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ON THE DISTRIBUTION AND ABUNDANCE OF SOME MOLLUSCS IN LAKE TIMSAH, SUEZ CANAL

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ABSTRACT

The present paper summarize observations on the abundance and densities of molluscs species (three bivalves: *Venerupis aurea*, *Ruditapes decussata* and *Cerastoderma glaucum*; four gastropods: *Cyclope neritea, Cerithium scabridium, Trochus erythraeus* and *Bulla striata*) in sand and clay flats in Lake Timsah. The substrates of selected sites ranged between sand and clay flats. The gastropod *Cyclope neritea* was the most common and abundant species, occurring at all sites and depths, followed by *Cerithium scabridium*. The results also suggested that exposure; water depth, intense fishing and substrate nature interacted and influenced the molluscan abundance and density.

1. INTRODUCTION

Lake Timsah is the main source of fish, molluscs and crustacean for the Ismailia governarate. The total catches of molluscs overcome that other invertebrates and the great majority of these are clams. The two clams *Venerupis aurea* and *Ruditapes decussata* represented the most commercially important and successful groups of bivalves in Lake Timsah (Mohammed *et al*, 1992). These clams are consumed as human food in large quantities in coastal cities of Egypt and also being exported to some European countries. So, they are suffering the extensive fishing in the Lake. The cockle *Cerastoderma glaucum* has largely commercial value in Sweden (Tulkki, 1961), Norweg (Rugg, 1970), Danish water and Baltic (Hopner Petersen, 1958). It was also common in the Atlantic region: in the Netherlands and British Isles (McArthur, 1998). This cockle was also distributed in Spain (Arjonilla *et al*., 1994) in addition to the Egyptian water. Generally, a lot of tons of commercial bivalves and gastropods are yearly harvested (1606 and 1968 tons) from Lake Timsah and Great Bitter Lake (G.A.F.R.D., 2004 and 2005 respectively). The gastropod *Cyclope neritea*, that was detected in a high density, also spread along the Atlantic coasts of protugal (Sérgio *et al*., 2007), Spain (Quintela *et al*., 2006) and France (Simon-Bouhet *et al*., 2006), Greece (Koutsoubas *et al*., 2000), Italy (Pranovi *et al*., 2000) and Turkey (Öztürk, 2005) in high abundance. The second dominant gastropod species was *Cerithium scabridium* which established large stable population from Egypt to South Eastern Turkey, Cyprus, Tunisia (Galil and Zenetos, 2002) and Italy (Vitturi *et al*., 2002). The other gastropods, *Trochus erythraeus* and *Bulla striata*, were scarcely detected and were not found in samples collected at all depths or sites. This was previously noticed by Gabr (1991).

The aim of this work is to assess the distribution and abundance of some molluscs in Lake Timsah.

2. MATERIALS AND METHODS

Seven species of molluscs were collected from Lake Timsah. This Lake lies between

30° 33′ and 30° 35′ N latitude and 30° 16′ and 32° 19′ E longitude, Ismailia, Egypt. Sixty samples were collected from three main sites (sites I and II are semisheltered and muddy-clay in nature while site III is exposed and sandy in nature). Site I is the most exploited site that exposed to intensive fishing. Site II is scarcely fished. Site III is the communication point between Lake Timsah and Suez Canal (Fig. 1).

The samples were collected from these sites at different depths (from 0 to 80 cm depth) by using a 20×20 cm quadrate in April 2006. Then washed with sea water through a 2 mm mesh size sieve and counted. Numbers of the collected species at 0, 25, 50 and 80 cm depth respectively were as follow: *Venerupis aurea* were 80, 180, 320 and 280 (site I); 400, 140, 1200 and 2800 (site II); 280, 80, 80 and 460 (site III). The collected specimens of *Ruditapes decussata* were 80, 80, 135 and 0 (site I); 80, 120, 160 and 720 (site II) whereas 20 individuals were only found at 50 cm depth (site III). For *Cerastoderma glaucum* the numbers were 5, 20, 40 and 60 (site I); 80, 40, 400 and 320 (site II) and there were not any specimen at site III. For the gastropod: numbers of *Cyclope neritea* were 440, 1800, 2315 and 600 (site I); 4880, 1820, 5680 and 3760 (site II); 900, 540, 400 and 160 site (III). Whereas the collected specimens of *Cerithium scabridium* were 70, 212, 291 and 45 (site I); 93, 123, 93 and 128 (site II); 940, 680, 440 and 640 (site III). *Trochus erythraeus* was only found at 25 cm and 80 cm depth (site I) and at 80cm depth (site III) with individual numbers of 60, 20 and 20 respectively. Whilst 20 individuals of *Bulla striata* were only found at 25 cm depth (site III). Numbers of individuals for each species at different sites and depth were tabulated using Pivot-table in Excel package. Water temperature, pH value and salinity were recorded.

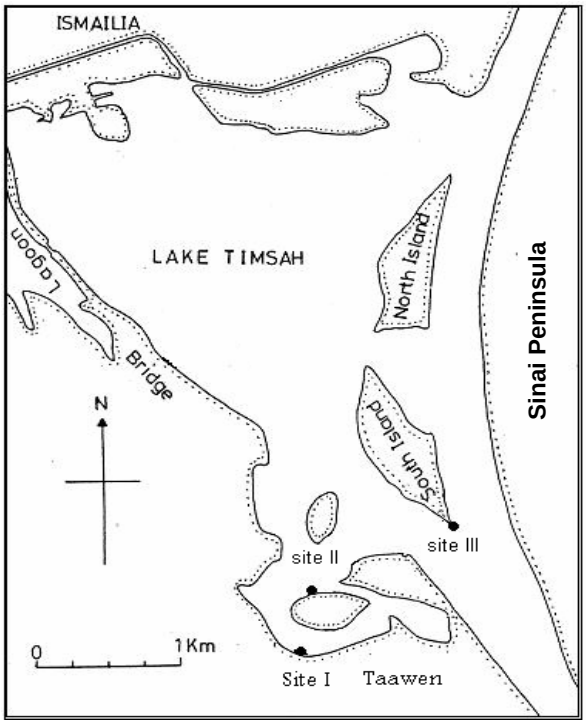

Figure (1). Map showing the selected sites in Lake Timsah.

3. RESULTS

Hydrographic parameters show little variation between sites. Values of pH ranged between 8.5 and 8.9, the salinity from 43-43.5‰, and the average of water temperature was 25°C.

3.1 Abundance and distribution of the collected organisms

3.1.1 Bivalves

Table (1) and figure (2) show variations in the abundance of the three bivalve species at the area investigated with respect to site and depth. Total numbers of the bivalves were 1280, 6460 and 920 at site I, site II and site III respectively. At each depth, individual number of *Venerupis aurea* exceeded that of *Ruditapes decussata* followed by *Cerastoderma glaucum*. At 50 cm depth (in site II only) the arrangement in a descending manner was as follow: *Venerupis aurea*, *Cerastoderma glaucum* then *Ruditapes decussata*. With respect to sites, the highest percentage number was recorded in site II (at 50 cm depth for *Cerastoderma glaucum* and at 80 cm for both *Ruditapes decussata* and *Venerupis aurea*).The two bivalves *Ruditapes decussata* and *Cerastoderma glaucum* disappeared in site III, except at 50 cm depth where *Ruditapes decussata* represented only 0.23% of the whole population.

3.1.2 Gastropods

Figure (3) reveals that *Cyclope neritea* had the highest percentage number of individuals in site II at 50 cm depth followed by the beach.The gastropod *Cerithium scabridium* recorded high frequencies in sites II and III. The number of *Cyclope neritea* exceeded that of *Cerithium scabridium* in sites I and II while the reverse occurred in site III. Both of the gastropods *Trochus erythraeus* and *Bulla striata* rarely recorded in the study area. *Bulla striata* which constituted 0.07% of the whole population was only found at 25 cm depth in site III. Whilst *Trochus erythraeus* constituted about 0.22%, 0.07% and 0.07% at 25 cm, 80 cm (in site I) and at 80 cm in site III respectively.

For the whole population, the bivalves constituted only 24.17% whilst the gastropods were 75.83%. Generally, the highest numbers of both bivalves and gastropods (6460 and 16577) were recorded in site II followed by site I (1280 and 5853) and then site III (920 and 4740) as shown in table (1).

Table (1): The abundance (number of individuals/m^2) of seven molluscs species in sixty samples in the investigated sites (April 2006).

Site	No. of bivalves /m^2	No. of gastropods /m^2	No. of bivalves and gastropods /m^2
Site I	1280	5853	7133
Site II	6460	1657	23037
Site III	920	4740	5660

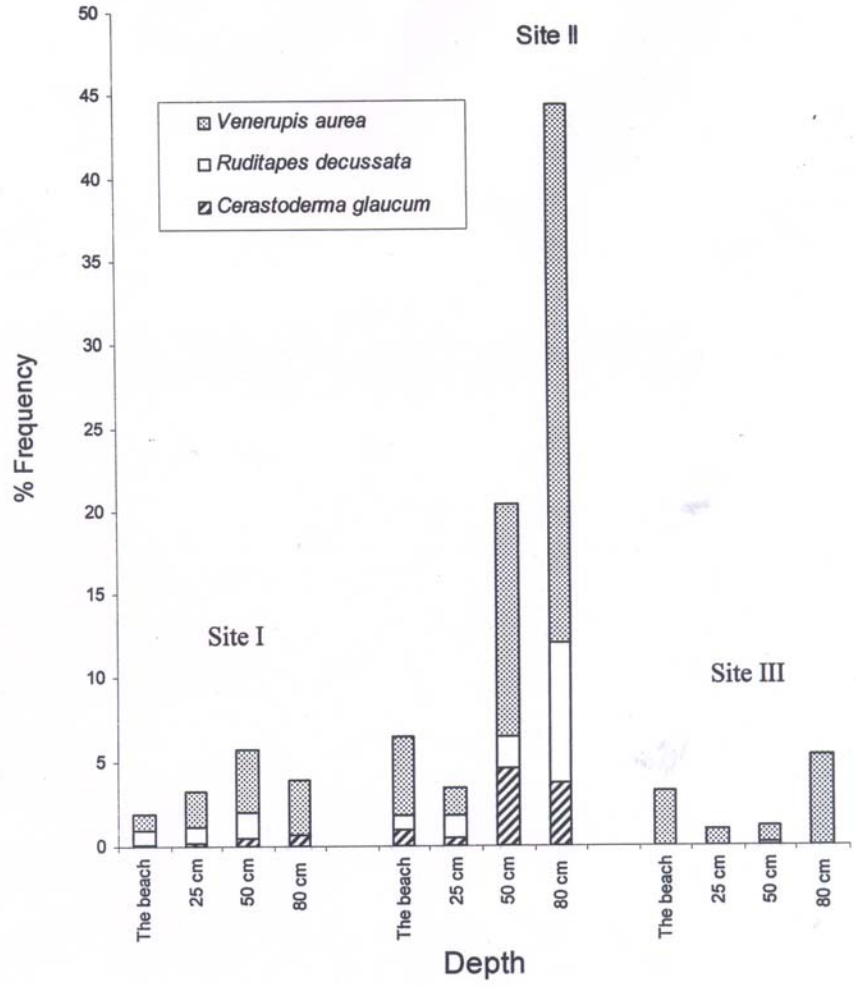

Fig. (2): Distribution of the three bivalves in the investigated sites at different depths.

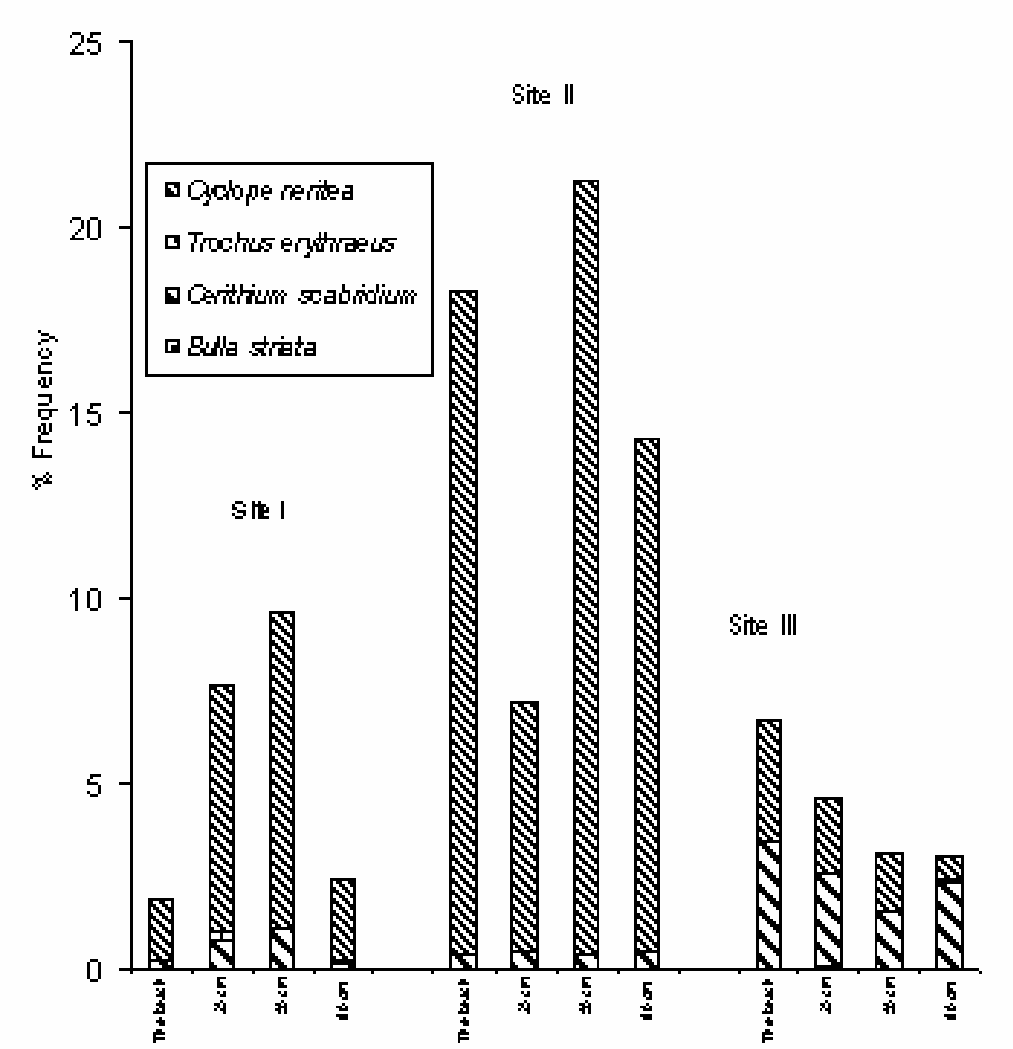

Fig. (3): Distribution of the four gastropods in the investigated sites at different depths.

4. DISCUSSION

Molluscs are the second largest one in the animal Kingdom; they are highly successful in terms of ecology and adaptation (Gabr, 1991). The present study revealed that *Venerupis aurea* (size range 3.3-21.9 mm) was the most abundant bivalve followed by *Ruditapes decussata* (size range 4.4-23.6 mm) then *Cerastoderma glaucum* (size range 3.2-26.8 mm). This may mean that *Venerupis aurea* had the best adaptation with the environment rather than the two species, in addition to its continuous reproduction. So Lake Timsah considers as a commercial bed and a nursery ground. This was confirmed by Kandeel (1992) who stated that environmental conditions of Lake Timsah are suitable for these continuous productive species. On the other hand, the total disappearance of *Cerastoderma glaucum* from site III [in spite of their large population in the preceding years (Mohammad, 2002)] might due to the impact of pollution resulting from ships which pass near this site together with dredging activities which took place recently. Physical disturbance such as dredging had a great effect on benthic assemblages. Skilleter *et al*., (2006) detected significant effects from the dredging on the abundance of bivalves.

It is assumed that *Cerastoderma glaucum* was the most suitable bivalve to the environment and may be used as an indicator of water quality, primarily pollution, or physical disturbance as dredging.

The dominant species of the gastropods in the present study were *Cyclope neritea* and *Cerithium scabridium*. The same observation was recorded by Koutsoubas *et al*. (2000) after studying the community structure of molluscan fauna in a shallow Mediterranean lagoon. Also, the exceeding number of *Cyclope neritea* on the remaining species led to the hypothesis that it was the most adapted species in Lake Timsah. This result agrees with Sauriau (1991) who studied spread of *Cyclope neritea* along the north eastern Atlantic coasts. He related the spread of this small gastropod to its encountering environmental conditions suitable for its settlement and reproduction, explaining the easly acclimatization of this eurythermic gastropod. The present work elucidated that the frequence appearance of gastropods as well as bivalves differed between sites with high representation in site II. This is also recorded by S. Mohammad (personal communication). So, it led to the assumption that the high abundance of molluscs species in site II might be due to it is not exposed to extensive fishing as site I and also to its semi-shelter nature [if compared with site III (exposed site)]. This assumption was in parallel with Bertasi *et al*., (2007) who found fewer species richness and different community structure in the exposed site as compared to the sheltered one. Further more, nature of the substrate play an important rule in the molluscs abundance. Seitz and Lipcius (2002) reported that bivalve abundance was threefold greater in mud than sand. Mohammad (2002) mentioned that site III is sandy in nature. So, this may be another reason in the fewest number of individuals obtained from this site in the present work. On the other hand, muddy and clay substrate of site II (M. Kaiser, personal communication) might play an important role in the numerically abundance of molluscs species. Depth also seams to play a significant role on the molluscan distribution between sites. Most species were more abundant in the deep zones (50- 80 cm). Matthews and Fairweather (2006) concluded that abundance of juvenile and adult bivalve were variable across site and water depth, but were often greater at the deeper water depth. The hypothesis was that molluscs might escape from their intertidal predators to deeper zones where they could live and spawn in safer than shallow one. This was in confident with Behrens and Boulding (1996) who attributed the absence of gastropods

from the low shore, despite higher growth and reproductive rates, to the high risk of predation from low shore and subtidal crabs.

The conclusion that: gastropods were represented in the three sites in a large number. This together with their exceeding the bivalve's percentage (~ 3 times) might lead to the following assumption: gastropods were more withstand to the change in the environmental condition (such as water quality, water depth, dredging and substrate nature) than bivalves. The present results confirmed the influences of these factors on the distribution and abundance of the studied molluscs groups.

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