CHAPTER 2.1.10.5: ATL. LITTLE TUNA	AUTHORS: R. SANT'ANA (UNIVALI), R. IVANOFF (UNIVALI) AND F. LUCENA-FRÉDOU (UFRPE)	LAST UPDATE: 30 June 2021 Original: English

2.1.10.5 Description of Atlantic little tuna (LTA)

1. Names

1.a. Classification and taxonomy

Species name: *Euthynnus alletteratus* (Rafinesque, 1810)
ICCAT species code: LTA
ICCAT names: Atlantic little tuna (English), Thonine (French), Bacoreta (Spanish).

According to Collette and Nauen (1983), the Atlantic little tuna is classified as follows:

- Phylum: Chordata
- Subphylum: Vertebrata
- Superclass: Gnathostomata
- Class: Osteichthyes
- Subclass: Actinopterygii
- Order: Perciformes
- Suborder: Scombroidei
- Family: Scombridae
- Genus: Euthynnus
- Species: *Euthynnys alletteratus*

1.b. Common names

List of vernacular names used by different countries according to ICCAT, FAO and Fishbase (www.fishbase.org). The list of countries is not exhaustive and some local names might not be included.

Albania: Trup.
Angola: Melva, Merma.
Bahamas: Little tuna.
Brazil: Albacora, Bonito, Bonito-cachorro, Bonito-pintado, Bonito-rajado, Curuatá-pinima, Merma.
Cabo Verde: Apluro, Bacoreta, Barrilete, Cachorra, Cachorreta, Cachorrinha, Judeu, Merma, Thonine.
China Main: 小鮪.
Cote d'Ivoire: Bokou-bokou, Bonita, Klewe.
Croatia: Luc.
Cuba: Bonito, Comevíveres.
Denmark: Almindelig, Thunnin Thunnin.
Dominican Republic: Bonito.
Egypt: Tunna.
Finland: Tunniina.
Former USSR: Atlanticheskyj malyj tunets, Malyj tunets, Tsyatnystyj atlanticheskyj tunets.
France: Thonine commune.
Germany: Falscher, Bonito, Thonine.
Ghana: El'la, Poponkou.
Greece: Τοννάκι, Τουνίνα, Τονίνα, Τάσκα, Καρβούνι, Καρβούνα, Λεκατίκι, Karvouni.
Guinea: Makreni.

Israel: Tunnit atlantit.
Italy: Alacurza, Aleterato, Alletterato, Allittirato, Allittiratu, Carcana, Cuvarito, Cuvaritu, Leterato, Letterato, Lettirado, Litterato, Littiratu, Nzirru, Palametidd, Pizziteddu, Sanguinaccio, Scampírru, Tonnella, Tonnetto, Tonnina, Tunna, Tunnina.
Japan: Taiseiyou-yaito, Taiwan yaito.
Lebanon: Balamydah.
Malta: Kubrit, Kubrita, Tonina.
Martinique: Bonite queue raide, Gueule molle, Thonine, Thonine commune.
Mauritania: Atlantic little tuna, Bacorète, Corrinelo, Labeidna, Ouolass, Ravil, Thonine.
Mexico: Bacoreta, Bacoreta, Bonito.
Monaco: Tunina.
Morocco: Lbakoura.
Nicaragua: Bacoreta.
Norway: Tunnin.
Poland: Tunek atlantycki.
Portugal: Atún, Fule-fule, Melena, Melva, Merma.
Puerto Rico: Bonito.
Romania: Ton mic.
Sao Tome Prn: Fulu fulu.
Senegal: Deleu deleu, Oualass, Thonine, Walas.
Sierra Leone: Little tuna.
Slovenia: Pegasti tun.
South Africa: Atlantic little tuna, Atlantiese kleintuna, Merma.
Spain: Bacoreta.
St Helena: Little tunny.
Sweden: Tunnina.
Togo: Bonite, Kpoku.
Trinidad Tobago: Bonito.
Tunisia: R'zem, Toun sghir.
Türkiye: Yaziliorkinos.
UK: Atlantic little tunny, Little tuna, Little tunny.
Ukraine: Malyi zapadnyi tunets, Pyatnistyi tunets.
US Virgin Islands: Little tuna.
USA: Bonito, False albacore, Little tuna, Little tunny.
Venezuela: Atuncito, Bonito, Cabaña pintada, Carachaza, Carachana pintada.

2. Identification

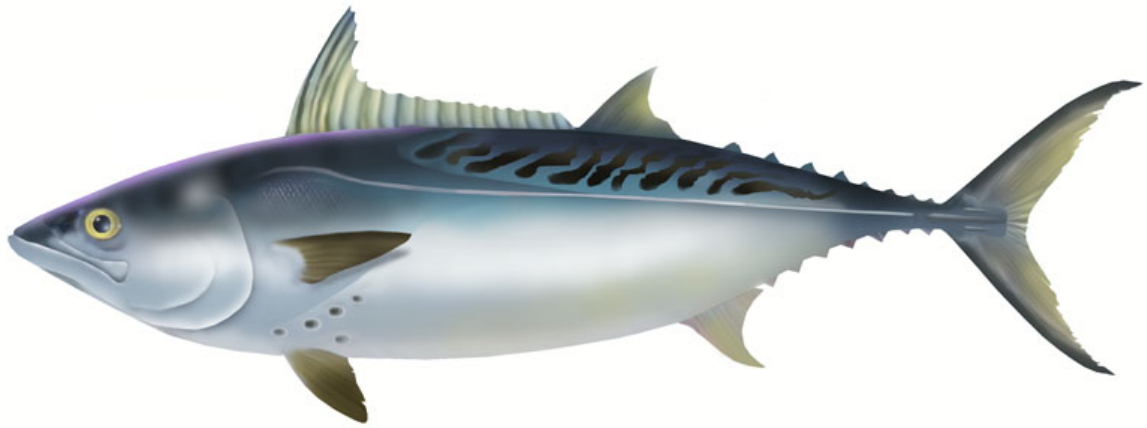

Figure 1. Drawing of an adult *Euthynnus alleteratus* (by A. López, 'Tokio').

Characteristics of *Euthynnus alleteratus* (see Figure 1 and Figure 2)

Atlantic little tuna is a small tuna species. The maximum reported sizes for *Euthynnus allentteratus* in the ICCAT regions were 80.6 cm FL in the Northeast Atlantic Ocean (Cayré and Diouf, 1980), 106.68 cm FL in the Northwest Atlantic Ocean (IGFA, 2011) and 81 cm FL in Southwest Atlantic Ocean (Menezes and Aragão, 1977). Maximum size in the Mediterranean Sea is around 100 cm fork length (FL) and maximum weight is around 12 kg (Collette and Nauen, 1983; Collette, 1986). For the Mediterranean Sea, more recently, Claro (1994) reported a maximum size of 122 cm FL for the species.

Colour:

- Dark blue on dorsal parts with a complex striped pattern not extending forward beyond middle of first dorsal fin. Silvery white on ventral and lower sides.
- Several characteristic dark spots between pelvic and pectoral fins (not always very conspicuous).

External:

- Body robust and fusiform.
- Body naked, except for the corselet and lateral line.
- Caudal peduncle slender with a prominent median keel between smaller keels.
- Two dorsal fins separated by a narrow space. Anterior spines of first dorsal fin large, giving the fin a strongly concave outline. Second dorsal much lower than first, followed by 8 finlets.
- Anal fin followed by 7 finlets.
- Short pectoral fin. Pectoral rays: 26-27.
- Dorsal spines: 10-15.
- Anal rays: 11-15.
- Gill rakers on first arch: 37-45.
- Inter-pelvic process small and bifid.

Internal:

- Swim bladder absent.
- Liver with right lobe much longer than left and middle lobes.
- Vertebrae: 37-39.
- Incipient protuberances on 33rd and 34th vertebrae.
- Cutaneous artery present.

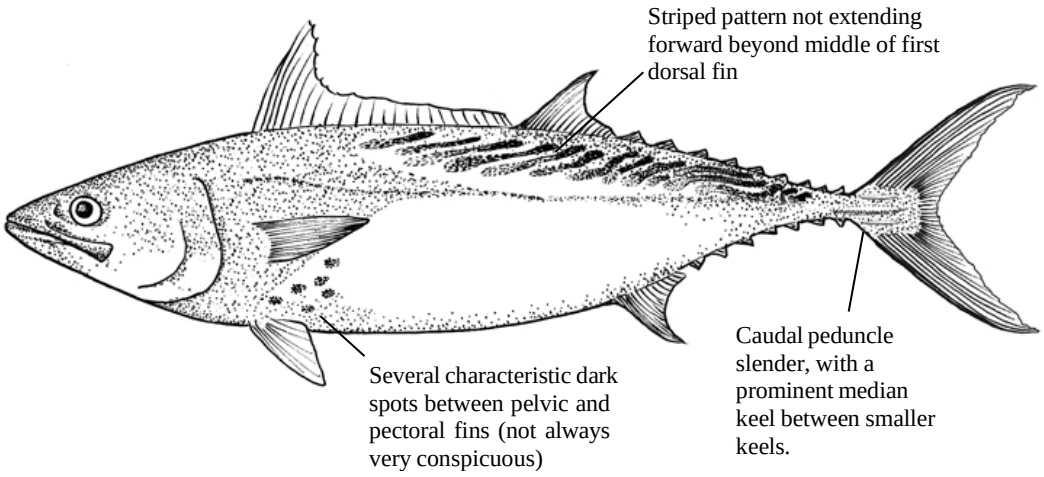

Figure 2. Synthesis of the most outstanding characteristics of *Euthynnus alleteratus* (by A. López, 'Tokio').

3. Distribution and population ecology

3.a. Geographical distribution

The species is distributed on both sides of the tropical and subtropical Atlantic Ocean, including the Mediterranean Sea, the Caribbean Sea and the Gulf of Mexico (Belloc, 1955; Johnson, 1983; Collette and Nauen, 1983; Cabrera *et al*., 2005) (**Figure 3**).

In the Eastern Atlantic, it is reported as far north as Skaggerak and as far south as South Africa, including the Mediterranean and Black Seas; however, it is rare in the northern Iberian Peninsula. In the western Atlantic Ocean, the species is reported from the coast of Canada, approximately 50º N to the south of Brazil, close to the 30º S (**Figure 3**).

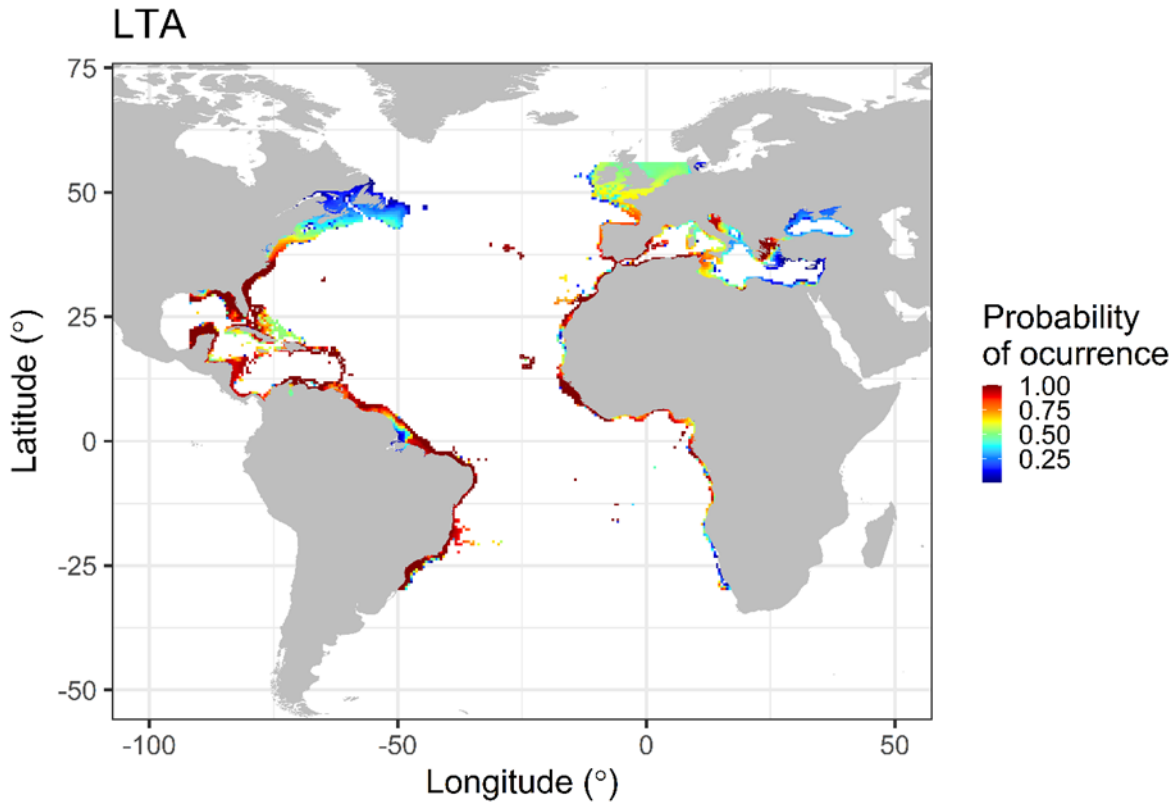

Figure 3. Native spatial distribution of Atlantic little tunny based on data available on aquamaps.org website. Distribution colour ranges indicate degree of probability of occurrence.

3.b. Habitat preferences

Atlantic little tuna is an epipelagic and neritic fish that typically occurs in inshore waters, being more coastal than other tuna species. This species, together with other scombrid species, forms schools according to size but tends to scatter during certain periods of the year. It is usually found in coastal waters with swift currents, near shoals, around the warmer waters of thermal fronts and upwellings. It is most abundant in the tropical Atlantic where the water temperature varies between 24ºC and 30ºC (Chur, 1973; Sabatés and Recasens, 2001).

3.c. Migrations

The migratory patterns of this species are still not fully known. However, tagging studies conducted in 1981 suggested a possible migration of little tunny from the Mediterranean Sea to the Atlantic Ocean (Rey and Cort, 1981).

3.d. Recruitment

The early life stages of tunas are mostly unknown, although it is assumed that the larval period is short.

4. Biology and life history parameters

For the purpose of this manual, the following five stocks unit areas, previously defined by ICCAT for data collection and management, were considered to summarize the results: Mediterranean Sea (MED), Northeast Atlantic (NE), Northwest Atlantic (NW), Southeast Atlantic (SE) and Southwest Atlantic (SW).

4.a. Growth

Atlantic little tuna age and growth have been determined in studies using different methodologies, such as otoliths, vertebrae, spine and size frequency. In general, the maximum reported age for this species is 8 years (Landau, 1965; Jonhson, 1983; Cayré *et al*., 1993; Kahraman, 1999).

Kahraman and Oray (2001) found 6 age groups (0+/5+) for the Aegean Sea and 9 age groups (0+/8+) for the eastern Mediterranean Sea. More recently, El-Haweet *et al*. (2013) found 8 age groups for the Mediterranean Sea. **Table 1** shows estimates of growth parameters for the different areas. Rodríguez-Roda (1979) studied vertebrae and length frequencies and developed a growth equation based on specimens from the western Mediterranean and Atlantic area near the Gibraltar Strait. Santamaria *et al*. (2005) estimated that growth rate of juvenile fish from the Mediterranean Sea based on otolith analysis (18-69 days) is 3.96 mm. Additionally, Kahraman *et al*. (2008) found a high percentage of the females caught in the Mediterranean Sea aged between 2 and 4 years old.

For the Northwest Atlantic Ocean, Adams and Kerstetter (2014) observed specimens of little tunny of no more than 5 years old, with a maximum fork length of 83.2 cm (**Table 1**).

Table 1. Growth parameters for Atlantic little tuna (L∞ in cm, K in y-1, t0 in y).

Growth parameter									
L∞	**K**	**t_0**	**Area**	**Country**	**Reference**	**N**	**Sex**	**FL range (cm)**	**Method**
99.5	0.315		Northeast Atlantic	Senegal	Diouf, 1980				
112	0.126		Northeast Atlantic	Senegal	Cayré and Diouf, 1983	100	Both	27-80	Dorsal spine
115	0.190	-1.710	Northeast Atlantic	Spain	Rodríguez-Roda, 1979				
111	0.220	-0.929	Mediterranean Sea	Tunisia	Hattour, 1984				Otolith
136	0.165			Tunisia	Hattour, 1984				Otolith
123	0.127	-3.840	Mediterranean Sea	Türkiye	Kahraman and Oray, 2001	1,454	Both	52-97.5	Dorsal spine
127.5	0.106	-4.180	Mediterranean Sea	Türkiye	Kahraman and Oray, 2001	145	Both	55-85	Dorsal spine
91.5	0.390	-0.400	Mediterranean Sea	Spain	Valeiras *et al*., 2008	127	Both	32-84	Dorsal spine
123.4	0.160	-0.590	Mediterranean Sea	Egypt	El-Haweet *et al*., 2013	531	Both	13-102	Vertebrae
86	0.26	-0.32	Northwest Atlantic	Mexico	Cabrera *et al*., 2005	480	Both		
77.9	0.690	-0.690	Northwest Atlantic	United States of America	Adams and Kerstetter, 2014	203	Both	25-83.2	Otolith
87.9	0.370	-1.650	Northwest Atlantic	United States of America	Adams and Kerstetter, 2014	121	Male		Otolith
77.5	0.640	-0.760	Northwest Atlantic	United States of America	Adams and Kerstetter, 2014	63	Female		Otolith
117	0.192	-1.127	Mediterranean Sea		Hattour, 2009		Both		Otolith
130.8	0.131	-2.220	Mediterranean Sea		Hajjej *et al*., 2010		Female		

4.b. Length-weight relationship

In the scientific literature, most studies on length-weight relationships for *Euthynnus allentteratus* are for the Mediterranean Sea. **Table 2** shows a summary of available scientific publications.

Table 2. Published data on the length-weight relationship of Atlantic little tuna.

Equation	N	FL range (cm)	Sex	Area	Country	Reference
$W = 0.0000575 \times FL^{2.697}$	145	55-85		Mediterranean Sea	Türkiye	Kahraman and Oray, 2001
$W = 0.0000476 \times FL^{2.725}$	1,454	52-97		Mediterranean Sea	Türkiye	Kahraman and Oray, 2001
$W = 0.0163 \times FL^{3.000}$	100	47-101		Mediterranean Sea	Tunisia	
$W = 0.0138 \times FL^{3.035}$	1,808	20-90	All	Northeast Atlantic	Senegal	Diouf, 1980
$W = 0.0441 \times FL^{2.755}$	217	56-86	All	Mediterranean Sea	Spain	Macías *et al*., 2006
$W = 0.0001 \times FL^{2.468}$	63	58-83	All	Mediterranean Sea	Türkiye	Kahraman, 2005
$W = 0.00002 \times FL^{2.956}$	41	34-63	All	Mediterranean Sea	Cyprus	Kahraman, 2005
$W = 0.0000222 \times FL^{2.915}$	325	40-90	All	Mediterranean Sea	Spain	Rodríguez-Roda, 1966
$W = 0.0380 \times FL^{2.770}$	96	43-87	All	Mediterranean Sea	Türkiye	Kahraman *et al*., 2008
$W = 0.0261 \times FL^{2.865}$	397	36.7-97.8	All	Mediterranean Sea	Tunisia	Hajjej *et al*., 2010
$W = 0.0301 \times FL^{2.830}$	153	36.7-97.8	Male	Mediterranean Sea	Tunisia	Hajjej *et al*., 2010
$W = 0.0212 \times FL^{2.918}$	244	36.7-90.5	Female	Mediterranean Sea	Tunisia	Hajjej *et al*., 2010
$W = 0.0614 \times FL^{2.623}$	101		Female	Mediterranean Sea	Egypt	El-Haweet *et al*., 2013
$W = 0.0370 \times FL^{2.752}$	44		Male	Mediterranean Sea	Egypt	El-Haweet *et al*., 2013
$W = 0.0201 \times FL^{2.908}$	695	13-102	All	Mediterranean Sea	Egypt	El-Haweet *et al*., 2013
$W = 0.01242 \times FL^{3.058}$	1,266	10.5-101	All	Mediterranean Sea / Atlantic Ocean	Spain	Saber *et al*., 2018
$W = 0{,}0302 \times FL^{2.831}$			All	Mediterranean Sea		Hajjej *et al*., 2011
$W = 0.00002 \times FL^{2.96}$			All	Northwest Atlantic		Ramirez-Arredondo *et al*., 1996
$W = 0.041 \times FL^{2.737}$			All	Southwest Atlantic		Menezes and Aragão, 1977
$W = 0.0000169 \times FL^{2.967}$	439	36-85	All	Mediterranean Sea	Spain	Macías *et al*., 2006

4.c. Convertion factors

There is a lack of information on this topic.

4.d. Reproduction

- *Spawning*

Atlantic little tuna is a multiple spawner with asynchronous oocyte development that produces several spawning batches by reproductive season. In North Atlantic, an extended spawning period has been observed from April to November. In tropical African coasts, spawning occurs from January to May (Chur, 1973; Rudomiotkina, 1986), while in the Mediterranean Sea, spawning generally occurs from May to September, although the most intensive spawning period seems to be in July and August (Kahraman *et al.*, 2008; Hajjej *et al*., 2010; El-Haweet *et al*., 2013).

- *Maturity*

For the Mediterranean Sea, 50% of males and females attained first maturity at 42.8 and 44.8 cm FL, respectively (Hajjej *et al*., 2010). This estimation is very similar to the reported by Hattour (2000) for the Gulf of Gabes, 42.9 cm FL. For the Spanish coast and in the southern Iberian Peninsula, the estimated Lm50% was 50.07 cm FL, with a 95% confidence interval ranging from 48.31 cm to 51.64 cm (Saber *et al*., 2018).

For the Atlantic Ocean, estimates of first maturity (Lm50%) were 43 cm FL in the Northeast Atlantic (Diouf, 1980) and 34.4 cm FL in the Northwest Atlantic (Cruz-Cástan *et al*., 2019). No estimates have been reported for the South Atlantic.

- *Sex ratio*

According to Saber *et al*. (2018), the sex ratio differed significantly among the length classes. In general, males were more abundant in the larger length classes than females. In the length classes lower than 46 cm FL, females were more abundant (more than 60% on average). In the Gulf of Gabes, the size-combined sex ratio deviates significantly from the expected ratio of 1:1, with females being more abundant (61.14%). However, the males were dominant in the larger length classes (Hajjej *et al*., 2010). For the Northwest Atlantic Ocean, the sex ratio estimated by Cruz-Castán *et al*. (2019) showed a sex equilibrium pattern (1:1) without size segregation. However, the males were more abundant in length classes between 28 cm FL and 30 cm FL and above 65 cm FL.

- *Fecundity*

Individual partial fecundity, defined as the number of oocytes of the last mode present in the ovary just before a spawning, varied from 70,000 to 2,200,000 eggs (size range: 30-78 cm) in Senegal (Diouf, 1980).

4.e. First life stages

- *Eggs and larvae*

Eggs are pelagic, 0.84 mm - 0.94 mm in diameter and with one oil globule (0.24-0.34 mm of diameter). The yolk is homogenous. The hatch size is 2.5 mm. The embryo presents light yellow chromatophores: 1-3 on oil globule, 2 between oil globule and ventral surface of notochord, 1 posterior to each optic cup, 2 block-shaped at anterior end of notochord. Larvae present pigmentation on forebrain, midbrain, hindbrain, tips of both jaws, ramus of lower jaw, cleithral symphysis, ventral margins of tail and D_1 fin (Richards, 2005).

4.f. Diet

The adult fish is an opportunistic and very voracious predator that feeds on a great variety of prey, i.e. crustaceans, fishes, squids, heteropods, tunicates and algae. Moreover, clupeoid fishes are particularly important food components (Etchevers, 1976; Menezes and Aragão, 1977). In the eastern tropical Atlantic Ocean, prey includes crustaceans (Isopoda, Decapoda, Stomatopoda, Anomura), cephalopods (Sepia sp., Loligo sp.), pelagic fish (Clupeidae, Scombridae, Thunnidae, Carangidae) and groundfish (Mullidae, Sparidae, Priacanthidae) (Chur, 1973).

The feeding ecology of little tunny from the Central Mediterranean Sea was predominately composed of fish, mainly *Maurolicus muelleri* and larval stages of teleost. Variations in the diet composition compared to fish size were observed. The smaller specimens feed mainly on adults of clupeiformes and larvae or other juvenile teleosts. For larger specimens, adult teleosts, crustaceans and cephalopods dominate. Anthropogenic materials such as plastics were sporadically recorded (Falautano *et al*., 2007).

In the central Colombian Caribbean, the little tunny is a top pelagic predator but not a voracious fish (trophic level of 4.49). According to García and Posada (2013), the diet of little tunny seems impoverished, especially when comparing results found in their study with those of another study conducted in 1986 in the same general location (Moreno, 1986). García and Posada (2013) observed seasonal behaviour in the diet and feeding ecology of little tunny. The authors suggest that the species tends to eat more in the dry season than in the rainy season. Additionally, García and Posada (2013) suggests that the little tunny had a daylight feed behaviour.

Predators: sharks, yellowfin tuna and billfishes.

4.g. Physiology

There is a lack of information on this topic.

4.h. Behaviour

Little is known of the behaviour patterns of little tuna. However, the occurrence of both pelagic and demersal fish in the analysed stomach of *Euthynnus allentteratus* in the Mediterranean Sea suggests a long vertical distribution of this species (Falautano *et al*., 2007).

4.i. Natural mortality

El-Haweet *et al*. (2013) estimated the natural mortality for little tunny in the Mediterranean Sea using two distinct methods. The first is based on Djabali *et al*. (1994) and the second is based on a method proposed by Taylor (1960). The results of both methods were 0.392 and 0.167 $year^{-1}$, respectively. More recently, Pons *et al*. (2019a) used different empirical methods to estimate the natural mortality of little tunny in four of the five ICCAT regions. The median values were 0.53 $year^{-1}$ for the Northeast, Northwest and Southeast Atlantic Ocean and 0.43 $year^{-1}$ for the Mediterranean Sea.

4.j. Stock structure

In a recent review, Lucena-Frédou *et al.* (2021) compiled some studies related to the stock structure of little tunny. In general, for the Eastern Atlantic Ocean, two groups of little tunny were identified by Gaykov and Bokhanov (2008) and Ollé *et al*. (2020). Those two groups were distinguished with antiphase sexual and migration cycles indicating intraspecies differentiation (Gaykov and Bokhanov, 2008) and deep genetic differences were found (Ollé *et al*. 2020). The first group habitat extended from the Western Sahara coast to Mauritania and Liberia, while the second group occupied the area from the Gulf of Guinea to Angola – Namibia (Gaykov and Bokhanov, 2008). Recent results show a deep differentiation between samples from the Southeast Atlantic and the Mediterranean, including samples from southern Portugal (Ollé *et al*., 2020).

However, currently, the SCRS considers the following five stocks unit areas previously defined by ICCAT for data collection and management: Mediterranean Sea, Northeast Atlantic, Northwest Atlantic, Southeast Atlantic and Southwest Atlantic.

5. Description of fisheries

Annual reported landings of the little tunny have been increasing consistently. Before 1974, annual landings did not exceed 10,000 MT. After 1974, an increase in annual landings was reported, with more than 30,000 MT registered in 1989, 2016 and 2017. However, it is possible to observe three distinct phases in annual landings of *Euthynnus allentteratus*. The first phase, between 1950 and 1974, reported low catches (≈ 3,882 MT on average). The second phase, from 1975 to 2006, was marked by a strong increase in average landings, which remained stable during this period (≈ 15,749 MT on average). In the third and most recent phase, from 2007 to 2019, an increasing trend in annual catches was reported, from 18,159 MT in 2007 to more than 21,000 MT in 2019 (≈ 22,367 MT on average) (**Figure 4**).

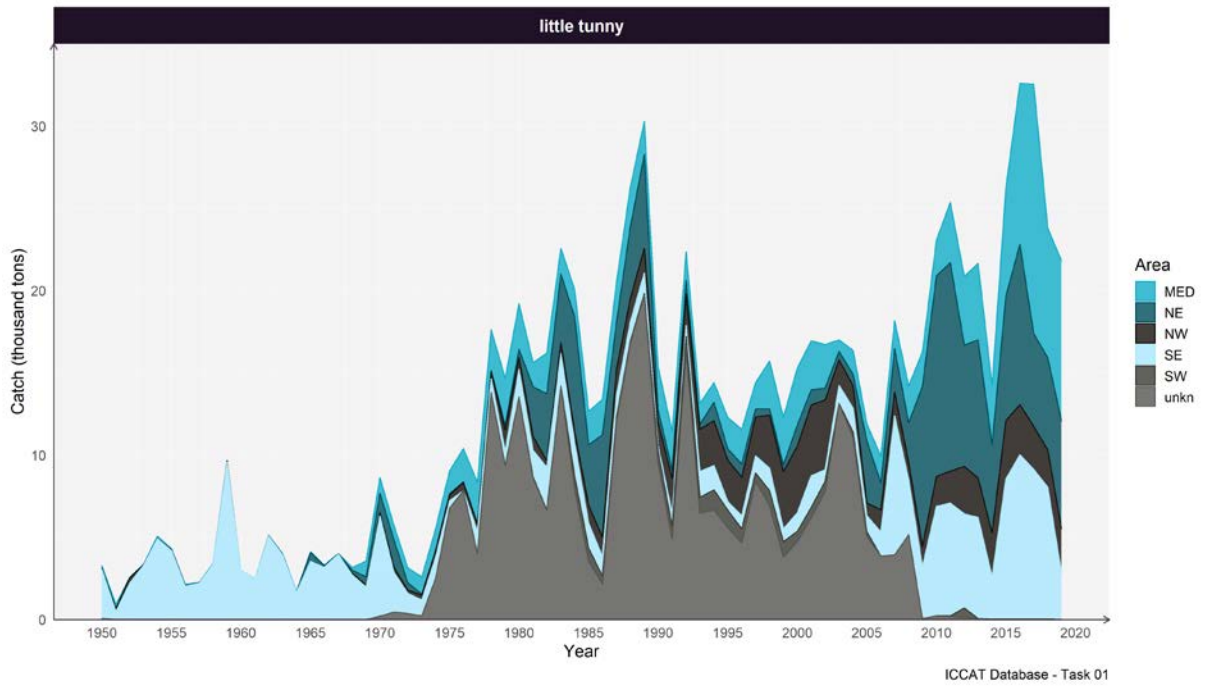

Figure 4. Catch distribution of Atlantic little tuna in the Atlantic Ocean and Mediterranean Sea for 1950-2019 (MT).

At the beginning of the time series, catches were more abundant in the Southeast Atlantic Ocean (81% of total catches recorded in the period). During the middle phase (1975 – 2006), most catches were from unknown areas (54% of total catches in the period). In the most recent period (2007 – 2019), annual landings were more abundant in the Northeast Atlantic Ocean (33%) and the Mediterranean Sea (25.3%) (ICCAT Task 1 database) (**Figure 5**).

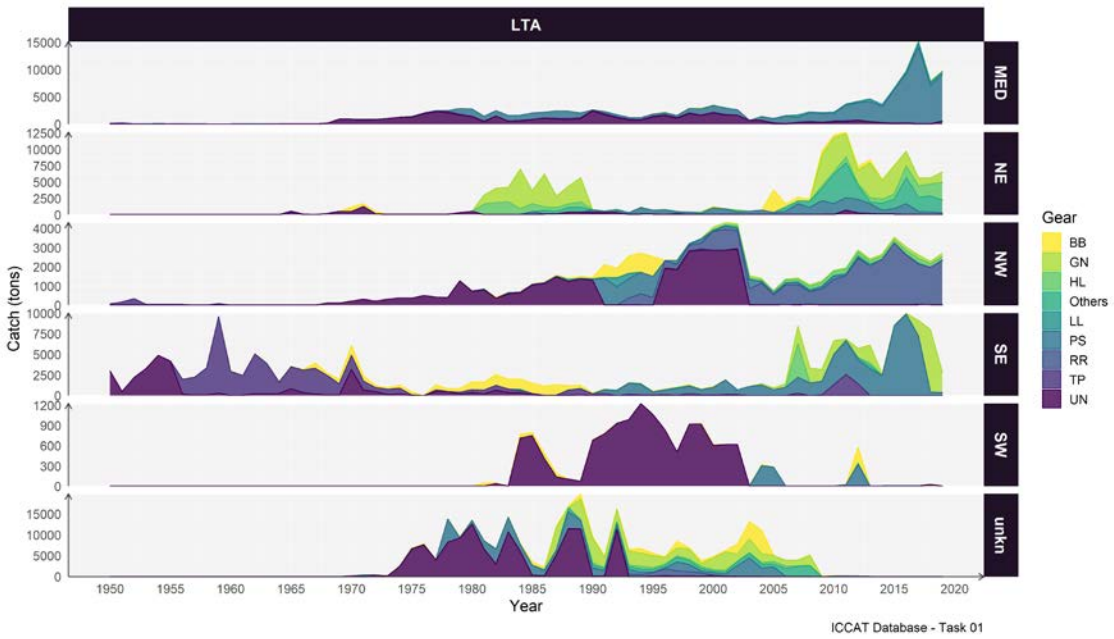

Figure 5. Catch distribution of little tunny in the Atlantic Ocean from 1950 to 2019 by ICCAT region and fishing gear (MT). BB: baitboats, TP: traps. RR: rod and reel. PS: purse seine. LL: longline. HL: handline. GN: gillnets. UN: unknown. Others includes trawl (TW), trolling (TR), haul seine (HS), trammel net (TN), sport (SP), tended line (TL), and harpoon (HP).

6. Size information

The available size samples for little tunny are not uniform throughout the spatial distribution of the species. In the Northeast and Southeast Atlantic, the highest number of fish measured and lowest mean sizes were recorded (**Figure 6**). The larger sizes were observed in the Northwest Atlantic Ocean (**Figure 6**). In the Mediterranean Sea, intermediate sized fish between 60 cm and 80 cm were recorded (**Figure 6**).

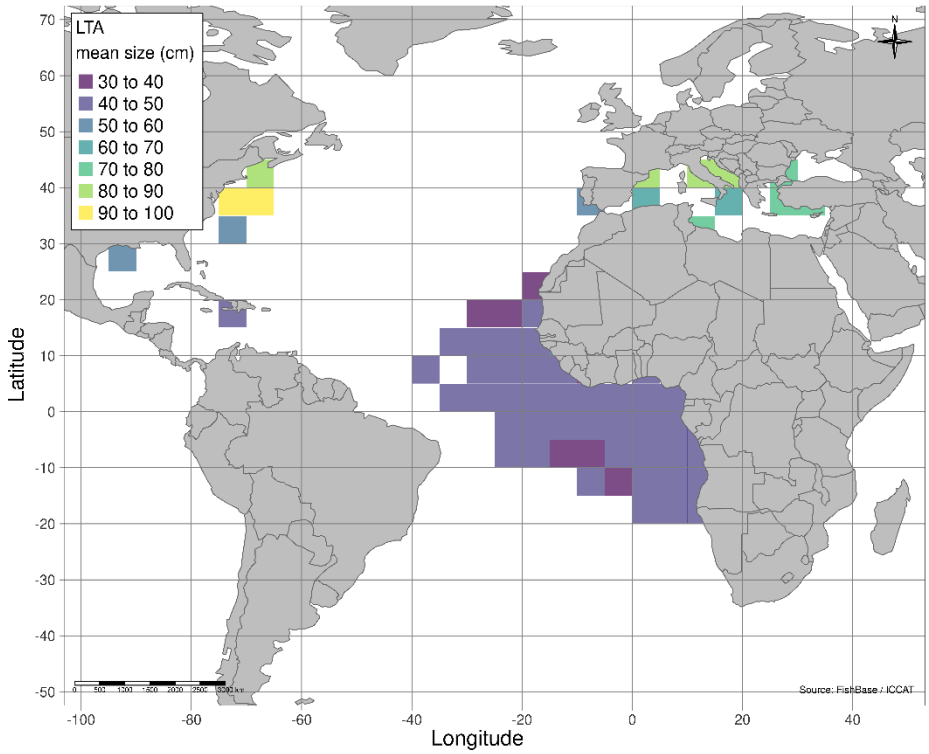

Figure 6. Spatial distribution of mean size of little tunny by gear type between 1975 and 2019.

Concerning the time series trend, in the Mediterranean Sea, many gaps and no trend in size composition were reported. For the Northeast Atlantic, mean size ranged from 65.2 cm FL in 1975 to 41.7 cm FL in 2019, indicating a decreasing trend (**Figure 7**). For the Northwest and Southeast areas, size distributions have shown some discontinuities, and no clear trends are reported (**Figure 7**).

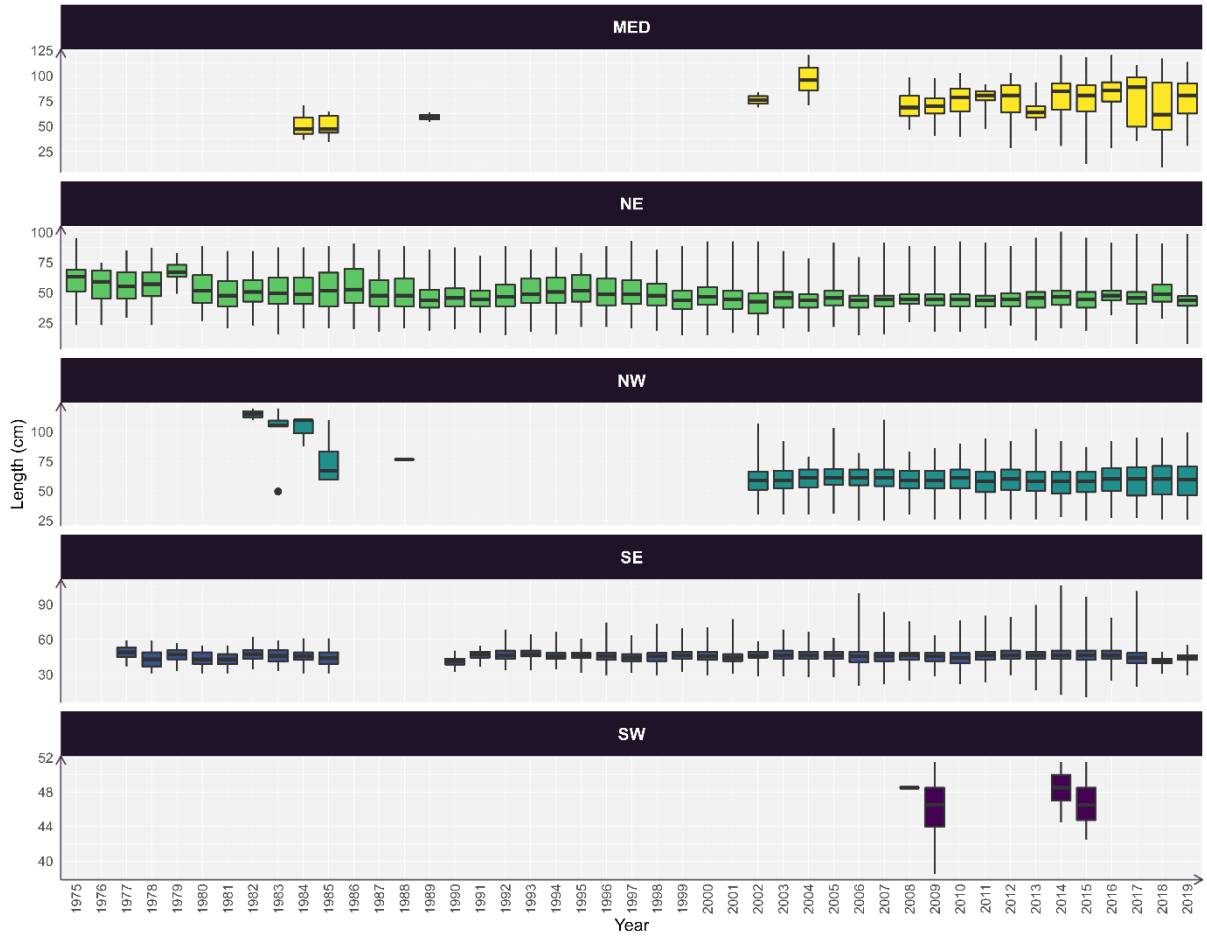

Figure 7. Length data for little tunny in the Atlantic Ocean between 1975 and 2019.

7. Stock assessment

Based on a semi-quantitative risk assessment (Productivity and Susceptibility Analysis, PSA), among the small tunas, little tunny was classified as high/moderate vulnerable in the South Atlantic and moderate vulnerable in the North Atlantic (Lucena-Frédou *et al*., 2017).

Studies based on the applications of data-limited quantitative methods, such as length-based and catch-based assessment models, showed that the Southeast Atlantic stock is considered to be overfished (Pons *et al*., 2019a and b; Lucena-Frédou *et al*., 2021). However, in an integrated assessment, Pons *et al*. (2019b) estimated that biomass (B) was above B_{MSY} (biomass that produces the maximum sustainable yield), indicating that the stock was not overfished. In a recent study of small tunas in the Atlantic Ocean, the authors recommended further analysis and review of the current catch data to reduce uncertainty in those estimates (Lucena-Frédou *et al*., 2021).

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