DRAFT

Thunnus thynnus - (Linnaeus, 1758)

ANIMALIA - CHORDATA - ACTINOPTERYGII - PERCIFORMES - SCOMBRIDAE - Thunnus - thynnus

Common Names: Kuromaguro (Japanese), Thon Rouge de l'Atlantique (French), Atlantic Bluefin Tuna (English), Atún Aleta Azul (Spanish), Atum-azul (Portuguese)
Synonyms: Orcynus thynnus (Linnaeus 1758) ; Thynnus secundodorsalis Storer 1855 ; Thunnus secundodorsalis (Storer 1855) ; Thynnus linnei Malm 1877 ; Thynnus mediterraneus Risso 1827 ; Albacora thynnus (Linnaeus 1758) ; Thunnus thynus (Linnaeus 1758) ; Thynnus thynnus (Linnaeus 1758) ; Orcynus secondidorsalis (Storer 1855) ; Thunnus thynnus coretta (non Cuvier 1829) ; Thynnus vulgaris Cuvier 1832 ; Scomber thynnus Linnaeus 1758 ; Thunnus vulgaris (Cuvier 1832) ; Thunnus thynnus thynnus (Linnaeus 1758) ; Thunnus thynnus saliens (non Jordan & Evermann 1926) ;

Taxonomic Note:
This is now considered to be a separate species from *Thunnus orientalis* (Collette 1999).

Red List Assessment

Red List Status
EN - Endangered, A2bd (IUCN version 3.1)

Assessment Information

Reviewed?	Date of Evaluation:	Status:	Reasons for Rejection:	Improvements Needed:
False	-	-	-	-

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Reviewer(s): Russell, B. & Polidoro, B.

Assessment Rationale

This Atlantic species has experienced declines in range and reported CPUE since the 1960's. Although a number of uncertainties exist in the reported data, especially from the Mediterranean region, the best estimates from the most recent 2010 stock assessment indicate that there has been a global decline of between a 29% and 50% based on summed SSB from both the Western and Eastern stocks over the past 21-39 years (based on a generation length of between 7 and 13 years). Pre-exploitation longevity is not known for the Eastern Atlantic, but it is assumed that at one point that this species had a similar longer generation length across its global range. In the Eastern Atlantic stock, current fishing mortality is above MSY and estimated SSB is below MSY. The Western Atlantic stock has experienced severe declines in the past, and recovery may not be reversible. This species is therefore listed as Endangered under Criterion A2. Management of the eastern Atlantic stock is essential to the future of this species, as it represents the majority of this species global population.

Distribution

Geographic Range

This species was present in the western Atlantic from Canada to Brazil including the Gulf of Mexico and the Caribbean Sea, although the bulk of the population off Brazil has disappeared (Porch 2005, Takeuchi *et al.* 2009). Over the last 20 to 36 years, the species has not been recorded off the coast of Brazil (Lessa and Amorim pers.comm. 2010) and there is no record of bluefin tuna in southern Brazil in the 20th century (Gasalla pers. comm. 2010).

In the eastern Atlantic, it is present from Norway to the Canary Islands. It is also reported from Mauritania (Maigret and Ly 1986) and off South Africa (Collette and Nauen 1983). It is present in the Mediterranean Sea and the southern Black Sea. Black Sea Bluefin Tuna was well documented in ancient times and there was an annual migration from the Black Sea to eastern Mediterranean spawning grounds. However, after World War II, the environmental condition in the Black Sea deteriorated and now sightings in the Black Sea are rare.

Elevation / Depth / Depth Zones

Depth Lower Limit (in metres below sea level): 500

Depth Upper Limit (in metres below sea level): 0

Depth Zone: Shallow photic (0-50m), Deep Photic (51-200m), Bathyl (201-4,000m)

Map Status

Map Status: Done

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Albania	Extant	Native	-	Resident
Algeria	Extant	Native	-	Resident
Anguilla	Extant	Native	-	Resident
Antigua and Barbuda	Extant	Native	-	Resident
Aruba	Extant	Native	-	Resident
Bahamas	Extant	Native	-	Resident
Barbados	Extant	Native	-	Resident
Belgium	Extant	Native	-	Resident
Belize	Extant	Native	-	Resident
Bermuda	Extant	Native	-	Resident
Brazil	Extant	Native	-	Resident
Bulgaria	Extant	Native	-	Resident
Canada	Extant	Native	-	Resident
Cape Verde	Extant	Native	-	Resident
Cayman Islands	Extant	Native	-	Resident
Colombia	Extant	Native	-	Resident
Costa Rica	Extant	Native	-	Resident
Croatia	Extant	Native	-	Resident
Cuba	Extant	Native	-	Resident
Cyprus	Extant	Native	-	Resident
Denmark	Extant	Native	-	Resident
Dominica	Extant	Native	-	Resident
Dominican Republic	Extant	Native	-	Resident
Egypt	Extant	Native	-	Resident
Estonia	Extant	Native	-	Resident
Finland	Extant	Native	-	Resident
France	Extant	Native	-	Resident
French Guiana	Extant	Native	-	Resident
Germany	Extant	Native	-	Resident
Gibraltar	Extant	Native	-	Resident
Greece	Extant	Native	-	Resident
Grenada	Extant	Native	-	Resident
Guadeloupe	Extant	Native	-	Resident
Guatemala	Extant	Native	-	Resident
Guyana	Extant	Native	-	Resident

Haiti	Extant	Native	-	Resident
Honduras	Extant	Native	-	Resident
Ireland	Extant	Native	-	Resident
Israel	Extant	Native	-	Resident
Italy	Extant	Native	-	Resident
Jamaica	Extant	Native	-	Resident
Latvia	Extant	Native	-	Resident
Lebanon	Extant	Native	-	Resident
Libyan Arab Jamahiriya	Extant	Native	-	Resident
Lithuania	Extant	Native	-	Resident
Malta	Extant	Native	-	Resident
Martinique	Extant	Native	-	Resident
Mexico	Extant	Native	-	Resident
Monaco	Extant	Native	-	Resident
Montserrat	Extant	Native	-	Resident
Morocco	Extant	Native	-	Resident
Namibia	Extant	Native	-	Resident
Netherlands	Extant	Native	-	Resident
Netherlands Antilles	Extant	Native	-	Resident
Nicaragua	Extant	Native	-	Resident
Norway	Extant	Native	-	Resident
Panama	Extant	Native	-	Resident
Poland	Extant	Native	-	Resident
Portugal	Extant	Native	-	Resident
Puerto Rico	Extant	Native	-	Resident
Saint Barthélémy	Extant	Native	-	Resident
Saint Kitts and Nevis	Extant	Native	-	Resident
Saint Lucia	Extant	Native	-	Resident
Saint Martin (French part)	Extant	Native	-	Resident
Saint Vincent and the Grenadines	Extant	Native	-	Resident
Slovenia	Extant	Native	-	Resident
South Africa	Extant	Native	-	Resident
Spain	Extant	Native	-	Resident
Suriname	Extant	Native	-	Resident
Sweden	Extant	Native	-	Resident
Syrian Arab Republic	Extant	Native	-	Resident
Trinidad and Tobago	Extant	Native	-	Resident
Tunisia	Extant	Native	-	Resident
Turkey	Extant	Native	-	Resident
Turks and Caicos Islands	Extant	Native	-	Resident
USA	Extant	Native	-	Resident
United Kingdom	Extant	Native	-	Resident
Venezuela	Extant	Native	-	Resident
Virgin Islands, British	Extant	Native	-	Resident
Virgin Islands, U.S.	Extant	Native	-	Resident
Western Sahara	Extant	Native	-	Resident

FAO Area Occurrence

	Presence	Origin	Formerly Bred	Seasonality
Atlantic - eastern central	Extant	Native	-	Resident
Atlantic - northeast	Extant	Native	-	Resident

Atlantic - northwest	Extant	Native	-	Resident
Atlantic - southeast	Extant	Native	-	Resident
Atlantic - southwest	Extant	Native	-	Resident
Atlantic - western central	Extant	Native	-	Resident
Mediterranean and Black Sea	Extant	Native	-	Resident

Population

This species has become rare because of massive overfishing (Fromentin and Powers 2005, Majkowski 2007, MacKenzie *et al.* 2009). The Center for Biological Diversity has petitioned the US Government to list the Atlantic bluefin tuna under the US Endangered Species Act and the US government has agreed to conduct a status review for this species.

Genetic differentiation and homing to breeding sites indicates that there are at least three reproductively isolated stocks (Boustany *et al.* 2008, Carlsson *et al.* 2007) although there is considerable trans-Atlantic migration of individuals from the Mediterranean and western Atlantic stocks (Rooker *et al.* 2008, Dickhut *et al.* 2009). The western Atlantic stock is found from Labrador and Newfoundland south into the Gulf of Mexico and Caribbean Sea; the eastern Atlantic stock from Norway south to the Canary Islands and the Mediterranean Sea. There is a distinct Mediterranean/East Atlantic stock but there is some mixing with the western Atlantic stock in the North Atlantic (Block *et al.* 2005).

Worldwide reported landings show fluctuating, but relatively stable landings from 1950 to 1993, of between 15,000 to 39,000 tonnes per year. Reported catches increased to a peak of 52,785 tonnes in 1996, and then fell again to 38,830 tonnes in 2006 (FAO 2009). However, in many regions, the catch statistics for this species are considered to be unreliable because catches are not reported from some countries and landings data are confounded by ranching harvests occurring months to years after the fish have been caught (STEFC 2009).

Western Atlantic Stock:
In the Western Atlantic, the catch from 2000-2004 averaged 2,000-3,000 tonnes/year, and the status of the stock is Depleted (Majikowski 2007). Western Atlantic bluefin fisheries have been managed since the early eighties (as of 1982 quota restrictions were imposed) and catches have been relatively stable around 2,500 tonnes until 2001, when they increased in 2002 to 3,319 tonnes and have been declining since then, reaching 1,624 tonnes in 2007. In 2008, catches increased again to 2,015 t. The most recent stock assessment (ICCAT 2010) is consistent with previous analyses in that spawning stock biomass (SSB) declined steadily between the early 1970s and early 1990s. Since then, SSB is estimated to have fluctuated between 21% and 28% of the 1970 level, but with a gradual increase in recent years from the low of 21% in 2003 to 29% in 2009. The stock has experienced different levels of fishing mortality over time, depending on the fish targeted by various fleets. A key factor in estimating MSY-related benchmarks is the highest level of recruitment that can be achieved in the long term. Assuming that average recruitment cannot reach the high levels from the early 1970s, recent F (2006-2008) is 70% of the MSY level and SSB2009 is about 10% higher than the MSY level. However, estimates of stock status are more pessimistic if a high recruitment scenario is considered (F/FMSY=1.9 and B/BMSY=0.15) (SCRS ICCAT 2010).

As linear regression did not provide the best fit for the steep declines observed in SSB over time in the Western Atlantic, using endpoints of the base case (ICCAT 2010) there has been an estimated 72% decline in SSB over the past 39 years (1970-2009), and a less than 1% decline in SSB over the past 21 years (1988-2009) in the Western Atlantic stock.

Eastern Atlantic and Mediterranean stock:
In the Eastern Atlantic and Mediterranean stock, the catch from 2000-2004 averaged 32,000-35,000 tonnes/year, and the status of the stock is Over-Exploited (Majikowski 2007). Currently this stock is fished at levels above FMSY, and estimated SSB is only about 35% of the biomass that is expected under a MSY (SRCS ICCAT 2010). The increase in mortality for large bluefin tuna is consistent with an apparent shift in targeting larger individuals destined for fattening and/or farming in the region. A quota system has been put in place to set levels for maximum sustainable yield (MSY) of 29,000 mt (STECF 2009), but current models put the MSY at 13,500 mt (SCRS ICCAT 2010). The current management structure has established TACs for the entire Mediterranean, however, recent genetic studies suggest multiple populations within the Mediterranean. This is problematic because there is the potential for overfishing of segments of the Mediterranean population. In addition, information available has demonstrated that catches of bluefin tuna from the East Atlantic and Mediterranean were seriously under-reported between the mid-1990s through 2007. The lack of compliance with TAC and underreporting of the catch may have undermined conservation of the stock (SRCS ICCAT 2010).

In the most recent stock assessment (SCRS ICCAT 2010), final estimated spawning biomass differ slightly between the two satisfactory model runs. The spawning biomass peaked at over 300,000 tonnes in the late 1950s and early 1970s, followed by a decline. Under run 13, the biomass continued to decline slightly to about 150,000 tonnes, while under run 15 biomass slightly increased during the late 2000s to about 2000,000 tonnes. Considering both runs, the analyses indicated that recent (2007-2009) SSB is about 57% of the highest estimated SSB levels (1957-1959).

Using endpoints of the base case (ICCAT 2010) there has been an estimated 45% decline in SSB over the past 39 years (1970-2009), and a 30% decline in SSB over the past 21 years (1988-2009) in the Eastern Atlantic stock.

Habitats and Ecology

This is a pelagic, oceanodromous species, that seasonally can be found close to shore and can tolerate a wide range of temperatures. This species schools by size, sometimes together with albacore, yellowfin, bigeye, skipjack etc. It preys on small schooling fishes (anchovies, sauries, hakes) or on squids and red crabs. A recent study on the Mediterranean diet of this species provided evidence that juveniles prey mainly on zooplankton and small pelagic coastal fishes, sub-adults prey on medium pelagic fishes, shrimps and cephalopods, while adults prey mainly on cephalopods and larger fishes (Sarà and Sarà 2007).

This species has a maximum size over 300 cm (FL), but is more common to 200 cm. Longevity is at least 35 years and possibly to 50 years (Santamaria *et al.* 2009).

In the Western Atlantic, this species spawns in the Gulf of Mexico from mid-April to early July at temperatures of 22.6-27.5ºC, starting at age 8 to 10 years at around 200 cm (FL), although most individuals first spawn closer to age 12 (Collette 2010, Diaz *et al.* 2009**,** Rooker *et al.* 2007, Rooker *et al.* 2008, Boustany *et al.* 2008). Maximum age is around 32 years (Neilson and Compana 2008), although age composition structure has also changed over time (e.g. there are more younger individuals). For the most recent stock assessment, an age of first maturity was estimated to be approximately 145 kg or about age 9 in the Gulf of Mexico (SRCS ICCAT 2010). For the western Atlantic stock, the generation length is therefore estimated to be approximately 13 years based on average survivorship and fecundity across known Scombrid stocks (Collette *et al.* 2011).

The Eastern Atlantic stock spawns in the Mediterranean Sea from May to August at temperatures of 22.5-25.5ºC, starting at age 3 and full recruitment is reached by age 5. There are distinct behaviors during the spawning time, most noticeably with changes in diving times and depths. Estimated relative batch fecundity is greater (more than 90 oocytes/g of body weight) than estimated for other tunas in the genus *Thunnus* (Collette 2010, Sissenwine *et al.* 1998, Corriero *et al.* 2003, Rooker *et al.* 2007, Boustany *et al.* 2008, Rooker *et al.* 2008). Fromentin and Powers (2005) reported that there is spawning site fidelity for this species both in the Mediterranean Sea and in the Gulf of Mexico. There are several spawning grounds throughout the Mediterranean. Median sexual maturity in the Mediterranean Sea was reached at 103.6 cm (FL), and females weighing between 270 and 300 kg produce as many as 10 million eggs per spawning season (Corriero *et al.* 2005).

In the Eastern Atlantic stock and in the Mediterranean Sea, age of first maturity is about 3 to 5 years (115-121 cm FL), with a longevity of 35 years or more (Corriero *et al.* 2003, Santamaria *et al.* 2009, Rooker *et al.* 2007, Rooker *et al.* 2008). For the most recent stock assessment, an age of first maturity was estimated to be approximately 25 kg or age 4 in the Mediterranean (SRCS ICCAT 2010). For the eastern Atlantic stock, the generation length is therefore estimated to be approximately 7 years based on average survivorship and fecundity across known Scombrid stocks (Collette *et al.* 2011).

The all-tackle angling record is of a 678.58-kg fish caught off Aulds Cove, Nova Scotia, Canada in 1979 (IGFA 2009.)

Based ICCAT collected volume of scientific papers Vol. 65:3 = gives a generation length of 18 years, so we are being very conservative with the Gen. Length.

IUCN Habitats Classification Scheme

Life History

Generation Length	Justification:
7-13	-

Age at Maturity: Female	Age at Maturity: Male	Longevity	Maximum Size (in cms)	Size at Birth (in cms)
3-10 Years	3-10 Years	35-50 Years	458 (TL)	0.3

Average Annual Fecundity or Litter Size
10000000 (128.5 eggs/gram/female/year)

Breeding Strategy

Does the species lay eggs?	Does the species give birth to live young	Does the species exhibit parthenogenesis
False / No	False / No	False / No

Does the species have a free-living larval stage?	Does the species require water for breeding?
False / No	False / No

Movement Patterns

Movement Patterns: Migratory

Systems

System: Marine

Use and Trade

General Use and Trade Information

This is a highly valued species for the Japanese sashimi markets, which has led to severe overfishing in both the Eastern and Western Atlantic. It is also an important gamefish particularly in the United States and Canada.

Threats

This species is mainly caught by purse-seine, longline and traps. It is also used for commercial fish farming in the Mediterranean Sea.

The eastern Atlantic Bluefin stock is taken by a variety of vessels and types of fishing gears, with landing sites located in many countries. The main gears are longline, trap and baitboat for the east Atlantic, and purse-seine, longline and traps for the Mediterranean. Recreational fishing may also be a relevant but unquantified source of fishing mortality on juvenile bluefin. The rapid development of tuna farming in the Mediterranean Sea has induced further pressure on this stock and compounds the serious and well known problem of obtaining accurate catch data. Length compositions of the catches is affected by under-reported or over-quota components. Data on juvenile bluefin catches from the Mediterranean have not been available for many years, even though fisheries targeting the first three age groups occur in many areas. The lack of reliable data on juvenile catches has also compromised the stock assessments and advice for many years (SCRS ICCAT 2010, STECF 2009). It is generally agreed however, that the stock will continue to be overfished because of its high economic value and inadequate protection.

In the western Atlantic, the fishery is conducted by the US, Canada and Japan. There are concerns over the potential impacts on the 2010 year class from the Deep Horizon oil spill that occurred in the Gulf of Mexico between April-August of that year (Compagna *et al.* 2011).

Conservation

There are several conservation measures for this species mainly based on regulation of fisheries activities. The International Commission for the Conservation of the Atlantic Tuna (ICCAT) was established in 1967. Fisheries quotas have been set up since 1998, and a comprehensive pluri-annual recovery action plan adopted by the ICCAT contracting parties in 2007, including time closure for fishing activities and mandated reduction in fishing capacity. Some countries, such as Taiwan, have ceased fishing in the

Mediterranean, despite having a quota.

However, many conservation measures are not fully enforced and illegal catch continues. Enforcement of the existing measures is needed to prevent extinction of this species. Also, although the bluefin tuna probably has more data collected on it than most other fish species, uncertainties in the data make much of it unreliable. It is crucial to improve the quality of data if fisheries managers are going to be able to improve their methods.

High priority also needs to be given to protecting spawning adults in the Gulf of Mexico and Mediterranean Sea. Large adults in the northern foraging region in the Gulf of Maine and Gulf of St. Lawrence also need protection because this region represents critical refugia (Rooker *et al.* 2008).

Eastern Atlantic and Mediterranean:

For EU Member States, driftnet fishing for tuna has been banned since January 1st 2002, while the ban entered into force in 2004 for all the other Contracting Parties to ICCAT, as well as the GFCM Member States, but a driftnet fishing activity is still officially permitted in Morocco. The ICCAT further believes that a time area closure could greatly facilitate the implementation and the monitoring of rebuilding strategies. Clearly, an overall reduction in fishing effort and mortality, as stated in 2008, is needed to reverse current trends. The 2007 fishing capacity largely exceeds the 2007 TAC, but the 2008 catch capacity might be under 2008 TAC if illegal fishing did not occur. However, the potential catch capacity is clearly above TAC. Therefore, management actions need to be pursued to mitigate the impacts of overcapacity as well as to eliminate illegal fishing. Deferring effective management measures will likely result in even more stringent measures being necessary in the future to achieve the ICCAT objectives. STECF agrees with the ICCAT-SCRS that the minimum catch size should be set at 25 kg in order to avoid misreporting and/or discarded catches of mature fish between 25 kg and 30 kg. There remains an urgent need to have more reliable and complete size frequency data (particularly, but not only, for early year-classes 1 to 3) for the period following the introduction of a TAC in the Mediterranean. Tagging programs, fishery independent surveys and mining of historical data will all contribute to a better understanding of the status of this species and should be encouraged (STECF 2009).

In [Rec. 09-06] the Commission established a total allowable catch for eastern Atlantic and Mediterranean bluefin tuna at 13,500 t in 2010. Additionally, in [Rec. 09-06] the Commission required that the SCRS provide the scientific basis for the Commission to establish a three-year recovery plan for 2011-2013 with the goal of achieving BMSY through 2022 with at least 60% of probability (SRCS ICCAT 2010).

Western Atlantic:

In 1998, the Commission initiated a 20-year rebuilding plan designed to achieve BMSY with at least 50% probability. In response to recent assessments, in 2008 the Commission recommended a total allowable catch (TAC) of 1,900 t in 2009 and 1,800 t in 2010 [Rec. 08-04] (SRCS ICCAT 2010). Probabilities of achieving BMSY within the Commission rebuilding period were projected for alternative catch levels. The "low recruitment scenario" suggests that biomass is currently sufficient to produce MSY, whereas the "high recruitment scenario" suggests that BMSY has a very low probability of being achieved within the rebuilding period. Despite this large uncertainty about the long term future productivity of the stock, under either recruitment scenario current catches (1,800 t) should allow the biomass to continue to increase. Also, catches in excess of 2,500 t will prevent the possibility of the 2003 year class elevating the productivity potential of the stock in the future (SRCS ICCAT 2010).

As noted previously by the Committee, both the productivity of western Atlantic bluefin and western Atlantic bluefin fisheries are linked to the eastern Atlantic and Mediterranean stock. Therefore, management actions taken in the eastern Atlantic and Mediterranean are likely to influence the recovery in the western Atlantic, because even small rates of mixing from East to West can have significant effects on the West due to the fact that Eastern plus Mediterranean resource is much larger than that of the West (SRCS ICCAT 2010, STECF 2009).

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