

# SYNTHESIS OF THE ALBACORE RESEARCH PROGRAM IN THE FRAME OF THE PROJECT "CHARACTERIZATION OF LARGE PELAGIC STOCKS IN THE MEDITERRANEAN"

SCRS/1994/094

Col.Vol.Sci.Pap. ICCAT, 44 (1) : 309-315 (1995)

*Megalofonou, P.*

## Introduction

In the frame of the project XIV-1/MED/91/012, under the title "Characterization of large pelagic stocks in the Mediterranean", eight operative research units have undertaken the responsibility to carry out investigations in relation with albacore (*Thunnus alalunga* Bonn., 1788) in the Spanish, French, Italian and Greek seas.

The main objectives of the investigations on albacore are to collect and analyse data related with the biology and fisheries of this species in the Mediterranean which are essential for stock assessment and management purposes as well to standardise the sampling and data analysis methods followed by the different operative units.

The work carried out from July 1, 1992 until the end of 1993 as well with some preliminary results are presented in details in the first interim report already submitted to the Commission. Since there are several countries and institutions reports, the aim of this work is to provide, in the occasion of the Meeting of Ad Hoc GFCM/ICCAT Working Group on Stocks of Large Pelagic Fishes in the Mediterranean Sea, a synthesis of the research already done gathering all the work, methodologies, results, problems, conclusions and recommendations for albacore.

## Operative units and work done

The work done by each of the participating universities and institutes during the aforementioned time period has as follows:

The Dept. of Animal Production of the University of Bari, in Italy, collected biological and fishery data from the Adriatic, Ionian and Tirrenian sea. It has also carried out tagging cruises in the gulf of Taranto.

The Dept. of Zoology of the University of Athens, in Greece, collected biological and fishery data from the Aegean sea.

The IFREMER Station of Sete, in France, collected fishery data along the French coasts in the Mediterranean.

The Spanish Institute of Oceanography, in Santander of Spain, collected biological and fishery data from the western Mediterranean. Moreover, it carried out tagging cruises for juvenile specimens of albacore.

The Institute of Marine Biology of Crete, in Greece, carried out tagging cruises for albacore in the Aegean sea.

The Laboratory of Ichthyology of the University of Girona, in Spain, has set up the necessary human and material resources for the genetic analysis of the biological material collected by other participants.

The Institute of Zoology of the University of Genova, in Italy, collected biological material from the Ligurian sea.

The National Center for Marine Research, in Greece, carried out plankton surveys in the Aegean sea.

In particular, the topics treated by operative units are the following:

- Enquires on fisheries
- Map of fishing areas by season
- Catches and effort by gear/month/area
- Size compositions of the catches (length, weight)
- Length-weight relationships
- Length conversion factors
- age and growth
- Sex ratio
- Gonad maturity and weight of gonads
- Relation with prey organisms
- Migration routes
- Eggs and larvae distribution

In order to realise the aforementioned research work, common methods have been applied in relation with additional instructions on the standardisation of the presentation of the results.

Most of the data provided in the first interim report have been collected in the Italian and Greek seas as the main albacore fleets in the Mediterranean belong to the corresponding countries.

Detailed fisheries and biological data have been collected on a regular basis from the main fishing ports for albacore fishery in Greece and Italy. At the pilot ports, fishing data have been collected from a significant number of boats and these have been used to estimate the catch per effort statistics. The selected pilot ports are the following:

-Alonisos, an island located in the middle north Aegean sea,

- Monopoli, situated on the Adriatic coast of Apulia,
- Porto Cesareo, situated on the Ionian coast of the same region and
- Lipari, an island located in the Tirrenian sea.

Specifically, data taken at the dockside are concerning the number of fishing days of each boat, the catches in kg and in number of fish, the kind of gear, the number of hooks used daily for the longlines and the length of the nets for the drift nets.

A number of measurements and observations have been carried out for a significant number of albacore sampled. Specifically, the fork length, round weight and various morphometrical measurements have been taken. The sex was identified after macroscopic observation of the gonads.

In order to collect stomachs, gonads and other visceral samples, albacore have been purchased. For biochemical studies, 63 samples have been collected from the Aegean, Ionian and Ligurian sea according to the instructions given. Samples for biochemical studies were also collected from the Atlantic.

Tagging cruises for albacore were carried out in the central Aegean sea from September 13 until September 15 and in the gulf of Taranto in 1993.

The total number of boats involved in this fishery and the total production by country have been obtained through interviews with the fishermen and information from the fishermen co-operatives at the fishing ports.

A description of the albacore fisheries as well as the results based on the collected biological and catch statistics data are presented below.

#### **General description of the albacore fishery in the Mediterranean**

##### ***Fishing areas and fishing periods***

Albacore fishing in several areas of the Mediterranean sea is usually carried out during the autumn and winter months. However, fishing is also known to take place in spring and summer in geographical areas where the reproduction occurs.

As it is known, also from previous studies, albacore fishing in Greece takes place mainly in the north Aegean sea where important trophic concentrations of albacore are observed every year. The area of operation of the main albacore fleet is delimited between the islands of Sporads complex and the peninsula of Chalkidiki. Numerous small size boats involved in this fishery begins fishing activities around the end of August and finishes during November.

In Italy the fishery for albacore is usually carried out from September to December in the south Adriatic and north Ionian sea. However, the Sicilian fleet, which is considered the

most important albacore fleet in Italy, begins this fishing earlier. Precisely, the fishing period extends from July to December in the south Ionian sea and from April to December in the Tirrenian sea.

Albacore is present along the Mediterranean French coasts from mid-August to end of October but the resource is occasionally exploited by seiners and sport fishermen.

In the western Mediterranean, albacore fishing occurs the same occasionally along the Spanish coasts during the autumn and winter months.

The most important fishing zones for albacore in the Mediterranean sea are shown in Figure 1.

#### **Fishery information**

##### ***Size and composition of the fleets***

The total number of boats involved in the albacore fishery in the Aegean sea varies a little from year to year. It is estimated that a total of about 150 boats carried out the albacore fishing during 1992 and 1993. The research work, conducted at the pilot port of Alonisos, revealed that the albacore fleet of Alonisos is consisted of about 50 boats. Specifically, a total of 48 boats was involved in this fishing in the years 1992 and 1993. Generally, fishing vessels are of small size and therefore considered as "vessels of coastal fishery". In fact, most of them have a length less than 10 meters. These boats carry out the albacore fishing seasonally, while during the rest of the year they perform other fishing activities.

The albacore fleet in the Adriatic sea consists more or less of 30 boats fishing in the south Adriatic and having regular base at the port of Monopoli and Mola di Bari. These boats carry out the albacore fishing seasonally, while during the rest of the year they perform other fishing activities.

The most important fleets involved in the albacore fishery in the Ionian sea are based in the ports of Sicily in the Sea-compartment of Messina, Apulia and Calabria. The total number of boats carrying out the fishing is estimated about 222, of which 35 in the gulf of Taranto in the north Ionian and 187 in the south Ionian sea. The boats of Sicily fleet in the Sea-compartment of Messina exploit mainly the south Ionian sea while the ones of Apulia and Calabria ports, along the coasts of the Ionian side, exploit mainly the gulf of Taranto.

In the Tirrenian sea, the most important fleets involved in the albacore fishery are based in the ports of Sicily in the Sea-compartments of Palermo and Messina exploiting mainly the area located between Palermo and the Ustica island as well the one situated on the north of the Eolian Archipelago. The albacore fleet of the Sea-compartment of Palermo fishing in

the Tirrenian consists of about 198 boats while the one of Messina consists of 268.

Summarizing, the total number of the boats fishing albacore by area as well the gears used are given below:

- AEGEAN SEA 150 boats (long lines and troll-lines)
- ADRIATIC SEA 30 boats (long lines)
- IONIAN SEA 222 boats (longlines and drift nets)
- SOUTH TIRRENIAN SEA 366 boats (longlines and drift nets)

The characteristics of the boats involved in the albacore fishery are summarized for each one of the pilot ports in the Aegean, Adriatic and Ionian sea and the results are shown in Table 1.

Table 1. Characteristics of the most important Greek and Italian albacore fleets .

AEGEAN SEA - Pilot port of Alonisos			
Size group	Number of boats	Mean HP	Mean GRT
<10 m	27	40	5.4
10-15 m	19	100	11.8
15-20 m	-	-	-
≥20 m	-	-	-
ADRIATIC SEA - Pilot port of Monopoli			
Size group	Number of boats	Mean HP	Mean GRT
<10 m	-	-	-
10-15 m	17	200	10
15-20 m	13	300	5
≥20 m	-	-	-
IONIAN SEA - Pilot port of Porto Cesareo			
Size group	Number of boats	Mean HP	Mean GRT
<10 m	-	-	-
10-15 m	16	142	9.4
15-20 m	-	-	-
≥20 m	-	-	-

#### Fishing methods

Troll-lines and surface drifting long-lines are commonly used for albacore fishing in Greece. Troll-line boats use two lines carrying on artificial baits. This fishing generally

takes place during the day and particularly early in the morning as well as early in the afternoon. Long-lines are usually equipped with about 800-1200 hooks. Hooks have a length of about 3 cm (no 8 or 7) and they are baited with *Sardina pilchardus*. This kind of long line fishes at a depth of 7 to 15 meters from the surface of the sea. Fishing begins early in the morning with the setting of the gear in the sea at 4 o' clock and finishes just a while before midday.

The gears used for the albacore fishing in Italy are the surface drifting long-lines and the drift-nets. Long-lines, commonly used by all the Italian albacore fleets, are usually equipped with about 3000-4000 hooks. Hooks have a length of about 3 cm and they are baited with *Sardina pilchardus*. Drift-nets for the albacore fishing are mostly used in the Tirrenian and Ionian sea. These nets, that are called "alalongara", differs from those ones used for the swordfish fishing in the size of the mesh that measures 16 cm.

Along the French and Spanish Mediterranean coasts albacore is occasionally caught by French purse seiners, rod-and-reel sport fishing and trolls. Some years, albacore is taken by the Spanish bait boat fleet based in the Atlantic.

#### Production

The total albacore catches in metric tons estimated by area for the 1992 and 1993 fishing periods are shown in table 2. However these data have to be completed.

Table 2. Annual albacore production by area for the year 1992 and 993.

	PRODUCTION (in metric tons)	
	1992	1993
AEGEAN	500.0	No available data
ADRIATIC	152.1	80.1
N. IONIAN	60.0	90.0
S. IONIAN	258.1	101.3
S. TIRRENIAN	694.4	491.4
TOTAL AREA	1664.6	762.8

#### Fishing effort and C.p.u.e.

Full catch and effort statistics were collected at the pilot ports in 1992 and 1993 and these were analyzed by gear. The summarized results are given in the Tables 3,4 and 5.

Table 3. Catch statistics data analyzed for the long-line fishing fleets by area and year.

	ALONISOS Aegean		MONOPOLI Adriatic		P.CESAREO N. Ionian		SICILY S. Ionian	
	1992	1993	1992	1993	1992	1993	1992	1993
Year	1992	1993	1992	1993	1992	1993	1992	1993
Sampled/Total boats	17/17	22/22	21/21	14/14	11/19	11/21	79	
Sampled fishing days	76	160	133	121	98	216	1129	
Catch in tons	14.6	22.9	138.9	75.7	15.0	33.4	10.5	
Number of albacore	1882	3051	26734	14615	2524	5765		
Average weight in kg	7.6	7.5	5.2	5.2	5.9	5.8		
Effort in 1000 hooks	77.3	196.8	709.5	625.8	223.8	521.1	2424	
CPUE in kg	188.6	116.3	195.7	120.9	67.1	64.1	36.0	
CPUE in No of fish	24.34	15.51	37.68	23.36	11.28	11.06		

Table 4. Catch statistics data analyzed for the troll-line fishing of the Alonisos fleet.

	ALONISOS Aegean	
	1992	1993
Year	1992	1993
Sampled/Total boats	30/31	28/28
Sampled fishing days	165	157
Catch in kg	21441	12017
Number of albacore	3249	1669
Average weight in kg	6.6	7.2
Effort in days	165	157
CPUE in kg	129.95	76.54
CPUE in No of fish	19.69	10.66

Table 5. Catch statistics data analyzed for the drift nets fishing fleets by area and year.

	SICILY S. Ionian	LIPARI Tirrenian
	1992	1993
Year	1992	1993
Sampled/Total boats	77	12/12
Catch in tons	142.2	25.5
Effort in 1000 m of net	9560	1111
CPUE in kg	102	22.9

### Biological information

#### Size Distribution

Measurements of fork length (FL) in cm and round weight in kg for a significant number of albacore landed at the pilot ports in the Aegean, Adriatic, Ionian and Tirrenian sea have been taken.

Specifically, a total of 4703 specimens were sampled during the landing at the dockside of the ports in the two-year period 1992-1993. The measurements of fork length are presented in Tables 6 and 7. The length-frequency distributions are shown in Figure 2.

Table 4. Summarized analysis of the length samples taken in 1992.

	YEAR 1992 FORK LENGTH in cm			
	Sample size	Mean	Minimum	Maximum
AEGEAN	342	72.4	62.5	86.0
ADRIATIC	903	70.4	43.0	100.0
N. IONIAN	355	70.7	44.0	86.0
TIRRENIAN	1178	79.2	67.0	103.0

Table 5. Summarized analysis of the length samples taken in 1993.

	YEAR 1993 FORK LENGTH in cm			
	Sample size	Mean	Minimum	Maximum
AEGEAN	456	75.3	64.0	88.0
ADRIATIC	382	73.3	55.0	95.0
N. IONIAN	436	68.6	56.0	122.0
TIRRENIAN	651	70.3	28.0	103.0

#### Length-Weight relationship

Several length-weight relationships have been presented for the Italian and Greek seas.

The length-weight relationships for both sexes combined, have been calculated from the formula:

$$\ln W = \ln a + \ln L$$

where  $W$  = round weight (kg),

L = fork length (cm),  
a, b are constants.

The equations and the correlation coefficients by area are given below:

Aegean sea (1992-1993)	$\ln W = \ln -9.92 + 2.77 \ln L$	$r=0.97$
Adriatic sea (1992)	$\ln W = \ln -7.26 + 2.10 \ln L$	$r=0.81$
Adriatic sea (1993)	$\ln W = \ln -7.89 + 2.26 \ln L$	$r=0.88$
Ionian sea (1992)	$\ln W = \ln -9.29 + 2.61 \ln L$	$r=0.91$
Ionian sea (1993)	$\ln W = \ln -8.90 + 2.53 \ln L$	$r=0.92$

#### **Sex Ratio, Gonad Maturity and Weight of Gonads**

Sex has been identified after macroscopic observation of the gonads. A total of 368 albacore were examined in the two year period in the Aegean sea. Of those, 218 were fished in 1992 and 152 in 1993. A domination of males, which are relatively larger in size than females, has been observed in the samples. The sex ratio (male/female) was calculated separately for each fishing period and the results are reported below:

YEAR	MALES		FEMALES		SEX RATIO
	Number	%	Number	%	
1991	157	72.0%	61	28.0%	2.57
1992	120	78.9%	32	21.1%	3.75

No individuals with ripe gonads were found whereas a lot of just spent gonads were observed. The weight of the gonads ranged from 28 to 84 gr for females and from 9 to 81 gr for males.

#### **Age and Growth**

For the purpose of the age estimation the first dorsal spine has been removed from albacore caught in the Aegean and Ionian sea. Spines closed in plastic bags, labelled with data concerning its length, weight, sex, place and date of capture have been transferred to the laboratory where they were prepared for age readings.

Detailed results considering age readings will be given in a future report when a sufficient number of samples will have been gathered.

#### **Tagging**

In 1993 tagging cruises for albacore were carried out in the Ionian and Aegean sea using chemical tracers and "spaghetti" tags. A total of 97 individuals in a good condition were tagged, 86 in the gulf of Taranto and 11 around the Sporads island complex, in the central Aegean sea.

#### **COMMENTS**

##### **Future activities**

Further collection of catch statistic and biological data for albacore is carried out during the fishing period of the 1994 by the operative units. Analysis of the data and biological material collected up to the present time as well as the new one will be performed and the results will be presented to the European Commission in the final report.

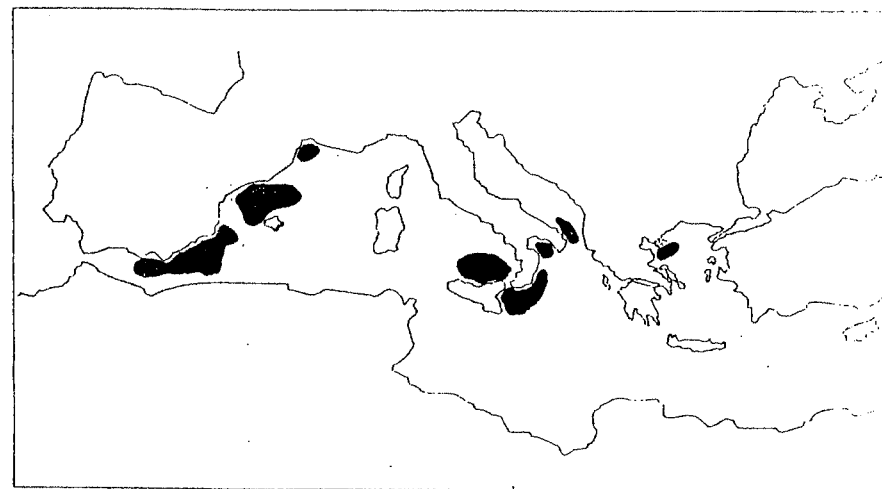
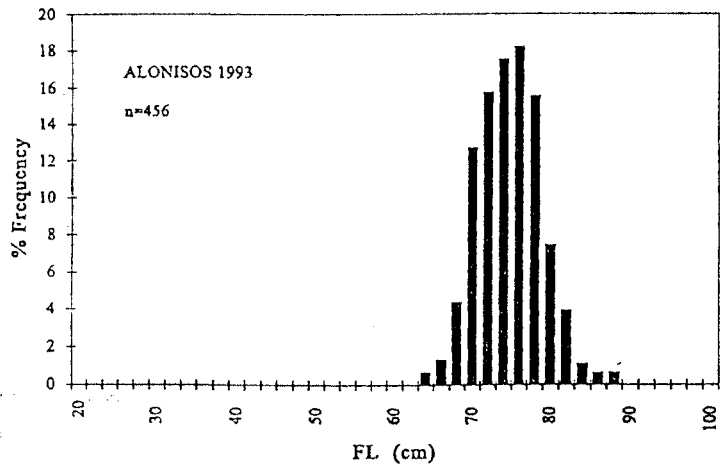
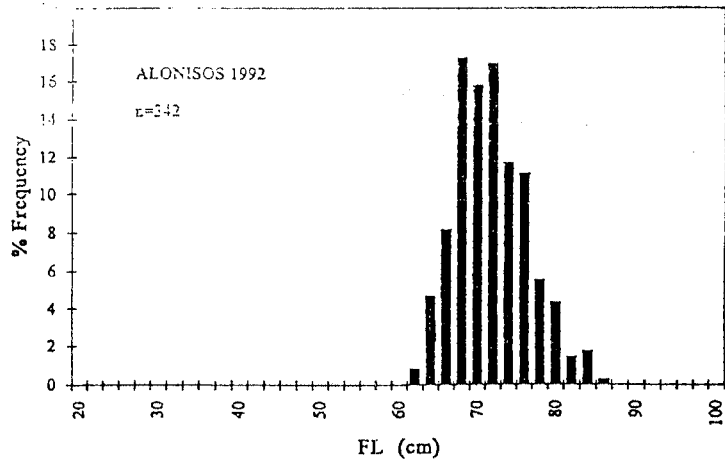
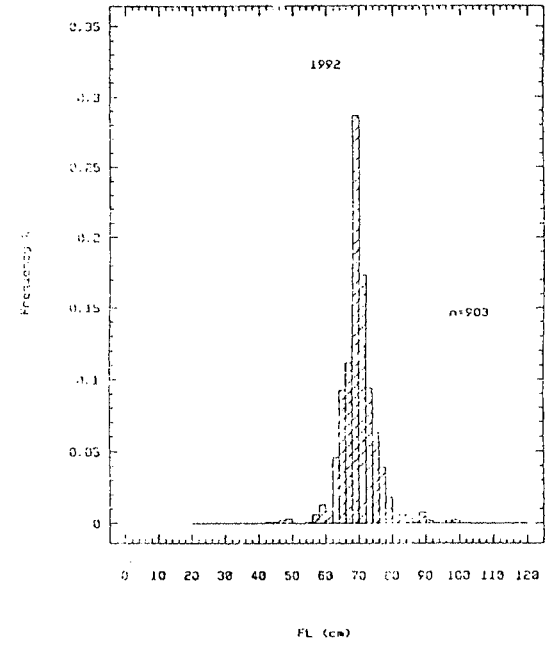


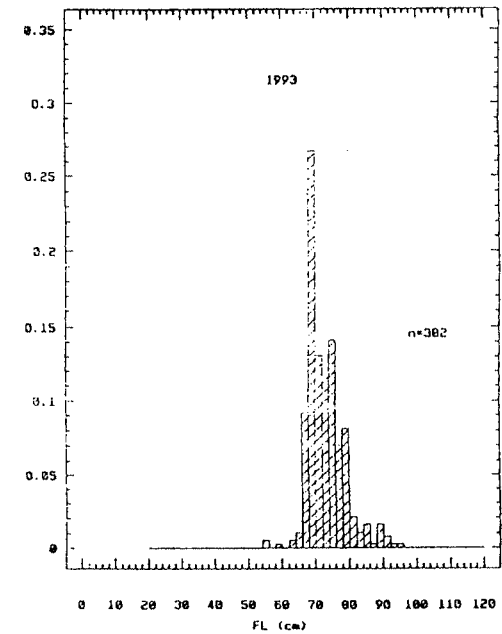
Figure 1. Graph indicating the Mediterranean areas where albacore fishing takes place.



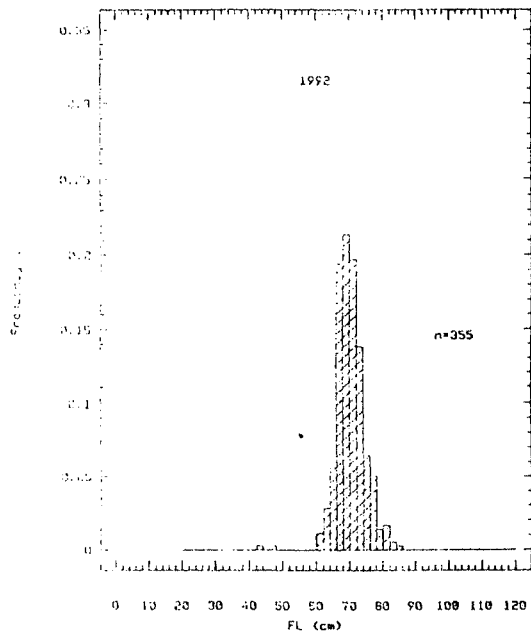
Length frequency distribution of albacore sampled at the port of Alonisos in 1992 and 1993.



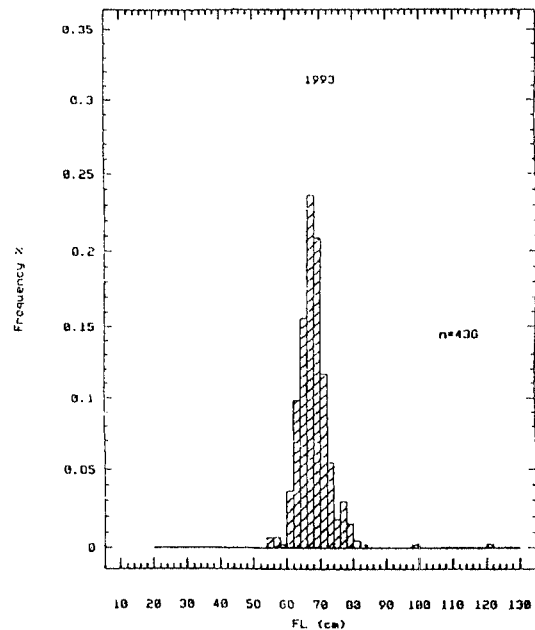
- Percentage length frequency distribution of the total sampled of albacore fished by long-line in the South Adriatic Sea in the 1992.



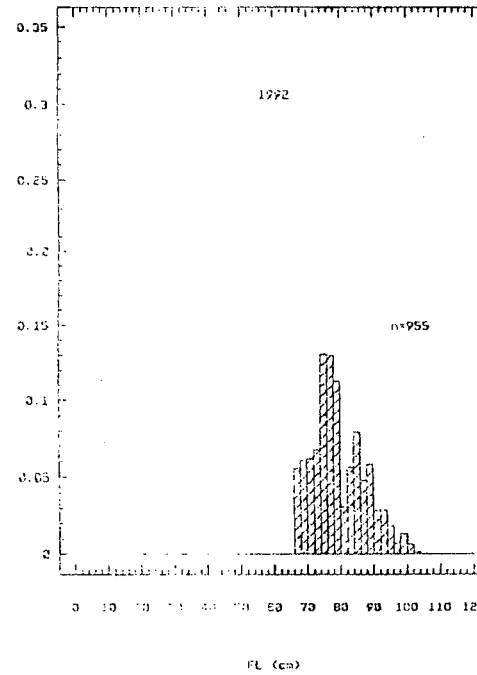
- Percentage length frequency distribution of the total sampled of albacore fished by long-line in the South Adriatic Sea in the 1993.



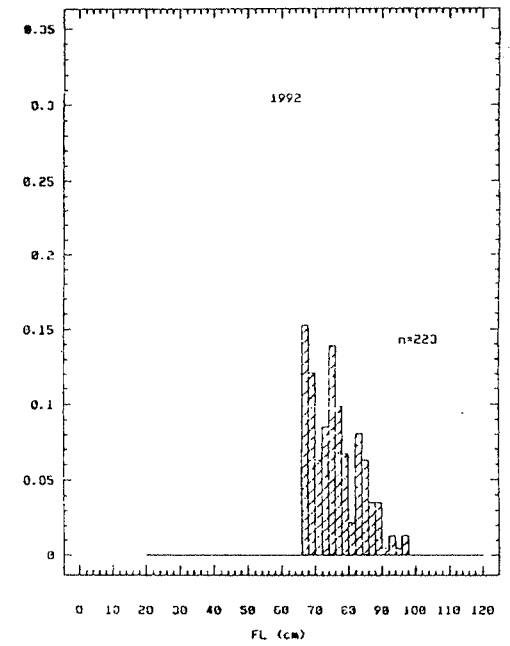
- Percentage length frequency distribution of the total sampled of albacore fished by long-line in the North Ionian Sea in the 1992.



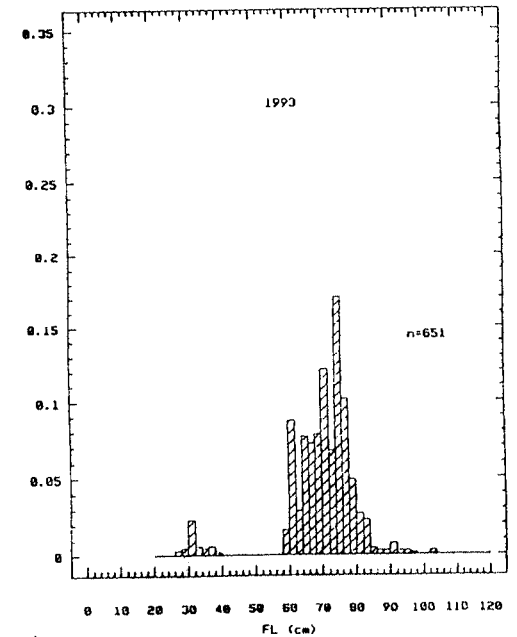
- Percentage length frequency distribution of the total sampled of albacore fished by long-line in the North Ionian Sea in the 1993



- Percentage length frequency distribution of the total sampled of albacore fished by long-line in the Tyrrhenian Sea in the 1992.



- Percentage length frequency distribution of the total sampled of albacore fished by drift-net in the Tyrrhenian Sea in the 1992.



- Percentage length frequency distribution of the total sampled of albacore fished by drift-net in the Tyrrhenian Sea in the 1993