Journal of
Fisheries and
Aquatic Science

**Academic
Journals Inc.**

Feeding and Spawning of *Sphyraena jello* in the North-West of Persian Gulf

[1]S.A. Hosseini, [2]S. Jamili, [2]T. Valinassab, [3]G. Vosoghi and [3]S.M.R. Fatemi
[1]Department of Marine Biology, Faculty of Marine Science and Technology,
Science and Research Branch, Islamic Azad University, Hesarak, Tehran, Iran
[2]Iranian Fisheries Research Organization, P.O. Box 14155-6116, Tehran, Iran
[3]Islamic Azad University of Science and Research Branch, Iran

Abstract: This study, being conducted in 2006-2007, attempts to investigate its biological habit and characteristics in Iran's water of the Persian Gulf. For the sampling purpose, three major landings namely Bushehr, Deylam and Genaveh were selected to obtain samples from commercial catches. The sampling is composed of 655 males and 515 females during a twelve month period. By studying the feeding through the counting method, it is revealed that, *Liza subviridis* characterized by 42.8% and *Sepia pharaonis* by 8.4% made the highest and lowest stomach content, respectively. The findings showed that male fish in smaller size will mature sooner than females specimen but this sex ratio or proportion was not significantly different except during October and September. Such a difference between male and female in different months could be originated from longer residing of female group in spawning ground compared to male group. The earlier spawning lasted during September-October and there was a peak of spawning in feeding in August. The lowest fat proportion for both male and female genders was reported 0.10 and 0.11, respectively in October; but the highest level of condition factor was reported to be 0.59 and 0.63 during November and June.

Key words: *Sphyraena jello*, nourishing and reproduction, biological habit, characteristics, Persian Gulf

INTRODUCTION

Pick handle Barracuda (*Sphyraena jello*) belongs to family of Sphyraenidae (Walters, 1966) which is also known as sea wolf signifying its savage and aggressive behavior while preying. Out of this fish family, 20 barracuda species inhabit in the world (Salini *et al.*, 1994) four of which can be found in the Persian Gulf waters, which include: Big eye Barracuda (*Sphyraena forsteri*), Yellow mouth Barracuda (*Sphyraena obtusata*), Swelling Barracuda (*Sphyraena putnamiae*) and Pick handle barracuda (*Sphyraena jello*) which seems to be the most important and abundant fish species being deprived of any fundamental and systematic biological research in Iran. The available data on its distribution are only available from the resources found in Yemen, Gulf of Aden, India, The Philippines, Kenya, Malaysia and some South-east Asian, West Atlantic Ocean countries and some areas of Caribbean and Pacific Ocean. Thus, conducting a study on its feeding regime, spawning time and any other characteristics in the Persian Gulf water specially in the Iranian Bushehr coastal water as the main inhabitant and fishing ground of the fish may seem necessary since any pertinent data would be used in the areas of aquaculture, stock-assessment, sustainable exploitation, management and setting closed season in spawning season as well as comparing the results with the available data from other countries.

The fish is physically characterized by a wide and long anatomy with lateral strips and it is often found in the tropical and semi tropical water bodies. Having sharp teeth on its jaws, the fish attacks its prey in an ambush and by its jaws, so that the fish can easily wound and grind its prey (Porter and

Motta, 2004). Some studies attribute origin of this fish to those fish species inhabiting in Coral reefs as their safe shelter (Aburto-Oropeza and Balart, 2001). On the other hand some reports state that even certain fishermen have been.

Commercially, the fish is highly valuable and contributes greatly to the fisheries economy of the countries enjoying such resources. According to recent investigations by the Iranian Fisheries Research Organization 2004, entitled Feeding Mass of Barracuda fish in the Persian Gulf and Sea of Oman, the fish yielding three tons of catch every year is ranked five out of ten key species. Therefore, given its economic role, this study investigates its biological characteristics in the Iranian Bushehr water and was carried out during 2006-2007.

MATERIALS AND METHODS

Bushehr Province is characterized by primary landing ground out of which, three are of prime significance which was used for the sampling purpose for this study. The selected landings are: Bushehr, Genaveh and Deylam.

Sampling was carried out in various inhabitants and from the delivered catch. To do so 300 specimens was studied biologically in each month and 90 pieces were dissected (From March 2006- February 2007), their total length was measured with 0.5 cm and 50 g weight precision. Having done the dissection, fish stomach was removed and following by a cut on its wall, it was washed up totally. Content of the stomach was investigated and frequency of each species was calculated through numerical method. To estimate the intensity of fish feeding, GSI was measured (Au, 1979).

Given the time lapse between the catch and examination due to particular circumstances, in some cases, certain parts of the stomach content had been destroyed. To identify the depleted fish Eolith were considered in organs of one fish (Porter and Motta, 2004). Having carried out the measurement process of both length and weight of all the sample pieces in a 12- month period, biological data on the dissected fish were analyzed through Statgraph software (Blaber, 2000). Through condition factor formula the Condition factor $K_f = W/L^3$. 100 (Froese and Pauly, 2005) was estimated and any changes along GSI and proportion of gonad weight and body weight GSR (or gonosomatic ratio) were investigated. After removing the gonads from the fish stomach, they were investigated in seven maturity stage procedure (Wainwright and Richard, 1995).

RESULTS

A significant relationship (95%) was found between fish length and weight in Pick handle Barracuda and this species has isometric growth with slope (b) of 3.35 for the female and 3.20 for male specimen, respectively (Table 1, 2). The lowest condition factor of both male and female during October proved to be 0.37 and 0.35, while during June and November was estimated 0.45 and 0.47, respectively as the highest level (Table 2).

The status of gonads of 655 male and 515 (Table 1) female ones were examined proportion of gender for various months showed to be different but the Chi-square test indicated a significant difference between the sex ratio in various months except July and September (Table 3). It was found

Table 1: The t-test for b-value with regard to male and female Pick handle Barracuda in NW Persian Gulf waters

Sex	b-calculated	B-value	R	N	df	tc calculated	t_t table	p-value
Female	3.35	3	0.954278	515	510	0.160	1.96	<0.05
Male	3.20	3	0.955876	655	650	0.149	1.98	<0.05

Table 2: Comparison of K, GSR and GSI of Pick handle Barracuda in the NW Persian Gulf waters

Month	GSI		K		GSR	
	Male	Female	Male	Female	Male	Female
Feb.	1.68	1.99	0.39	0.43	3.11	3.58
Mar.	2.82	3.02	0.42	0.44	4.12	4.81
Apr.	2.87	1.93	0.40	0.39	4.18	5.21
May	2.56	1.89	0.41	0.41	4.16	5.33
Jun.	2.64	2.09	0.45	0.41	4.17	5.18
July	2.69	3.36	0.39	0.39	4.08	4.14
Aug.	3.69	3.74	0.46	0.44	2.51	3.58
Sep.	2.96	3.48	0.42	0.46	2.10	3.22
Oct.	3.15	4.11	0.35	0.37	1.03	2.06
Nov.	3.28	4.09	0.42	0.47	0.94	0.78
Dec.	2.19	3.81	0.41	0.44	0.37	1.33
Jan.	1.87	2.02	0.44	0.44	0.58	1.11

Table 3: Sex ratio (M: F) for *S. jello* (χ^2 Test) in the NW Persian Gulf water

Mouth	ni	Nith	(ni-nith)	(ni-nith)^2	(ni-nith)^2/nith	Significance difference
Jan.	48	45	3	9	0.21	-
Feb.	46	45	1	1	0.02	-
Mar.	40	45	5	25	0.55	-
Apr.	45	35	10	100	2.85	+
May	43	40	3	9	0.22	-
Jun.	44	34	10	100	2.94	+
July	42	42.5	0.5	0.25	0.005	-
Aug.	41	38	4	16	0.42	-
Sep.	41	39	3	9	0.23	-
Oct.	44	42	2	4	0.09	-
Nov.	45	44	2	1	0.02	-
Dec.	48	34.5	5.5	30.25	0.87	
Total					-8.425	

$$\chi^2 = R = \sum_{i=1}^{i=r} \frac{(ni - nith)^2}{nith} \ , \ r = 12_{(95\%)} \ df = r-1 = 11, \ \chi^2 = 8.425, \ ni: \text{Observed frequency, nith: Expected frequency}$$

R: Number of sampling months

Table 4: A comparison of stomach contents for *S. jello* in different months

Stomach contents	Month											
	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
Empty stomachs	128	61	53	40	34	36	50	61	63	64	63	64
Full stomachs	52	29	37	50	56	54	40	29	27	26	27	26
Total	180	90	90	90	90	90	90	90	90	90	90	90

out that the spawning peak for Striped Barracuda in Bushehr coastal waters is during July and September. Out of 180 *S. jello* fish explored that 52 of their stomach had feeding and classified as full or semi-full stomachs, but the remaining 128 of stomachs were roughly empty (Table 4).

GSR index of female fish amounts to its peak in July (GSR = 5.33), while the lowest rate was reported in November (0.78) (Fig. 1). However, male fish proved to enjoy the highest GSR index in April (Table 2).

Feeding index for female fishes decreased from 4.11 in October to 1.93 in April , which got to be increased then till June and amounted to 3.36, GSI changes proved to be slow which decreased to the lowest rate i.e., 1.68 in February (Fig. 2).

Examination of the gastro content among the male fish showed that *Liza subviridis* enjoyed the highest rate i.e., 42.8% but *Sepia pharaonis* showed the lowest rate i.e., 5.9%. The highest and lowest gastro content rates belonged to male *Tenualosa ilisha* species as 39.8% and *Anodontostoma chacunda* as 6.4% (Fig. 3).
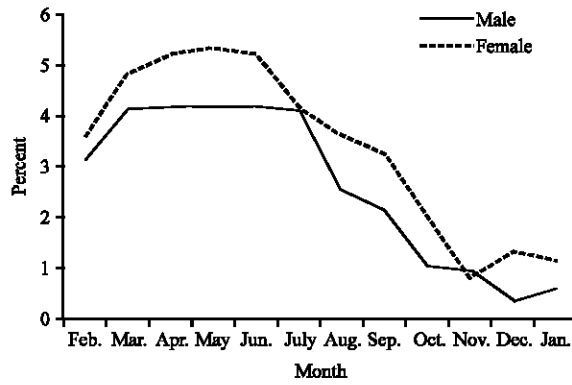
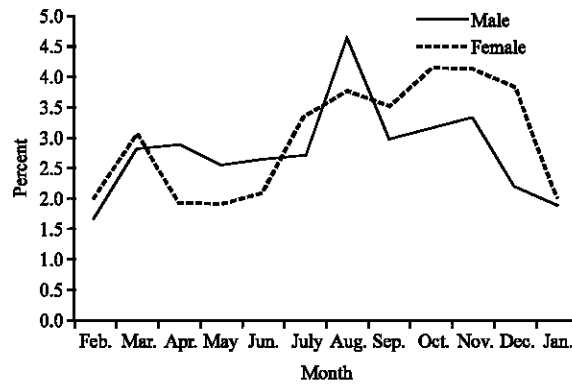Fig. 1: Changes in GSR for *S. jello* (2006-2007) in the NW Persian Gulf water

Fig. 2: The changes of GSI for *S. jello* in the NW Persian Gulf water
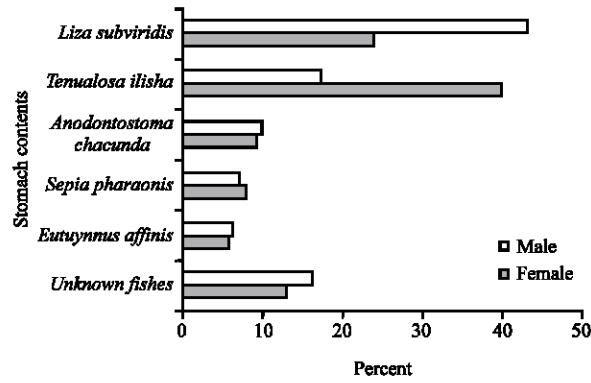

Fig. 3: The stomach contents of *S. jello* in the NW Persian Gulf water (2006-2007)

DISCUSSION

Lack of significant difference in B-value concerning the relationship between length and weight with b = 3 on the basis of B-value supports an isometric growth of fish. Comparison of K, GSI and GSR indices indicated that K value decreases parallel to the approach of spawning peak. GSR index

of female fish amounts to its peak in July (GSR = 5.33), while the lowest rate was reported in November. However, male fish proved to enjoy the highest GSR index in June and July; on the other hand changes in feeding index had negative correlation with that of GSR, indicating that feeding ratio possibly takes declining trend at the peak of spawning. Seasonal sexual maturity of Pick handle Barracuda showed that its sexual organs mainly rest during the winter and autumn or they are at the early stages of development (Barletta-Bergan *et al.*, 2002). Furthermore, signs of sexual maturity and spawning were recorded from August till late September. This study also indicated that there was a peak of spawning during June and July and the youngest ones, i.e., 10-20 cm specimen have been caught as a by-catch of shrimp trawl in Bushehr coastal water in this period.

According to the investigation carried out in this water under question, the proportion of male and female is 57 and 43%, respectively. However, the proportion fluctuates in favor of male fish in the spawning season (Nahhas *et al.*, 2006) holds that sex ratio of Barracuda in the Caribbean region at p<0.05, which may be attributed to longer stay of female group in the spawning grounds than the male group (Hood *et al.*, 1999).

The studies indicated that Barracuda is a carnivorous species and attacks its prey through either camouflage or in an ambush and tears it into pieces by its sharp jaws (Ramachandran *et al.*, 2006). Skolow (1998) study indicates that the fish feeds on planktons on the water in its post-larvae and juvenile stages of life cycle and then starts to be carnivorous from maturity at which it feeds on shellfish, cephalopods, crustacean and other fishes. RLG mean estimator at 64% indicates the claims made so far and the claims that it attacks fish schools such as *Liza subviridis, Tenualosa ilisha* and *Sepia pharaonis* (February-April) and other pelagic and semi-pelagic species. According to the study conducted by Blaber (2000) in the West Indian Ocean, lobster, cephalopods and other invertebrate compose the main content of its stomach as an indication of differences compared with similar research findings in other areas. Fish species and other aquatics in coral reefs include some parts of its prey (Dorenbosch *et al.*, 2004). CV = 0.13 as and index of empty gastro signifies gluttonous nature of the fish. The increase of GSI in September and October sustains the fact that the fish takes the best advantage of environmental nutrition condition, which in turn results in an increase of energy in its body. It occurs when its gonads are evacuated which by themselves, due to the decrease in their capacity, lead to further space for magnifying the capacity of its stomachs and consequently appropriate feeding (Halpern, 2004). The study carried out by reveals that the highest feeding takes place in October and November in the Bushehr water, which sustains the findings of the present study.

REFERENCES

Aburto-Oropeza, O. and E.F. Balart, 2001. Community structure of reef fish in several habitats of a rocky reef in the Gulf of California. Mar. Ecol., 22: 283-305.

Au, K.C., 1979. Systematic study on the barracudas (Pisces: Sphyraenidae) From a northern sector of the South China Sea. J. Natl. Hits., 13: 619-647.

Barletta-Bergan, A., M. Barletta and U. Saint-Paul, 2002. Structure and seasonal dynamics of larval fish in the Caete River Estuary in North Brazil. Estuar Coast Shelf Sci., 54: 193-206.

Blaber, S.J.M., 2000. Tropical Estuarine Fishes: Ecology, Exploitation and Conservation. 1st Edn., Blackwell Sci., Oxford.

Dorenbosch, M., M.C. van Riel, I. Nagelkerken and G. van der Velde, 2004. The relationship of reef fish densities to the proximity of mangrove and seagrass nurseries. Estuar Coast Shelf Sci., 60: 37-48.

Froese, R. and D. Pauly, 2005. Fish base. World Wide Web Electronic Publication, Version February 2005.

Halpern, B.S., 2004. Are mangroves a limiting resource for two coral reef fishes?. Mar. Ecol. Prog. Ser., 272: 93-98.

Hood, R.R., H.V. Wang, J.E. Purcell, E.D. Houde and J.L.W. Harding, 1999. Modeling particles and pelagic organisms in Chesapeake Bay: Convergent features control plankton distribution. J. Geophys. Res., 104: 3289-3290.

Nahhas, F.M., O. Sey and G. Nakahara, 2006. Digenetic trematodes of marine fishes from the Arabian Gulf off the coast of Kuwait. Family Bucephalidae Poche, 1907 and the description of a new species. J. Helminthologia, 43: 147-157.

Porter, H.T. and P.J. Motta, 2004. A comparison of strike and prey capture kinematics of three species of piscivorous fishes: Florida gar (*Lepisosteus platyrhincus*), redfin needlefish (*Strongylura notata*) and great barracuda (*Sphyraena barracuda*). Mar. Biol., 145: 989-1000.

Ramachandran, D., M. Mohan and T.V. Sankar, 2006. Physicochemical characteristics of muscle proteins from barracuda (*Sphyraena jello*) of different weight groups. LWT Food Sci. Techn., 40: 1418-1426.

Salini, J.P., S.J. Blaber and D.T. Brewer, 1994. Diets of trawled predatory fish of the Gulf of Carpentaria, Australia, with particular reference to predation on prawns. Aust. J. Mar. Freshw. Res., 45: 397-411.

Skolow, G.S., 1998. Predation as a Press Structuring Coral Fish Communities in Sale, The Ecology of Fishes on Coral Reefs. 1st Edn., Academic Press, San Diego.

Wainwright, P.C. and B.A. Richard, 1995. Predicting patterns of prey use from morphology of fishes. Environ. Biol. Fish., 44: 97-113.

Walters, V., 1966. The problematic hydrodynamic performance of Gero's great barracuda. Nature, 212: 215-216.