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Spawning Season of *Argenteus* (Euphrasen, 1788) in the Northwest of the Persian Gulf and its Implications for Management

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Abstract: The spawning periodicity of silver pomfret, *Pampus argenteus*, was investigated in 627 specimens (137 female and 490 male) collected monthly by trawl net from the Northwest the Persian Gulf for a one year period (March 2004 to February 2005). Seven maturity stages were recognized by Kesteven scale. The length at first maturity (LM_{50}) was calculated as 192 mm in combined sex. The overall sex ratio (female: male) was 1:3. Fluctuations in the Gonadosomatic Index (GSI) values and percentage of mature specimens suggested prolonged spawning season from May to October. There were two spawning peaks, the first one between May and July and the second in October. It is concluded that Iranian waters (in Khuzestan province) are the main spawning and nursery grounds for silver pomfret in the Persian Gulf.

Key words: Silver pomfret, GSI, length at first maturity, sex ratio, fisheries management

INTRODUCTION

The silver pomfret, *Pampus argenteus*, are members of the Stromateidae family and widely distributed throughout Indo-West Pacific: Persian Gulf to Indonesia, Japan, West and Southwest of Korea and Eastern part of China (Haedrich, 1984).

Locally known as zobeidy, it is a prime and valuable shared fish stock in the Northern Persian Gulf between Iran, Kuwait and Iraq (Al-Hussaini, 2003). Due to the high economic value, Commercial fisheries in Persian Gulf usually prefer them.

Although some authors have conducted studies and investigations into the reproductive biology of this species in other parts of the world (Kim and Han, 1989; Lee *et al.*, 1992; Dadzie *et al.*, 2000; Al-Abdul-Elah *et al.*, 2002; Al-Hussaini, 2003; Almatar *et al.*, 2004; Liming and Yongsong, 2005), little is known about the North part of Persian Gulf (Iraq waters, Mohamed and Ali, 1993; Ali, 2001) and Iran water (Safikhami, 1998).

The catch statistics show, in spite of increasing fishing effort, the total catches and catch rates of Iran and Kuwait decreased in recent years (Al-Hussaini, 2003). Consequently economic loss was high due to this. It might be the result of high fishing pressure upon spawning biomass and the young fishes smaller than first maturity length.

The present study was carried out to investigate the sexual maturation, length at first maturity (LM_{50}) and spawning season of the silver pomfret population in the Northwest of Persian Gulf, with a view to providing information for the rationale management of fisheries.

MATERIALS AND METHODS

Sampling of *Pampus argenteus* occurred in the Northwest of the Persian Gulf from March 2004 to February 2005.

A total 627 specimens (137 female and 490 male) were caught monthly with Otter trawl net (mesh size of net body 75 and 40 mm in codend) from Iranian waters (coastal water of Khuzestan province). The study area was located between longitudes 48° 45' to 49° 50' and latitudes 29° 48' to 30° 06' (Fig. 1).

The caught fish were transported to the laboratory with ice. In the laboratory, the fork length ($FL \pm 1$ mm), total weight and gonad weight ($W \pm 1$ g) were recorded. The sex was determined by a macroscopic examination of the gonads and stages of maturity were determined by using Kesteven (1960) macroscopic scale seven stages for female and male. Fishes in stages 4 to 6 were considered as matures (Biswas, 1993).

The spawning period was estimated from gonad development, direct observation of the gonads and

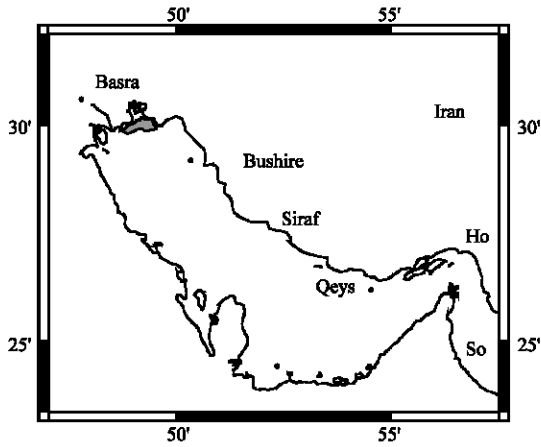


Fig. 1: The map of study area

monthly variations in Gonadosomatic Index (GSI) value for females, males and both sex (population). GSI was calculated by the following formula:

$$GSI = (Wg/Wt) \times 100$$

Where:

Wg = Weight of the gonads in grams

Wt = Total weight of the fish (Biswas, 1993)

RESULTS

The sampled silver pomfret were between 100 and 312 mm (FL). The average fork length and total weight during the 12-month period were (186±47) mm and (296±251) g.

The smallest mature male and female were observed at 148 and 205 mm (FL), respectively.

All the maturity stages appeared in the caught fish. Percentage frequencies distributed at 10 mm class intervals of advanced stages of maturity which included stages 4 to 6 are plotted (Fig. 2). The sigmoid-curve, resulted from this, showed that 50% of total specimens matured at 192 mm (FL). LM_{50} for male and female was separately obtained as: 180 and 222 mm (FL).

The overall sex ratio for 627 specimens obtained was 1:3 (female: male). The Chi-square showed annual sex ratio was male-biased and statistically different from expectation, 1:1 ($p < 0.05$).

The GSIs calculated monthly for silver pomfret are shown in Fig. 3. The GSI began to rise in March and reached the highest values in April (7.71 for both sexes).

The GSI showed one major decrease during May-July and a minor decrease in October.

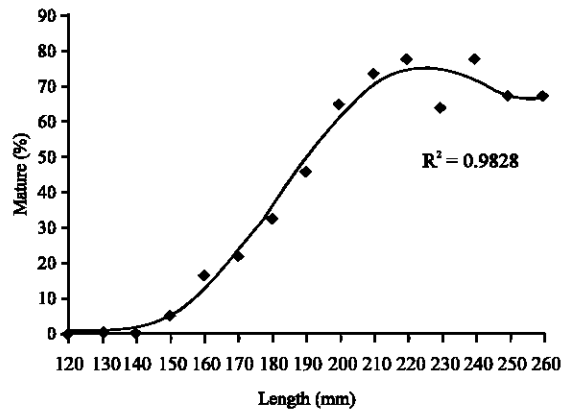


Fig. 2: Maturity curve of *P. argenteus* population

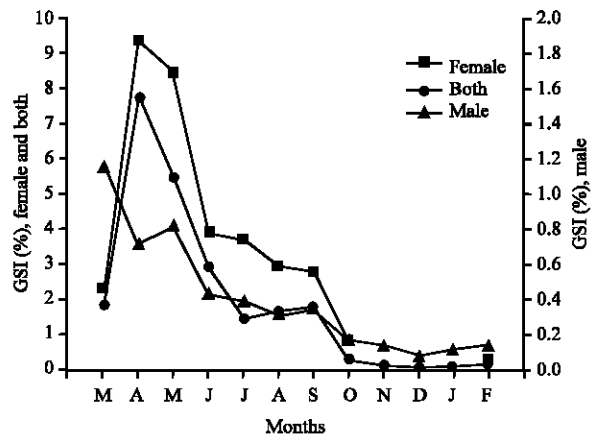


Fig. 3: Average gonadosomatic index of males, females and both sex in monthly samples of *P. argenteus*

No female specimens were found during October-January.

The percentage of mature specimens calculated during the 12 month period. The percentage increased rapidly in April, declined from May to August and then increased in September and another decreasing was in October. Fluctuation in these values were similar to those of GSI. No mature specimens were seen in the months of December and January.

It, according to the Gonadosomatic Index (GSI) values, the monthly investigation of mature percentage and the direct observation of gonads of the *P. argenteus* population in Northwest of Persian Gulf, was revealed that there was prolonged spawning season from May to October with two spawning peaks, the first one during May-July and the second in October.

DISCUSSION

This study showed that males mature earlier than females.

Lee *et al.* (1992) reported that LM_{50} for this population in Korean waters was 180 mm. Another investigation in Korean waters estimated this length as 185 mm (Kim and Han, 1989). Liming and Yongsong (2005) showed that in the Pearl Estuary of China, silver pomfret first attained sexual maturity in 150 mm. Lee and Jin (1989) reported that in the population of *P. argenteus* in the Eastern part of China, the males mature earlier than females, at a minimum size of 167 mm, while the females mature at 186 mm. Pati (1982) showed that the length at first maturity of this species in the Indian waters was 150 mm for males and 170 mm for females. Ali (2001) reported that LM_{50} for this species in Iraq waters was 157 mm. Dadzie *et al.* (2000) found that in the population of silver pomfret from Kuwait waters, males matured earlier than females, at a minimum size of 125-144 mm, while the females mature at 205-224 mm. Differences between results of our study and researches of other areas, may be due to the geographical variation which leads to the variation in environmental factors.

The estimated sex ratio confirm previous investigations of Al-Abdul-Elah *et al.* (2002) in Kuwait waters and Mohamed and Ali (1993) in Iraq waters. They reported that males were more than females.

Mohamed and Ali (1993) reported that the spawning period of silver pomfret in Iraq waters extended from May to September, with a peak in June-July. Dadzie *et al.* (2000) determined the spawning time of the *P. argenteus* population in Kuwait waters to be from May to August with two spawning peaks, the first in May and the second in August. Safikhani (1998) stated that spawning time of silver pomfret in Mahshahr estuaries was from March to September, with two peaks in June and September. The result of present study, witnessed the prolonged spawning season of *P. argenteus* population with two peaks of spawning. Pati (1982) found that the spawning of this species in Indian waters took place between February and August while Lee and Jin (1989) observed one peak from May to July in the Eastern China sea.

Based on these results and evaluations, in order to maintain the population in equilibrium it is of great importance to give each fish the chance of reproducing at least once in its lifetime to recruit the stock and therefore the length at first capture, LC_{50} , should be bigger than LM_{50} (192 mm in terms of fork length) while the actual fishery figure was less than it (62% of total specimens was less than 192 mm and there were specimens with 100 mm

(FL)). As a result, the current LC_{50} for *P. argenteus* population in Northwest of Persian Gulf was lower than its LM_{50} , this problem may cause a greater reduction of this species catch in future due to the continuous removal of pre-spawning fishes.

Therefore a management work should be started to design a net of an appropriate mesh size to collect optimum lengths and increase the size at first capture to size at first maturity. In same investigations that did in China sea: Liming and Yongsong (2005) suggested that LC_{50} should be increased to 150 mm (LM_{50}) from 120 mm, Lin *et al.* (2006) suggested that LC_{50} should be reached 170 mm to have sustainable fishery.

It is believed that the major spawning and nursery areas for silver pomfret population are located in Iran waters (Khuzestan province) while feeding and wintering areas are within Kuwait waters (Dadzie *et al.*, 2000), Hence for protection of spawning biomass, pomfret fishing in main spawning areas during the major spawning peak, which lasts from May to July, should be prohibited and priority should be devoted to create a natural coastal protected area.

Fisheries management; such as size-limit regulation, time-limit regulation, in shared stocks is essential because in this situation any damage to the stocks in one country will definitely affect the catches in the other country. Thus properly cooperative research and management of *P. argenteus* population in the Persian Gulf should be done for future sustainable harvesting. Therefore further investigations are essential to be carried out: especially the study of seabed, which swept during trawling and its importance as a habitat for feeding and nursery grounds. The estimation of yield per recruit that can predict the population situation.

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