ATLAS OF THE MALDIVES

A COMPREHENSIVE INVENTORY OF ORGANISMS AFFECTED BY GHOST NETS IN THE MALDIVES

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MARINE ENTANGLEMENTS

Ghost nets pose significant risks to many marine organisms. Often many of the species affected go unrecorded and so the impact on ghost nets on different species is poorly understood. Ghost nets can act as shelter and micro habitats for certain species, but the negative consequences of ghost nets far outweigh the short term positive impact. Fishing nets are now produced using man-made materials that degrade extremely slowly due to their resistance to UV radiation and breakdown. This means that once ghost nets are in our ocean they can remain relatively unchanged for hundreds of years. Ghost nets can entangle a great diversity of species. A single ghost nets may entangle so many organisms that the weight causes the net to sink to the sea floor. Once on the bottom of the sea bed, the benthic communities get to work on feeding on the catch, the net loses its weight and starts to rise to the surface again. This process can happen many times in a ghost nets life. Injuries sustained by ghost nets can be severe and many organisms eventually die due to lack of food or inability to swim upwards, to breath on the surface. Organisms die unnecessarily and ghost nets effect an extremely delicate ecosystem.

GHOST NETS BY THE OLIVE RIDLEY PROJECT

Fishing gear has been lost, abandoned or discarded at sea since fishing began. An increase in the fishing pressure combined with an advancement in technology enables the fishing industry, to target more species and exploit areas previously untouched. Modern day fishing gear is now made from plastic with the problem increasing significantly over the last 50 years. The problem of lost, abandoned or discarded fishing gear, sometimes called “ghost nets”, has been brought up at the United Nations General Assembly (UNGA) on numerous occasions. As early as 1988, the Food and Agriculture Organisation (FAO) recognised this problem as a major threat to marine ecosystems and coastal environments. In 1995 the FAO Code of Conduct for Responsible Fisheries (CCRF) was adopted to promote sustainable fishing practices and encourage regional fisheries to tackle the problem of lost fishing gear

Ghost nets are not a new problem to the Maldives, but it is a confusing one. At present it is illegal to fish in the Maldives using any type of net within its Exclusive Economic Zone* (EEZ). However, nets are used to catch bait fish and therefore, on rare occasions, nets may be used illegally. The majority of ghost nets washing into the Maldives drift over with currents during the monsoons. This transboundary nature of ghost nets makes it also extremely difficult to confidently identify where the fishing net came from.

© Photo: Martin Stelfox

*EEZ - COVER APROX 859 000 km²

THE MALDIVES

The meteorology of the Northern Indian Ocean is dominated by the two major monsoons. The South West Monsoon (SW or Summer Monsoon) lasts from May to October, while the North East Monsoon (NE or Winter Monsoon) occurs between December and March. April and November are normally transitional periods between monsoons. During these periods, the oceanic currents reverse. Currents flow mainly eastwards during the Summer Monsoon (SW), and westwards during the Winter Monsoon (NE). The Maldives, lying north-south across the east-west flow of the monsoon currents, acts as something of a trap for drifting objects.

The Maldives consists of around 1,190 islands made up of 26 atolls. Most of the islands are uninhabited. This makes finding and removing ghost nets a bigger challenge, as many areas are not frequented by humans. The two main monsoons can bring nets from outside the Maldives but once inside the Maldives channels,ghost nets are subject to strong currents and can pass by islands quickly and silently.

This atlas explains thedetailsfor entangled or affected organisms reported,thoughtheareamaynotbe the exact location of theentanglement or injury.

Data collected between July 2013 and July 2014 but this atlas continues to be updated as more species are reported. The atlas will be updated twice per year once in April and the other in November.

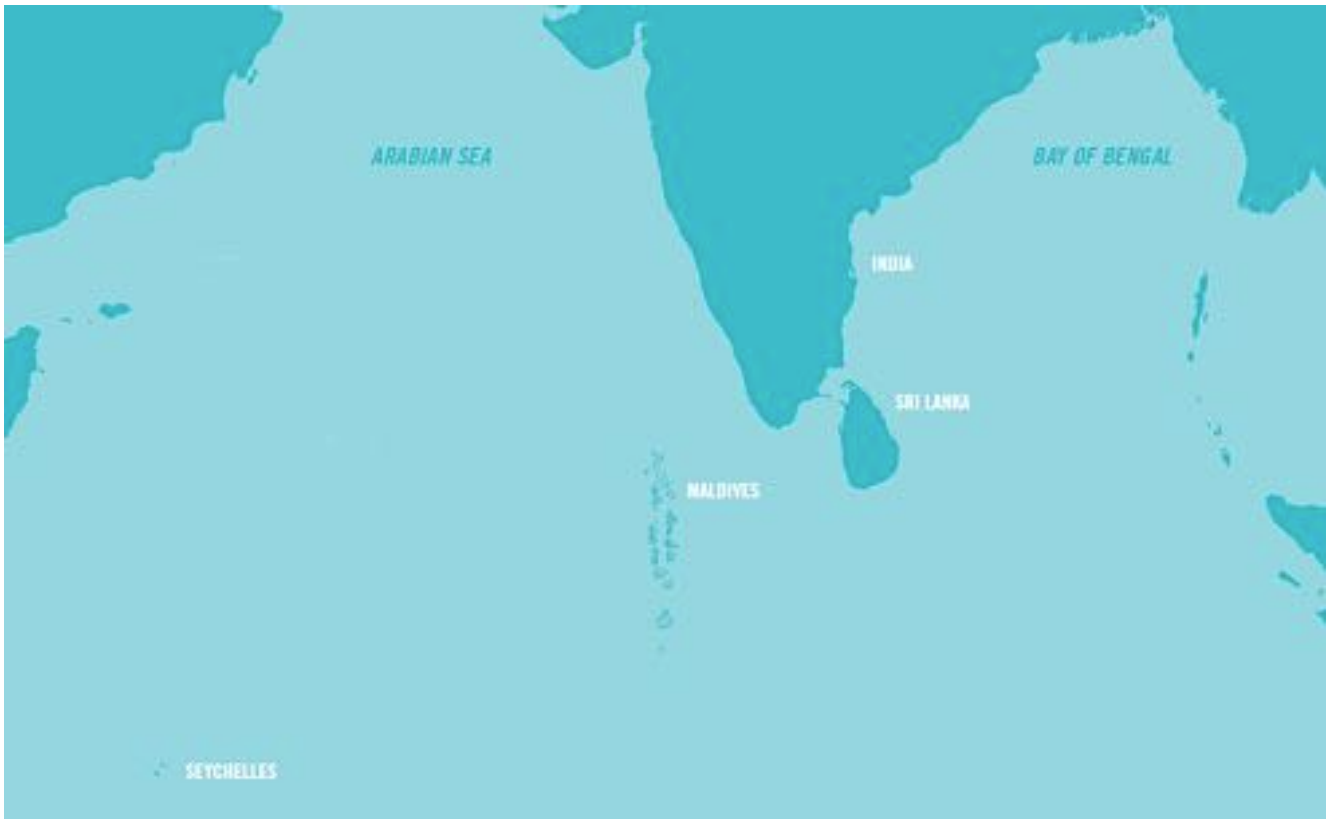
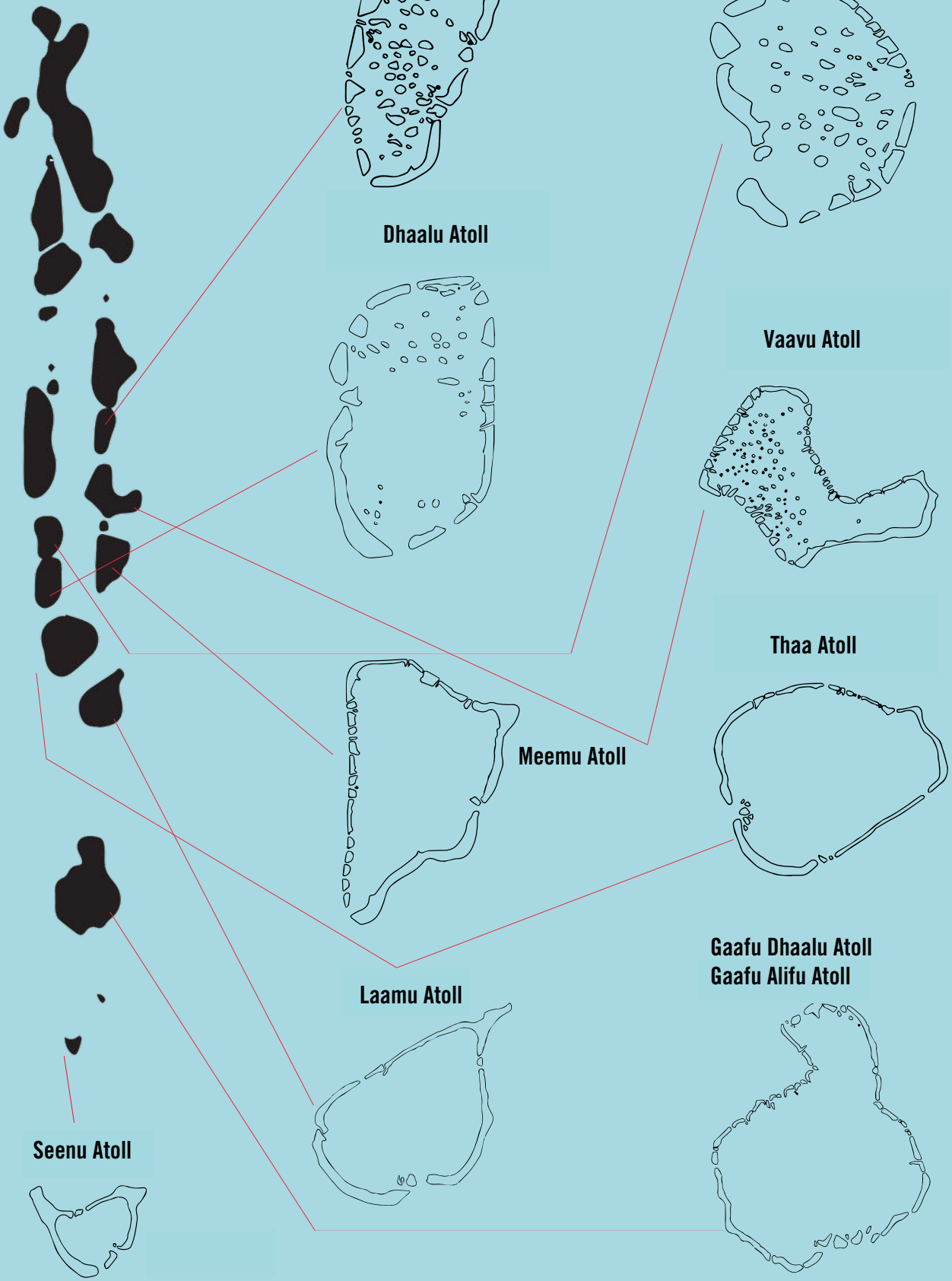


PHOTO: Location of the Maldives within the Central Indian Ocean - © Susie Gibson

ATOLLS OF THE **MALDIVES**



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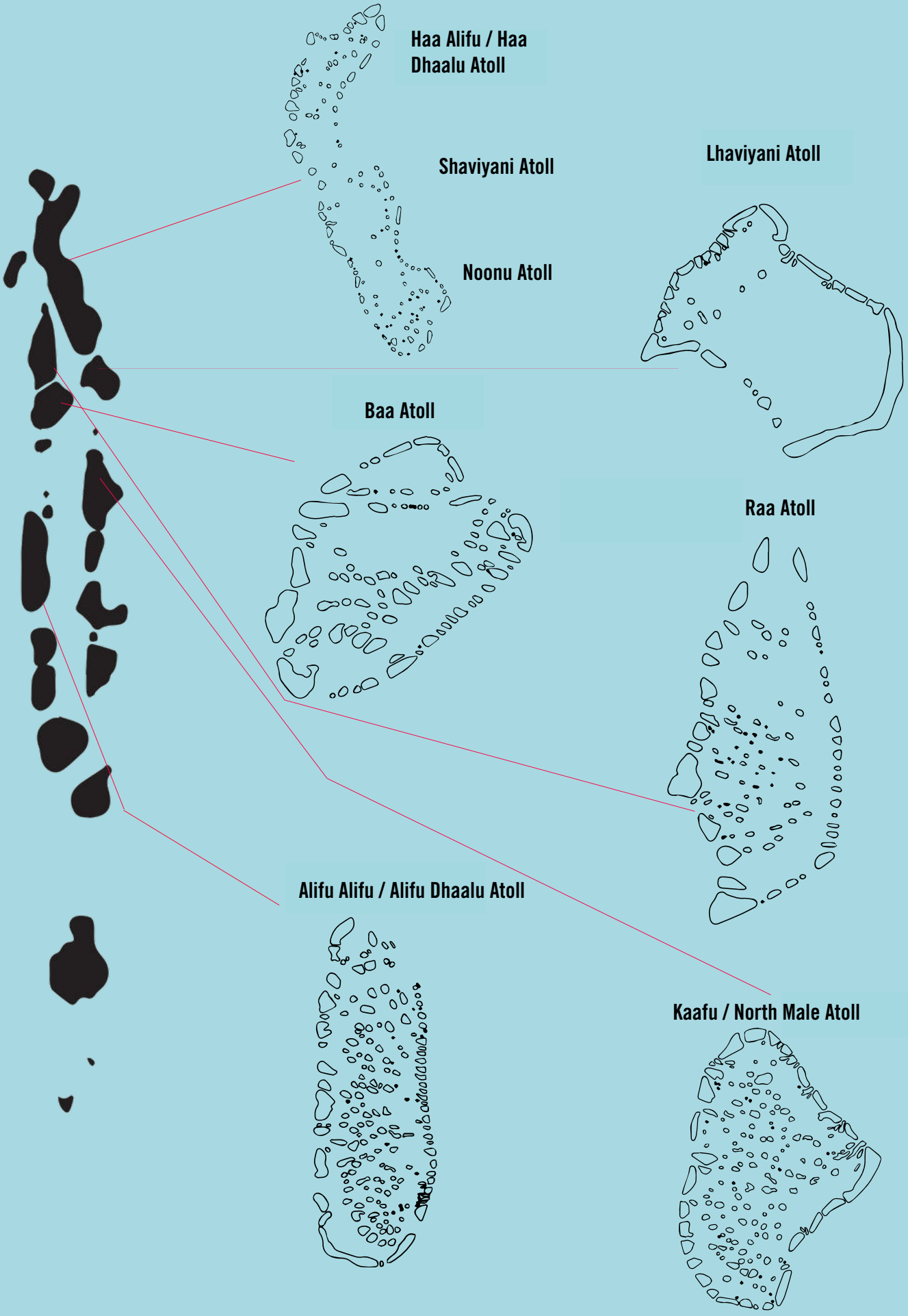


FROGFISHES
ANTENNARIIDAE

Frogfishes are rarely affected by ghost nets unless the ghost nets sink and rest on the reef. Frogfishes rely on camouflage, and are considered ambush predators, which makes it unlikely to find reef species entangled or resting on ghost nets. Sargassum (brown macroalgae) Frogfishes however are associated with drifting sargassum, which is typically on the ocean surface. When the sargassum encounters a ghost net, they often mix together. In these cases, the sagassum frogfish may partially rest on the ghost net. This species is particulary vulnerable to being removed from the ocean when the ghost net is removed. Care must be taken to ensure all marine organisms are removed if a ghost net is retrieved from the ocean.

Sargassum frogfish
Histrio histrio

© Photo: Walter Koditek

Maximum Size: 20 cm
Status to the Red List: Unknown
Diet: fishes and shrimps seeking refuge in floating weeds
Number Found Entangled: 0
Number Found Near Net: 5
Entanglement Threat: Unknown
Reported: Baa, North Male Atoll

FUSILIERS
CAESIONIDAE

Fusiliers are fast swimming fishes that feed primarily on plankton. They can often be found in large schools on reefs or in the open sea. They have been found near ghost nets but move away quickly when approached. No fusiliers have been reported entangled.

Further research is needed to understand the threats that ghost nets pose to the fusilier family.

Blue and gold fusilier
Caesio caerulaurea

© Photo: Richard Field

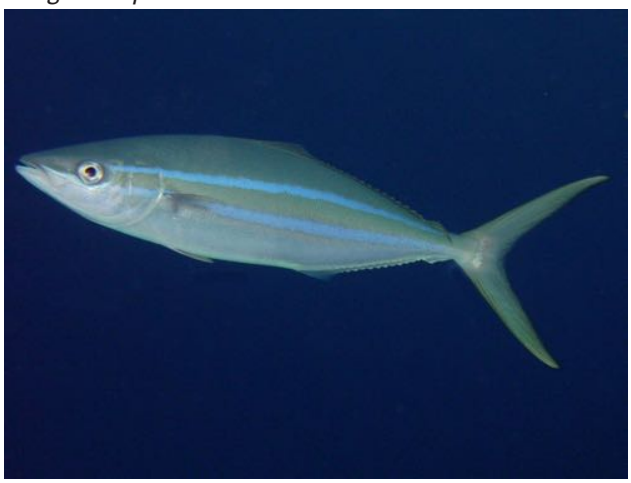
Maximum Size: 35 cm
Status to the Red List: Least Concern
Diet: Zooplankton
Number Found Entangled: 0
Number Found Near Net: 200+
Entanglement Threat: Unknown
Reported: North Male Atoll

JACKS & RUNNERS
CARANGIDAE

Carangidae fish includ the jacks, pompanos, jack mackerels, runners, and scads. They are fast swimming predators situated on reef systems or in the open sea. Ghost nets harbour crabs and other small fish which may lure jacks close to the net; potentially, during a feeding attempt, the Jack may become entangled accidentally when trying to catch its prey.

Further research is needed to understand the threats that ghost nets pose to the carangidae family.

Rainbow runner
Elagatis bipinnulata



© Photo: Florent Charpin

Maximum Size: 107 - 120 cm
Status to the Red List: Unknown
Diet: Small shrimps, crabs, fish and cephalopods
Number Found Entangled: 2
Number Found Near Net: 4
Entanglement Threat: Unknown
Reported: Dhaalu Atoll

Golden trevally (juvenile)
Gnathanodon speciosus

© Photo: Kitagawa / e-photography

Maximum Size: 120 cm
Status to the Red List: Unknown
Diet: Crustaceans, amphipods, molluscs and small fish
Number Found Entangled: 0
Number Found Near Net: 50+
Entanglement Threat: Unknown
Reported: Dhaalu Atoll

SPADEFISHES
EPHIPPIDAE

Spadefishes are spade shaped and laterally compressed. The triangular and elongated dorsal and anal fin makes this fish an unlikely species to become entangled. They have been encountered near ghost nets most likely in search of food. They were situated just below the ghost net, but disappeared when approached. More information is required on their interaction with ghost nets.

Longfin batfish
Platax teira

© Photo: Dray Van Beeck

Maximum Size: 70 cm
Status to the Red List: Unknown
Diet: Omnivore: plankton, sessile invertebrates, small invertebrates and marine algae
Number Found Entangled: 0
Number Found Near Net: 3
Entanglement Threat: Unknown
Reported: North Male Atoll

GROUPERS
EPINEPHELIDAE

Groupers are generally associated with reef systems and rarely approach the surface; entanglement in ghost nets is therefore unlikely. Groupers often spend daylight hours hiding in crevices or caves and ambush their prey. The one time a species of grouper was found in the Maldives affected by a ghost net, it was found inside a crate attached to the ghost net. Large ghost nets that drift over containing crates or any other man-made feature that acts as a shelter may help species hide and ambush prey approaching the net. This also poses a risk for species of groupers to become invasive, inhabiting areas brought over by a ghost net with the currents.

White spotted grouper
Epinephelus coeruleopunctatus

© Photo: Randall. J.E

Maximum Size: 76 cm
Status to the Red List: Least Concern
Diet: Feeds on small fish but predominantly crustaceans
Number Found Entangled: 0
Number Found Near Net: 1
Entanglement Threat: Unknown
Reported: North Male Atoll

CHUBS
KYPHOSIDAE

Chubs can be found in exposed rocky areas and usually congregate in small groups. The juveniles can be found amongst floating seaweed feeding on small crustaceans and subsequently may encounter ghost nets. Only a small number of juveniles have been encountered near ghost nets. Entanglements have never been reported in this family.

Further research is needed to understand the threats that ghost nets pose to the kyphosidae family.

Brassy chub
Kyphosus vaigiensis

© Photo: Ole Johan Brett

Maximum Size: 70 cm
Status to the Red List: Unknown
Diet: Small crustaceans
Number Found Entangled: 0
Number Found Near Net: 4
Entanglement Threat: Unknown
Reported: North Male Atoll

DAMSELFISHES
POMACENTRIDAE

Pomacentridae includes both damselfishes and clownfishes. They can be found close to reef structures, using corals or anemones as protec-tion. They are known to be aggressive and defend their territory veraciously. They are generally opportunistic feeders and the only species of damsel reported linked to a ghost net was the common sergeant major. This species may have been drawn to the ghost net due to the abundant food supply. Entanglements have occurred in this family and therefore chubs are considered at risk of entanglement.

Further research is needed to understand the threats that ghost nets pose to the pomacentridae family.

Sergeant major
Abudefduf saxatilis

© Photo: Brian Gratwicke

Maximum Size: 15 - 20 cm
Status to the Red List: Unknown
Diet: Small shrimps, crabs, fish and algae
Number Found Entangled: 2
Number Found Near Net: 200+
Entanglement Threat: Unknown
Reported: North Male Atoll, Baa Atoll

RAYS AND SKATES
BATOIDEA

Batoidea are cartilaginous fishes commonly known as Rays and Skates. Closely related to sharks, they are extremely diverse with over 500 species. Habitat and behaviour are also very diverse; however, the majority of species within Batoidea can be found on the sea floor. The exception to this are the Manta rays, which can be found filter-feeding near the surface. Normally mantas are extremely good at avoiding obstacles, so entanglement is unlikely in ghost nets. Despite this reports have been recorded. Most encounters with Manta ray entanglements are with the manta swimming and trailing a net behind it, which makes it difficult to determine where the entanglement took place. Fishing lines which are much more difficult to detect, are a big threat to Mantas.

Reef manta
Manta alfredi

© Photo: Abdulla Sivad

Maximum Size: 450 cm
Status to the Red List: Vulnerable
Diet: They are planktivores, feeding especially on zooplankton
Number Found Entangled: 4
Number Found Near Net: 0
Entanglement Threat: Low
Reported: Rasdhu, North Male and Lhaviyani Atoll

SHARKS
SELACHII

Sharks are a group of fish characteised by a cartilaginous skeleton. With over 500 species, they occupy a great diversity of habltats and display various behaviours. Sharks are often considered scavengers, favouring prey that is trapped or weak. It is no surprise that sharks may interact with ghost nets in an attempt to feed on prey entangled in the ghost net. Unfortunately, most species of sharks need to continuously swim in order to breathe and; if they become entangled, breathing may stop completely and death will shortly follow. Sharks are unable to swim backwards so reversing out of a ghost net is not an option. As a result fast, rapid movements in an attempt to free themselves may results in further entanglement.

Further research is needed to understand the threats that ghost nets pose to the selachii family.

Silky shark
Carcharhinus falciformi

© Photo: Andy Murch

Maximum Size: 3.5 m
Status to the Red List: Near Threatened
Diet: Feed primarily on fishes, as well as squids, paper nautiluses, and pelagic crabs, tuna (little tunny and yellowfin), alba-core, mullet, mackerel, porcupine fish, and various others including crabs.
Number Found Entangled: 2
Number Found Near Net: 0
Entanglement Threat: Unknown
Reported: Alifu Dhaalu

Grey reef shark
Carcharhinus amblyrhynchos

© Photo: Andy Sallmon

Maximum Size: 2.6 m
Status to the Red List: Near Threatened
Diet: Reef fishes, along with smaller quantities of cephalopods, squid and octopus, and crustaceans (shrimp and lobster), provide for the majority of the grey reef sharks prey.
Number Found Entangled: 1
Number Found Near Net: 0
Entanglement Threat: Unknown
Reported: Baa Atoll

TOOTHED WHALES
CETACEA

The order cetacea includes marine mammals commonly known as whales, dolphins and porpoises. All cetaceans must come to the surface to breathe. This puts them at risk of encountering ghost nets drifting on the surface. Globally cetaceans and ghost net interac-tions are well documented. In the Maldives this fact is rarely seen. Our only record in the Maldives is of a sperm whale found decomposing on the surface with a ghost net entangled in the carcass. Cetaceans are rarely found entangled in the Maldives.

Further research is needed to understand the threats that ghost nets pose to the cetacea family.

Sperm whale
Physeter macrocephalus

© Photo: Francois Gohier

Maximum Size: 18 m
Status to the Red List: Vulnerable
Diet: Fish and Squid
Number Found Entangled: 1
Number found Near Net: 0
Entanglement Threat: Unknown
Reported: North Male Atoll

SEA TURTLES
CHELONIOIDEA

Sea Turtles are reptiles comprising seven species. Five of those species can be found in the Maldives: the Green, Hawksbill, Loggerhead, Leatherback and Olive Ridley Sea turtles. Most commonly encountered species are the Hawksbills and Green turtles, which can be found on many reefs within the Maldives. The Olive Ridley sea turtle is rarely sighted free swimming in the Maldives, though Juveniles are suspected to occupy Maldivian waters. Unfortunately, marine turtles are under great threat from ghost nets. Juveniles use sargassum beds as shelter and many mistake ghost nets for natural materials and become entangled. Adults are also known to approach ghost nets to climb on top of them to warm themselves up or to find food, with many becoming entangled. The Olive Ridley turtle is one of the rarest species to be found in the Maldives, but one also commonly found entangled in ghost nets.

Olive Ridley sea turtle
Lepidochelys olivicia

© Photo: Emma Doyle

Maximum Size: 80 cm
Status to the Red List: Near Vulnerable
Diet: Common prey items include jellyfish, tunicates, sea urchins, Bryozoan, bivalves, snails, shrimps, crabs, rock lobsters and sipunculid worms.
Number Found Entangled: 132
Number Found Near Net: 0
Entanglement Threat: Very High
Reported: Gaafu Alifu, Lhaviyani, North and South Male, Vaavu, Dhaalu, Baa, Alifu Alifu, Alifu Dhaalu and Noonu Atoll

Hawksbill sea turtle
Eretmochelys imbricata

© Photo: Jillian Hudgins

Maximum Size: 87 cm
Status to the Red List: Critically Endangered
Diet: Sponges make up the majority of their diet
Number Found Entangled: 6
Number Found Near Net: 0
Entanglement Threat: High
Reported: South Male, Lhaviyani and Baa Atoll.

SEA TURTLES
CHELONIOIDEA

Green turtle
Chelonia mydas


© Photo: Jasmin Pape

Maximum Size: 114 cm
Status to the Red List: Endangered
Diet: Changes significantly during its life. When less than 8 to 10 inches in length eats worms, young crustaceans, aquatic insects, grasses and algae. Once green turtles reach 8 to 10 inches in length, they mostly eat sea grass and algae, being the only sea turtle that is strictly herbivorous as an adult
Number Found Entangled: 2
Number Found Near Net: 0
Entanglement Threat: Medium
Reported: North Male.

CRUSTACEANS
CRUSTACEA

Crustaceans are a very large group including familiar animals like crabs, lobsters, crayfish, shrimps, krill and barnacles. They inhabit various different habitats and many are filter feeders. Ghost nets often harbour many barnacles on the twine, which rather than be entangled, they appear to be growing on the net and have been observed filter feeding. Although many species have been found in ghost nets, this group can be very difficult to identify and so only barnacles have been correctly indentified at present. More information is needed on this group to understand what species inhabit ghost nets.

Goose barnacle
Lepa spp.

© Photo: Ross Hoddinott

Maximum Size: 5 cm and the peduncle varies between 4 - 80 cm
Status to the Red List: Unknown
Diet: Filter feeders
Number Found Entangled: 0
Number Found Near Net: 10000+
Entanglement Threat: Low
Reported: On the majority of ghost nets found.

ACKNOWLEDGEMENTS

The Olive Ridley Project would like to thank all volunteers who made this atlas possible, by reporting animals that fall victims to ghost nets we attempt to quantify the problem and understand a little more on the negative effects ghost nets have on our environment. We will continue to add to this atlas as more information is received. We would like to give special thanks to the IUCN for their technical support throughout the creation of this atlas and to Global Blue for making it possible. We also would like to thank Susie Gibson and Danielle Gravon for the images created for the atlas. We thank Chiara Fumagalli ,for her support throughout the Olive Ridley Project and to Dr Shiham Adam and Khadeeja Ali from the Marine Research Centre (MRC), for supporting our work. We would also like to thank Verena W Ali, Shubana Chugsy Weebana, Tess Moriarty, Angela Jensen Scharfbillig, Jack Willans, Licia Lycis Corallo, Jannicke Hallum, Amanda Batlle Morera, Guy Stevens, Emily Bright, Deborah Burn, Judith Hannak, Lauren Arthur, Umer Khalifa, Kylie Merritt, Fathimath Nistharan, Kelsey Miller, Francesca Pancaldi, Sarah K. Jago, Vaidotas Kirsys, Elisa Fini, Yvonne Richter, Nicky Herz, Rifaee Rasheed, A Riyaz Jauhary, Agnese Mancini, Katie Hindle, Ibrahim Shamyl, Jillian Hudgins, Sarah Kompascher, Prodivers team, Per Laumark, Marc Chicano, Jasmin Pape, Musa Mohamed, Judith Sergent, Casa Mia Guest House, Ahmed Shamoon, Vaadhoo Island Council, Licia Farano, Jade-Alexandra Trottier, Lisa Bauer, Lars Hoffman, Sebastien Stradal, Jesse Carrizzo, Magali Boussion, Moomin Ageel and everybody else who's name we did not mention, we really appreciate all your hard work to keep our oceans free from ghost nets.

FRONT COVER:

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