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Effect of Jigs Color to Catching Efficiency in the Squid Fishing in Turkey

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Abstract: To investigate and compare squid jigs, six squid-jigging experiments were conducted from 1 July 2005 to 30 August 2005 with small scale fishermen. The aim of these experiments was to determine the effects of color of jigs on catch rates and catching efficiency of European squid taken by the hand jigging methods used by small scale fishermen in Turkey. Same types of two different colored red and green jigs were used in per gears in trials. A total of 102 squid were caught by the handline jigging during the study. After six fishing trials 12510.1 g squid were caught totally. 7890.3 g (n:63) of these value was belong to green type of jig and 4619.8 g (n:39) squid were caught by red jigging line. Average catch weight of squids per trial was 2085 g. One way ANOVA revealed that for both jig types no significant relationship ($p>0.05$) was found between the means of groups. Fishing with squid jigging line is proposed to small-scale fisheries due to high price of squid, low by-catch, no requirements of complex fishing gears and having low cost. And the green types of jigs are found more efficient.

Key words: Squid fishing, squid jigging, jig color

INTRODUCTION

European Squid (*Loligo vulgaris*, Lamarck, 1798) belongs to Loliginidae family. Because of its highly commercial value and large amount of catch rate, it has important place in cephalopods (Turk *et al.*, 1986). *Loligo vulgaris* occurs from lat 55°N to 20°S in world seas. It inhabits the waters of the continental shelf and slope and is most abundant in waters 50-250 m deep (Roper *et al.*, 1984). *Loligo vulgaris* is available all seas in Turkey except Black Sea (Katagan *et al.*, 1993; Salman *et al.*, 1997; Unsal *et al.*, 1999; Sen, 2004).

Squid is a valuable cephalopod both human nourishment and other sea creature as a bait. There are many species of squid in the world seas and also there are many harvesting methods for squid. They can be caught by various fishing gear like purse seines, trawls, seines, gill nets in Turkey. Squid jigging is one of them used by small scale fishermen.

Squid jig fishery is widespread in Japanese fishermen. Squid jigging most often takes place at night with bright overhead lights to attract the squid. Jigs of various types, makes and color are attached to the handline at 70 to 90 cm intervals. Often as many as 8 to 12 jigs are on one line and many more are used on automated squid reeling systems (Bjarnason, 1992).

These fishing gears are used as handlines in Turkey. These gears are different from Japanese fishermen's. Jigs are attached to handline at 25 to 30 cm intervals. Often as many as 3 to 4 jigs are one line and all of them are used on hand.

It is important to keep the jig moving constantly in the water. This is usually done by jerking the line, quickly pulling in the slack, jerking once again and so on, until the jig is back to the surface. The line is then thrown out and allowed to sink to the desired depth and the same jerking motion is repeated over again (Bjarnason, 1992).

Prime ministry, Turkish statistical institute has been declared 506 ton squid harvested for 2004 in Turkey (TURKSTAT, 2004). Little of them are caught by squid jigging and most of them are caught by purse seines. The aim of these experiments was to determine the effects of color of jigs on catch rates and catching efficiency of European squid taken by the hand jigging methods used by small scale fishermen in Turkey.

MATERIALS AND METHODS

Experimental jigging for European squid was conducted in Izmir Bay in western Turkey waters (Fig. 1) during the period from 1 July 2005 to 30 August 2005 on small trade fishing boats.

Same types of two different colored red and green jigs were used in per gears in trials. Four gears has two jigs were used at the same time. All jigs were the same sized 7 cm and shrimp shaped (Fig. 2). The nylon jig-line on each hand reel had attached a 250 g teardrop-shaped sinker at the bottom end and plastic jigs barbless lures 30 cm apart. In the trials, two or three fishermen operated fishing in a boat. Squid jigging lines were used by turns by the fishermen.

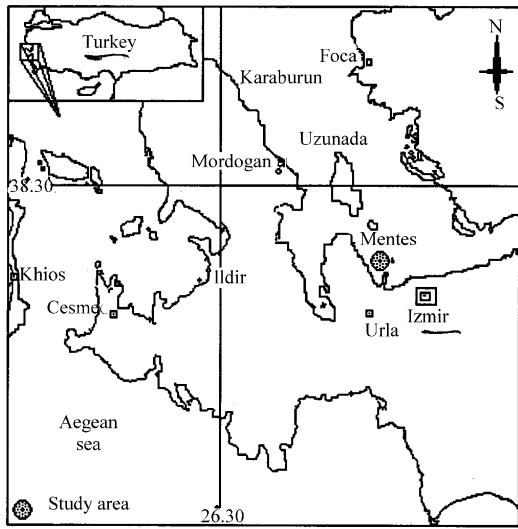


Fig. 1: The study area Izmir Bay in Turkey

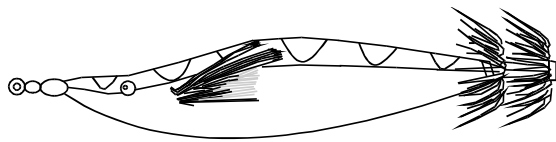


Fig. 2: Squid Jig used in the study (L: 7 cm)

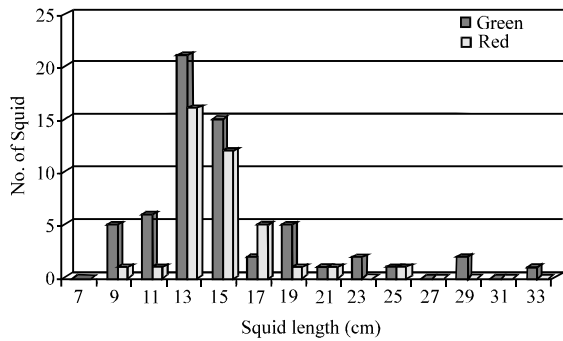


Fig. 3: Graph of Length-frequency of Squids

The trials were conducted in the day times. During squid jigging operations, the sinker weights of hand-jigs were usually allowed to drop to the seabed. In the study area the water depths ranged between 15 and 27 m. Bottom substrates were muddy and some locations covered with seaweeds. All locations were open to commercial inshore fisheries, including gillnetting and trammel netting.

Squid-jigging trials were conducted to test the effects of color of jigs and mantle length-frequency composition of squid for each of the jig as shown in Fig. 3 Six fishing trials were carried out totally.

For statistical analysis, catch per unit effort CPUE for the hand-jigging method was expressed as grams per

colored jigs. Where statistically significant, ANOVA was applied to compare CPUE values between jigs. Statistical relationships were considered significant at $\alpha = 0.05$ level

RESULTS

A total of 102 squid were caught by the handline jigging during the study. After six fishing trials 12510.1 g squid were caught totally. 7890.3 g (n:63) of these value was belong to green type of jig and 4619.8 g (n:39) squid were caught by red jigging line (Fig. 4). Average catch weight of squids per trial was 2085 g. In catch composition, average mantle length of squids and average weight of squids were measured as 14.441 cm and 125.242 g for green jigs, 13.623 cm and 118.456 for red jigs, respectively. Minimum and maximum mantle lengths of squids were measured 7.8 and 33.2 cm for green jigs, 8.1 cm and 24.6 g for red jigs. Furthermore, minimum and maximum weights of squids were measured 17.7 and 503.4 g for green jigs, 17.6 and 315.7 g for red jigs, respectively.

In totally green type of jigs in the lines caught squids more then the red ones (Fig. 4). One way ANOVA revealed that for both jig types no significant relationship ($p > 0.05$) was found between the means of groups (Table 1).

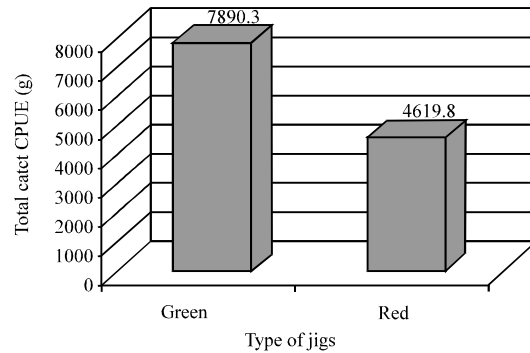


Fig. 4: Graph of total catch of squids by different colored jigs (g)

Table 1: Statistical summary and ANOVA table between the means of groups

Groups	Number	Mean	Variance			
Red	39	13.623	8.21			
Green	63	14.441	28.75			
ANOVA						
Source	SS	df	MS	F	p-value	F-crit
Between groups	16.12562	1	16.12562	0.769814	0.382378	3.936151
Within group	2094.742	100	2094.742			
group Total	2110868	101				

Source of the Variance: Between group and within group comparisons SS: Sum of Squares, df: Degrees of freedom, MS: Mean squares, F: The result of the statistical test, the test statistic, p-value: The probability that the F score was due to chance, F crit: The value our test statistic F needs to be larger than in order for our groups to be significantly different

DISCUSSION

Nowara and Walker (1997) claimed that catch rates are highly variable between regions and change from year to year. Catch rates kilograms per machine hour or kilograms per fisher-hour are higher for the hand-jigging method than for the machine-jigging method at all times over. Hand-jigging CPUE in the water column 0-80 m was higher than machine-jigging CPUE in the water column 0-80 m.

Color becomes very important related to the depth, with colors changing depending upon how deep they go. Red filters out of the color spectrum first at about 9 m and yellow and chartreuse at about 18 m with blues, greens and darker colors the last ones to turn gray. White and pearl turn gray at about 18 m and black is always black, regardless of depth. This means a fish in deep water will see blacks, grays, blues and greens in terms of day-to-day food while a shallow water fish would be tuned in to all colors (Fishsa.com, 2000).

It has been told that blue and green jigs are the best colors to use in winter while the pink and orange jigs are best in summer. Some jigs glow in the dark and they have their devotees (Squidfish.net, 2006).

Purse seine and other seine nets have been restricted since 2001 in the Izmir Bay in Turkey. Because of these, amount of squids increases in the bay. So small scale fishermen have fished squids by jigging. Fishing with squid jigging line is proposed to small-scale fisheries due to high price of squid, low by-catch, no requirements of complex fishing gears and having low cost. And the green types of jigs are found more efficient.

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