The Effects of Jig Color and Depth Variation on Catch Rates of Purpleback Flying Squid, *Sthenoteuthis oualaniensis* (Lesson, 1830) in Iranian Waters of the Oman Sea

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The objective of the present study was to determine the effects of jig color and depth variations on squid catchability in Iranian waters of the Oman Sea (Bandar-e jask and Chabahar). Two different colors of jigs (green and blue) were used together in same angle. A total of 2270 (1119 Kg) squid were captured by automatic machine during the study. Purpleback Flying squid (*S. oualaniensis*) with 96.5% of the total catch was the dominated species and Indian squid (*L. davauseli*) was also found rarely. The number of 1247 (weight: 603.3 Kg) of this value was belong to green type of jig and 1023 (weight: 515.7 Kg) were caught by blue type of jig. Catch rates were calculated 5.188 Kg h⁻¹ and 3.8 Kg h⁻¹ for green and blue jigs, respectively. According to t-test results, wasn’t significantly difference between catch rates of squid with green and blue jigs (P>0.05). Kolmogorov-Smirnov test proved that the size composition of dorsal mantle of caught squids didn’t differ significantly between different jig colors (P>0.05). Result of one-way analysis of variance (ANOVA) test showed that the catch rate of squid was higher in shallower waters (P<0.05).

**Key words:** Squid fishery, Jig color, Catch rate, Purpleback Flying squid, Oman Sea

1. INTRODUCTION

In the last decades population has been increased and it has been raised need for food. Aquatic resources and seafoods can provide the world's prime source of high-quality protein. Cephalopods are one of the most important sources of seafoods. Squid is a valuable cephalopod both human nourishment and utilization in fisheries such as live bait for angling and feed of some aquaculture species (Altinagac, 2006). Total cephalopods (squid, cuttlefish and octopus) production was computed as 2.18 million tonnes in the world in 2002 (FAO, 2002). This is 2.3% of the whole fishery production of the world. Spain, France, China and South East Asia countries had the highest Squid fishing value in the worldwide (Papan et al., 2011). Squid catching is conducting by different fishing gears such as jigging (as targeted) and trawl, purse seine and gill nets (as bycatch) in the worldwide.

The waters of the Persian Gulf and Oman Sea are environmentally unique that many species of cephalopods and squid live in this region (Reynolds, 1993; Carpenter et al., 1997). Since there is no literature about squid jigging in Iranian waters of the Oman Sea, The purpos of this study is to determinate the effects of jig color and depth variation on squid jigging.

2. MATERIALS AND METHODS

2.1. Data collection

The study area covered the fishing grounds of Bandar-e Jask and Bandar-e Chabahar in the Oman Sea (longitude of 57’ to 61’ E and latitude of 24’ to 26 N) (Fig. 1). The specimens were caught by C/V KAVEH which had 62 m length and 2364 horse power engine. Two jig colors (green and blue) and monofilament lines (as main line) were used in the fishing operations. A swivel was also used to avoid the twisting. All jigs were the same sized 7 cm and shrimp shaped (Fig. 2). 350 g sinkers were used at the end of monofilament lines. The cruises were carried out in the night time and squids attracted by powerful lights on the vessel. The number of 136 lamps (1500 W) was suspended on cables above the deck of the vessel. Dorsal mantle length (DML) of individuals was measured to the nearest 0.1 cm. In addition, body weight was taken on a digital balance with 0.01 g accuracy. Fishing grounds depths were measured by echo-sounder and ranged from 72 to <2500m.

2.2. Data Analysis

Data analyses were done by SPSS19 software. Kolmogorov-Smirnow and Levene tests were used to analyze normality of the data and homogeneity of variances (Zar, 1999). A two independent
samples t-test and ANOVA test were used for comparison of catch rate between different jig colors and three depth strata (<500m, 500-1500m and >1500m). Duncan’s test was used for a posteriori comparison among means of different depths. A Kolmogorov-Smirnov test was also used to determine whether the size composition of dorsal mantle of individual’s significantly differed between different jig colors. Statistical analyses were considered significant at $\alpha=5\%$ level.

3. RESULTS

At this study Purpleback Flying squid (*Sthenoteuthis oualaniensis*) was the dominated species with 96.5% of the total catch. However, Indian squid (*Loligo davauseli*) was also found rarely. A total of 2270 squid with total weight of 1119 Kg were caught. The number of 1247 (weight: 603.3 Kg) of this value was belong to green type of jig and 1023 (weight: 515.7 Kg) were caught by blue jigs. Catch rate was computed 4.495 Kg h$^{-1}$ generally. Catch rates were also calculated 5.188 Kg h$^{-1}$ and 3.8 Kg h$^{-1}$ for green and blue types of jig respectively (Fig. 3). Result of t-test showed not significant differences between catch rates of squid with green and blue jigs ($P>0.05$). The size composition of dorsal mantle of caught squids didn’t differ significantly

Fig. 1: Map of the study area (Oman Sea – Bandar-e Jask and Chabahar).

Fig. 2: Shape of Squid jig used at the present study.
between different jig colors ($D_{K_s} = 14.082$, $P = 0.07$; Fig. 4). The catch rate of squid was also affected by depth variation and it was higher in shallower waters ($P < 0.05$; Fig. 5).

**Fig. 3:** Mean catch rates ± SD (kg h⁻¹) of squid with different jig colors.

**Fig. 4:** Length frequency distribution of caught squids during the present study.
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4. DISCUSSION

The fishing variation, such as changes in abundance and size or age structure, are one of the principal aims of study in exploited cephalopod stocks (Boyle and Rodhouse 2005). According to our results efficiency of green and blue jigs had not significantly difference, this is in agreement with reports of Mercer and Bucy (1983) and Ulas and Aydin (2011). While Altinagac (2006) reported that the green jigs were more efficient than red jigs in his day time samplings. Time of sampling and low visibility of water could be the reasons to this difference. At present study the difference of jig colors on dorsal mantle length (DML) of caught squids was not statistically significant, which this is in agreement with report of Ulas and Aydin (2011). The difference between the catch rates (Kg h⁻¹) of squid in shallow and deeper waters indicates the bathymetrical distribution of squid in the study area. Young and Hirota (1998) recorded the lowest catch rate of *S. oualaniensis* in deeper waters of the Hawaiian Archipelgo. They reported also squid normally occupy depths of about 650m or more during day time. Nesis (1993) also cited the absence of *S. oualaniensis* from continental shelves and deeper waters.

Fisheries for squid have attracted interest worldwide over the last two decades. This is interesting, both because of the commercial potential of squid fisheries, and the role that they might have in the provision of high quality protein for human consumption (Caddy, 1990) (Fig. 6). Developing of squid jigging in Iranian waters of the Oman Sea is affordable for small-scale fishermen due to (i) high price of squid, (ii) low bycatch value and (iii) low cost of fishing gears.

![Fig. 5: Mean catch rate ± SD (kg h⁻¹) of squid in different depths (*: indicate the significant difference)](image)

![Fig. 6: Annual catches of all Squids in the worldwide (1982-2002)](image)
5. CONCLUSION

Declining catches in many traditional fisheries have led to increased effort to develop the potential of non-traditional species such as the cephalopods and squid. This was the first study on squid jigging in Iranian waters of the Oman Sea, and it can provide basic information for squid fishery in the region.

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REFERENCES
