

## OCCURRENCE OF FISH EGGS (FAMILIES: ENGRAULIDAE AND CARANGIDAE) IN THE BACKWATER OF KARACHI HARBOUR

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Fishes of the families Engraulidae and Carangidae are known to breed all along the coastline of Pakistan and their eggs and larvae drift in the mangrove areas. During the 13 months of sampling from Dec. 1992 - Dec. 1993, a total of 2979 fish eggs were collected from the mangrove area along the Karachi harbour. 47 fish eggs belonged to families Engraulidae and Carangidae. These eggs were separated in three genera: *Thrissocles*, *Anchoviella* and *Caranx*. The study reports distribution and occurrence of eggs and their detail description.

**Key words:** Fish eggs, Engraulidae, Carangidae, Karachi harbour.

### Introduction

The study of fish eggs and their developmental stages is essential for understanding spawning season, breeding grounds and other problems related to biology of food fishes. Knowledge of such important aspects of fisheries from Pakistan waters is lacking. Some recent studies on eggs of mullets, sardines and flatfishes are that of Khatoon and Hussain (1997, 1998 a & b). Present study describes, for the first time the eggs of families Engraulidae and Carangidae and their seasonal occurrence in the mangrove area of Karachi harbour. The area serves as spawning ground and nurseries for many commercial species (Ahmad 1985 and 1988) and is a source of potential sustainable fisheries. Many workers (Snedaker 1984; Saifullah 1985) have emphasized ecological significance and the role mangroves play in the marine ecosystem. This study is a part of investigations for understanding the ecological importance of the mangrove system along Karachi harbour.

### Materials and Methods

The sampling area along the Karachi Harbour (24° 49' - 66° 57') is partly covered with mangrove plants. Seawater enters from harbour and passes through Baba and Bhit Islands extending further into a vast wet land. Sampling for the study was done at four stations, Station 1 (Bhit Island), Station 2 (Baba Island), Station 3 (Chari Kund Channel) situated inside mangrove area and Station 4 (outside mangrove area towards the open sea). Details about the site and stations are given by Khatoon and Hussain (1997). Zooplankton net of 0.33 mm mesh size, about 1.5 m long with mouth area of 0.5

m in diameter was towed horizontal 0.5 m below sea surface fitted with flow meter. Samples at Stations 1 & 2 were taken from December 1992 - December 1993; at Station 3 from December 1992 - July 1993 and at Station 4 from August 1993 - December 1993. All fish eggs were sorted out from each sample and later identified into families and genera. The identification of eggs and their developmental stages was based on characters given by Delsman (1929), Nair (1952), Balakrishnan (1969), Ricker (1971) and Moser and Ahlstrom (1985).

### Results and Discussion

**Station wise occurrence of eggs.** Eggs of two families (Engraulidae and Carangidae) were rare in occurrence in the area. The eggs of family Engraulidae obtained from the samples were identified to genera *Thrissocles* (n = 41) and *Anchoviella* (n = 3). *Thrissocles* sp. eggs occurred in January (1 egg at Sta. 1); February (1 egg at Sta. 2); March (15 eggs at Sta. 1, 8 eggs at Sta. 2); June (1 egg at Sta. 2); October (2 eggs at Sta. 3) and November (13 eggs at Sta. 3). The eggs of genus *Anchoviella* were separated into species. One egg of *Anchoviella* sp.1 was found in August (at Sta.1) and two eggs of *Anchoviella* sp.2 were found in November (at Sta. 3).

Only 3 eggs of family Carangidae were found in the month of January (1 from Sta. 1 and 2 from Sta. 2); these eggs belonged to genus *Caranx*. A single yolk sac larva of *Caranx* sp. was also collected in March (at Sta. 2).

### Description of eggs

*Thrissocles* sp. (Family Engraulidae). Eggs of *Thrissocles* were spherical, transparent without pigment. Yolk was clear,

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segmented, oil globule was absent. The egg size ranged from 0.90 - 1.1 mm and the yolk mass from 0.75 - 0.90 mm in diameter. Out of total 41 eggs collected, 3 eggs belonged to stage VI, 10 eggs were of stage X and 28 eggs belonged to stage XI.

**Stage VI (Fig 1 a).** Egg size is 1.1 mm and yolk mass ranges from 0.80 - 0.90 mm in diameter. The eggs are characterized by the presence of embryo with optic capsules and notochord. The tail is rounded at the tip and remains attached to the yolk mass. Appearance of finfold at the tail tip is clear. Embryo has 25 - 28 somites.

**Stage X (Fig 1 b).** Eggs in this stage measure 0.90 - 1.1 mm and yolk mass ranges from 0.75 - 0.80 mm in diameter. The embryo is well developed, the tail reaches three quarters of the yolk sac length. Eyes and the auditory vesicles are formed, narial openings are visible, heart is distinct. Finfold is distinct and wide at the tail region. Embryo has 50 - 55 somites.

**Stage XI (Fig 1 c).** Stage XI eggs are similar in measurements to those found in stage X. The head of the embryo has more defined mid and hindbrain. Olfactory capsules, eyes, narial openings and heart are distinct. Tail reaches far beyond the head. Finfold becomes wider than the one found in the earlier stage. Embryo has 65 - 75 somites.

*Anchoviella spp* (Family *Engraulidae*). Eggs of *Anchoviella sp.* are planktonic, oval and have smooth chorion. Three eggs of *Anchoviella sp.* belonged to two species differentiated as *Anchoviella sp. 1* and *Anchoviella sp. 2*. The egg of *Anchoviella sp. 1* had segmented, oval shaped yolk without oil globule whereas eggs of *Anchoviella sp. 2* had unsegmented, round shaped yolk and oil globule is present.

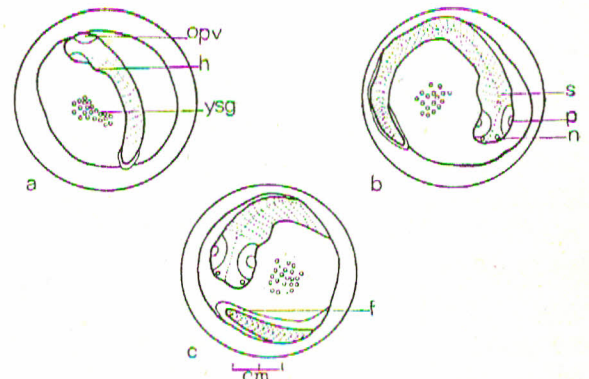
***Anchoviella sp. 1* (Fig. 2 a).** One egg of *Anchoviella sp.1* belongs to stage VIII. The oval shaped egg measures 1.15 mm in length and 0.6 mm in width. Perivitelline space is transparent, moderate, yolk is segmented and oval, 0.90 mm in length and 0.5 mm in width. Oil globule is absent. The embryo is well developed and unpigmented. The optic vesicle is developed with lenses. Heart is distinct, notochord is well developed from head to caudal region. The tail is free pointed, narrow and bends around the yolk, the tail length equals the head length. Ventral finfold is well developed and wider than the dorsal finfold. The embryo has 46 somites.

***Anchoviella sp. 2.*** The two eggs were classified as of stage V and stage VI.

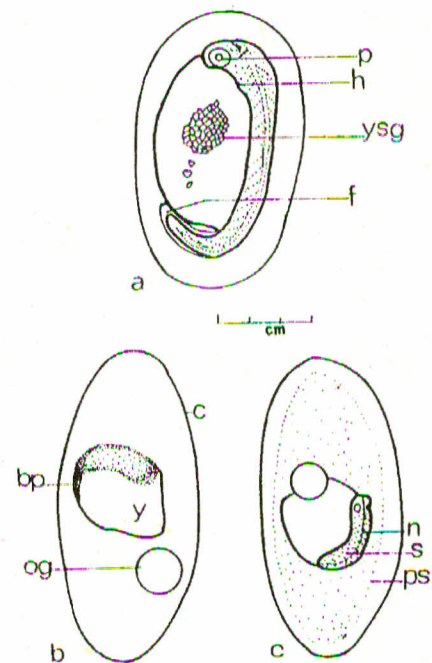
**Stage V (Fig 2 b).** Egg at this stage measures 1.15 mm in length and 0.50 mm in width. Yolk mass measures 0.35 mm in diameter. Perivitelline space is opaque and longer than wide; oil globule lies close to yolk and measures 0.15 mm in

diameter. Outline of the embryo is visible with blastopore closure incomplete.

**Stage VI (Fig 2 c).** Egg at this stage measures 1.1 mm in length and 0.50 mm in width. The diameter of the yolk and oil globule is same as found in stage V egg of *Anchoviella sp.2*. The oil globule is attached to yolk, lies closer to the head of the embryo. Perivitelline space is transparent at the periphery and opaque in the middle. Embryo has well developed optic vesicles, notochord extending to tail tip. Embryo has 14 somites.



**Fig 1.** Development stages of *Thriassocles sp.* eggs. a. Stage VI; b. Stage X; c. Stage XI.



**Fig 2.** Developmental stages of *Anchoviella sp.* eggs  
*Anchoviella sp. 1.* a. Stage VIII.  
*Anchoviella sp. 2.* b. Stage V; c. Stage VI.

**Legend:** bp, blastopore; c, chorion; er, embryonic ridge; f, finfold; h, heart; n, notochord; no, narial opening; og, oil globule; opv, optic vesicle; p, pupil; ps, perivitelline space; s, somites; y, yolk; ysg, yolk segments.

*Caranx sp.* (Family Carangidae). Three eggs of family Carangidae belonged to genus *Caranx*. A single yolk sac larva is also described. Eggs of *Caranx sp.* are spherical, transparent, with moderate perivitelline space. Yolk is segmented with large vacuoles. Single oil globule is visible. Pigments on yolk, oil globule and embryo are prominent. The eggs belonged to stage V, VI and IX.

**Stage V (Fig 3 a).** Egg at this stage measures 1.35 mm, yolk mass. 1.0 mm and oil globule 0.32 mm in diameter. The outline of the embryo is not distinct. Dense, minute, brownish pigments are present on the embryo but absent on yolk and oil globule.

**Stage VI (Fig 3 b).** The diameter of the egg, yolk and oil globule remains the same as described in stage V egg of *Caranx*. The optic vesicles and notochord are well developed. Minute pigments are seen scattered all over the embryo, optic vesicles, over the yolk and on the oil globule. The embryo has 31 somites.

**Stage IX (Fig 3 c).** Egg at this stage measures 1.075 mm, yolk 0.775 mm and oil globule 1.0 mm in diameter. Head region of the embryo is well developed, eye lenses are visible, heart is distinct. Number of somites increased to 44. Small fin fold is observed at the tail end. Pigments become dark and appear as chromatophores.

**Yolk sac larva (Fig 3 d).** The yolk sac larva measured 1.25 mm in length. Yolk sac is 0.8 mm in diameter. Oil globule is

located at the posterior end of the yolk sac. Head is completely developed. Number of somites is 55. The fin fold becomes wider. Chromatophores become more prominent on the yolk, oil globule, head, optic vesicles and all over the body.

Total 47 eggs of families Engraulidae and Carangidae were found during sampling period of 13 months (December 1992 - December 1993) which indicate their rare occurrence in the region. Fishes of both the families are reported to spawn in the coastal areas of the Arabian Sea (Longhurst and Pauly 1987). Some of these species may also spawn outside Karachi harbour. The eggs obtained from the samples might have drifted in the backwater area by strong currents and ascending tides from the nearest spawning ground.

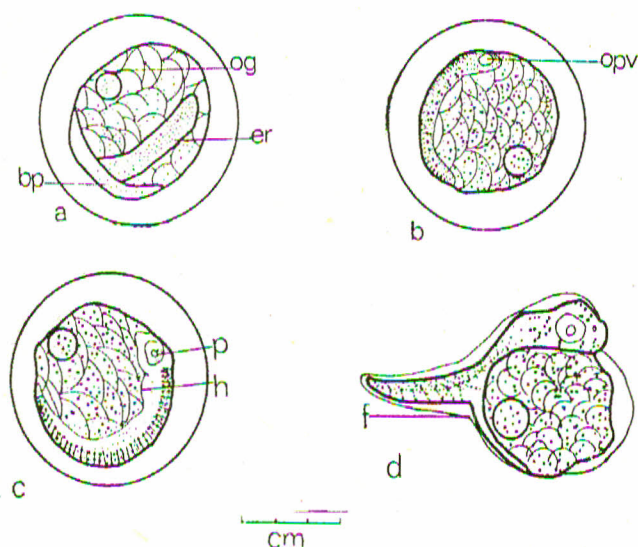
Identification for Engraulidae eggs is based on the characters described by Delsman (1929), Nair (1952), Balakrishnan (1969), Nakamura (1970) and Moser and Ahlstrom (1985). The eggs of family Engraulidae are separated into two genera *Thrissocles* and *Anchoviella* according to their shape. The diameter of *Thrissocles* eggs, as observed in the present study, shows a range of 0.90 - 1.1 mm which is very close to *Thrissocles hamiltonii* as described by Delsman (1929).

*Anchoviella* eggs were of two types and considered as *Anchoviella sp.1* and *sp.2*. The eggs of *Anchoviella sp.1* resemble the *Anchoviella II* eggs described by Nair (1952) in their segmented yolk and absence of oil globule. The eggs of *Anchoviella sp.2* have unsegmented round shaped yolk and oil globule is present.

Eggs of family Carangidae are identified according to the characters described by Delsman (1926); Nair (1952); Miller and Sumida (1974) and Thangaraja (1985). The Carangidae eggs are spherical, possess segmented yolk with large vacuoles, foam like in appearance. Chromatophores are present on embryo, oil globule and yolk.

## References

- Ahmad M F 1985 Vertebrate fauna of the mangrove swamps. In: Mangroves of Pakistan. *Proc Nat Workshop Mangroves*, Karachi, 8-10 August, 1983, Pak Agri. Res Council, Islamabad, pp 45 - 47.
- Ahmad M F 1988 Fish of Pakistan's mangrove areas. In: Marine Sciences of the Arabian Sea. *Proc Int Conf, Karachi, March 1986*. eds Thompson M F & Tirmizi N M. Press American Inst Biol Sci, Washington D C, pp 429 - 438.
- Balakrishnan K P 1969 Eggs and early larvae of *Thrissocles* species (Engraulidac: Pisces). *Mar Biol* 2 224 - 227.



**Fig 3.** Developmental stages of *Caranx sp.* eggs.  
a. Stage V; b. Stage VI; c. Stage IX; d. yolk sac Larva.

Legend: bp, blastopore; c, chorion; er, embryonic ridge; f, finfold; h, heart; n, notochord; no, narial opening; og, oil globule; opv, optic vesicle; p, pupil; ps, perivitelline space; s, somites; y, yolk; ysg, yolk segments.

- Delsman H C 1926 Fish eggs and larvae from the Java sea. 5. *Caranx kurra*, *Machosoma* and *Crumenophthalmus*. *Treubia* **8** 199 - 211
- Delsman H C 1929 Fish eggs and larvae from the Java sea. 12. The genus *Engraulis*. *Treubia* **11** 275 - 81.
- Hussain S M, Samad M 1995 Some physico-chemical parameters of backwaters of Sandspit (Northern Arabian Sea, Pakistan coast). *Pak J Zool* **27** (2) 191 - 194.
- Khatoon Z, Hussain S M 1997 On the distribution and abundance of *Liza carinata* and *L. subviridis* (Fam. Mugilidae) eggs with description of their early developmental stages. *Pak J Zool* **29** (4) 341 - 350.
- Khatoon Z, Hussain S M 1998a Description of eggs and developmental stages of *Sardinella* sp. with notes on their abundance and distribution in the backwaters of Karachi harbour. *Pak J Zool* **30** (2) 143 - 149.
- Khatoon Z, Hussain S M 1998b Distribution and abundance in the Karachi harbour backwaters of the flatfish *Cynoglossus* sp. eggs with descriptions of developmental stages. *Pak J Mar Sci* **7** (2) 137 - 146.
- Longhurst A R, Pauly D 1987 *Ecology of tropical oceans*. Academic Press, London, United Kingdom, pp 407.
- Miller J M, Sumida B Y 1974 Development of eggs and larvae of *Caranx mate* (Carangidae). *Fishery Bull* **72** (2) 497 - 514.
- Moser H G, Ahlstrom E H 1985 Staging Anchovy eggs. In: *An egg production method for estimating spawning biomass of pelagic fish: Application to the northern anchovy, Engraulis mardax*, ed Lasker R, US Dep Commer NOAA Tech Rep NMFS 36, pp 37-41.
- Nair R V 1952 Studies on some fish eggs and larvae of the Madras plankton. *Proc Indian Acad Sci* **35** B 181 - 208.
- Nakamura E L 1970 Synopsis of biological data on Hawaiian species of *Stolephorus* In: *The Kuroshio. A symposium on the Japan Current*, ed Marr J. C. East West Centre Press, Honolulu, Univ. Hawaii, pp 425 - 446.
- Ricker W E 1971 *Methods of assessment of fish production in fresh waters*. Int Biol Prog Blackwell Scientific Publication, Oxford and Edinburgh, pp 348.
- Saifullah S M 1985 Ecology of Mangroves. In: *Mangroves of Pakistan. Proc Nat Workshop Mangroves*, Karachi, 8 - 10 August, 1983, Pak Agric Res Council, Islamabad, pp 29 - 32.
- Snedaker S C 1984 Mangroves: A summary of knowledge with emphasis on Pakistan. In: *Marine Geology and Oceanography of Arabian Sea and Coastal Pakistan*. eds Haq B U & Milliman J D, Van Nostrand Reinhold Company, New York, pp 255 - 262.
- Thangaraja M 1985 On the laboratory reared fish eggs and larvae of five species of Carangids from the Vellar Estuary, Proto Novo. *Mahasagar* **18** (4) 477 - 488.