

DATA ON REPRODUCTION OF ATLANTIC LITTLE TUNA IN THE TROPICAL WEST AFRICAN WATERS *

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There are fragmentary data on the area and periods of reproduction of the Atlantic little tuna, *Euthynnus alleteratus* (Rafinesque), in the literature. Using the results of the author's own long-term investigations into the distribution of the small-sized larvae (fig. I) as well as the information on occurrence of the fish with mature sexual products (Marchall, 1953; Postel, Frade, 1955; Correia da Costa a Frade, 1958; Alekseev, Alekseeva, 1979; Chur, 1979) and larvae (Kazanova, 1962; Richards, Simmons, 1971; Nishikawa, Kikawa, Honma, Yeyanagi, 1978), an attempt was made to find out, and in some cases to specify, the areas and dates of spawning of the Atlantic little tuna in the near shelf waters of the Tropical Africa.

Running females were recorded in the area of the north-western African coast near Cap Blanc in July (Chur, 1977). Judging by the occurrence of the pre-spawning and spawning fish the spawning was observed in the Cap Verte area in the warm season from April to November, the most intensive spawning recorded in July-August (Postel, Frade, 1955). The larvae were also observed in great numbers (to 60 sp. per haul) in April-June (Kazanova, 1962). As is evident from our data only two larvae were caught from the Central Atlantic (station O605 N, 2603 W; station O905 N, 3458W) in summer (August and September) at the surface water temperature of 20.0-21.5°C and salinity of 35.9-36.2‰ (fig. I-III).

In the area of Guinea massive spawning was observed in October-May (Marchall, 1963).

Off the Sierra Leonean coast running females were found from January to April with their largest number recorded in February-March (Chur, 1977). In the Freetown area the spawning commenced

from February and ended in summer; the females with gonads at maturity stage II predominated in October (Alekseev, Alekseeva, 1979). During the period of occurrence of the fish with mature sexual products the larvae were also found in February-March (Richards, Simmons, 1971) and April-June (fig. I-II). With the same sampling coverage of the coastal and offshore regions in the Conakry-Freetown area the larvae were only recorded in the oceanic waters at the temperature of 25-27°C and salinity of 34.5-35.0‰. The absence of larvae in the coastal waters of this area may be attributed to the formation of the region of maximum freshening there with salinity below 27‰ (Berrit, 1961, 1962).

As is evident from the observations for the maturation of sexual products the spawning was recorded in the Gulf of Guinea during the warm period from October to June (Marchall, 1963), in October-December in the Saõ-Tome and Principe area (Correia da Costa a. Frade, 1958), and in the Fernando-Po Islands area in June (Alekseev, Alekseeva, 1979). The larvae were found from October to December (Kazanova, 1962). During the Geronimo surveys the larvae were only recorded in February-April and August-October near the Gulf of Guinea coast at the temperature ranging from 22.7 to 29.3°C and salinity of 32.7 to 35.4‰ and were absent on the outer stations of the sections near the equator (Richards, Simmons, 1971). Our observations showed that in the Gulf of Guinea the larvae were only found during the warm season from October to March (fig. 1 - I, II, IV) at the temperature of 25.2 to 28.3°C and salinity of 34.6 to 35.9‰. Maximum larval catches (to 5 sp. per haul) were taken late in the warm season from April to June in the Biafra Bay and in the waters adjacent westerly (to Tema) and southerly (to Pointe-Noire) (fig. 1 - II). The si-

* Not to be cited without reference to the author.

tes of large larval aggregations are closely coincided with the zone of high biological productivity due to the river flow. In the Biafra Bay rather stable conditions with high surface water temperature (28-29°C) and high (in relation to the Biafra Bay) salinity (31-34‰) set in. It is worth of noting that during this period larval catches decrease south of Pointe-Noire and west of Tema (fig. 1 - II). In the western site the larvae were recorded in June at the decreased values of salinity (34-35‰) and under the extremely unfavourable conditions of the sharp transition of the temperature from 27-29°C to 24°C and below. A decrease in the larval catches from the southern site off the coast may be explained by decreasing of the Benguela Current surface water temperature to 24°C and 20°C with the favourable values of salinity (35-36‰); the absence of larvae in the coastal waters may be also attributed to considerable freshening (to 30‰) due to the Congo River flow. During the other periods of occurrence of larvae (October-June), except for April-June considered above, in the Gulf of Guinea area they were usually recorded outside the Biafra Bay with relatively steady temperature values (above 24°C) but different values of salinity (22-35‰) due to seasonality of precipitations and river flow. No larvae were found in our samples taken from the Gulf of Guinea between July and September (fig. 1 - III); however, some researchers reported on their occurrence in the area (Richards, Simmons, 1971). In the winter months intensification of the Guinean Current (Sigaev, 1976) and a system of counter-currents connected with it result in the formation of sharply unstable hydrological situation which is characterized at first by the variable in space and unfavourable (for spawning and appearance of the larvae) combination of thermohaline conditions.

In the Congo-Angola area mature females were found in November and April (Chur, 1977). Alekseev and Alekseeva (1979) reported on the massive spawning in the Pointe-Noire area during the summer-fall period (January-June). The larvae were observed in October-June (Nishikawa et. al., 1978) with maximum larval catches in April-June as is also evident from our observations (Table 1).

No common opinion exists regarding the spawning grounds of the Atlantic little tuna: in the shelf waters or open ocean. Distribution of the adult fish is limited by the continental shelf waters where commercial concentrations are formed (Postel, 1956; Marchall, 1963; Chur, 1977). The areas of larval occurrence are located mainly in the coastal waters. Most of the researchers (Gorbunova, 1965; Calkins, Klawe, 1963; Marchall, 1963; etc.) consider that the reproduction occurs near the coasts. However, it should be noted that larval eastern little tuna *E. affinis*, Cantor (Gorbunova, 1962; Jones, Kumaran, 1963) and Atlantic little tuna (Nishikawa et. al., 1978; our data) are found in the open waters of the Indian and Atlantic oceans.

It should be more thoroughly studied if a presence of larvae in the open ocean is a result of spawning there or drifting by the currents from the coastal spawning grounds.

Thus, judging by the periods of larval occurrence and from the data on distribution of the fish with mature gonads a seasonal pattern in reproduction of the Atlantic little tuna is noticeable. Massive spawning in each area near the West African coast (between 15°N and 10°S) is confined to the warmest season of the year: from April-May to August-September in the Senegal area; in February-June in the Sierra Leonean area; from September-October to March-April in the Gulf of Guinea; and in the Congo-Angola area from January to June (Table 1). Spawning takes place usually in the warm (temperature above 25°C) and saline (above 34.6‰) waters, although it is sometimes recorded at low temperature (20.0-22.7°C) and salinity (32.7‰).

REFERENCES

1. Alekseev F.E., E.I. Alekseeva, 1979. Some problems of reproductive biology of oceanic and neretic Tunas of the Tropical Atlantic. ICCAT SCRS (79)37, 16 p.
2. Berrit G.R., 1961. Contribution a la connaissance des variations saisonnieres dans le golfo de Guinee. Observations de surface, le long des lignes de navigation. Cahiers oceanogr., vol. 13, N° 10, pp. 715-727.
3. Berrit G.R., 1962. Contribution a la connaissance des variations saisonnieres dans le golfe de Guinee. Cahiers oceanogr., vol. 14, N° 9, pp. 633-643.
4. Calkins T.P. a. W.L. Klawe, 1963. Synopsis of biological data on black skipjack *Euthynnus lineatus* Kishinouye 1920. FAO Fish. Rep., N° 6, vol. 2, pp. 130-146.
5. Chur V.N., 1977. Biology and fishing of skipjack, little tunny, frigate and bullet mackerels in the eastern Atlantic Ocean. Theses. INBYUM, Sevastopol, 24p.
6. Correia da Costa F., F. Frade, 1958. Investigações Sobre os peixes de superfície da pesca nas ilhas de São Thomé e do Príncipe. Commun. int. W. Afr. Conf. N° 6(4), pp. 151-168.
7. Gorbunova N.N., 1962. Larvae of Scombridae (Pisces, Scombriformes) from the Indian Ocean. Tr. in-ta okeanol. AN SSSR - IOAN, v. 62, p. 68-95.
8. Gorbunova N.N., 1965. Periods and conditions of reproduction of Scombridae (Pisces, Scombroidei). Tr. in-ta okeanol. AN SSSR - IOAN, v. 80, p. 36-61.
9. Jones S., M. Kumaran, 1963. Distribution of larval tuna collected by the Carlsberg Foundation's Dana Expedition (1928-1930) from Indian Ocean. FAO Fish. Rep. N° 6, vol. 3, pp. 1 753- 1 774.
10. Kazanova I.I. Larval tunas of the tropical Atlantic. Vopr. ikhtiologii, v. 2(3), iss. 24, p. 451- 461.
11. Marchall F.G. 1963. Exposé synoptique des données biologiques sur la thonide *Euthynnus alleteratus* (Rafinesque, 1810). FAO Fish. Rep., 6, vol. 2, pp. 647-662.
12. Nishikawa Y., S. Kikawa, M. Honma, S. Yeyanagi. Distribution atlas of larval tunas, billfishes and related species. Results of larval surveys by R/VShynyo Maru and S hoyá Research Shimizu 424, Japan, ser. 9, 1978, pp. 33-37.
13. Postel E., F. Frade. 1955. Contribution a l'étude de la reproduction des Scombrides et thonides de l'Atlantique tropical Rapp. Couns. Explor. Mer, 173, pp. 33-35.
14. Postel E. 1956. Contribution a l'étude des thonides des l'Atlantique tropical. Rapp. Couns. Explor. Mer, 137, pp. 31-32.
15. Richards W.J., D.C. Simmons. 1971. Distribution of tuna larvae (Pisces, Scombridae) in the North-Western Gulf of Guinea and off Sierra Leone. Fish. Bull., vol. 69, N° 3, pp. 555-568.

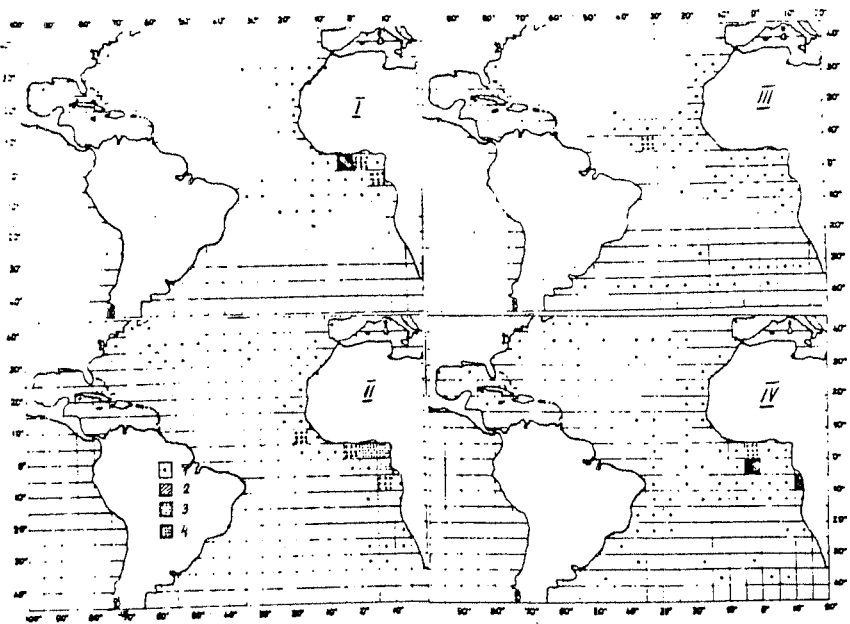


Fig. 1. Distribution of larval Atlantic little tuna in January-March (I), April-June (II), July-September (III), October-December (IV).

Definitions: 1 - no larvae; 2 - less than 0.09 larvae;
3 - 0.1-1.0 larva; 4 - 1.1-5.0 larvae per haul.

Table 1
Periods of spawning of Atlantic little tuna

Area	Seasons of Northern Hemisphere												Author
	Spring			Summer			Autumn						
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Cap Blanc						X							Chur, 1977
Cap Verde				X	X	X	X	X	X	X	X	X	Postal, Prade, 1955; Kazanova, 1962
Sierra Leone		X	X	X	X	X							Chur, 1977; Alekseev, Alekseeva, 1979; our data
Gulf of Guinea				X	X	X	X	X	X	X	X	X	Prade, 1955; Correia, da Costa, Prade, 1958; Kazanova, 1960; Alekseev, Alekseeva, 1979; our data
Congo-Angola							X	X	X	X	X	X	Chur, 1977; Nishika- wa, 1978; Alekseev, 1979; our data
	Seasons of Southern Hemisphere												
	Spring			Summer			Autumn						
	VII	VIII	IX	X	XI	XII	I	II	III	IV	V	VI	