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The Effect of Delayed Opening on Yield and Economy of *Mullus barbatus* Linnaeus, 1758 and *Upeneus pori* Ben-Tuvia & Golani, 1989 Fisheries in the Northeastern Mediterranean

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Abstract.- This study was carried out during the 2002-2003 fishing season (September 2002- April 2003) off the Karatas Coasts located at the entrance of the Iskenderun Bay. Sampling was conducted in monthly intervals through the stations chosen from 0-20, 20-50 and 50-100m depth ranges. An evaluation for the fishing season was done by taking into account *Mullus barbatus* and *Upeneus pori* among the species which made up the main catch. At the end of this evaluation we found that if the beginning of the fishing season along the Northeastern Coasts of Turkey was delayed from September to October, the increase in the TW of the stock of *M. barbatus* and *U. pori* would be 15.05% and 82.87% in turn; if it was delayed until November the above mentioned increases were calculated at the level of 82.87% and 83.36% respectively. From the commercial point of view, by shifting the opening of the fishing season to November there would be a 350% increase in the income earned from the species *M. barbatus*. As a result, we conclude that delaying the fishing season to November instead of September would be better for both the fish stocks and the economy.

Key Words: *Mullus barbatus*, *Upeneus pori*, fishing season, fisheries regulation.

INTRODUCTION

According to Bilecenoğlu *et al*. (2002), 390 fish species are known in the Mediterranean coasts of Turkey. The species variety of the region can easily be seen, especially when considering that over 700 fish species are distributed throughout the whole Mediterranean Water System (Quignard and Tomasini, 2000). The fishing activities in the Northeastern Mediterranean are generally characterized by coastal fishery that is operated by small boats. The demersal species with high economical values are mainly caught and landed by the bottom trawl fishing fleet (Dimech *et al*., 2008). Fishing is conducted in the Northeastern Mediterranean Coasts of Turkey between 20 to 150m depths (Bingel, 1987).

It has been reported that the fishing activity in 1950s created a high fishing pressure on the regional fish stocks (Akyüz, 1957). Continuous contributions of new boats to the fishing fleet, have also exposed the regional fish stocks to overfishing today (Gücü and Bingel, 1994a). As a result, the fish stocks in the northeastern Mediterranean have been decreasing under the increased exploitation pressure. Considering both this fishing effort and the poor management of the fisheries of ideal stocks, the situation is not sustainable (Gücü and Bingel, 1994a). There has been a decrease in the yield and catch per unit effort (CPUE) year by year (Gücü, 2000). It has also been reported that a dramatic decrease in the average TL of the species is of economical importance as the species that have high economical values are substituted by species that have less economical value (Gücü, 2000). In the study of Gücü (2000), the series of stocks of CPUE in the Northeastern Mediterranean showed a yearly decrease in the demersal fish stocks, such as *Saurida undosquamis*, *Mullus barbatus*, *Upeneus moluccensis* for 20 years (Gücü, 2000).

Gücü and Bingel (1994b) stated that, the highest yield by bottom trawl fleet along the Northeastern Mediterranean Coasts of Turkey should not exceed 7700 tones, and fishing capacity should not exceed 20000HP. However, the fishing capacity for Turkey's entire Northeastern Mediterranean was almost exceeded by the fishing boats based only in the Karatas Harbor (13500HP).

The studies carried out up to now point out

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that the stocks of the Northeastern Mediterranean have been over-exploited and fishery is not sustainable (Gücü and Bingel, 1994b; Gücü, 2000; Rochet *et al*., 2005). The limitation of the fishing effort (Gücü and Bingel, 1994b) or increases in mesh size are considered as solutions. However, at present no technical measures or fishing effort regulations have been applied in the area. The presence of mixed fishery/multi-species fisheries type observed along the Northeastern Mediterranean means that enlarging the mesh size of the nets will not be an optimal solution to decrease the yields (Özyurt, 2003). Mediterranean Fisheries need to think of ~~is~~ the multispecies characteristics of their landings and how single species models may indicate that a fishery is non profitable due to overexploitation. Therefore, some other measures such as Marine Protected Areas should be taken. In this study, we analyze the possibilities and positive effects of delaying the opening of the fishing season on fish stocks in the northeastern Mediterranean.

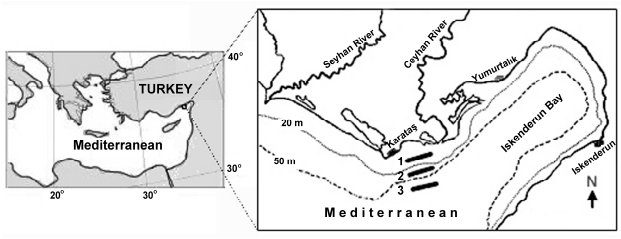

Fig. 1. Study area and sampling stations

MATERIALS AND METHODS

This study was carried out between September 2002 and April 2003 by taking *M. barbatus* and *U. pori* samples from three stations (located at 0-20, 20-50 and 50-100m depth) off Karatas Coasts located at the entrance of the Iskenderun Bay (Fig. 1). A commercial trawler was used for sampling (270 HP, 19m overall length). A one hour haul as a unit was used throughout a period of eight months (day time) in the above-mentioned three stations. A traditional Mediterranean bottom trawl net type with cod-end mesh size 22mm (knot-to-knot) was used.

Samples were taken from each haul randomly (Holden and Raitt, 1974) and preserved in 4% formaldehyde solution buffered by borax. In the laboratory, the total length (TL) and total weight (TW) of each individual was measured to the nearest 0.1cm and 0.01g, respectively.

Trawl catch composition, and the changes in the monthly CPUE (kg h^{-1}) were determined.

RESULTS

The catch composition showed that *M. barbatus* and *U. pori* were the main species in catches and being in their fast growth period for new cohort, it was decided to concentrate on both of these species.

Mullus barbatus

The monthly mean TL, TW, CPUE value and percentage variation of mean TL and TW of *M. barbatus* are shown on Table I. The minimum mean TL was obtained in September (9.86±2.05cm); after this month, this value shows an increase and reaches its highest level in April (13.43±1.94cm).

Mean individual weight of *M. barbatus* increases by 15.05% from September to October and by 58.95% between October and November (Table I). Taking this increase into consideration, the obtained mean CPUE value as 15.57kg in September will become 17.91kg and 28.47kg, respectively if the fishing season is delayed till October and November instead of September,. In this case, the CPUE value which was calculated as 3.11kg for the whole fishing season will become 4.73kg with increasing 52.58%. Besides this increase that will become as biomass**,** it will lead to economic growth as well. In line with its commercial value, *M. barbatus* is classified by fishermen into 5 different categories in terms of size, that is extra, 1^{st}, 2^{nd}, 3^{rd}, bizri=zibil barbun. While approximately the 60% of the total landing of September is bizri barbun (0.50TL kg^{-1} in the year 2002), the majority (60%) of the catch in November is 2^{nd} barbun (1.75TL kg^{-1}). Therefore if *M. barbatus* is marketed in November instead of September, the income earned from this species will increase by 350%. If this data is taken into consideration and the fishing season opens in November, the fishermen will have a 290.22% increase in their incomes considering the 82.87% increase in the total biomass and the 350% increase in income.

Table I.- Monthly mean total length, total weight, CPUE value and % differences in length and weight of *Mullus barbatus* and *Upeneus pori.*

Months	n	Mean total length (cm)	Mean total weight (g)	CPUE (kg/h)	Increase in mean weight compared to September (%)
Mullus barbatus					
September	132	9.86±2.05	11.56±8.49	15.57	
October	117	10.38±2.12	13.30±9.70	3.68	15.05
November	121	12.08±2.44	21.14±15.55	1.00	82.87
December	113	12.21±1.25	20.74±8.13	0.35	79.41
January	126	12.42±1.61	21.04±11.63	2.74	82.01
February	96	12.25±1.73	20.54±12.97	0.65	77.68
March	104	12.73±1.74	23.10±12.97	0.23	99.83
April	98	13.43±1.94	29.73±15.59	0.69	157.18
Mean		11.30±2.34	17.48±12.71	2.91	
Upeneus pori					
September	83	8.15±1.39	5.29±3.17	5.52	
October	89	9.74±1.58	9.32±4.71	3.00	78.18
November	102	9.98±1.24	9.70±3.49	0.34	83.36
December	78	10.57±1.10	12.15±4.19	0.7	129.68
January	91	11.01±1.00	13.40±3.84	0.93	153.31
February	93	10.99±0.92	14.00±4.02	0.25	164.65
March	79	11.12±0.84	14.08±3.44	0.11	166.16
April	68	10.57±1.05	11.87±3.80	0.05	124.39
Mean		10.44±1.30	11.68±4.46	1.29	

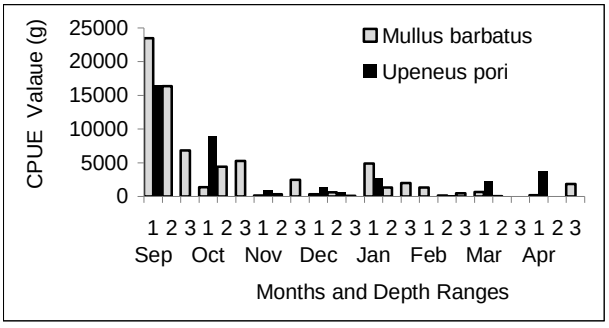

Fig. 2. Monthly changes of biomass in depth range for *Mullus barbatus* and *Upeneus pori* (1: 0-20m, 2: 20-50m, 3: 50-100m depth ranges).

As it is seen on Figure 2, throughout the studying period, the 62.50% of the biomass of *M. barbatus* was gained in September, 17.78% in October and the rest was caught in the other six months. This situation can be put forward as *M. barbatus* fishery is based on recruiting year-class. Moreover, when the depth ranges are considered, the biomass obtained from 0-20m depth range for *M. barbatus* which is bound by a 3 mile prohibition is also destroyed with the opening of the fishing season. This data can be considered as an indicator that the fishermen have been in breach of the 3 miles prohibition. If the situation was not so, no decrease would be expected in biomass obtained from 0-20m depth range.

Upeneus pori

The monthly mean TL, TW, CPUE value and growth rate in length and weight of *U. pori* are given in Table I. The increase in the weights of individuals that belong to *U. pori*, between September and October was calculated as 76.18% and between October and November as 4.08%. In the event that the opening of the fishing season is delayed till October instead of September, the CPEU value will increase from 5.85kg to 9.75kg. With a longer delay to November, it is obvious that this value will increase to 10.15kg. According to this result, the calculated mean CPUE value obtained for the whole studying period as 1.58kg will increase up to 2.16kg an increase of 36%.

However, since the *U. pori* is labeled together with the lowest price of *M. barbatus*, there will not be any economic.

The relationship between time and growth in length was estimated as $y=0.324x+8.806$ ($R^2=0.648$). One concludes from the Figure that the 43.75% of the total catch was caught in September and 23.80% was caught in October. In the event of the opening of the fishing season in October instead of September, the CPEU value will increase from 5.85kg to 9.75kg increasing to 10.15kg with a longer delay to November. According to this result, the calculated mean CPUE value obtained for the whole period as 1.58kg will increase to 2.16kg with a 36% increase. However, since the *U. pori* is labeled together with the lowest price of *M. barbatus*, there will not be any economic advantage.

DISCUSSION

Çoral (1988) reported that *M. barbatus* is growing the fastest at age 1. Taking into account the fact that the reproduction period takes place in the period of May and September (increasing in July especially) for *M. barbatus* (Şahin *et al*., 1992, Şahin and Akbulut, 1997), and when the fishing season starts in September, individuals that belong to that year's cohort are exposed to a fishing pressure in their rapid growing period. Indeed Şahin *et al*. (1992) reported that in Southeastern Black Sea coast, the majority (70%) of landed *M. barbatus* individuals consisted of young ones that are immature or maturing. The same finding is reported from Greek fisheries which have reported that, Helenic demersal and inshore fisheries stocks are overfished (Stergiou *et al*., 1997; Stergiou and Petrakis, 1993; Stergiou *et al*., 1994). Also many important Helenic fish stocks including Mullidae family and hence commercial catches, consist mainly of young fish (age 0+ to 2 years) (Stergiou *et al*., 1997; Petrakis *et al*., 1992; Stergiou *et al*., 1992).

First maturity length has been reported to vary from 10.0 to 13.5cm in previous studies for *M. barbatus* (Mert *et al*., 1983; Celik and Torcu, 2000; İşmen and İşmen, 2003; Özyurt, 2003). It is clearly seen that, mean total length in September (Table I) is lower than the length at first maturity.

Considering the selectivity curves and the length at first maturity of *M. barbatus* (Mert *et al*., 1983; Celik and Torcu, 2000; İşmen and İşmen, 2003; Özyurt, 2003) and *U. pori* (Mert *et al*., 1983; Kaya *et al*., 1999), if the fishing season is to be opened in October or in November, it is apparent that the negativities caused by the fisheries will be less.

Immature and smaller than the minimum permitted landing size are caught on the opening of the fishing season in the eastern Mediterranean Coasts of Turkey and the same findings have been reported in Hellenic seas (Stergiou *et al*., 1997). Immature and small size catch are generally discarded or marketed illegally with low prices in both the Turkish and Hellenic markets (Stergiou *et al*., 1997).

In addition to this, it is known that the primary production has reached to its maximum level in autumn season not only in whole Mediterranean (Zingano *et al*., 1995) but also in Northeastern Mediterranean (Kıdeyş *et al*., 1989; Polat and Piner, 2002). This situation offers an excellent growing opportunity for newly hatched *M. barbatus* individuals that are in a rapid growing period. Therefore, opening of the fishing season should be delayed until November.

Another point is the price of fish at the beginning of the fishing season which is the lowest in comparison with other months. Both regional fish consumption behaviors and high weather temperature (average 26.1°C in September, 21.6°C in October) have influence on the low price of fishes. Therefore, the opening of fishing season should be delayed to cold months (average whether temperature in November, 15.3°C) instead of September.

The data obtained from *M. barbatus* and previous studies indicated that fishing season must not be open before November. When all these data are evaluated and *U. pori* is considered, it is obvious that the fishing season should not be opened before October.

As a result of the evaluation of the beginning of the fishing season, if the fishing season in the area is to be opened in October instead of September, biomass of *M. barbatus* that consists the

11.83% of the total catch can increase 82.82%. When the same positive affect is considered to happen in the other species, it will increase the incomes of the fishermen and it will also be a rational decision about the fish stocks and make them more plentiful.

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