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Report of the second

TECHNICAL CONSULTATION ON STOCK ASSESSMENT IN THE EASTERN MEDITERRANEAN

Athens, Greece, 28 March - 1 April 1988

Rapport de la deuxième

CONSULTATION TECHNIQUE SUR L'ÉVALUATION DES STOCKS DANS LA MÉDITERRANÉE ORIENTALE

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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APPENDIX/ANNEXE Q

Fisheries for Large Scombrids in Greek Waters: Catches of Bluefin Tuna (Thunnus thynnus L.)

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ABSTRACT

Fishing activity for bluefin tuna in Greece in 1986-87 is described. This fishery is practised specifically only by five fleets with a total number of 50 vessels and the total annual catch in 1986 was 131 t. This include a sporadic catch by other fleets in the course of the albacore fishing campaign. In 1987, production was lower. The cpue, size distribution and length-weight correlations are reported.

1. INTRODUCTION

As may be deduced from the writing by Homer, Aeschylus, Herodotus and Aristotle, fishing for tuna in Greece goes back to ancient times and must have been carried out with coastal nets "tonnara".

In fact as R. Sara (1983) likes to recall, Herodotus, referring to the times of Pisistratus (550 B.C.) wrote "The net is ready and skilfully put to sea, in the moonlight the plump tuna fish will come".

However it must have declined more and more over the centuries, so much that Ninni (1923) quoting from one of his works in 1921 says "Prof. Vinciguerra who was in Greece for a long time studying that fish species says that, in Greek Seas, at least in the Aegean, real tuna are not numerous...." ".... the only places where tuna are caught are Melina in the Gulf of Volo and Gialta in the Eubea". The situation recorded by our research, was not very different untill 1986, but with an awakening of interest on the part of operators due to demand by the Japanese market, in the near future, this will probably promote the consequent expansion of fishing areas, and increase in production. This investigation aims at the acquisition of information on the distribution of the species in Greek Seas and on the present exploitation of the resource.

2. MATERIALS AND METHODS

On the spot investigations and information obtained directly provided the number and sizes of vessels.

Two harbours were monitored for fishing effort and cpue: Kavala where fishing was carried out with pole-line and Alonisos where bluefin are caught occasionally, together with albacore, by long-line and troll-line.

Fishing effort for pole-line and troll-line , was defined from: $E = h \times d$

where h represents the average number of working hours for fishing per day, and d the fishing days.

1/ "This study does not necessarily reflect the opinion of the Commission of the European communities and does not prejudice their future attitude in this field"

For the long-line it was obtained with the formula

$$E = \frac{\bar{a}}{1\ 000} \times d$$

Where $\frac{\bar{a}}{1\ 000}$ represents the average number of hooks immersed daily, divided by the unit of measurement of the effort in 1 000 hooks; and d the number of days fished. Biometric data was collected in the same harbours.

For the study of size distribution at Kanala the length from the base of the pectoral fin to the fork (Lp) of 381 individuals was taken in 1986, and 156 in 1987. In 27 individuals the fork length (FL) was also measured and the FL-Lp relationship was calculated. The weight of 594 specimens eviscerated and decapitated was taken over the two years period.

At Alonisos the fork length and the total weight of 100 specimens was measured in 1986. The fork length-weight correlation was computed.

3. RESULTS

3.1 Harbours and Vessels

Only 5 zones with a total of 50 vessels whose sizes are shown in Table 1, are involved in bluefin fishery. The zone with the highest number of vessels (33) is Kavala in the north Aegean. Bluefin is considered fish by catch in albacore fishery carried out in the zones of Halkidiki and Sporades Isles.

3.2 Fishing Area

Although personal experience leads us to consider a wide distribution of bluefin tuna in Greek Seas, its fishery is carried out in quite limited zones. The areas in which this fishery is carried out today are the peninsular of Hallidiki, the northern Gulf of Evia and the area in front of the Gulf of Patrass. However from personal observation there is a diffuse presence of bluefin tuna and albacore in various other zones of the Aegean, in particular in the Dodecannisos and near Lesbos. The accidental catch of tuna by vessels during swordfish and albacore fishery also confirms that the diffusion of this species is quite wide but as far as we know, through direct information from fishermen, this resource is not developed due to scarce market demand and lack of suitable fishing techniques.

3.3 Fishing Period

The fishing period for bluefin tuna (Table 2) begins at the end of August and continues to the end of November. The four vessels of Rodopi that fish in spring, and the two vessels of Kalimnos equipped with Japanese long-line that have begun fishing in March, since 1987 are exceptions.

3.4 Systems of Capture

Equipment used for capture are: pole-line, troll-line, long-line surrounding nets and, since 1987, Japanese long-line. The pole-line is made up of a stainless steel hook attached to a steel cord about 1 m long and 2 mm in diameter, attached to a plaited nylon line 8 mm in diameter and about 25 cm in length.

This equipment is used at Kavala for the capture of "giant" tuna attracted by chumming sardines thrown into the sea at regular intervals near the vessel are caught with pole and line that is baited with sardine.

The long-line is an occasional means for capture of little tuna (average weight: 5 kg), principally being used for swordfish and albacore fishing which provides a reasonable catch of young specimens. This equipment is used in the waters of the Sporades, and Halkidiki, where they also use trolling.

Encircling gillnets constitute another means of capture. They are utilized by 4 vessels of Rodopi, in spring to catch in this case, individuals from 10-60 kg these are nets, 1 000 m long and 32 m high made of 3 bands the top band 50 cm high, with meshes of 5 cm where floats are attached, a middle band 31 cm high with 16 cm meshes, a bottom band 50 cm high with 5 cm meshes where ballast is attached. They have no form of closure. Fishing is carried out by two vessels that work in 20-30 m depth, surrounding the sighted shoal and driving the fish into the gillnets by noise. One vessel of Kavala and perhaps some others of Halkidiki and Thessaloniki use purse seines with meshes of 22-35 mm.

3.5 Experimental Fishing with Japanese Long-line

The Japanese long-line was used experimentally for the first time in Greece in 1987. In the fishing season of 1987 some Japanese operators had made contact with local co-opeerative societies in Kavala and Kalimnos for experimental fishing and commercialization of bluefin tuna.

In October to December about 230 giant tuna were caught by a modified long line technique for an average weight of 130 kg. The eviscerated and decapitated fish were sold to the Japanese at Dr. 800 per kg.

3.6 Total Catch

The total production of bluefin tuna for 1986 was 125 t Table 3. The most productive area being Kavala with 43.5 t equal to 34.78% of total catch. Other important zones were Halkidiki with a production of 40 t fished in the course of the albacore campaign, and Rodopi with 28 t.

The average annual catch per vessel was 0.67 t with a maximum value of 7 at Rodopi and a minimum value of 0.3 in Peloponnisos.

In 1987 although the fishery at Kavala was more intensive the production diminished to 25.5 t. About 10 bluefin were taken in October near the coasts of Thrace and about 80 giant fishes at Halkidiki at the end of November.

In October-December 1987, about 230 specimens were captured in the area of Kalymnos at an average weight of 130 kg. Total catch data of 1987 are not yet available.

3.7 Fishing Effort and Cpue

At Kavala 25 vessels worked in 1986 for 210 days totalling 1 551 working hours (Table 4) capturing 382 giant tuna for a total weight of 43 421 kg average individual weight 113.67 kg. Monthly variations in fishing effort and biomass caught are expressed in Figure 1, cpue is seen in Figure 2.

In the same harbour in 1987, 23 vessels fished with pole and line and totalled 333 working days for a total of 2 005 hours. They captured 212 individuals with an average weight of 112.7 kg and a total weight of 23.901 kg (Table 5). Notwithstanding the increase in effort, there was a decrease in values of both total catch and cpue.

Average weight variations over the months in the two-year period are shown in Figure 3.

The results for the harbour of Alinisos where bluefin is considered a by catch to the albacore fishery are reported in Table 6.

3.8 Size Distribution

3.8.1 Alonisos

One hundred specimens were measured. FL was between 60 and 103.6 cm. In the histograms of Figure 4 it is possible to see that the most frequent sizes were between 62 and 65 cm (71%) relative to two-year old individuals.

3.8.2 Length-weight correlation

The length-weight correlation on the 100 individuals (not eviscerated) was calculated, as follows:

$$W = 9.213 \times 10^{-5} \times FL^{2.61} \qquad r = 0.930$$

Where W is expressed in kg. and FL in cm

3.8.3 Kavala (pole-line)

In the port of Kavala 281 speciments of blue-fin tuna were measured.

As already said, the fish arrived in the harbour already decapitated, so the length of most of the specimens was calculated from the base of the pectoral fin to the fork.

As it was possible to measure the length from the superior jaw to the fork (min. 187 - max. 234) and from the base of the pectoral fin to the fork (min. 134 - max. 175) we calculated the correlation between the two lengths obataining the formula:

$$FL = 13.216 + 1.289 \times Lp \qquad r = 0.992$$

Where Lp represents the length from the base of the pectoral fin to the fork.

In Figure 5, the distribution of the frequencies of fork length is reported. Animals had a minimum size of 162 cm, and a maximum size of 253 cm, so they were between 7 and 14 years old according to Arena and Cefali (1980). The length classes mostly represented were those between 185 cm and 235 (86.5%) corresponding to animals between 9 and 12 years old. In 1987 the FL of 156 specimens was measured with the same method. Frequency distribution is shown in Figure 6. The sizes were between 170 and 272 cm, and the lengths most frequently registered were between 185 cm and 235 cm. The catch this year also fell within the same age range with a prevalence of 9-10 year old individuals.

4. DISCUSSION

Although it is indicated that in the Greek Seas there are bluefin of various ages - even juveniles of 1 kg were captured during swordfish autumn tagging - fishing areas are very confined and limited to the north Aegean and to the east of Kalimnos island. A specific fishery is mainly carried out on giant autumn tuna, and through professional fishermen, presents all the features of a sport fishery. It is practised from September to November near the coast where as there is no information about bluefin abundance in the open Aegean sea except from the occasional capture of young bluefin (w:5 kg) to the north of Sporades islands.

Ripening bluefin exploited in other parts of the Mediterranean, are fished only by four vessels in Greek waters of Rodopi, in April-May.

All the above, make us suppose either that their presence is quite widespread in the Greek waters but up to now has not attracted local fishermen or that it is really limited.

The positive reotropism that bluefin presents has to be taken into consideration in the study of its migration. At least in the west and central Mediterranean, bluefin follows the surface Atlantic water current. Ninni (1923) refers that according to Greek and Turkish fishermen, bluefin migrates keeping the right eye along the coast.

Looking at the current circulation in the Aegean Sea (Georgopoulos, 1984) we notice that the beginning of giant tuna fishery coincides to the east of Kalimnos the entrance of warm surface waters from the East Mediterranean into the Aegean, passing along the turkish coast and Dodecanisos islands, and extending temporarily into the area to the south of the islands of Andros-Tinos-Miconos-Ikaria-Samos.

In the north Aegean, presence of bluefin in autumn seems to follow the water current of the Dardanelles. A continued collaboration with other Mediterranean countries will be needed in order to improve our knowledge of the bluefin resource.

5. REFERENCES

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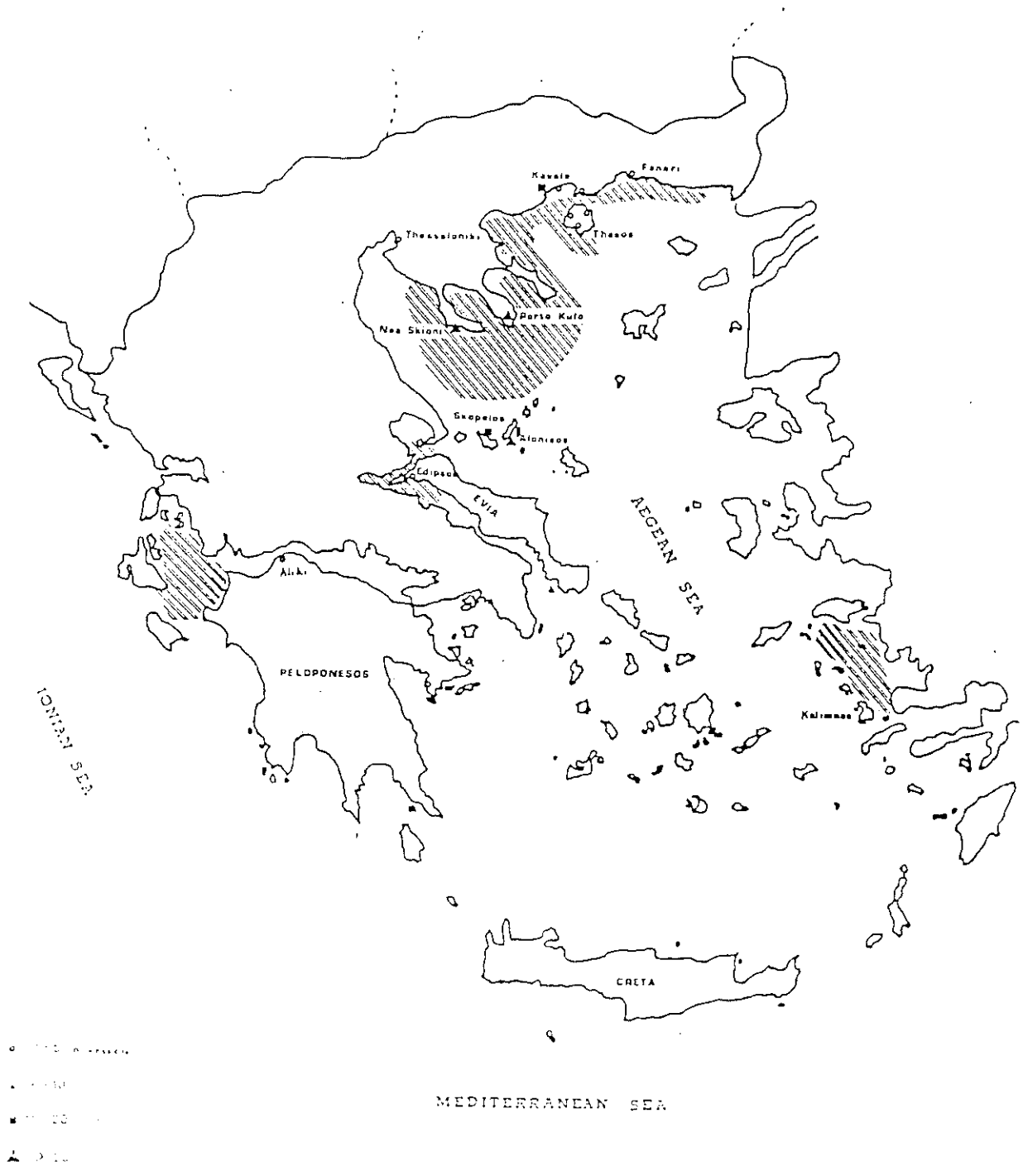

THUNNUS THYNNUS FISHING AREAS AND FISHING PORTS IN THE GREEK SEAS

Table 1

Division of bluefin fishing vessels according to the size for each geografical zone

ZONES	NUMBER OF VESSELS	LENGTH OF VESSELS (m)		
		< 9	9 - 14	> 14
PELOPONISOS	4	-	4	-
SPORADES[a/]	65	42	21	2
KAVALA	33	19	11	3
RODOPI	4	-	4	-
THESSALONIKI	5	-	-	5
HALKIDIKI[a/]	80	17	35	7
EVIA	4	3	1	-
TOTAL	195	81	76	17

a/ In these zones bluefin is considered a by-catch

Table 2

Distribution of vessels in the fishing period of Thunnus thynnus

ZONES	Vessels	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PELOPONISOS	4	-	-	-	-	-	-	-	-	4	-	-	-
KAVALA	33	-	-	-	-	-	-	-	-	33	33	33	-
RODOPI	4	-	-	-	1	4	3	-	-	-	-	-	-
THESSALONIKI	5	5	-	-	5	5	-	-	-	5	5	5	5
EVIA	4	-	-	-	-	-	-	-	4	4	-	-	-
T O T A L	50	5	-	-	6	9	3	-	4	46	38	38	5

Table 3

Total bluefin tuna catches per region and average annual catch per vessel in the year 1986

ZONES	No vessel	Total catch (tn)	Average catch per vessel (tn)
PELOPONISOS	4	1.2	0.3
KAVALA	25	43.5	1.7
RODOPI	4	28.0	7.0
SPORADES	64	6.4	0.1
THESSALONIKI	5	3.5	0.7
KALKIDIKI	80	40.0	0.5
EVIA	4	2.4	0.6
T O T A L	186	125.0	0.67

Table 4

Summarized data of catches, fishing effort and cpue estimated for Kavala bluefin fishery during the period August-November 1986

	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	TOTAL
No of vessels	8	19	5	9	25
No fish. days	16	118	7	69	210
No hours/vess.	9.3	8.0	2.6	6.3	7.4
No bluefin	44	201	11	126	382
Kg bluefin	4817	25418	1388	11798	43431
Average weight	109.5	126.5	126.2	93.6	113.7
E (X hour)	149	949	18	415	1551
CPUE in number	0.2	0.2	0.6	0.3	0.2
CPUE in biom.	32.3	26.8	77.1	27.1	28

Table 5

Summarized data of catches, fishing effort and cpue estimated for Kavala pole-and-line bluefin fishery during the period August-November 1987

	AUGUST	SEPTEMBER	OCTOMBER	NOVEMBER	TOTAL
No of vessels	3	9	20	13	23
No fish.days	3	77	174	79	333
No hours/vess.	2	6.3	6.4	5.1	6.0
No bluefin	0	29	144	39	212
Kg bluefin	0	3684	16472	3745	23901
Average weight	-	127	114.4	96	112.7
E (X hour)	6	485	1113	401	2005
CPUE in number	0	0.06	0.13	0.10	0.11
CPUE in biom.	0	7.6	14.8	9.3	11.9

Table 6

Summarized data of catches, fishing effort and cpue estimated for Alonisos long-line and trolling line fishery in 1986

	LONG - LINE	TROLLING-LINE
No of vessels	20	45
Fishing days	156	471
No bluefin individ.	96	611
Kg bluefin	466	2960
Average weight (Kg)	5.7	4.5
No total individual	2906	6157
Kg total catch	16763	31796
Fishing effort	160.9[a/]	3585[b/]
$CPUE_N$ bluefin	0.6	0.2
$CPUE_B$ bluefin	2.9	0.8

a/ E (x 1 000 hooks)
b/ E (x hour)

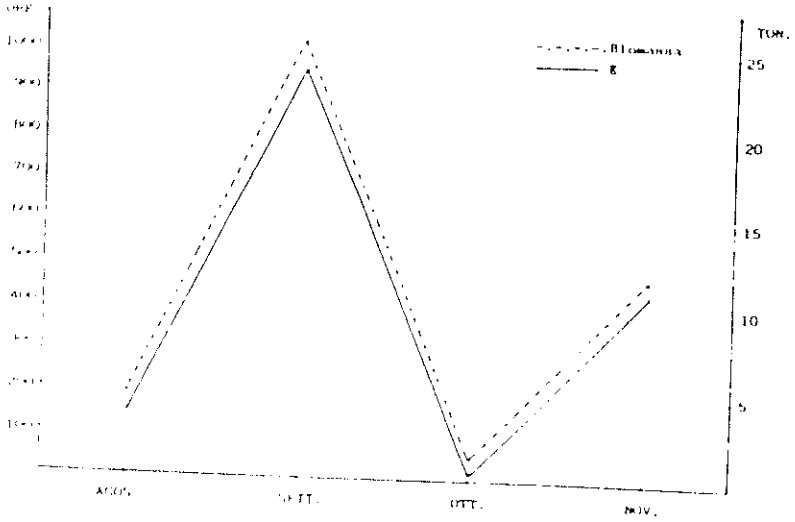

Figure 1a - Monthly variations of fishing effort and bluefin catches (biomass) for the fishery of Kavala during 1986

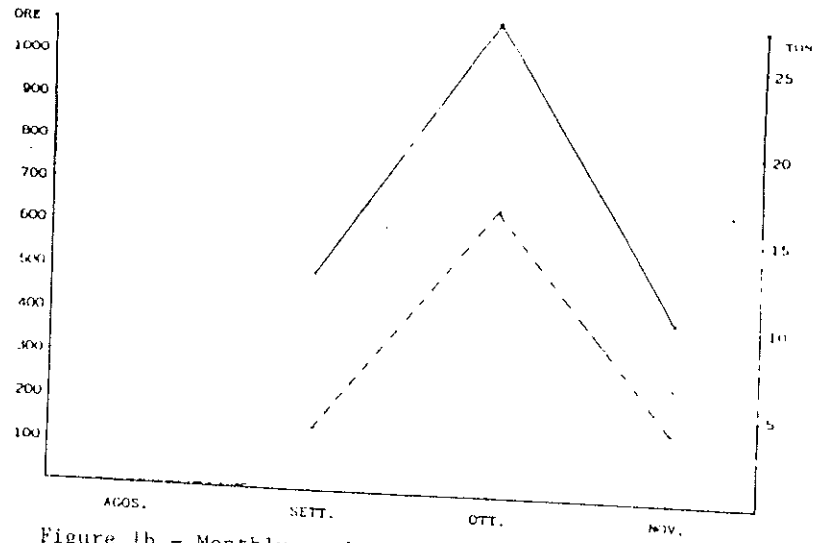

Figure 1b - Monthly variations of fishing effort and bluefin catches (biomass) for the fishery of kavala during 1987

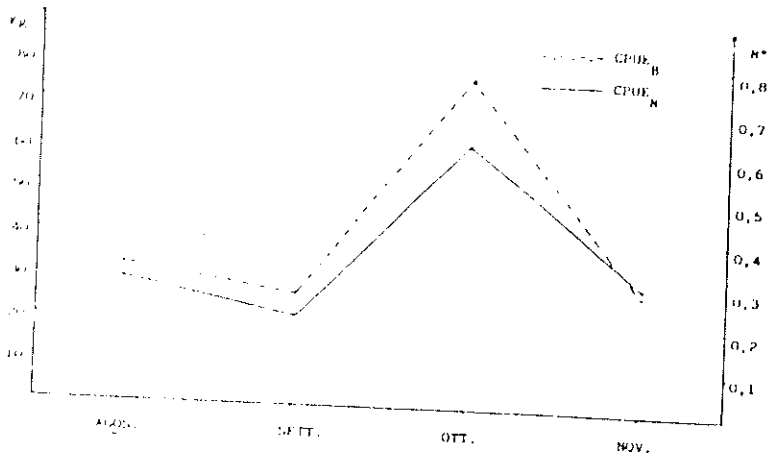

Figure 2a - Monthly variations of cpue in number of fish and in biomass (catches) for bluefin fishery in Kavala during 1986

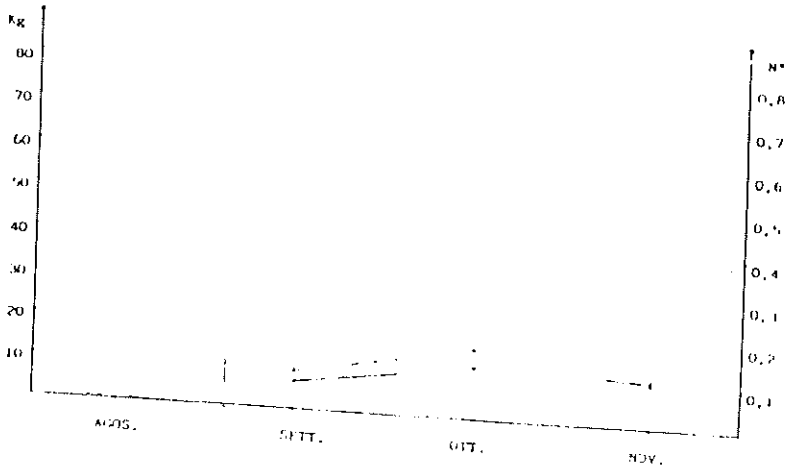

Figure 2b - Monthly variations of cpue in number of fish and in biomass (catches) for bluefin fishery in Kavala during 1987

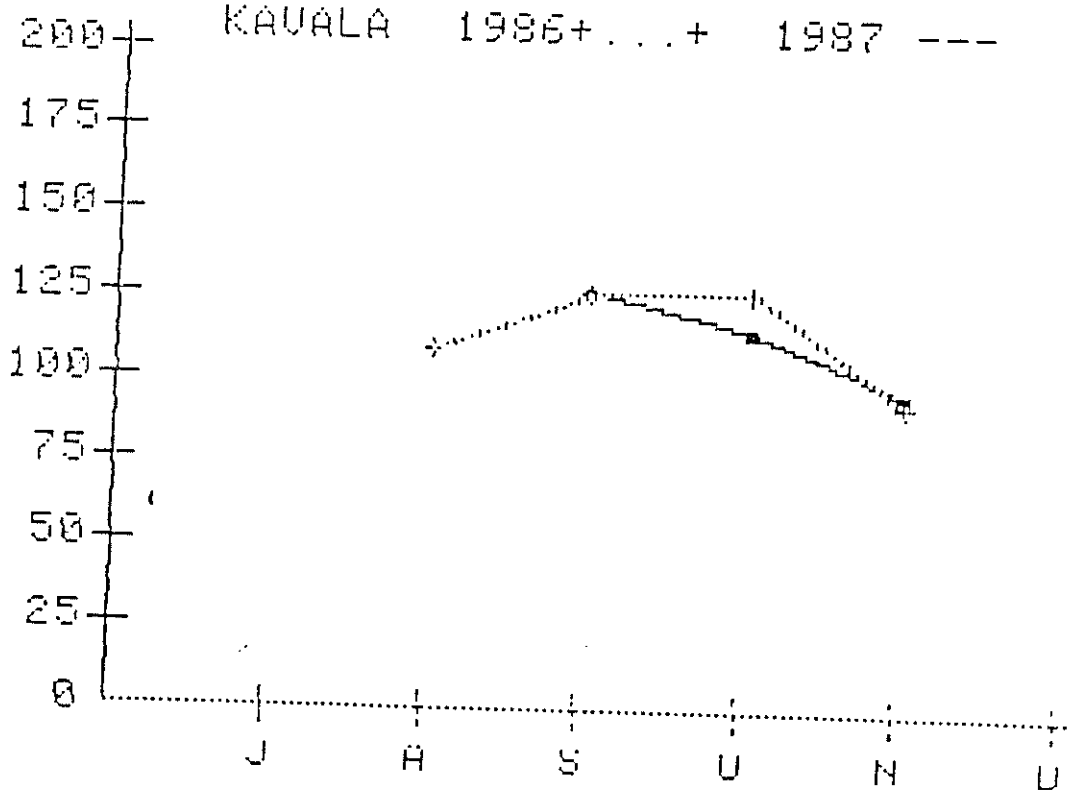

Figure 3 - Monthly variations of Thunnus thynnus average weight. Kavala fishery 1986/87

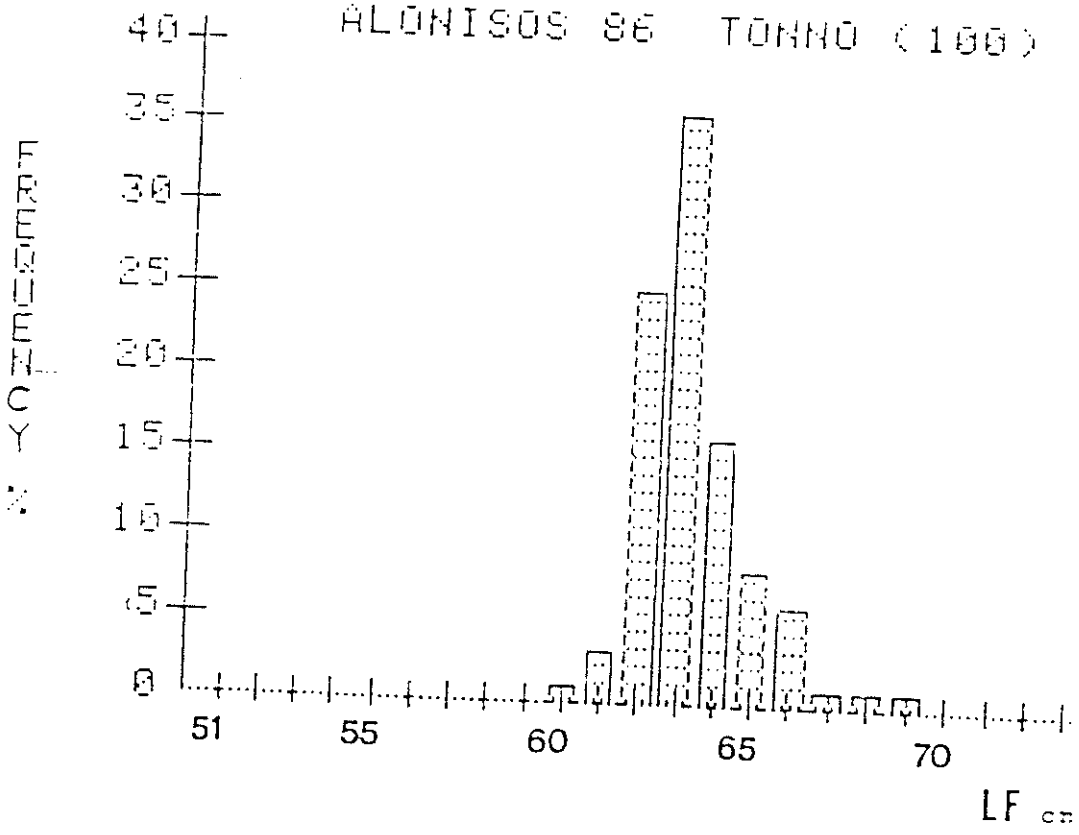

Figure 4 - Length frequency distribution (LF) of Thunnus thynnus. Alonisos fishery 1986

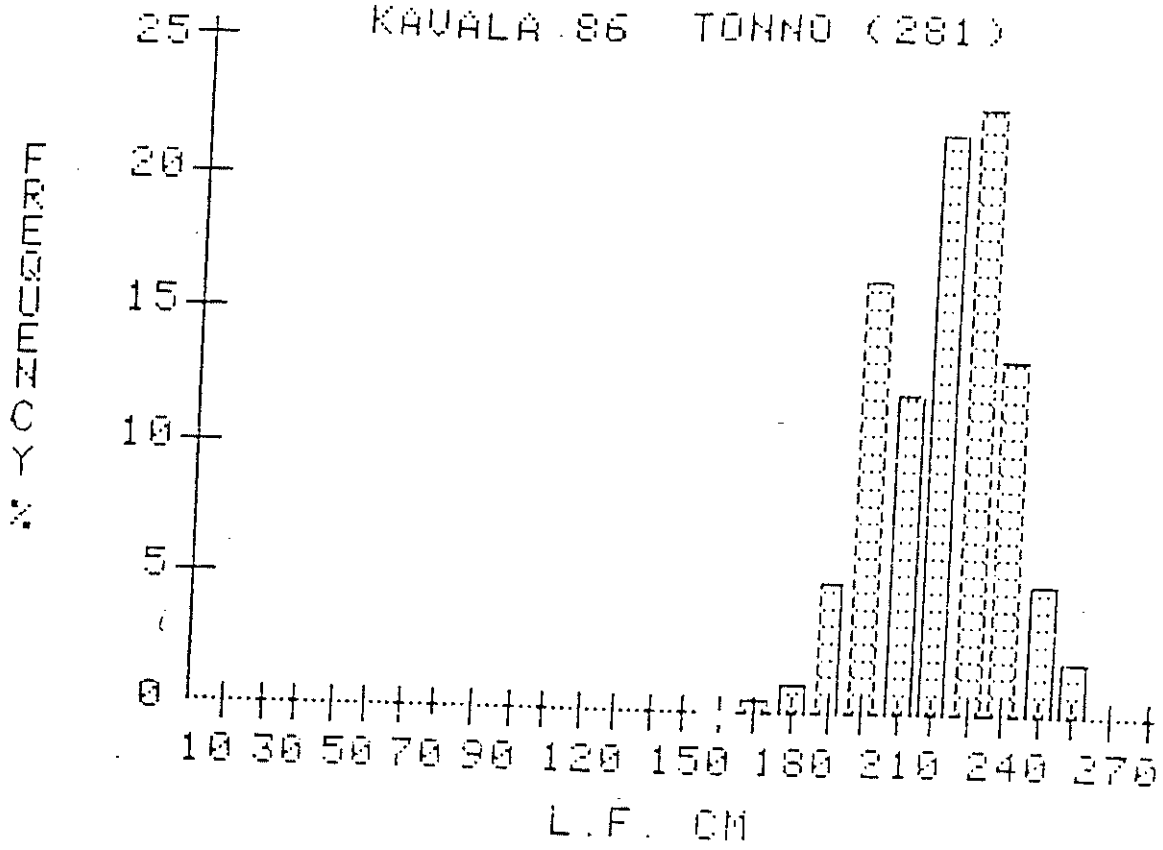

Figure 5 - Length frequency distribution (LF) of Thunnus thynnus. Kavala fishery 1986

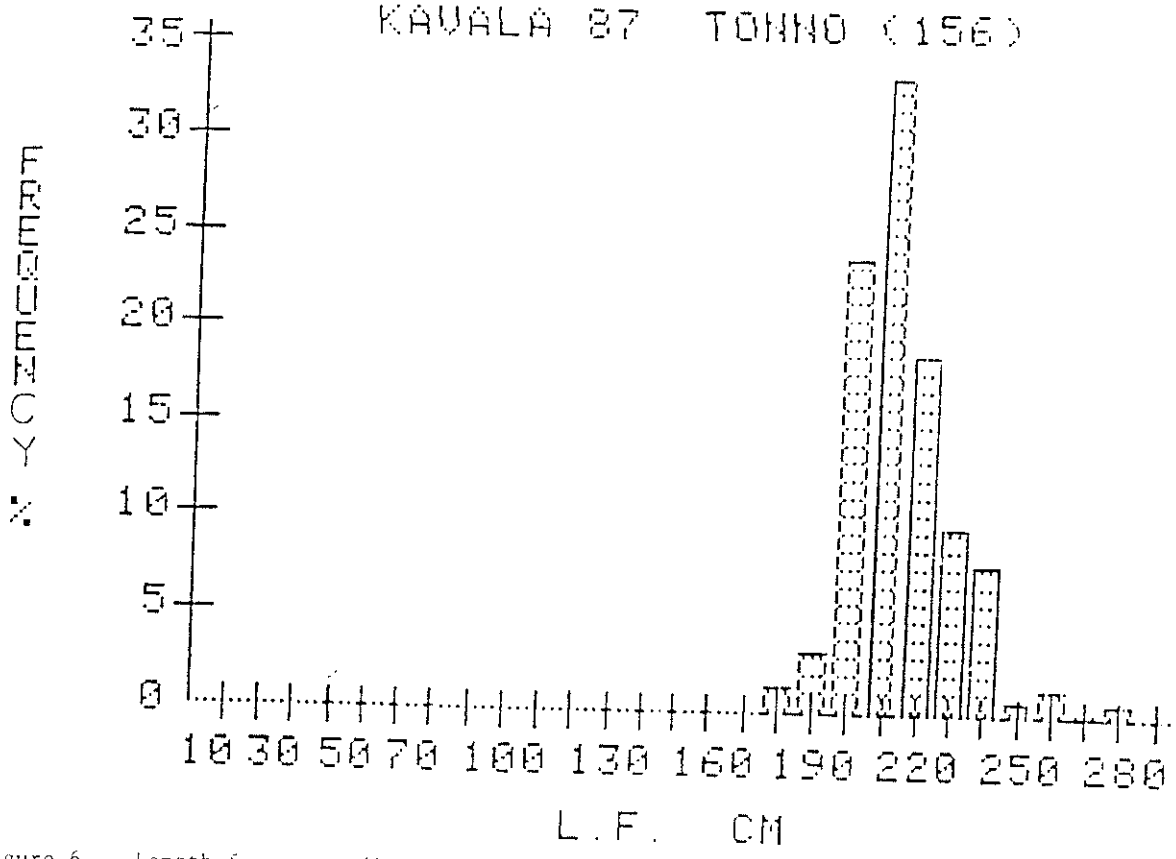

Figure 6 - Length frequency distribution (LF) of Thunnus thynnus Kavala fishery 1987