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Morphological and taxonomic study for some fish families eggs with reference to their abundance in the North West of Arabian Gulf

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Abstract - Eggs of fish sampling was conducted at two stations in the northwestern part of Arabian Gulf (Shatt Al-Arab estuary A1 and Khor Amaya A2), during April 2012 to March 2013. A total of 2902 fish eggs were collected using conical plankton net (mesh size 330µm). Six families (Sciaenidae, Clupeidae, Soleidae, Polynemidae, Engraulidae and Ariidae) of fish eggs were identified. Sciaenid fish egg comprised 45.6 % of all eggs collected and peak of abundance (1680.3 egg/10m^2) at station A2 in May. Water temperature was ranged 13-34°C and salinity was 32-42 ‰. Water temperature seams to be the most vital factor in determining the onset of the spawning in the Arabian Gulf. This study showed the importance of northwestern part of Arabian Gulf as spawning sites and nursery for Sciaenidae, Clupeidae, Soleidae, Polynemidae, Engraulidae and Ariidae.

Keywords: Morphology, taxonomy, fish families, eggs, NW Arabian Gulf.

Introduction

Eggs of most marine and estuarine teleost fall into two categories: planktonic or damersal, most marine and estuarine teleost species have planktonic egg. The most planktonic egg is similar in appearance usually being spherical and transparent with smooth chorine. The diameter however, may range between 0.5-5.5 mm (Ahlstrom and Moser, 1980; Miller and Kendall, 2009).

Specific characteristic useful in recognition of eggs of different species, are egg diameter and shape, nature of the chorine (smooth or paternal) homogenous or segmented yolk, presence or absence of oil globules the number position and size of oil globules in the yolk and the size of the periviteline space (Kunz, 2004).

Studies of abundance and distribution of fish eggs and larvae in the North West part of Arabian Gulf are limited to that of (Ahmed and Hussain (1998); Ahmed and Hussain (2000a); Ahmed and Hussain (2001)). Studies on the description of fish egg are restricted to that of Ahmed and Hussain (2000b) for mugilid egg in the North West of Arabian Gulf. The aim of present study is to identify the eggs of six families (Sciaenidae, Clupeidae, Soleidae, Polynemidae, Engraulidae and Ariidae) occurred in North West of the Arabian and their abundance in different months.

Materials and Methods

The present study is carried out in part of North West Arabian Gulf. This part

differs physic-oceanographically from other Arabian Gulf region due to the sediments transported by Shat Al-Arab river. Al-Badran (1995) found that these sediment were composed of 48.2 % sand, 28.3 % clay and 23.5 % silt.

Ichthyoplankton samples were collected from the two stations monthly during the period April 2012 till March 2013. during daytime and at low tide.
Station A1 (Shatt Al-Arab Estuary): depth 5m.
Station A2 (Khor Al-Amaya): depth 15 m (Fig. 1).

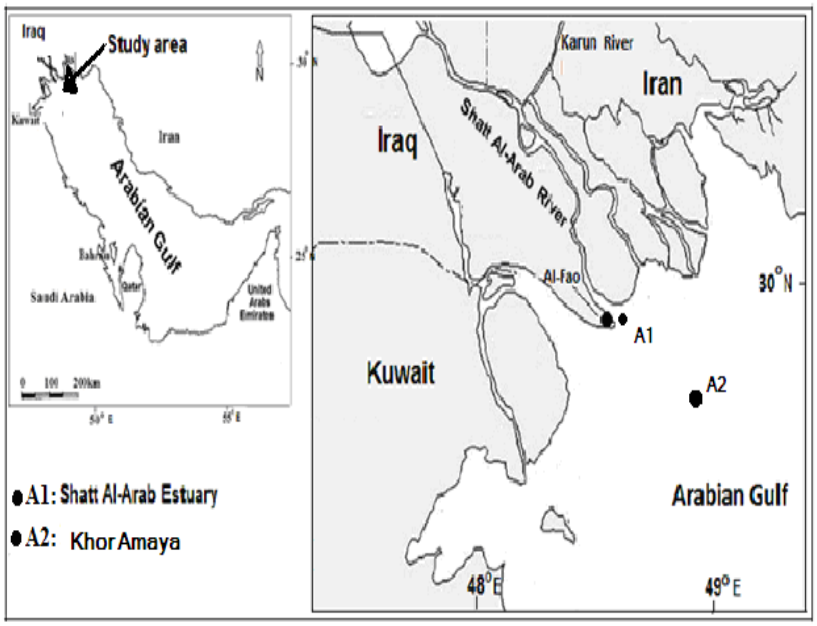

Figure 1. Map showing sampling stations in the region.

Sampling was conducted using conical nets, length 1.25m and has opening diameter 50 cm with mesh sizes 330µ, equipped with a flow-meter. Oblique tow was conducted at a speed of 0.5 m/s for approximately 10 minutes from near the bottom to the surface (Robinson *et al.*, 1996). Samples were preserved in 10 % formalin.

Some hydrographic aspects were recorded in the field; water temperatures, salinity. These aspects were measured immediately in the field by a digital multi meter Multi350i/SET Germany.

In the laboratory, fish eggs were sorted out and identification was done by dissecting microscope (Wild M 38). The importance morphological characters in identification of eggs are (Ahlstrom and Moser, 1980; Bunn *et al.*, 2000):
1) Egg shape (spherical, elliptical).
2) Egg size.
3) Chorion (shell) thickness, filaments.
4) Egg membrane (color, thickness, sculpture, appendage).
5) Yolk (segmented or homogeneous, color, large or small).
6) Perivitelline space (width, narrow).
7) Oil globules (number, size and color).

Eggs were measured using an ocular micrometer and the drawing were made with camera lucida. Fish eggs were identified to families according to Al-Nasiri and Shamsul Houda (1977); Moser *et al.* (1983); Moser *et al.* (1984); Houde *et al.* (1986); Manickasunderam and Ramaiyan (1990); Bensam (1990); Munk and Nielsen (2005) and Ditty *et al.* (2006).

Abundance of eggs was calculated according to the formula of Smith and Richardson (1977):

$$A = N \times D \times 10 / V$$

A = Abundance under 10 m^2 of sea surface.
N = Number of fish eggs.
D = Depth of tow (m).
V = Volume of water filtered (m^3).

Results:

Temperature and Salinity:

Monthly variations in average values of water temperature in the study regions are illustrated in Figure (2). Water temperature were ranged between 13°C in February to 34°C in July.

While the salinity ranged between 32-41 ‰. The lowest value was recorded during April at station A1 (Fig. 3).

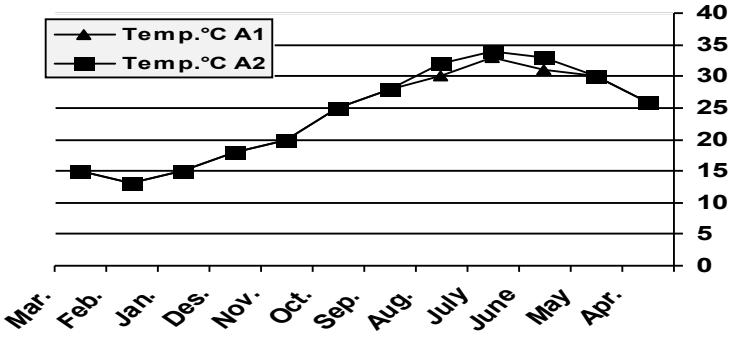

Figure 2. Monthly variations in the water temperature (°C) in the sampling stations.

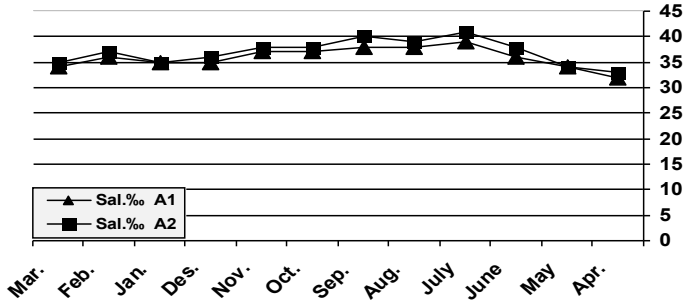

Figure 3. Monthly variations in salinity (‰) in the sampling stations.

Description and Abundance of Egg:

Sciaenidae:

Sciaenidae eggs were collected during April-July and October. A total of 1324 eggs of Sciaenidae were collected at station A1 and A2 (Table 1). Eggs were most abundance during April (5232 egg/10 m² in A2) (Table 2). Eggs were collected where surface temperature ranged from 25-30 °C and surface salinity varied from 32-42 ‰.

Eggs are pelagic, spherical and transparent measures 0.81-1.02 mm in diameter, yolk is un segment and preivitelline space narrow. A single oil globule measures 0.22 mm in diameter (Fig. 4).

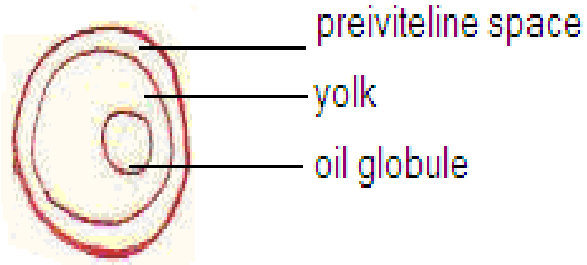

Figure 4. Egg of Sciaenidae (4X).

Table 1. Total number and abundance (egg/10 m²) of fish eggs collected from two stations in the N.W. of Arabian Gulf.

Families	Total number	%
Sciaenidae	1324	45.6
Clupidae	876	30.1
Solidae	538	18.5
Polynemidae	90	3.1
Engraulidae	65	2.2
Ariidae	9	0.3
Total	2902	

Table 2. Abundance (egg/10 m²) of fish eggs from two stations in the N.W. of Arabian Gulf.

Families	April		May		June		July		August		September		October	
	A1	A2	A1	A2	A1	A2	A1	A2	A1	A2	A1	A2	A1	A2
Sciaenidae	82.0	5232	822.7	1680.3	725.8	1610.2	-	0.9	-	-	-	-	3.9	2.8
Clupidae	260	-	53	52.7	4.9	53	2.1	98.2	1.5	17.3	-	-	19.3	126.3
Solidae	-	-	80	622	-	-	2.1	105.5	4.1	17.3	-	-	-	-
Polynemidae	-	-	-	-	-	-	-	-	0.85	52.7	-	-	-	-
Engraulidae	-	-	-	-	-	--	-	-	-	-	-	-	20.2	-
Ariidae	-	-	-	6.36	-	-	-	-	-	-	-	-	-	--

Clupeidae:

A total of 876 eggs of Clupeidae were collected from two stations A1, A2 during April-August and October (Table 1). The eggs were more abundance in April (260 egg/10 m²) in A1 (Table 2).

Eggs are pelagic, spherical and transparent. Two type of Clupeidae eggs were recognized. Type (A) eggs range from 2.1-2.5 mm in diameter with one oil globule having diameter 0.09 mm. Yolk vacuolated, preivitelline space is wide. Type (B) Eggs range from 0.9-1.1 mm in diameter. Yolk segmented with 8-9 oil globule, preivitelline space is moderate (Fig. 5).

Clupeidae eggs were collected at temperature (25-30 °C) and salinity (32-42 ‰).

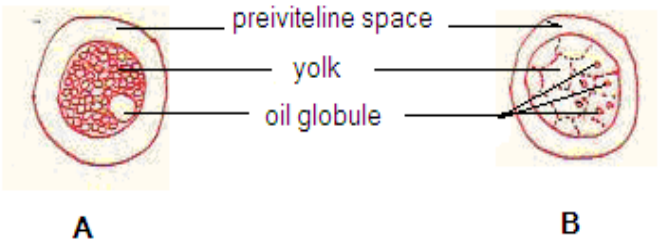

Figure 5. Egg of Clupeidae (4X).

Soleidae:

Table (1) shows the total number of Soleidae eggs (538) collected during May, July and August. The eggs were more common in May (622 egg/10 m²) in A2 (Table 2). The eggs collected at temperature (25-30 °C) and salinity (32-42 ‰).

Soleidae eggs are pelagic, spherical and transparent measuring 0.6-0.8 mm in diameter. preivitelline space is moderate. Yolk segmented with 25 oil globules present (Fig. 6).

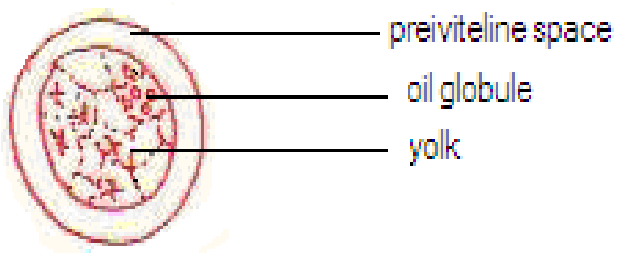

Figure 6. Egg of Soleidae (4X).

Polynemidae:

Polynemidae eggs were found in study region during one month of the year, the number of eggs was 90 in August (Table 1). The abundance of Polynemidae eggs were 0.85 egg/10 m² at station A1 but 52.7 egg/10 m² at station A2 (Table 2).

Eggs were collected at temperature (31-34 °C) and salinity (33-3 8‰) in A2. Eggs are pelagic, spherical and transparent measuring 0.6-0.8 mm in diameter, yolk is un segmented and preivitelline space narrow. A single oil globule measures 0.27-0.37 mm (Fig. 7).

Figure 7. Egg of Polynemidae (4X).

Engrauildae:

A total of 65 eggs of Engrauildae were collected at station A1 during October only (Table1), no eggs was recorded at station A2, with abundance (20.2 egg/10 m²) (Table 2). Eggs were collected at temperature (31 °C) and salinity (33 ‰).

The eggs pelagic, transparent and oval, with narrow perivitelline space. Length of long axis 1.01-1.08 mm. Length of short axis 0.3-0.4 mm The yolk is segmented, no oil globules (Fig. 8).

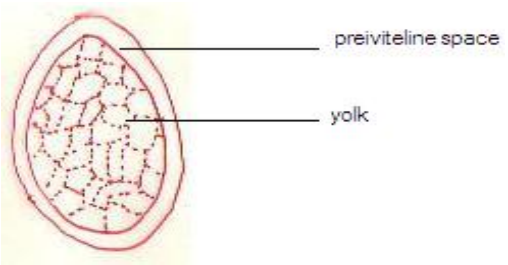

Figure 8. Egg of Engrauildae (4X).

Ariidae:

Very limited number of Ariidae eggs were collected during May (9 eggs) in station A2 (Table 1), with abundance (6.36 egg/10 m²) (Table 2), at temperature (30 °C) and salinity (39‰).

Ariidae eggs are large, spherical, golden yellow in color, measuring nearly 5 mm in diameter. The preivitelline membrane was loosely attached to the yolk (Fig. 9).

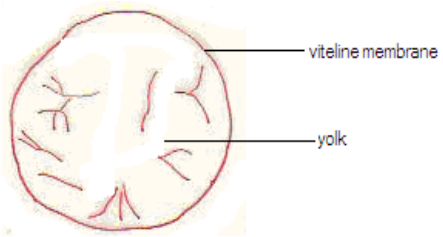

Figure 9. Egg of Ariidae (2X).

Discussion

There is no research on description and classification of fish eggs in the North West Arabian Gulf for the purpose of comparison with the current study. The survey showed that Sciaenidae, Clupeidae and Soleidae eggs are dominate in study area. These fishes families are represented as very common in all its life stage during the year (Ali, 1993). Such families are known as a resident species in the north west Arabian Gulf (Hussain *et al*., 1999).

The highest abundance of fish eggs during spring and summer and its lowest abundance during winter were agreed with Houd *et al*. (1986); Ahmed and Hussain, (2001) and Al-Okailee (2001).

The seasonal distribution of fish eggs were coincided with the seasonal fluctuation in temperature due to it impact on spawning rather than by salinity (Ahmed and Hussain, 2001).

Members of Sciaenid eggs were the most abundant in this study from April to October. The densities of the eggs revealed that the highest collection were in the months in which high values of water temperature. According to published information (Fischer and Biauci, 1984; Ali, 1993; Hussain *et al*., 1999; Mohemed *et al*., 2002) many species of this family are very abundant and the occurrence of eggs coincides with the adult fish maturation cycle as determined by gonad examination of *Johienops sina, Johius* belangerii in Shatt Al-Arab Estuary (Al-Mahidi, 1996).

The spawning season of Clupeidae fish in north west Arabian Gulf which was in April to October. Clupeidae egg abundance was also high in April to October. Similar results were also reported by Ahmed and Hussain (2000 b). Younis (2000) noticed That *Ilisha megaloptera* spawning period during May and July in Shatt Al-Arab Estuary.

Soleid eggs appeared during May, July and August agreed with Al-Okailee (2001), also Kopoula and Lacroix (1992) found spawning period of *Solea solea* during April, May and June in Biscay Gulf in France.

Polynemid eggs occurred in August. Hussain and Ahmed (1995) remarked that Polynemid larvae occurred in Shatt Al-Arab Estuary during summer, while Jabir (1999) has indicated that *Polydactylas sextarius* (polynemidae) in Iraqi marine water have two spawning seasons in year, one start in May and the other in October. Few egg of Engraulidae occurred here in October. This family is known to be estuarine residents, estuarine dependents (Castro *et al*., 2005). Similar results were also reported by Al-Okailee (2001) remarked that Engraulidae larvae occurred in Shatt Al-Arab Estuary during March to October period.

Very limited number of eggs of Ariidae were collected in May due to parental care of eggs and larvae, Eggs were found rolling down from the buccopharyngeal cavity (Bagarino and Chua, 1986; Al-Nasiri and Shamsul Hoda, 1977).

Previous studies have shown that Ariidae generally spawn in warm season or associate with increasing temperatures, and coincide what has been found in this study, marine catfishes generally exhibit a single annual spawning period corresponding to the warm season or associated with high water temperature (Dmitrenko, 1970; Rimmer and Merrick, 1983; Gomes and Araujo, 2004).

In general, occurrence eggs of Sciaenidae, Clupeidae, Soleidae ,Polynemidae, Engraulidae and Ariidae in the region indicate that this area is the spawning ground for members of these families. Ali (1993) collected the spawners from the same area.

Hussain *et al*. (1999) consider Shatt Al-Arab estuary and costal water as nursery ground for many marine species. This region considered as the highest productivity area in the Arabian Gulf (Al-Shaban, 1996), due to the Shatt Al-Arab River discharge (Abaychi *et al*., 1988).

Al-Zubaidi (1998) pointed out that the primary productivity in the Iraqi marine water was of bi modal pattern, the first peak was in early spring and the second in late summer. The highest abundance and occurrence of fish eggs noticed are synchronized with these two period. The primary and secondary productivity and topography of study area provided ideal condition for the distribution of fish eggs (Hussian and Ahmed, 1995).

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دراسة مظهرية وتصنيفية لبيوض بعض عوائل الأسماك مع الإشارة إلى وفرتها في شمال غرب الخليج العربي

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المستخلص - اجري مسح لبيوض الأسماك في الجزء الشمالي الغربي من الخليج العربي (محطة مصب شط العرب A1 ومحطة خور العمية A2) للفترة من نيسان 2012 إلى آذار 2013. جمع 2902 بيضة أسماك باستعمال شبكة هائمات مخروطية (حجم فتحة الشباك 330 ماكرون). صنفت بيوض ستة عوائل سمكية (النعاب Sciaenidae والصابوغيات Clupidae واللسان الأيمن Solidae والداكوك Polynemidae والبلم Engraulidae والجري البحري Ariidae). سجلت أعلى نسبة لبيوض عائلة النعاب إذ بلغت 45.6 % وأعلى وفرة 1680.3 بيضة/10م^3 عند محطة A2 في أيار. تراوحت درجات حرارة الماء بين 13-34 ^{o}م والملوحة بين 32-42 جزء بآلاف. كانت درجة حرارة الماء العامل الحيوي المهم في تحديد مواسم طرح البيوض في الخليج العربي. أظهرت الدراسة الحالية أهمية الجزء الشمالي الغربي من الخليج العربي كمناطق تكاثر لعوائل أسماك النعاب والصابوغيات واللسان الأيمن والداكوك والبلم والجري البحري.