

## ON THE SPAWNING ACTIVITIES OF KINGFISH, *SCOMBEROMOROUS COMMERSON*, IN OMAN WATERS

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### ABSTRACT

The spawning activities of kingfish, *Scomberomorus commerson*, in Oman waters are traced out for the first time. The possible spawning period and spawning ground are identified on the basis of collection of its eggs and larvae from Oman waters. The eggs and early larval characteristics are described suitably with photographic illustration of 4.9 - mm larva. The optimum surface water temperature and salinity recorded for the occurrence of kingfish eggs and larvae are 23.57 - 26.05 °C and 36.0 - 36.1 ‰, respectively.

**Keywords :** King fish, spawning grounds, Development.

### INTRODUCTION

Fish spawning is the process by which any fish species reproduces successfully in a fluctuating environment and thereby maintains viable populations. Many fishes have a yearly cycle of spawning and once they have begun it, they follow it until they die. Several other species spawn more than once in a year and more or less continually. Many fish species have definite seasons for spawning as a part of their reproductive relationships. Warm water fishes are summer spawners and cold water fishes spawn at the fall of winter. Species living in intermediate temperatures are generally spring spawners. Some tropical species spawn the year around. After spawning, the warm water planktonic fish eggs take only a few days to hatch and the young ones emerge into an environment generally favourable to further growth and survival.

The spawning period of kingfish, *Scomberomorus commerson*, varies from place to place within the geographical limits of its distribution. Information pertaining to kingfish spawning and occurrence of the early larval stages along its distribution range in the Indo-Pacific is, however, quite fragmentary (Munro, 1942; Jones, 1962; Whiteley, 1964; Williams, 1964; Lewis *et al.*, 1974; Devaraj, 1983; Jenkins *et al.*, 1984). Kingfish spawns in the Indian waters from January to September with the peak spawning from April to May. The occurrence of postlarvae and early juveniles of the size groups between 14.4 and 91.5 mm in total length was recorded at Vizhinjam, in the southwest Arabian Sea coast of India, during January- March. Kingfish larvae of 83 to 139 mm sizes were also found in the beach seine catches at Karwar coast of the Arabian Sea, in the west coast of India in December (Dhulkhed, 1981).

In Oman, kingfish with various developmental stages of ovaries were caught in different seasons; however, a preliminary observation on the ripped ovaries disclosed that the peak spawning season is probably between April and July (Duley *et al.*, 1992). The recruits with the size range of 30 - 60 cm fork length appear in Musandam and Batinah catches from September to October. Fishermen of Oman have an assumption that a part of kingfish caught in Oman waters spawn and spend their early stages in the Arabian Gulf before migrating to the Gulf of Oman and the Arabian Sea (Anon, 1995). In contradiction to fishermen's assumption, our plankton samples collected from Musandam to Dhofar coast in various periods revealed the occurrence of King fish eggs and very early stages of larvae in Masirah and Ras Madrakah Bays in the Arabian Sea.

## MATERIAL AND METHODS

Ichthyoplankton samples had been collected from different areas of the country, both from the Gulf of Oman and the Arabian Sea since the year 1987. During our regular search for documenting commercially important species of fish eggs and larvae, a special search for the eggs and larvae of the kingfish *S. commerson* was also made in the zooplankton samples collected at various occasions. The samples were collected by horizontal hauls at the surface waters by bongo nets of 200 mm mesh size. The nets were towed by fishing boats, department boats and R/V Rastrelliger of FAO along the surface waters at uniform speed and depth for five minutes. The samples were preserved in 5% neutralized formalin.

During each collection, the environmental parameters such as water temperature, salinity, dissolved oxygen and pH were recorded by Hydrolab water quality data logging multiprobe (Model H 20). The Hydrolab can be used to measure the hydrographic parameters within the ranges of the following: temperature - 5 to +45 °C; dissolved oxygen-0 to 20 mg/l; 0 to 14; depth-0 to 200 m.

In the laboratory, fish eggs and larvae were sorted out from rest of the zooplankton and observed under a binocular microscope. They were identified upto species level by studying various characteristics under the microscope. The eggs and larvae were measured by a micrometer and photographed.

## RESULTS

The kingfish eggs were collected on two occasions during our onboard R/V Rastrelliger sampling cruises at station 123 (lat. 19° 34'N; long. 58° 13'E) on 23 September 1990 and station 126 (lat. 18° 40'N; long. 57° 45'E) on September 1990. Totally eight eggs were collected, a batch of two eggs at station 123 and another batch of six eggs at station 126. Two larvae post larvae were collected; one postlarvae of 4.9 mm total length size at station 125 (lat. 19° 09'N; long. 58° 15'E) on 24 September 1990; the other one (2.39 mm total length) was collected at Mahout water (Station 8 - lat. 20° 28'N; long. 58° 10'E) on 15 September 1997 during our regular plankton sampling survey.

### Description of eggs and larvae :

The kingfish eggs collected from Oman

waters are pelagic, spherical in shape with the diameter ranging from 1.28 to 1.32 mm. The egg surface is smooth, and perivitelline space is narrow. The yolk contains a single oil globule. The larva has its own characteristics of large head and eyes, elongate snout, wide mouth with many large teeth and pre-operculum with spines. These characteristics are very prominent in 4.9 mm size larva, however in the early larva of 2.39 mm size, the pre-opercular spines are yet to be developed. The larvae have 45 or 46 myomeres corresponding well with the descriptions by Jones (1962) and Jenkins *et al.*, (1984). The formalin-preserved larvae have melanophore pigments on different areas of their body. The larva of 4.9 mm size had pigments at the snout and the tip of lower jaw, prominent stellate pigments at fore, mid and hind brain, premaxilla, mandible, and a large patch of melanophore at mid anterior part of the trunk to the posterior region of the anus. Pigments were also seen on the abdomen, just below the posterior end of the eyes on the operculum, and along the base of primordial fin fold on the ventral side of postanal region (Figure - 1). The small early larva (2.39 mm) had

mid and hindbrain pigments on the abdomen, below the eyes on the operculum and along the primordial fin fold at the ventral part.

### Ecology of kingfish spawning ground:

The ecological parameters recorded from the sites where the eggs and larvae were collected were surface water temperature 23.57 - 26.05°C; salinity 36.0 - 36.1 ‰; 8.69 - 8.85 and dissolved oxygen 3.89 - 5.24 mg/l. The secondary production (zooplankton) at the eggs and larvae collection sites recorded was 4.135 - 65.282 g/100 m<sup>3</sup> in wet weight.

### DISCUSSION

Each species of fish lives under a unique set of ecological conditions so that it has a unique spawning strategy with special adaptations. Several factors influence the fish to spawn. The internal physiological rhythm of gonadal maturation, involving predominantly pituitary-gonadal interactions is adjusted to insure that

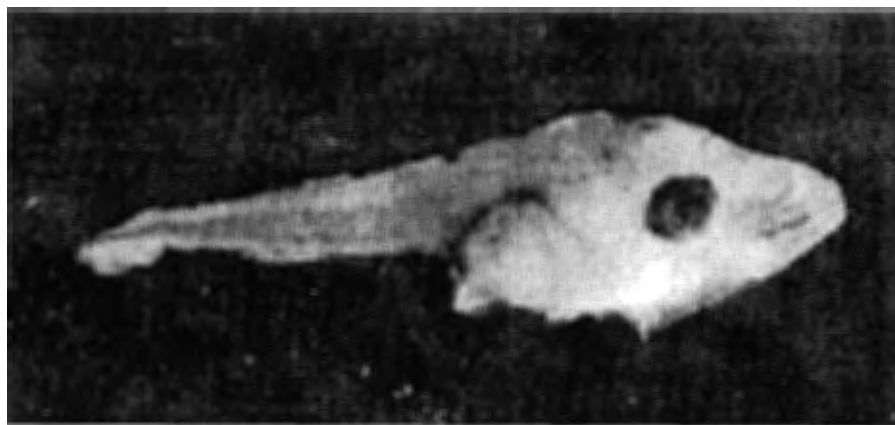


Fig. 1 : Postlarva (4.9 mm size) of kingfish, *S. commerson*, collected from Masirah Bay

spawning will occur at a time when external environmental conditions are most favourable for survival of the offspring. Spawning activity in many tropical fishes often coincides with extensive flooding during monsoon. In Oman, although fish spawning takes place year round, the maximum spawning intensity begins in May (premonsoon) and extends to October, (postmonsoon) with peak spawning in June and July (Thangaraja, et al., 1989, 1998, 2000). The kingfish spawning also takes place during May - October when the environmental conditions are optimum for its spawning and survival of young ones. The optimum surface water temperature and salinity required for kingfish spawning and survival of larvae are probably between 23.57 and 26.05 °C and 36.0 and 36.1 ‰, respectively.

Fish eggs and larvae in very early stages of development are likely to be nearer to the spawning grounds than those in the advanced stages (Peter, 1969; Thangaraja, 1987). Therefore, in the present situation, the places of which the eggs and early larval stages of kingfish were collected are considered as the spawning ground that covers the area between Masirah and Ras Sharbithat (Masirah and Ras Madrasah Bays) in the Arabian Sea. In Indian waters, spawning ground is located along the protected coasts in Palk Bay and Gulf of Mannar in the Bay of Bengal and the spawning season extends from January to September. During the period, a weak brood was recorded in January - February, a strong brood in April - May and another weak brood in July - September (Devaraj, 1983). This indicates that kingfish is a batch spawner and spawns successively at

intervals of one month or less. The collection of both eggs and larvae in the month of September possibly belongs to the last batch of the brood. This shows that kingfish also spawns along with other fish species between the period May and October in Arabian Sea which is coinciding with the southwest monsoon when the productivity of the Arabian Sea attains its maximum along the coast of Oman.

The present findings clearly disprove the prevailing general opinion of the fishermen that the kingfish of Oman migrates to Arabian Gulf waters to spawn and the young juveniles of zero year class (Khabat) migrate from Arabian Gulf to Gulf of Oman and the Arabian Sea for further growth. The young fish of 30-60 cm size caught in Musandam and Batinah waters in the Gulf of Oman were considered as migrated from the Arabian Gulf. Contradicting to this general opinion, the present findings indicate that the young juveniles available in Batinah and Musandam waters have migrated from the Arabian Sea for feeding and further growth, since sardines and other small pelagic species are available in plenty in the Gulf of Oman during the period September - October.

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