



Delta Journal of Science

Available online at
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Research Article

ZOOLOGY

Reproductive Biology of *Pseudonereis anomala* (Nereidae: Polychaeta) from The Barge Canal, Damietta, Egypt.

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ABSTRACT

The Polychaete *Pseudonereis anomala* Gravier, 1902 had been recorded firstly in the Barge Canal. From all 792 collected individuals the sex ratio was 1.6 male: 1 female. *Pseudonereis anomala* has two spawning seasons, the first was reported in early spring (March and April) and the second in late summer and early autumn (August and late September) at water temperature (19-30 °C). The mature oocytes diameter ranged between 170 to 207.9 µm.

INTRODUCTION

The Polychaete species *Pseudonereis anomala*, is a lessepsian species, migrating from the red sea to the Mediterranean sea by shipping and via the Suez Canal. It is a common species among the hard-bottom fauna in the Red Sea, and the Indian and Pacific oceans (Wu et al., 1985). It was first recorded in Alexandria by Fauvel (1937) in addition to Suez Canal, Suez Bay and the Red Sea (Abd-Elnaby, 2009). This species has been recorded in many coasts of the Mediterranean sea, along the coast of Cyprus (Katsanevakis et al., 2009), in Iskenderun Bay (Levantine Sea, Eastern Mediterranean) (Melih, and Cem, 2006), around Alsancak harbor (Turkey) (Kambouroglou and Nicolaidou, 2004), and Piraeus (Kambouroglou and Nicolaidou, 2003).

Studies of reproductive biology provide essential information for understanding reproductive patterns and strategies, and therefore vulnerability to abiotic and biotic impacts (Osman et al., 2010).

The reproductive biology of *Pseudonereis anomala* is poorly documented. So, this study was conducted to obtain information on the sex ratio, maturity stages and spawning season, contributing to knowledge of their population dynamics and management of stocks.

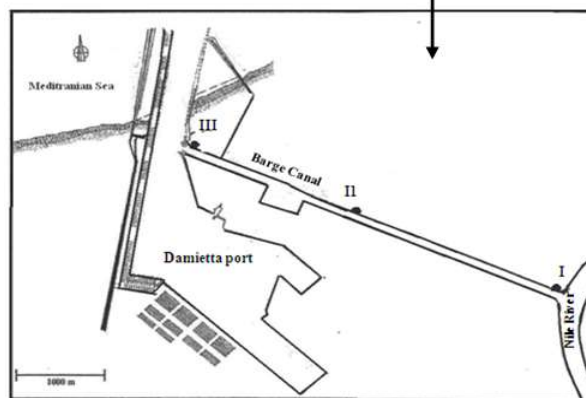
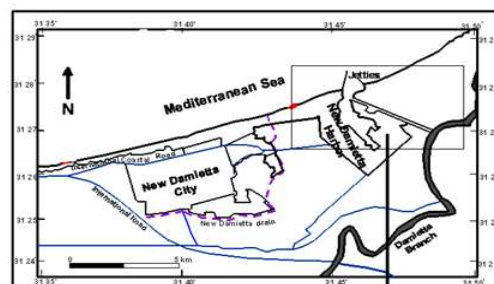
2. Materials and Methods

Study site and sampling technique

During the period from April, 2010 – March, 2011 specimens of the polychaete *Pseudonereis anomala* were collected from the Barge Canal Damietta, Egypt. Three stations were chosen on the barge canal for the present study, and distributed to cover the environmental characteristics of the different parts

of the barge canal Station (I) at the entrance of the canal from the river side, Station (II) at the middle of the canal and Station (III) at the end of the canal from the sea side (Fig.1).

Each sample consists of 1 m² quadrat entire contents. After collection from rocks and sediment, sediment samples were immediately sieved through a 1 millimeter screen and the polychaetes of our interest that retained on the screen and picked from rocks will be preserved with 10% buffered formalin. For the study of reproductive cycle, a short incision was made



in the worm body wall, then about ten oocytes each was measured using a calibrated eye piece micrometer. The longest and the shortest diameter of oocytes were determined, and the average value was used as an estimate of oocytes size. At each sampling date, water temperature and salinity were recorded.

Figure (1) The Barge canal and locations of the sampling stations.

RESULTS

Temperature and salinity

The water temperature during the period from April 2010 to March 2011 showed the classical seasonal variations known to the Egyptian coast of the Mediterranean Sea. The absolute value of temperature was lowered to the minimum of 16 °C in January, increased gradually to reach the maximum in August (30°C), and decreased again during the period from October to December (Fig.2).

The salinity appeared to be variable over the whole canal, the monthly average salinity appeared to fluctuate from average lowest salinity $18.9 \pm 1.5\text{‰}$ to the highest $36.2 \pm 5.1\text{‰}$.

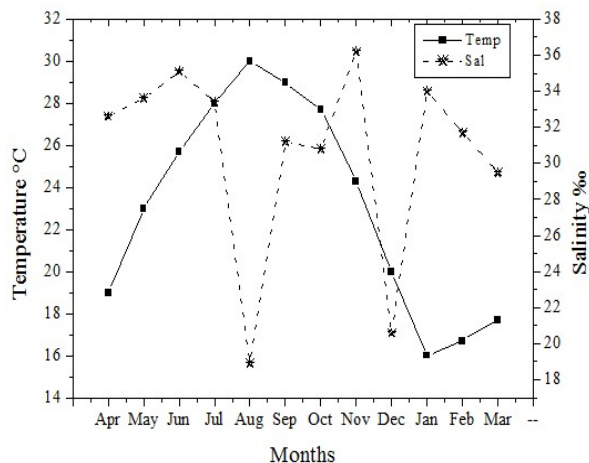
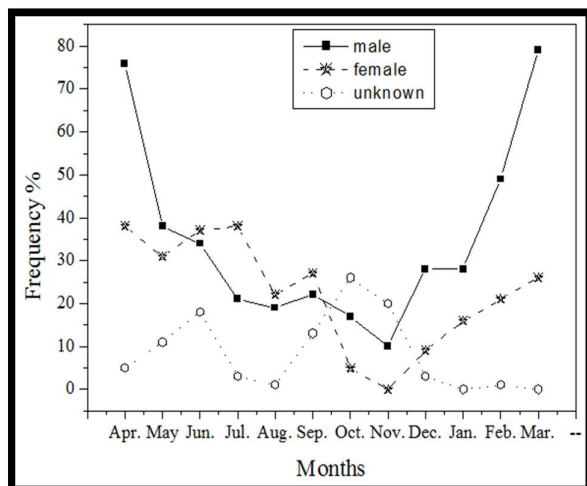


Figure (2) Monthly variations of water temperature °C and Salinity ‰ in the Barge canal

Reproductive biology

Sex ratio

Figure(3) shows the annual change in the sex ratio for *Pseudonereis anomala* throughout the period of sampling.



There were a small percentage of worms in which coelomic gametes could not be recognized. These are worms of unidentified sex, and they probably represent a recruitment of juvenile worms. During most of the year, there was a predominance of males over females in the whole catch specimens. Out of 792 individuals, 421 were males (53.2%), 270 individuals were females (34.1%), and 101 individuals were juveniles (12.7%) with sex ratio 1.6 male: 1 female.

Figure (3) monthly total frequency of males, females, and unidentified sex of *Pseudonereis anomala*.

Oocyte cycle of *Pseudonereis anomala*.

The oocytes of *Pseudonereis anomala* undergo vitellogenesis while floating in the coelomic fluid. Over an annual reproductive cycle, the monthly variations in the main oocyte diameter of female *Pseudonereis anomala* are shown in figure (4). The figure illustrated pronounced two peaks in April and August and two declines in the main oocyte diameter in June and February. No oocyte carrying females were observed in November. As a result, it may have two spawning seasons for *Pseudonereis anomala*, the first begins in March and April and the second in August and September at water temperature (19-30 °C). The largest oocytes encountered had a diameter of about 207.9 μm, and the smallest oocytes of about 37.8 μm. For each sample, there was a considerable variation in the oocyte size.

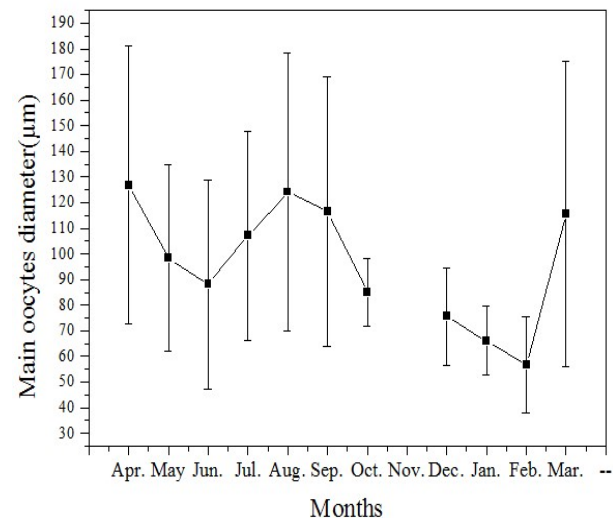


Fig.(4). Monthly variations of mean oocytes diameter of *Pseudonereis anomala*. Vertical lines indicate standard deviation

Discussion

There is scarce data on sex ratio of *Pseudonereis anomala*. The sex ratio was influenced by the species, location and environmental conditions, as reported Barbary (1992) that female outnumbered males with ratio (4:1) when he studied the reproductive biology of *Nereis (neanthes) brandti* from Lake Timsah, *Pernereis nuntia brevicirris* from china water (1:1) throughout the whole period of observation (Hardege et al., 1994), while Osman (2007) indicated that males of *Pernereis nuntia brevicirris* outnumbered females for most of the year, with aratio of (3:2) in Suez Canal. For *Pedonereis anomala*, the sex ratio results showed a high proportion of males. The annual changes in sex ratio of the two species indicated that males outnumbered females for most of the year with general ratio (2.2:1).

Nereidae in natural populations always breeds in the spring (Linke, 1939; Dales, 1950; Smidt, 1951; Olive and Garwood, 1981). Reproduction will inevitably be followed by a genetically programmed death shortly after spawning (Olive and Garwood, 1981). In the present study, *Pseudonereis anomala* have two spawning seasons, the first in early spring (March and April) and the second in late summer and early autumn (August and late September) at water temperature (19-30 °C). The number of *Pseudonereis anomala* females decreased in number from July to November, while the juveniles increase sharply from April to June and from August to October, enhancing the spawning period of that species.

Nereidae showed a wide range of oocyte diameter; and according to Olive et al., (1998) from 170 to 200 µm for *Nereis virens*, while *Nereis diversicolor* has small range of oocyte diameter from 130 to 140 µm at three different latitudes in Southwestern Portugal (Costa, 2003). The diameter of mature oocytes in *Perinereis nuntia brevicirris* ranges from 200 to 250 µm. Dass et al. (2007) indicated that oocytes of *Nereis falsa* took less than one year to develop fully, and the first mature oocyte diameter occurred in the coelomic fluid of females was greater than 160 µm (approximately 180 µm). *Pseudonereis anomala* in Iskenderun Bay have a diameter of mature oocytes in specimens with epitokal modification that may reach 195 µm (Çinar and Ergen, 2005). In the Barge canal the maximum oocytes of *Pseudonereis anomala* observed was 207.9 µm, and the mature oocytes diameter ranged between 170 to 207.9 µm.

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الملخص العربي

بيولوجية التكاثر في بسيدونيرس انومالا (نيريدي - عديدة الأشواك) من القناة الملاحية - دمياط - مصر

فاديه ناجي هيبه* ، علا عبد الحليم أبو سمك**، أحمد السيد الغباشي** و أحمد محمود الزيني**
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تعتبر هذه هي المرة الأولى التي يتم فيها تسجيل بسيدونيرس انومالا في القناة الملاحية بدمياط. فمن خلال ٧٩٢ فرداً تمت عليهم الدراسة لوحظ أن عدد الذكور فاق عدد الإناث بنسبة ١,٦ ذكور : ١ إناث. سُجل أيضاً موسمين لوضع البيض أحدهما في فصل الربيع (مارس و أبريل) و الآخر في نهاية الصيف و بداية الربيع (أغسطس و حتي نهاية سبتمبر) في درجة حرارة تراوحت بين (١٩ و ٣٠ °م). ومن الجدير بالذكر أيضاً أنه تراوحت أحجام البويضات الناضجة ما بين (١٧٠ و ٢٠٧,٩ ميكرون).