



## SEA TURTLES ON THE HOOK

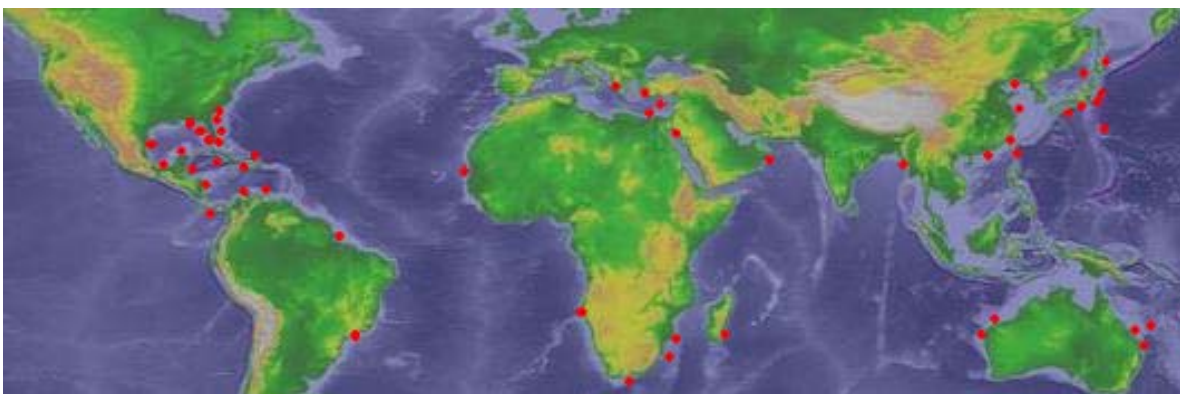
There are eight species of sea turtle, five of which can be found in the North Atlantic, and, of these, two are regularly caught as accidental catches by longliner fleets: the leatherback turtle (*Dermochelys coriacea*) and, above all, the loggerhead sea turtle (*Caretta caretta*). Less frequently, the hawksbill sea turtle (*Eretmochelys imbricata*) and the Kemp's Ridley turtle (*Lepidochelys kempii*) are also caught.



Oceana is carrying out a conservation project at both ends of the North Atlantic to establish the true scope of accidental turtle catches by longliners, their impact on the turtle population and what alternatives are available to reduce this impact.

### NESTING BEACHES

The nesting beaches for the majority of sea turtles found in the North Atlantic are in the countries in the Western Atlantic, i.e. the Caribbean and North American Atlantic coasts. The main laying beaches of loggerhead turtles are in the United States (especially the states of Florida and North Carolina), Mexico (Quintana Roo and the Yucatan) and Brazil (Bahía), although less frequently, or only sporadically, they also use the coasts of other Atlantic/Caribbean countries such as Cuba, the Bahamas, Panama, Honduras, Colombia, Belize, Haiti, the Dominican Republic, Jamaica, Puerto Rico and other Caribbean islands<sup>1</sup>.



*Main nesting beaches of the loggerhead turtle (*Caretta caretta*) around the world*

Nesting beaches can also be found in the East Atlantic and specifically in the Mediterranean, most notably in Greece, Turkey and Cyprus but also possibly in Israel, Libya and Egypt<sup>2</sup>.

## REPRODUCTION

The breeding season of the loggerhead turtle extends from March to October, reaching its peak between June and August. The females, which are able to reproduce from the age of 10-30<sup>3</sup> and can reach ages of 47-62<sup>4</sup>, lay around one



hundred eggs in the nests they excavate on the beaches in these areas<sup>5</sup>. They tend to nest from two to seven times a year and then rest for two to three years before starting to lay again. The eggs hatch after 60 days<sup>6</sup>, giving rise to the next generation of turtles.

### GENDER DEPENDS ON HEAT

In order for the eggs to hatch successfully, the main determining factors are the size of the sand granules on the beach and the temperature of the nest. The ratio of males to females will depend on whether it is hotter or cooler; there will be more females at a higher temperature. The maximum temperature at which the gender of the turtles can be modified seems to be 29°C<sup>7</sup>, with a females-only outcome when the temperature exceeds 33°C<sup>8</sup>.

## TRANSATLANTIC MIGRATION

Sea turtles are a migratory species who, after hatching from their eggs on the beaches of Eastern America, head towards the sea to start a journey of more than 10,000 miles across the entire North Atlantic.

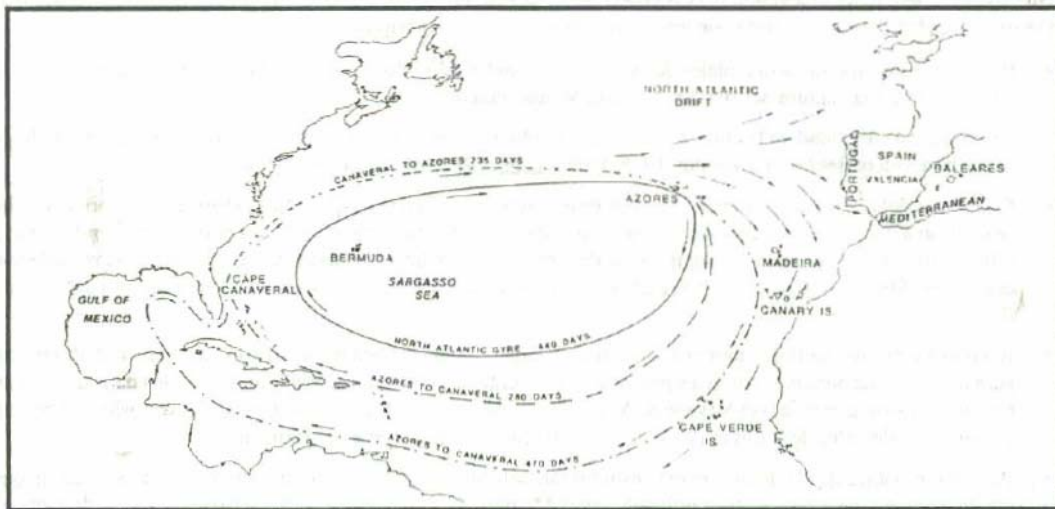
After their birth on a Florida or Yucatan beach, the small turtles, measuring barely 15 centimetres long, head out to sea towards the Sargasso Sea, where they spend a period of time known as the “lost year<sup>9</sup>”, as years ago there was no knowledge of what these animals did between leaving the beach and turning up again as young turtles.

In the Sargasso Sea, the small turtles feed on crustaceans and other small creatures that they find in the algae until continuing their journey, taking advantage of the Gulf Stream, towards the Azores and from there to the European continent.

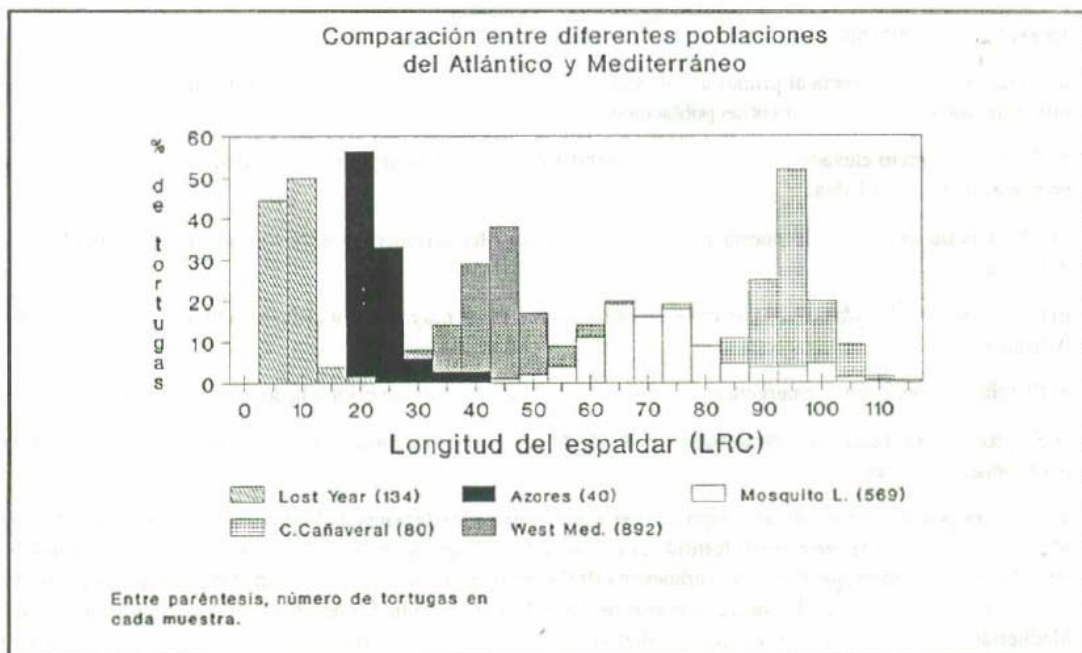
Most of them follow the warmer waters that take them to the coasts of Spain and Portugal; many of them even attempt to enter the Mediterranean, where they manage to concentrate in numbers that exceed several hundred thousand (and where they also encounter the less-numerous colonies of loggerhead turtles that do their nesting in the Mediterranean Sea). From Europe, the Gulf Stream, aided by the trade winds, pushes them towards the south, traversing the western coasts of Africa, until they pass by the Canary Islands and Cape Verde. South of this archipelago, the current changes direction and heads back out to the Atlantic Ocean in a westerly direction towards the waters of the Caribbean and the east coast of the Americas.

## STUDIES ON MIGRATIONS

In 1986, an American sea turtle biologist, Archie Carr<sup>10</sup>, presented the hypothesis that loggerhead turtles that laid their eggs on North American beaches made a lengthy round-trip migration along the whole American coast using the Gulf Stream. He supported his hypothesis on the size of individual turtles caught in various zones of the Atlantic, including the US coasts, the Sargasso Sea, the Azores and the Gulf of Mexico.



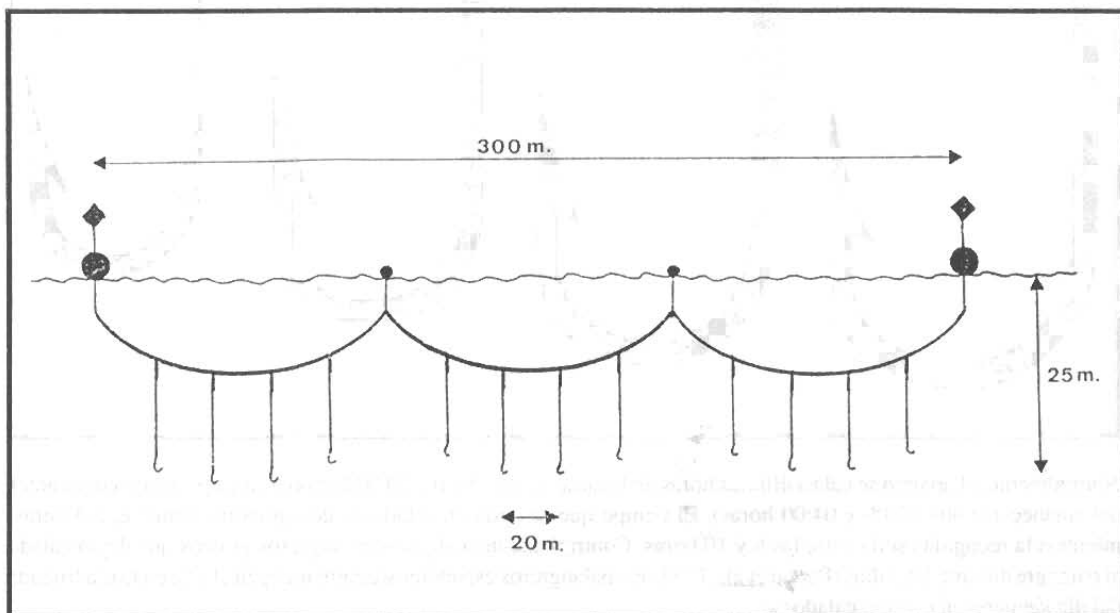
In 1993<sup>11</sup>, Spanish researchers – Aguilar, Más and Pastor - corroborated this hypothesis, providing data on populations in the Eastern Mediterranean whose size perfectly matched the type of specimens that would presumably be found in this zone if completing the cycle described by the North American researcher.



Subsequent work on the DNA of loggerhead turtles found in the Azores and Madeira<sup>12</sup>, as well as in the Mediterranean<sup>13</sup> dissipated any doubts on the origin of the populations found in the Eastern Atlantic. Likewise, the discovery of marked turtles in the Mediterranean subsequently being found in the Caribbean conclusively confirmed the credibility of this hypothesis<sup>14</sup>.

## WHAT IS LONGLINING?

Longlining is a passive fishing technique using baited hooks. The full fishing gear consists of various branch lines – between 100 and 200 – which hang from a main line (kept on the surface by buoys) onto which the hooks are attached. In the case of the Spanish longlining fleet working in the Mediterranean, the total length of the gear can exceed 40 kilometres and use more than 2,000 hooks, while the large industrial fleets are capable of setting 100 kilometres of longlines.



The hooks are baited with small pelagic fish (sardinella, mackerel, etc.), cephalopods or artificial bait (occasionally luminous), to attract the swordfish. But other carnivorous species, such as tuna, dolphinfish and sea turtles, can also be caught by this method of fishing.

## WHAT IS THE TARGET SPECIES OF LONGLINER FLEETS?

The majority of longliner fleets working in the North Atlantic specialise in catching swordfish, tuna and occasionally sharks. Sea turtles are an unwanted by-catch, as are many other species such as rays, sunfish, palometas, dolphinfish and certain species of marlin, tuna and sharks<sup>15</sup>.

Although some of these species are commercialised along with the target species, others are thrown back overboard.

## WHY ARE TURTLES CAUGHT?

The bait used to catch fish by longliners also attracts other carnivorous marine creatures such as seabirds and sea turtles. In the case of the latter, with the exception of the green sea turtle (*Chelonia mydas*), which is herbivorous, all the other species can fall victim to these hooks, particularly if they are used for fishing in surface waters where they are easier for the turtles to spot and access.

On biting or swallowing the bait, the hook ends up caught in the mouth or oesophagus of these animals. Extraction can be more or less difficult depending where the hook is located, so it is not unusual to see turtles that have repeatedly been caught on longlines over the same season, with various hooks and fishing wire sticking out from their mouths.



## ACCIDENTAL CATCHES

Oceana is working to reduce the accidental catches of sea turtles at both ends of their zone of distribution: the US and Mediterranean coasts. In both areas these species are caught by the thousands on the hooks of longliner fleets.

According to estimates made in the United States, some 2,000 sea turtles are caught each year (60% loggerheads and 40% leatherbacks)<sup>16</sup>, while in the Mediterranean, just as a result of the Spanish fleet operating in this area, this figure could reach more than 20,000 animals per year<sup>17</sup>.

We need to add to this figure the catches made by other fleets throughout their whole migratory period. It is known that the fleets of Italy, Tunisia and other

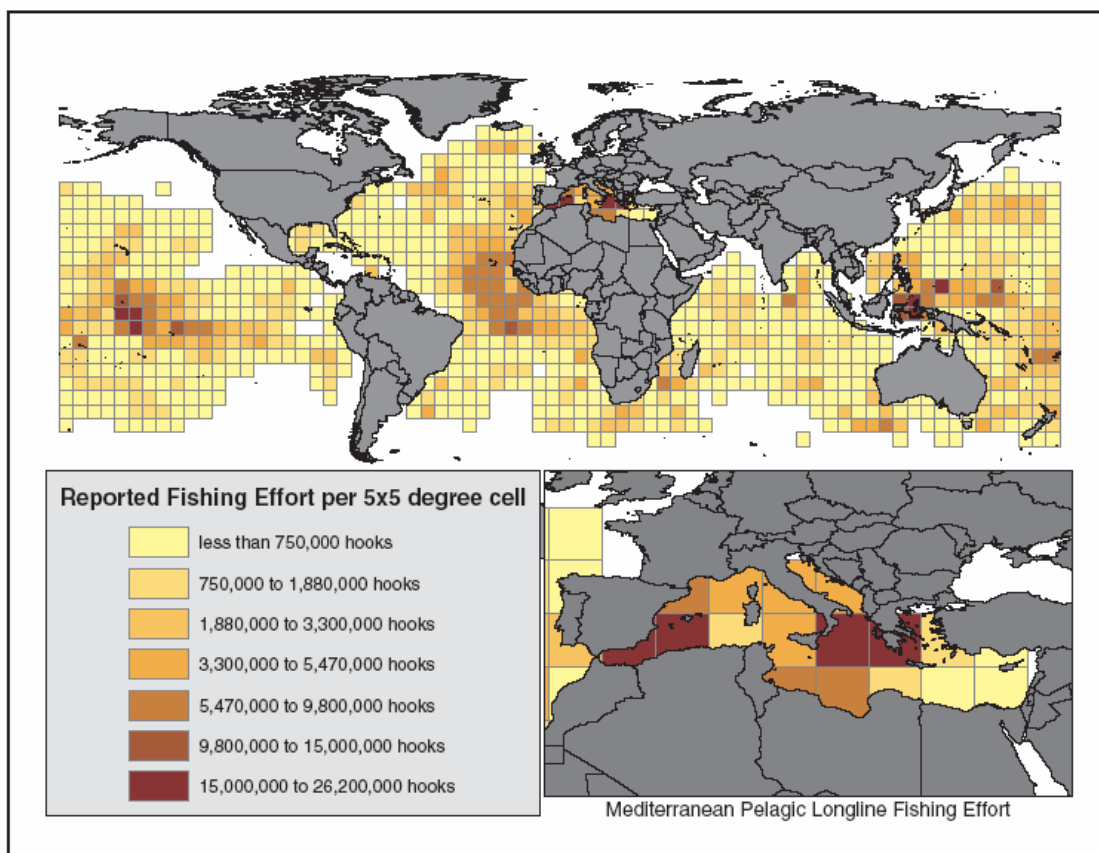


Mediterranean countries make high numbers of accidental catches<sup>18</sup>, as well as the huge deep-sea fleets of Japan, North Korea, Taiwan, Portugal and Spain and the more coastal fleets of Canada, plus various vessels flying flags of convenience working in the Atlantic Ocean.

Fortunately for the turtles, not all the species caught on these hooks end up dying, although a large number of them suffer injuries that are serious enough to cause death in high numbers. According to some estimates, the level of mortality could be close to 30%<sup>19</sup>, or even higher when the hook has been deeply swallowed<sup>20</sup>.

A recent study<sup>21</sup> calculated that each year between 250,000 and 430,000 turtles are caught worldwide (200,000-316,000 loggerheads and 50,000-114,000 leatherbacks), of which 60% of catches take place in the Atlantic and 10% in the Mediterranean. Meanwhile, other estimates believe that catches in the Mediterranean could be higher<sup>22</sup>.

According to this study, every day some 3.8 million hooks are set around the world, which would represent 1,400 million hooks per year, of which 200 million would be targeted at swordfish and around 1,200 million at tuna. Thirty-seven percent of this enormous fishing effort takes place in the Atlantic and Mediterranean<sup>23</sup>. Up to 2.4 leatherback turtles and 14 loggerhead turtles can be caught for each thousand hooks set.



## THE STATUS OF SWORDFISH

The stock of swordfish (*Xiphias gladius*) in the North Atlantic is overexploited, although since 1998 a improvement has occurred thanks to their high rate of reproduction<sup>24</sup> (a young female can lay more than 15 million eggs<sup>25</sup>, while a mature fish can lay 29 million<sup>26</sup>). It is increasingly difficult to find large-sized individuals (it is believed that fish over five years of age have diminished by 66% in the last 25 years) and the majority of catches made correspond to fish measuring between 1.2 and 1.8 metres long – the lower jaw fork length (LJFL) – and around 25-40 kilos in weight. Mature fish can exceed 3 metres in length and 9 years of age (although it is believed they are capable of living to 25 years of age), measure almost 4.5 metres and weigh more than 500 kilos<sup>27</sup>.

The minimum size established for the commercial sale of this fish is 125 cm (males reach breeding age when they measure more than 112 cm, while females need to reach 158 cm<sup>28</sup>). Even with minimum size limits, around 20% of swordfish landings in the Atlantic in the last few years were under this size<sup>29</sup>, while in the Mediterranean, the landings below the size limit reached 50%<sup>30</sup>.

One of the clearest examples of the overexploitation of this stock can be seen in the size of the fish offloaded: the average weight of swordfish caught in the Atlantic went from 120 kilos to just 40 kilos between 1963 and 1995.<sup>31</sup> Meanwhile, in the Mediterranean this figure dropped from 48 kg in the Eighties to an average of 10 kg in 1997<sup>32</sup>.

Annual catches of swordfish in the North Atlantic come to between 10,000 and 15,000 tonnes, to which we need to add a further 15,000 tonnes of catches made in the Mediterranean, where the stock has been under heavy pressure for decades although existing data does not provide us with information on its true status<sup>33</sup>.

Added to the catches made by practically every coastal country, especially Italy, Morocco, Greece and Spain, we need to add those made by the Asian fleets<sup>34</sup>. Meanwhile, some Mediterranean countries, despite catching this species, do not keep international organisations informed or provide any data, this being the case with Israel, Libya, Egypt and Monaco. Nor should we forget the presence of industrial longliners throughout the Atlantic dedicated to catching other large pelagic species – including several hundred fishing vessels sailing under flags of convenience – which, though mainly specialising in catching bluefin tuna (*Thunnus thynnus*), bigeye tuna (*Thunnus obesus*) and other tunas, also catch swordfish<sup>35</sup>.



In the case of the Mediterranean, catches of immature fish are very high, believed to be between 50% and 70% of the total numbers corresponding to fish less than three years old, which means that the majority have never had a chance to reproduce<sup>36</sup>.

In the Atlantic, the age of maturity is estimated at five years, while in the Mediterranean it would appear to be slightly earlier<sup>37</sup> (when the females reach a length of 142 cm<sup>38</sup> as opposed to 158 cm in the Atlantic).

Ninety percent of swordfish catches in the Atlantic and 55% in the Mediterranean are made by longliner fleets<sup>39</sup>.

## THE STATUS OF TURTLES

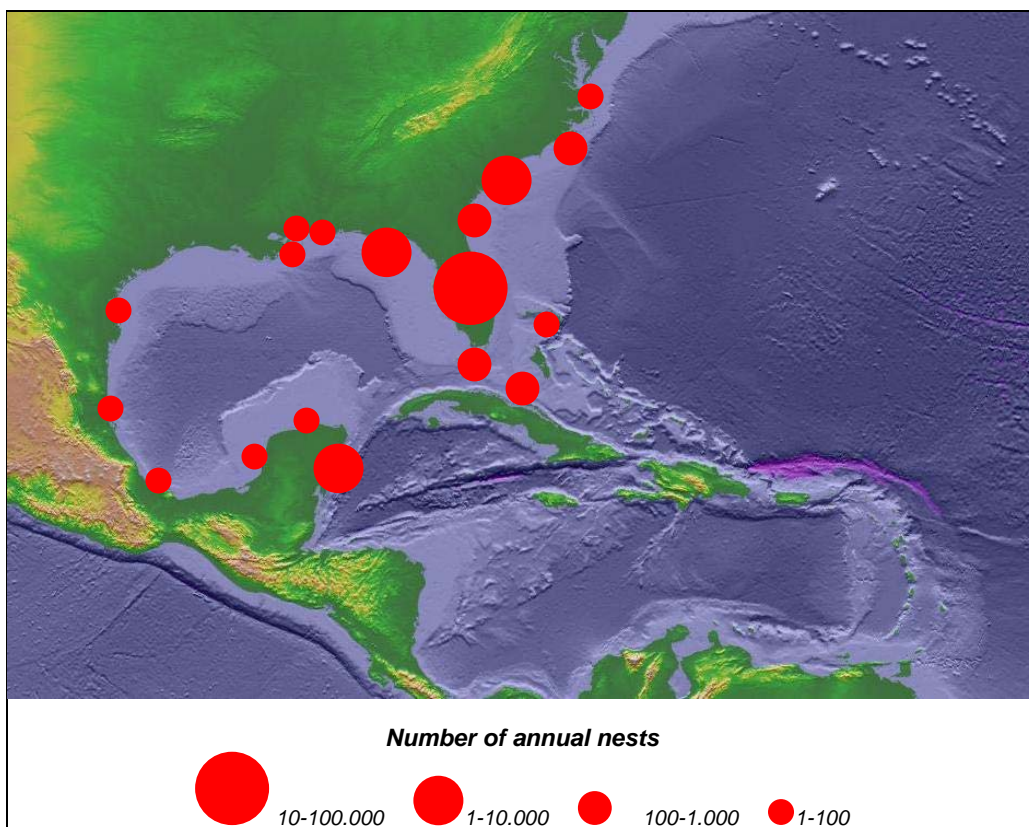
All sea turtles are regarded as species in danger of extinction<sup>40</sup>. There is no accurate information on the numbers of loggerhead turtles in the North Atlantic although it is believed that the number of females of breeding age cannot be more than 100,000 worldwide, of which half of them would be found in the Atlantic<sup>41</sup>.

Loggerhead turtles generally have a shell-length of between 80 and 100 cm, although some have been found that reach 114 cm and 227 kilos in weight<sup>42</sup>.

After leaving the nest, they spend their first seven to twelve years pelagically, migrating across the Atlantic, until they reach their adult age and adopt a more “sedentary” lifestyle close to the nesting beaches, in spite of which they continue to travel distances of hundreds of kilometres. Just a few individuals from every thousand turtles born reach adult age<sup>43</sup>.

Studies on the mitochondrial DNA of loggerhead turtles have allowed us to distinguish at least six sub-populations of Atlantic turtles: (1) North Carolina to north-east Florida; (2) southern Florida; (3) north-east Florida; (4) Yucatan-Quintana Roo, Mexico; (5) Brazil and (6) Greece<sup>44</sup>.

The importance of the loggerhead turtle nesting beaches in the United States has been established beyond any doubt; this is home to the second largest population in the world which maintains 35%-40% of the world population of this species<sup>45</sup>, with around 68,000-90,000 nests a year<sup>46</sup>.



Generally speaking, all the North Atlantic sea turtle populations are decreasing and some, such as those of Little Cumberland (Georgia, USA) have diminished at a rate of 2.6% per year over the last three decades<sup>47</sup>.

Almost 50% of turtles caught in the Mediterranean come from populations that nest in the United States, and the other half would appear to be of Mediterranean origin, while around the Azores and Madeira, 100% are of American origin (90% from the United States and 10% from the Caribbean<sup>48</sup>). In the Mediterranean, the population of nesting females is estimated at 2,000-3,000, distributed mainly between Greece, Turkey and Cyprus<sup>49</sup>.

## ROUNDED HOOKS TO SAVE TURTLES

For years now, various modifications have been suggested to fishing and baiting gear as well as proposals for close-seasons, prohibited zones, and changes to the time or way in which the longlines are set and pulled in, etc., to try to reduce the huge volume of turtle by-catches that take place around the world.

One of these proposals is to use circular hooks. Although in principle they were suggested as a means of reducing occupational accidents and the cost of material, it has also been seen that they offer an efficient way of minimising the impact of longlining on sea turtles. On the one hand, it is more difficult for turtles to become caught up on them and on the other if they *are* ingested they tend to remain in the mouth so that extraction is much easier. According to information from the US National Oceanic and Atmospheric Association (NOAA), just 10% of turtles caught with circular hooks had swallowed them as far as the oesophagus, as compared to the 80% who had done so in the case of traditional hooks. Furthermore, the larger the hook, the lower the chance of breeding turtles being able to ingest it.

Studies by the NOAA have demonstrated that the use of circular hooks can save thousands of turtles from becoming hooked. According to these studies, the use of these hooks could reduce catches of loggerhead and leatherback turtles by between 65% and 90%<sup>50</sup>. The results also appear encouraging for the fishermen, because in addition to reducing the possibility of occupational accidents from becoming caught on the hooks, swordfish catches (the target species), remain consistent and could even increase by 30%.



Sea turtles concentrate in certain zones during very specific times of the year. Equally, the water and ambient temperature and the visibility of sunlight have an influence on the volume of catches. We should incorporate our knowledge of rounded hooks with these factors in order to reduce accidental catches of turtles to the utmost.

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