

## Preliminary analysis of tuna catches along the eastern Adriatic coast

### Preliminarna analiza ulova tonida na istočnoj obali Jadrana

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#### INTRODUCTION

Although tuna, and particularly bluefin tuna, are important component of commercial catches, they have been poorly studied so far. Tuna fishing along the eastern Adriatic coast was known some five hundred years ago. Various gears were used, mainly traps and fixed nets similar to small traps (Basioli, 1962). These techniques were applied up to 1964. Tuna seine fishing technique applied now was introduced in 1929 when the first tuna-seiner was used.

Tuna fishing has been intensively developed since World War II. In spite of considerable annual fluctuations it reached (after 35 year series) 2.3% of the total national catch. Two stages of this development may be distinguished. The first one extending over the 1947—1964 period terminated with the disappearance of traps. It is characterized by the application of both the passive and active fishing techniques constituting 3.4% of the total national catch. In the second stage covering the time from 1965—1981, only active tuna seine fishing was applied. These purse-seiners were alternatively used in small pelagic fishing (some vessels were also used as trawlers at the beginning of the second period). The proportion of tuna catch in the total catch was reduced to only 1.5%. Obtained percentages are in accordance with the world production of tuna which makes up 3% of the total catch (in weight).

#### TUNA VESSELS

Yugoslav tuna fleet was intensively developed in the postwar period. Thus, even 32 vessels were used for tuna fishing in 1958. Due to the period of poor production this number was reduced. After the period of adjustment, 14 ( $\pm 1$ ) boats remained.



These seiners are of 20.5—26.5 m in length and 70—110 gross tonnage with 180—400 HP engines. They are equipped with seine net for sardine and tuna fishing and they fish according to the seasonal presence of tunas.

## TUNA FISHING GROUNDS

Northern part of the eastern Adriatic is principal tuna fishing ground. Best catch has been realized from Kvarner and Kvarnerić and recently from the open sea, off the islands of Lošinj and Dugi otok. Considerable catch has also been realized round the islet Jabuka and the islands of Vis and Palagruža.

## TUNA CATCHES

Bluefin tuna (*Thunnus thynnus* L.) occupy the first position with respect to the catch quantities. On the average for 35 years they constituted 73.6% of the total tuna catch. Bonito (*Sarda sarda* Bloch), frigate tuna (*Auxis rochei* Risso) and little tuny (*Euthynnus (Euthynnus) quadripunctatus* Geoffroy Saint-Hilaire) are caught in small quantities.

During the first period (1947—1964) annual tuna catch varied from 1388 tons at the beginning (1948) to 162 tons in 1962. This period is characterized by a decrease index ( $b = -49.50$  tons/year) and annual mean catch of 598.39 tons. During the second period (1965—1981) the catch showed an increase from 218 tons in 1965 to 1117 tons in 1978 followed by a decrease down to the average level of 620 tons (Fig. 1). In this period increase index was 38.45 tons/year and annual mean catch 485.92 tons (Table 1).

Table 1. Trend of tuna and bluefin tuna catch in the passive-active period, 1947—1964 (A) and active period, 1965—1981 (B)

	Period	Correlation	Trend index	Catch (tons)		
				Max.	Mean	Min.
Tuna	A	-0.801	-49.50	1338	598.39	172
	B	0.584	32.90	1117	462.88	129
Bluefin tuna	A	-0.794	-34.84	897	407.0	87
	B	0.658	36.73	1049	396.59	90

Proportion of bluefin catch in the total tuna catch showed a trend of increase (Fig. 1). It constituted 46.5% of the total tuna catch in 1947 to reach 94.0% in 1981. Lower values were recorded in 1955 (38.4%), 1961 (46.6%) and 1962 (50.6%).

Bluefin tuna catch began to decrease from 1948 on, and following a pattern of normal fluctuations it decreased up to 1962 when smallest catch was realized (87 tons). Up to 1964 decrease index was  $-34.84$  tons/year with mean catch 407.0 tons/year. This was followed by a period of mean catch varying about 300 tons/year, up to 1975. The 1976—1978 is characterized



by sudden catch increase to the maximum value of 1049 tons. Catch has been again reduced for the last few years (Table 1).

Figure 2 shows catch fluctuations of other tuna species.

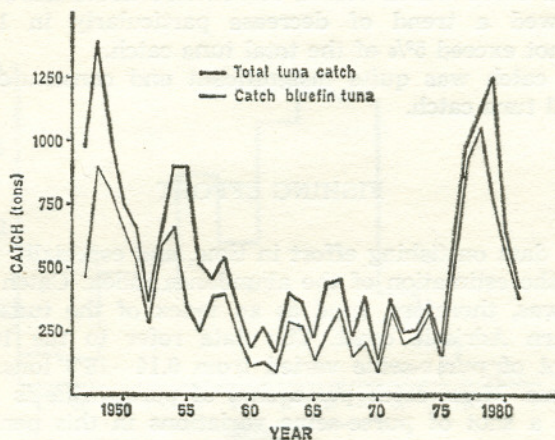


Fig. 1. Total tuna catch and bluefin tuna catch in the eastern Adriatic in 1947—1981

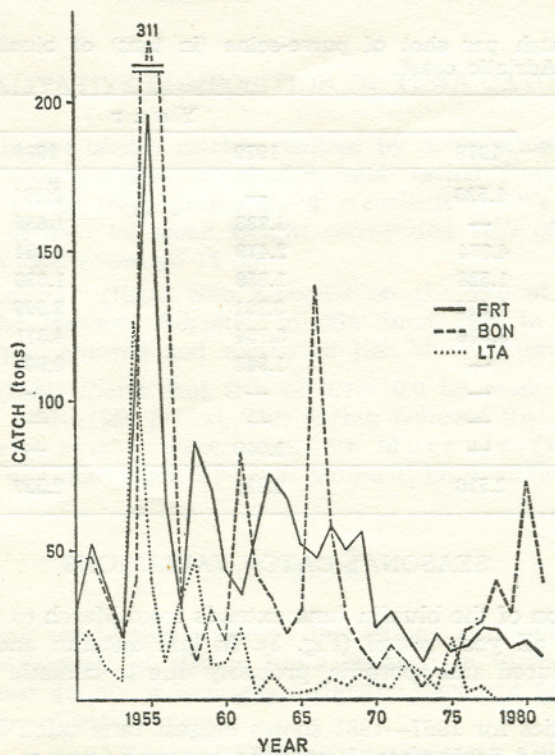


Fig. 2. Catch of bonito (BON), frigate tuna (FRT) and little tunny (LTA) in the eastern Adriatic in 1947—1981



Bonito make, on the average, 11.6% of the total tuna catch. However, the bonito catch in 1955 reached maximum quantity of 311 tons, that is 35% of the total tuna catch and it has been particularly low for the last decade (about 4%).

Frigate tuna catch which varied somewhere about 12% of the total tuna catch also showed a trend of decrease particularly in 1972—1981 period when they did not exceed 5% of the total tuna catch.

Little tuny catch was quite insignificant and constituted not more than 2.4% of the total tuna catch.

## FISHING EFFORT

The lack of data on fishing effort in time, and especially in searching time, does not allow the estimation of the abundance index. Catch realized per shot of purse-seine was, therefore, used as an index of the tuna population yield along the eastern Adriatic coast. The data refer to the 1978—1981 period. Catch per a shot of purse-seine varied from 0.14—16.0 tons, most frequently from 2.0—3.5 tons. Mean catch per a shot of purse-seine is 2.7 tons. Monthly mean catch per a shot of purse-seine variations in this period are shown in Table 2. Best catch per a shot of purse-seine realized in May and August corresponds to the better total tuna catch.

Table 2. Mean catch per shot of purse-seine (in tons) of bluefin tuna along the eastern Adriatic coast

Month	Year			
	1978	1979	1980	1981
III	1.526	—	0.294	1.639
IV	—	1.733	1.639	—
V	4.374	2.479	6.054	2.084
VI	1.528	1.358	1.636	1.862
VII	1.578	3.221	2.999	5.320
VIII	3.579	3.754	4.371	6.579
IX	—	1.948	0.908	4.004
X	—	—	—	—
XI	—	—	—	—
XII	—	1.019	—	—
Mean	2.516	2.216	2.557	3.581

## SEASONAL CATCH VARIATIONS

Fishing season of the bluefin tuna extends from March to October, although tuna are fished all year round (Fig. 3). In late autumn and winter catch is considerably reduced and sporadic, probably due to climatic factors and tuna migrations.

Catch statistics for 1967—1981 shows biggest tuna catch in summer, particularly in July and September. It may be assumed from catch variations that tuna schools migrate northward in spring and greater concentrations are recorded off Dugi otok and in the area of Jabuka and Palagruža in late summer.



As reported by Levi (1976) two fishing seasons may be distinguished from the Italian side. The first in March—April in the middle Adriatic off Pescara and Punta Penna, and the second from August to October in the north off Porto Garibaldi and Cattolica.

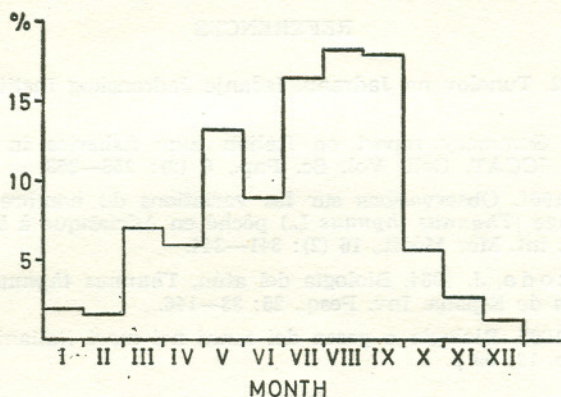


Fig. 3. Monthly mean catch of bluefin tuna in the eastern Adriatic in 1967—1981.

#### QUALITATIVE COMPOSITION OF TUNA CATCH

The analysis of the landed catches realized by purse-seiners in the 1978—1981 shows that mean weight of bluefin tuna varied from 3.1 to 20 kg. Specimens of 8—15 kg were predominant constituting 80% of the studied catch, while fish of 3—7 kg mean weight constituted 12% of the catch, and the rest of bluefin tuna exceeded 15 kg.

After Scaccini (1965) who reported on the age of tuna from the Mediterranean and western Adriatic, bluefin tuna two to three year old were predominantly captured and somewhat less bluefin tuna at age 1.

Morović (1961) found that fish of 3.4—10.0 kg made up 70% of the total catch of the 1957—1960 period. This author believed that these specimens achieved the age of two or three years. As Morović (1969) stated, the dominant weight of tuna caught by traps varied from 4 to 10 kg.

#### CONCLUSION

The total tuna production showed fluctuations between years. Having in mind that the number of fishing units engaged in tuna fishing has not changed for the last decade, it is pretty difficult to account for the significant differences between successive years.

After Rodriguez-Roda (1964) and Scaccini (1965) bluefin tuna reach first sexual maturity between the end of the second year of age and the beginning of the fourth. Therefore, with some exceptions, the part of tuna



stock under exploitation in the Adriatic Sea includes mainly individuals of two to three years, that is fish in the preadult stage or at best fish which reached first maturity.

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#### KRATKI SADRŽAJ

Na osnovu statističkih podataka analizirane su fluktuacije ulova tonida na istočnoj obali Jadrana u razdoblju 1947—1981. Najveći dio ulova čini tunj (73.6%) dok se ostale vrste tonida (palamida, trupac i luc) pojavljuju u malim količinama. Trend ulova u razdoblju upotrebe tunolovke i brodova tunolovaca (1947—1964) je negativan, dok se primjećuje trend povećanja u razdoblju 1965—1981. kad je ulov ostvaren samo plivaričarenjem.

S rijetkim izuzecima, dio stoka koji se eksploatira obuhvaća tunja od 2—3 godine starosti a u manjoj mjeri i jednogodišnje primjerke. Radi se o ribi koja se nalazi u preadultnoj fazi razvoja ili je tek dostigla prvu spolnu zrelost.