Thunnus thynnus (Atlantic Bluefin Tuna)

Family: Scombridae (Mackerel, Tunas and Bonitos)
Order: Perciformes (Perch and Allied Fish)
Class: Actinopterygii (Ray-finned Fish)

Fig. 1. Atlantic bluefin tuna, *Thunnus thynnus.*

[http://firstworldfacts.com/6-extinct-animals-that-are-still-hunted/atlantic-bluefin-tuna-thunnus-thynnus-captive-gozo-maltese-islands/ downloaded 26 January 2015]

TRAITS. The largest species of the Scombridae family (Block et al., 2005), the Atlantic bluefin tuna can reach up to 3 m in length although they are more commonly found to be 0.5-2 m (Marinebio, 2015). Adults weigh between 136 and 680 kg, although they rarely meet the upper weight range (Marinebio, 2015). Small eyes and long pointed head; blue to black colour on upper half of body, silver coloured on lower half (Marinebio, 2015). Fins: two dorsal (upper) and two ventral (lower), (with first dorsal fin having 12-14 spines and second having 13-15 rays (Johnson, 2006; Marinebio, 2015); dorsal and ventral yellow-edged finlets present; short pectorial fins (Marinebio, 2015; Johnson, 2006).

DISTRIBUTION. Bluefin tunas are distributed in the North Atlantic and North Pacific Oceans (Schultz, 2004), although Pacific populations are now often regarded as a separate species, the

Pacific bluefin tuna *Thunnus orientalis* (Wikipedia, 2015). The name *Thunnus thynnus* is then reserved for the Atlantic bluefin tuna. In the western Atlantic, distribution occurs in Labrador (Canada), heading south to Trinidad and Tobago, Venezuela and Brazil and are widespread off New York, New Jersey, North Carolina and the Bahamas (Schultz, 2004). In the eastern Atlantic they occur as far north as Norway and Iceland, extending into the Mediterranean Sea and the Black Sea and as far south as the Canary Islands (Schultz, 2004; Johnson, 2006).

HABITAT AND ACTIVITY. Bluefin tuna are highly migratory marine fishes (Johnson, 2006; Marinebio, 2015). They have been observed making trips back and forth from the North American Atlantic coast to the European Atlantic coast several times a year. They are found in pelagic waters (near the surface of open seas, far from land) and seasonally in coastal waters (Block et al., 2005). They mainly occupy subtropical and temperate waters (Johnson, 2006) but can tolerate a wide range of temperatures whereby they make ocean-scale migrations rapidly, ranging from warm subtropical areas during spawning season to subarctic feeding grounds (Block et al., 2005). This is because they can regulate their internal body temperature to keep it stable (Block et al., 2005). Bluefin tuna school according to size (Fig. 3) and sometimes school with other species of tuna (IUCN Redlist, 2015). Although they live mainly near the surface and subsurface, both the young and the adults are shown to dive to depths of 500-1000 m frequently (Fromentin and Powers, 2005). In summer and early fall, they dive at dusk and dawn, feed in the morning hours and bask in the afternoon near the surface (Block and Stevens, 2001). In spring and early winter, they exhibit diurnal diving patterns for long periods (Block and Stevens, 2001). They can swim up to 72.5 km/hr and feed mainly on smaller fish and invertebrates (Johnson, 2006; IUCN Redlist, 2015). These fish, though highly migratory, always travel to the same grounds (Gulf of Mexico or Mediterranean) to spawn (Block et al., 2005) (Fig. 2).

FOOD AND FEEDING. Bluefin tuna are primarily carnivores. Due to their high speeds, they can chase their prey (Johnson, 2006) which are small schooling fish such as herring, anchovies and mackerels, cephalopods such as squid and crustaceans such as shrimps and crabs (IUCN Redlist, 2015). The larvae and small juveniles primarily consume zooplankton and miniscule fishes while sub-adults consume medium fishes, cephalopods and shrimps and the adults mainly consume larger fishes and cephalopods (Sarà and Sarà, 2007). The juveniles, sub-adults and adults are opportunistic predators, able to take advantage of a wide variety of resources (Sarà and Sarà, 2007). Fully mature tuna appear to have a trophic level of about 4, which means they are highly situated in the food web of the pelagic ecosystem (Sarà and Sarà, 2007). It was found that the life stage of the tuna (juvenile, sub-adult, adult) affects the trophic level it is on as the larger it gets, the higher the trophic level it assumes (Sarà and Sarà, 2007).

POPULATION ECOLOGY. Atlantic bluefin tuna are social, forming aggregates (schools) based on size instead of species (Johnson, 2006). The smallest individuals form the largest schools and vice versa (Schultz, 2004). There swimming styles are single file, side by side or in an arc (Schultz, 2004). They form large aggregates to spawn. They can live up to 30 years but have a typical lifespan of 10 to 25 years (Johnson, 2006). There is very little knowledge of the population structure of this species. Population assessments consider them to be two separate populations with minimal mixing and their own distinct breeding grounds (Block et al., 2005). One population is proposed to live in the western part of the Atlantic and breeds in the Gulf of Mexico and the other is thought to live in the eastern part of the Atlantic with spawning ground in the Mediterranean,

with an overlapping of foraging grounds in the northern Atlantic between both populations (Block et al., 2005) (Fig. 2). Estimates indicate that Atlantic bluefin tuna populations are comprised of several million individuals (Fromentin and Powers, 2005).

REPRODUCTION. Iteroparous (breeds many times in its lifetime) and oviparous (lays eggs) (Fromentin and Powers, 2005). Batch spawner - spawns multiple times in a season (Fromentin and Powers, 2005). Number of eggs produced depends on age (or size) of female; 5-year old produces 5 million eggs on average and at age 15-20 they can produce over 40 million eggs (Fromentin and Powers, 2005). Breeding season in the Gulf of Mexico is between the months of April and June and in the Mediterranean is from June to August (Schultz, 2004). Spawning is typically done every year but evidence suggests that some individuals may breed once every 2-3 years (Fromentin and Powers, 2005). After the females release their eggs, fertilization is carried out by the males in the water column. The eggs incubate for 2-3 days on average then hatch. The pelagic larvae are usually 3-4 mm in size with a yolk sac which detaches a few days later. The larvae then feed themselves as there is no parental care provided for them (Fromentin and Powers, 2005). Sexual maturity occurs between ages 4 and 8 years (Johnson, 2006).

BEHAVIOUR. Juvenile behaviour: There is no parental care involved hence juveniles aggregate along ocean fronts for foraging (Fromentin and Powers, 2005).

Antipredator behaviour: Sharks, whales, marine mammals, humans and larger fish are among the predators of the Bluefin tuna. Schooling and speed are their antipredator mechanisms. Their colouring also aids in camouflaging them (Johnson, 2006). The different colours of their upper and lower halves make them difficult to see from both above and below (Johnson, 2006).

APPLIED ECOLOGY. Listed as endangered by the IUCN due to over-exploitation (IUCN Redlist, 2015; Block et al., 2005). Has been exploited for thousands of years by humans for food and sport (Fromentin and Powers, 2005). Highly valuable for sushi-sashimi in Japanese markets and as gamefish in North America (IUCN Redlist, 2015). Population is estimated to have decreased by over 51% in the last 40 years (IUCN Redlist, 2015). They are caught using various nets and traps and are used in the Mediterranean for fish-farming (IUCN Redlist, 2015). Conservation actions include development of the International Commission for the Conservation of the Atlantic Tuna (ICCAT), establishment of time limits for fishing, postulated reduction in the extent of fishing and farming, shipment prohibitions and measures to monitor and survey activities (IUCN Redlist, 2015).

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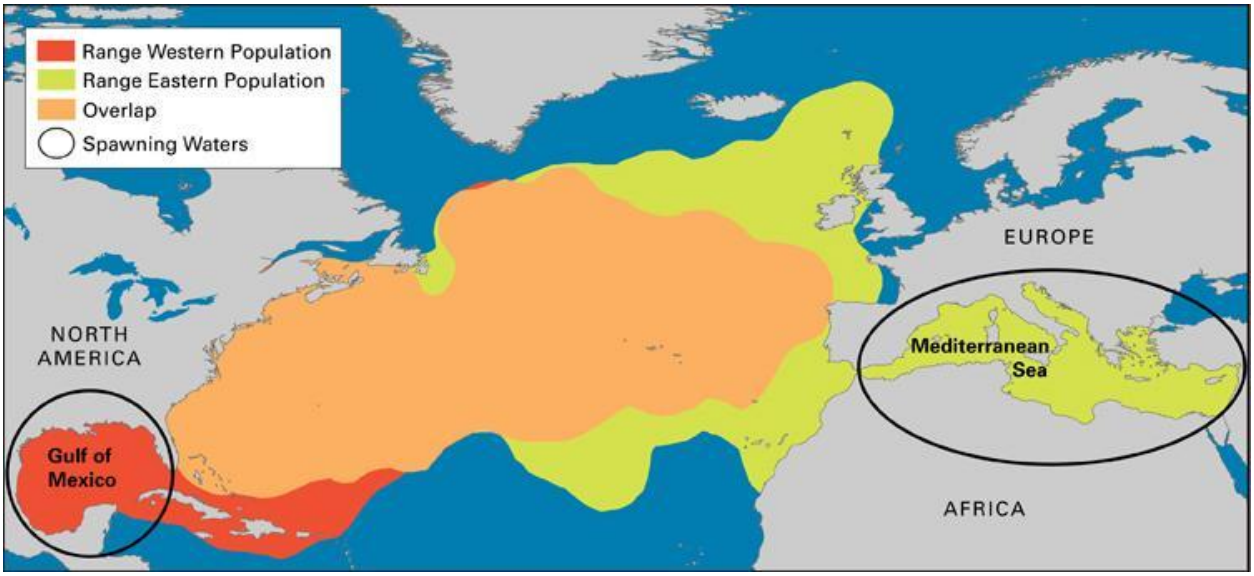

Fig. 2. Spawning grounds and overlapping feeding ground of two *T. thynnus* populations.

[http://ocean.si.edu/sites/default/files/styles/colorbox_full/public/photos/Tuna-Spawning-Map-cropped-full_1.jpg?itok=2PVnzMLm, downloaded 25 March 2015]

Fig. 3. School of Atlantic bluefin tuna.

[http://iss-foundation.org/2012/08/23/exploring-the-ecosystem-impacts-of-farmed-bluefin-tuna/, downloaded 25 March 2015]