of					2	24			Port-sampling data IOTC-2013-WPEB09
Japan				14	0	2	1		Observer data: submi 2012) and IOTC-2014
Kenya									
Korea, Republic of			36	0		0	1		Observer data: IOTC-
Madagascar						4kg	0		Observer data: IOTC-
Malaysia						0			
Maldives, Republic of			0	0	0	0	93		*"observed annul catc*

[2] Extrapolated PS data reported were provided aggregated for EU and France OT. In 2012 no extrapolations were available so observer data reported separately for EU.FRA and FRA(OT) are shown.

								2014-SC17-NR17 2013: discard form
Mauritius					0			
Mozambique					0			No interactions report Secretariat (2012). Ob
Oman, Sultanate of								
Pakistan								
Philippines	0	0	0		0	0		*"no reported interact* SC17-NR22
Seychelles						0		"*…not reported any i* *turtles via logbook"*. NR23
Sierra Leone								
Somalia								
Sri Lanka						25		Sample data: IOTC-2
Sudan								
Tanzania								*"There is no informa* *to* *interaction between s* *fishery"* IOTC-2014-
Thailand								
United Kingdom (OT)	0	0	0	0	0	0		Discard forms for the
Vanuatu			0					
Yemen								
Cooperating Non-Contracting Parties								
Djibouti								
Senegal								No 200
South Africa	15	13	24	14	4	95		Dis fore

Green = CPC reported level of marine turtle interactions; Red = CPC did not report level marine turtle interactions

Purse seine

European Union observers (covering on average 5% of the operations annually from 2003 to 2007) reported 74 marine turtles caught by EU,France and EU,Spain purse seiners over the period 2003–2007[3]. The most common species reported was olive Ridley, green and hawksbill turtles, and these were mostly caught on log (natural Fish Aggregation Devices – FAD) sets and returned to the sea alive (although there is no systematic information on survivorship after release). Mortality levels of marine turtles due to entanglement in drifting FADs set by the fishery are still unknown and need to be assessed. The EU has indicated that its purse-seine fleet is making progress towards improved FAD designs aimed at reducing the incidence of entanglement of marine turtles, including the use of biodegradable materials. EU,France has indicated that it is already deploying FADs that are likely to reduce the entangled of marine turtles in both the Atlantic and Indian Oceans, while EU,Spain has indicated that it will conduct experiments in the Atlantic Ocean on several FADs designs aimed at reducing the incidence of entanglement of marine turtles, before recommending a final FAD design to replace current FADs. Data collected through observer programs from 1995 to 2011 on purse seine fishing operations suggested that the purse-seine fishery has a low impact on marine turtles with an estimated 240 (SD=157) individuals incidentally captured annually[4]. This study suggested that drifting FADs, considered a critical conservation issue for this fishery, may play a key role in the aggregation of juvenile turtles and could be improved by avoiding entangling devices such as nets. Nevertheless, initial results suggest that this is not the main source of incidental captures of marine turtles in this fishery.

Longline

There is limited information on the interactions of longline fleets in the IOTC with marine turtles and~~d and~~ it is not known if this fishing activity represents a serious threat, as is the case in most other regions of the world.

[3] IOTC-2008-WPEB-08
[4] Bourjea et al. 2014

The South African longline fleets have reported that marine turtle bycatch mainly comprises predominantly leatherback turtles, with lesser amounts of loggerhead, hawksbill and green turtles[5]. Estimated average catch rates of marine turtles ranged from 0.005 to 0.3 marine turtles per 1000 hooks and varied by location, season and year. The highest catch rate reported in one trip was 1.7 marine turtles per 1000 hooks in oceanic waters. Over the period 1997 to 2000, the Programme Palangre Réunionnais[6] examined marine turtle bycatch on 5,885 longline sets in the vicinity of Reunion Island (19-25° S, 48-54° E). The fishery caught 47 leatherback, 30 hawksbill, 16 green and 25 unidentified marine turtles, equating to an average catch rate of less than 0.02 marine turtles per 1000 hooks over the 4 year study period.

The Fishery Survey of India (FSI) carried out a survey covering the whole Indian EEZ using four longline vessels from 2005 to 2009. During this period around 800,000 hooks were deployed in the Arabian Sea, in the Bay of Bengal and in the waters of Andaman and Nicobar. In total 87 marine turtles (79 olive Ridley, 4 green and 2 hawksbill turtles) were caught. Catch rates were: 0.302 marine turtles per 1000 hooks in the Bay of Bengal area, 0.068 marine turtles per 1000 hooks in the Arabian Sea and 0.008 marine turtles per 1000 hooks in the Andaman and Nicobar waters. The highest occurrence of incidental catches in the Bay of Bengal area is probably due to the large abundance of olive Ridley turtles whose main nesting ground in the Indian Ocean is on the east coast of India, in the Orissa region.

Gillnets

Due to the nature of this gear, the incidental catch of marine turtles is thought to be relatively high compared to that of purse-seine and longline gears, however, quantitative data for this gear type are almost non-existent. While the IOTC currently has virtually no information on interactions between marine turtles and gillnets, the IOSEA database indicates that the coastal mesh net fisheries occur in about 90% of IOSEA Signatory States in the Indian Ocean, and the fishery is considered to have a moderate to relatively high impact on marine turtles in about half of those IOSEA member States. Given the widespread abundance of mesh net fisheries in the Indian Ocean, there is clearly an urgent need for careful, systematic information to be collected and report on this gear type and its impacts on marine turtles.

Other data sources

The IOTC and the Indian Ocean – South-East Asian Marine Turtle Memorandum of Understanding (IOSEA), an agreement under the Convention on Migratory Species, are actively collecting a range of information on fisheries and marine turtle interactions. The IOSEA database covers information from a wider range of fisheries and gears than those held by the IOTC. The IOSEA Online Reporting Facility[7] compiles information through IOSEA National Reports on potential marine turtle fisheries interactions, as well as various mitigation measures put in place by its Signatory States and collaborating organisations. For example, members provide information on fishing effort and perceived impacts of fisheries that may interact with marine turtles, including longlines, purse seines, FADs, and gillnets. While the information is incomplete for some countries and is generally descriptive rather than quantitative, it has begun to provide a general overview of potential fisheries interactions as well as their extent. No information is available for China, Taiwan,China, Japan, Rep. of Korea (among others) which are not yet signatories to IOSEA. Information is also provided on such mitigation measures as appropriate handling techniques, gear modifications, spatial/temporal closures etc. IOSEA is collecting all of the above information with a view to providing a regional assessment of member States' compliance with the FAO Guidelines on reducing fisheries interactions with marine turtles.

It is also useful to compare the impact of large scale fisheries on marine turtles in the overall context and to highlight that other fisheries, such as the artisanal fishery, may have a greater impact on marine turtles than industrial fisheries. A recent study showed for example that the annual turtle catch in the south-western province of Tulear (Madagascar) alone is between 10,000 and 16,000 (Humber et al., 2010). Another recent study estimated that 5,900 turtles were captured annually in Peru only by the national small-scale long-line, bottom set nets fisheries (Alfaro-Shigueto et al., 2011). At last, we must keep in mind the impacts of fisheries in the light of other land-based or coastal threats. It is also clear that, despite strong legislation prohibiting the direct take of turtles throughout, it is still regarded as the most important threat (see review for the IO in Bourjea, 2015).

ASSESSMENT

A number of comprehensive assessments of the status of Indian Ocean marine turtles are available, in addition to the IUCN threat status:

[5] IOTC-2006-WPBy-15
[6] Poisson F. and Taquet M. (2001) L'espadon: de la recherche à l'exploitation durable. Programme palangre réunionnais, rapport final, 248 p. available in the website www.ifremer.fr/drvreunion
[7] (www.ioseaturtles.org/report.php)

- Hawksbill turtle – Marine Turtle Specialist Group 2008 IUCN Red List status assessment[8].
- Loggerhead turtle – 2009 status review under the U.S. endangered species act[9].
- Loggerhead turtle – 2013 Assessment of the conservation status of the loggerhead turtle in the Indian Ocean and South-East Asia. IOSEA Species Assessment: Volume II.
- Leatherback turtle – Assessment of the conservation status of the leatherback turtle in the Indian Ocean and South-East Asia (IOSEA Marine Turtle MoU, 2006)[10].
- Leatherback turtle – 2012 Assessment of the conservation status of the leatherback turtle in the Indian Ocean and South-East Asia – 2012 update. IOSEA Marine Turtle MoU Secretariat report
- Green turtle – Marine Turtle Specialist Group IUCN Red List status assessment expected for 2015 - 2016

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[8] http://www.iucnredlist.org/documents/attach/8005.pdf
[9] http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/loggerheadturtle2009.pdf
[10] http://www.ioseaturtles.org/content.php?page=Leatherback%20Assessment

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