Population dynamics of freshwater snails in relation to environmental factors at Ismailia Governorate, Egypt

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Received: *25/6/2010*

Abstract: Ismailia one of Suez Canal Governorates, situated in North-east of Egypt. It is divided into seven study sites namely, Ismailia City, El-Tal El-Kabeer, Al- Kantara West, Al- Kantara East, Fayed, El-Kassaseen and Abo-Sweer. Survey and monthly abundance of freshwater snails were studied from July 2007 to June 2009 in different freshwater ecosystem. Survey of snail revealed the occurrence of seven species belonging to five families and two subclass of class Gastropoda. From 35059 snail individuals collected during the two successive years *Theodoxus niloticus* n=2929 individuals (8.35%); *Bellamya unicolor* n=4230 indiv. (12.06%); *Lanistes carinatus* n=5722 indiv. (16.32%) and *Milanoides tuberculata* n=9312 indiv. (26.57%) and *Cleopatra bulimoides* n=8061 indiv. (22.99%); *Biomphalaria alexandrina* n= 1548 indiv. (4.41%) and *Bulinus truncates* n= 3252 indiv. (9.27%).Results revealed also that, East Qantara shown highest prevalence of freshwater snails (n=6701 individuals); where the lowest prevalence was recorded in Abo-Sweer city (n= 3519 indiv.) during the two successive years of study. Some bionomic aspect of breeding place associated with snial were study.

Keyword: Freshwater snails, Population dynamics, Gastropoda.

INTRODUCTION

The phylum mollusca is a large assemblage of animals having diverse shapes, sizes, habits and occupy different habitats (Subba Rao 1993). Based on their habitat preference, mollusks can be classified into aquatic and land communities. Freshwater mollusks have been known to play significant roles in the public and veterinary health and thus need to be scientifically explored more extensively. The Freshwater snails occur across a variety of habitats, reflecting the wide ranging biology of many different species. Snails usually play a dominant role in the ecology of freshwaters by providing food for many other aquatic animals and by grazing on vast amounts of algae and detritus (debris), and it can be used as indicators of water quality (Subba Rao 1993).

In Egypt, the freshwater snail fauna has been studied long time ago with a wide variety of interests. In recent times, the interest of zoologists has been focused on the group of mollusks which play an important role in transmitting diseases of man and his livestock Salem *et al.* (1993) and Yousif *et al.*, (1998). Apart from being important horticultural and agricultural pests, mollusks, are intermediate hosts to Schistosoma and Fasciola which are the causative agent of Schistosomasis and Fasciolasis in Egypt for both animal and human (Salem *et al.*, 1993 and Yousif *et al.*, 1998). Several studies have been done to survey and studied the distribution patterns of freshwater snails at different in Egypt (Atia et al., 1984; Kamel, 1984; Salem *et al.*, 1993; Yousif *et al.*, 1993; Hassan, 1999 and El-Kady *et al.*, 2000). The present investigation aims to survey, diversity, population dynamics and the important role of some snail species as possibility to transmission disease to human and animal at Ismailia governorate.

MATERIALS AND METHODS

Study area: Ismailia Governorate is located in the eastern parts of Arab Republic of Egypt at the middle part of Suez Canal (30° 35′ N and 32° 16′ E). Ismailia Governorate was divided into seven study sites namely, Ismailia City (site no. 1), El-Tal El-Kabeer (site no.2), Al- Kantara West (site no.3), Al- Kantara East (site no.4), Fayed (site no.5) El-Kassaseen (site no.6) and Abo-Sweer (site no.7).

Field sampling and snail collections:

Samples of freshwater snails were carried out during two successive years; from July 2007 to June 2009. Monthly five dip nets per 250 m along 1km length (The total dips net 25dip / month / sites). Samples were done by a dip net measuring standard dipper 16 cm in diameter and 33 cm in depth. The depth is long-handled to permit collecting snail from more inaccessible parts of breeding places (WHO, 1965). Snails were placed in small plastic bags with some water and transferred to the laboratory in Plant Protection Department, Faculty of Agriculture, Suez Canal University, Ismailia, Egypt. Where they kept alive under laboratory conditions counted and identified according to Frandsen (1983) and Ibrahim *et al.*, (1999).

Physical and chemical analysis of water:

Water samples were analyzed by using the pipette method as described by Tribouth (1970). Electrical conductivity (E.C.) was measured on 5 ml samples of water according to Richard *et al.*, (1954). The pH value was determined by pH meter. Soluble anions and cations were determined according to Jackson (1958).

Statistical analysis:

All statistical analysis for this work was done in COSTAT software. Two- way ANOVA and Duncan's multiple tests were used to analyze the differences in abundance between species.

RESULTS

Water analysis:

The pH values in Ismailia canal water ranged between 7.2 and 7.9 in all studied sites along the canal (Table 1).

Table (1): Physico-chemical properties of Ismailia canal water.

Parameters	Mean ±S.D	Range
pH	7.63±0.25	7.2 – 7.9
E. C (dcm^{-1})	0.86±0.26	0.47 – 1.23
Salinity	340.67±80.1	250.8– 431.2
Anions (meg l^{-1})		
HCO_3^-	2.61±0.58	1.9 – 3.2
Cl^-	4.08±1.58	2.4 – 5.9
SO_4^{-2}	2.35±0.99	1.06 – 3.75
CO_3^{-2}	-	-
Cations (meg l^{-1})		
Mg^{2+}	1.41±0.61	0.85 – 2.3
Na^+	2.93±0.89	1.6 – 4.0
K^+	0.24±0.06	0.15 – 0.32
Ca^{2+}	1.880.5	1.2 – 2.6
T.S.S.* (mg l^{-1})	3.9±1.65	2.1 – 5.8
Water temperature °C	25.27±0.28	3.7 – 25.2

The canal's water salinity ranged between 250.8 to 431.3 g/l. Total Suspended solids (T.S.S.) ranged between 2.1 and 5.8 mg l^{-1} and its suitable range for snail breeding. The mean water temperature ranged between 3.7 and 25.2 °C.

Vegetation quantity from different sites:

Results shown that six type of plant was recorded in different breeding laces association with snail species. Its namely: *Pontamogeton crispus*, *Ceratophyllum demersum*, *Eichhornia crassipes*, *Phragmites maurites*, *Cyperus sp.* and *Polygonum salicifolium* .

Incidence and abundance of freshwater snail:

Survey of freshwater snails revealed that the occurrence of seven species belonging to five families and two subclass of class Gastropoda. From 35059 snail individuals collected during the two successive years *Theodoxus niloticus* n=2929 individuals (8.35%); *Bellamya unicolor* n=4230 indiv. (12.06%); *Lanistes carinatus* n=5722 indiv. (16.32%) and *Milanoides tuberculata* n=9312 indiv. (26.57%) and *Cleopatra bulimoides* n=8061 indiv. (22.99%); *Biomphalaria alexandrina* n= 1548 indiv. (4.41%) and *Bulinus truncates* n= 3252 indiv. (9.27%) (Fig.3). Results revealed also that, East Qantara (site 4) shown highest prevalence of freshwater snails (n=3367 and 3334 individuals in both years, respectively); where the lowest prevalence was recorded in Abo-Sweer city(site 7) (n= 1774 and 1745 individuals in both years, respectively) (Fig.1).

Monthly abundance of total freshwater snails at different sites in Ismailia Governorate shown that April, may and June were the highest percentage of collected snails in both years of study Fig. (2) and Table (2). On the other hand December, January February and March were the lowest percentage.

Snails collected shown that *Milanoides tuberculata* (Muller) was the highest recorded compared with other species, 27 % and 26.2 % in both years of study. On other hand, *Biomphalaria alexandrina* (Ehrenberg) was the lowest in the both years of study (4.5 % and 4.3 %), respectively Fig. (3).

On the other hand *Bu. tr.* the main vector of schistosoma was recorded 9.1% and 9.5% from total snails collected in both years, respectively (Table 2).

DISCUSSION

Results revealed that occurrence of seven species belonging to five families and two subclass under class Gastropoda. Survey and incidence of snail species at Ismailia governorate shown that; seven species were recorded at the seven localities. Barsoum (1987) found that 16 species of freshwater snails; 7 species belonging to Prosobranchia and 9 species belonging to Pulmonata in different sites along the River Nile. Also, El-Kady *et. al.*, (2000) surveyed freshwater snails from different water systems in El-Abtal village east of Ismailia governorate. They recorded 12 species belonging to 9 families and two subclasses under Gastropoda. Subclass Prosobranchia included 6 families with 7 species and subclass Pulmonata included 3 families with 5 species. Most of collected snails species play a medical and veterinary important to man and animals, particularly *Bulinus truncatus* and *Biomphalaria alexandrina* which transmit schistosomaiasis.

From 17410 individuals in the first year and 17649 in the second year , *Bulinus truncatus* and *Biomphalaria alexandrina* were 9.1 and 4.5 % in the first year, and 9.5 and 4.3 in the second year. Atia *et al.* (1984) mentioned that *Bulinus truncatus* was much higher in number than *Biomphalaria alexandrina*, and these may be due to the changes of pH levels of water, salinity and other ecological factors and these species prefers the slower water velocity especially after the High Dam constructions.

Two peaks of snails collected were showed in two years of study, the first in September and October and the second from April to June. Our results are agree with Yousif, *et al.*, (1998) studies the patterns of spreading and seasonal variation of population density of *Biomphalaria alexandrina*, the snail vector of Schistosoma mansoni in Egypt, in correlation with some environmental parameters in four irrigation canals in Giza and Qalyoubiya Governorates . They mentioned that spreading patterns of snails along canals were changeable because of water current and irrigation activities and may be due to the extent of the winter closure and the prevailing water temperature. Yousif, *et al.*, (1998) studied distribution and seasonal fluctuation of *Biomphalaria alexandrina* and *Bulinus trancatus*, the intermediate host snails of *Schistosoma mansoni* and *Schistosoma haematobium*, respectively in Suez canal area. They showed that the collected snails had two peaks, of *B. alexandrina* was in March-April and August, while *B. trancatus*, occurred in March – May and August, respectively. Low density in winter months and their gradual decrease may be due to unfavorable temperature and the lowest in vegetation abundance in these times. El-Kady, *et al.*,(2000) showed the highest number of snails collected were recorded in April, May and June. On the other hand, January and February showed the lowest number of snails collected.

Most of collected species play a medical and veterinary important to man and animals. For long time,

most malacologists paid special a mention to the principal groups which transmit schistosomiasis to man such as *Bulinus spp.* and *Biomphalaria spp.* On the other hand, freshwater mollusks play an important role in the freshwater ecosystem and some of their local members were recently incriminated in transmitting serious human and animal diseases.

Low extremes of concentration of different chemical ingredients such as Chloride content, Total Hardness, Sulphate, Calcium, Magnisum, Electric Conductivity, Alkalinity and Salinity are found in all breeding place of snails where the population densities of *B. truncatus* and *B. alexandrina* was higher. Alkalinity of water in different localities in Egypt observed by Gohar and El-Gindy (1961) ranged between 108–360, 152–504 p.p.m as $CaCO_3$, where *B. truncatus* and *B. alexandrina* were found.

Examination of aquatic vegetations, which accompanied the snails as shown in this study, revealed that *Pontamogeton crispus, Ceratophyllum demersum, Eichhornia crassipes, Pharfmites mauritionus, Polygonum salicifolium* and *Cyperus sp.* are the most prevalent aquatic plants in water channels examined. The quantity of vegetations increase in summer and decrease in intensity in the winter. These distributions of aquatic vegetations coincided with increasing of the snails. Aquatic vegetation provides food, protection and an egg-laying medium for snails. Thus, it is naturally that the snails' number should increase with increasing vegetation.

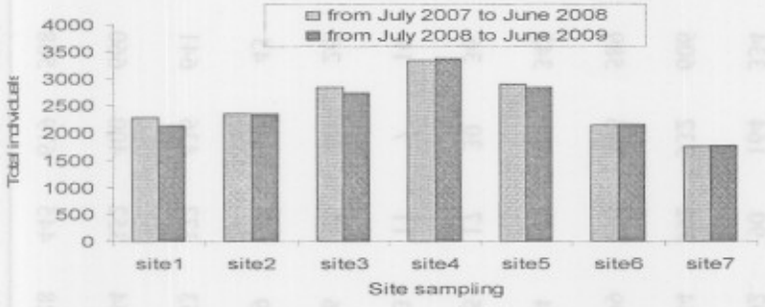

Fig. (1): Total of freshwater snails collected from different sites at Ismailia Governorate

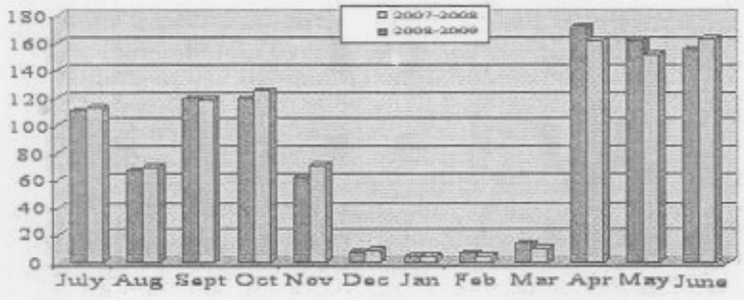

Fig. (2): Monthly variation of snail species collected at Ismailia Governorate from July 2007 to June 2009

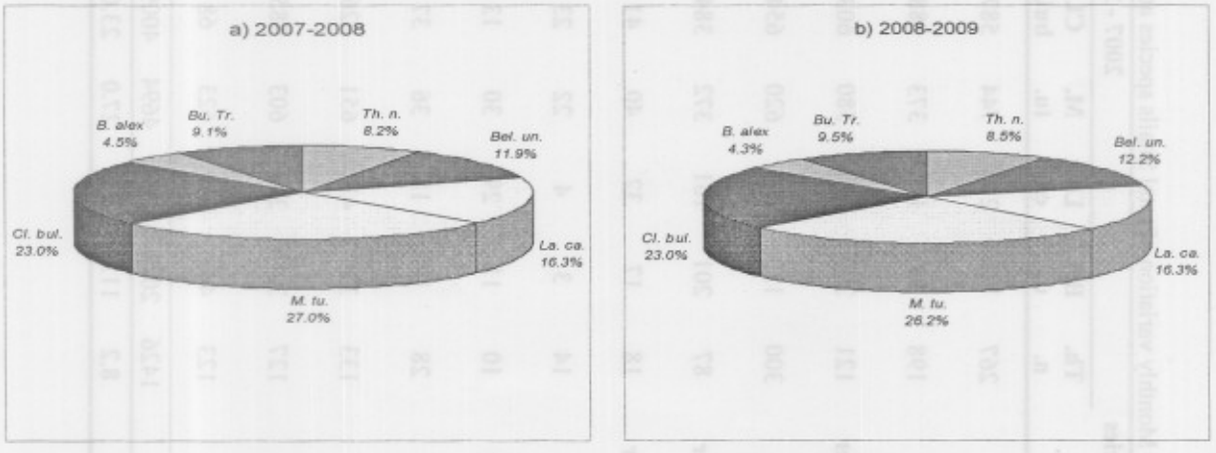

Fig. (3): Percent of snails during a:(2007-2008) & b:(2008-2009)

Table (2): Monthly variation of total Snails species at Ismailia governorate during 2007- 2009

Species / Month	2007 - 2008									2008 - 2009								
	Th. n.	Bel. un.	La. ca.	M. tu.	Cl. bul.	B. alex	Bu. Tr.	Total	%	Th. n.	Bel. un.	La. ca.	M. tu.	Cl. bul.	B. alex	Bu. Tr.	Total	%
July	267	113	210	744	587	18	10	1949	11.2	255	111	220	758	561	20	10	1935	11.0
August	198	86	161	373	388	6	5	1217	7.0	202	90	164	334	377	5	6	1178	6.7
September	121	399	320	580	603	15	10	2048	11.8	134	392	332	606	614	14	6	2098	11.9
October	300	132	431	620	654	27	19	2183	12.5	299	135	396	589	647	22	16	2104	11.9
November	87	201	161	372	384	16	11	1232	7.1	74	187	150	342	319	11	8	1091	6.2
December	18	17	32	40	41	3	-	151	0.9	25	17	30	36	36	2	1	147	0.8
January	14	3	4	22	23	2	1	69	0.4	13	11	7	19	27	4	1	82	0.5
February	10	11	29	30	13	-	-	93	0.5	16	15	40	26	24	-	-	121	0.7
Marsch	28	17	18	36	37	20	24	180	1.0	39	29	30	45	43	33	37	256	1.4
April	133	334	434	651	626	47	595	2820	16.2	163	372	436	641	703	61	659	3035	17.2
May	127	320	399	603	585	40	553	2627	15.1	154	352	400	660	643	41	618	2868	16.2
June	123	441	639	623	68	598	349	2841	16.3	128	445	679	568	58	543	313	2734	15.5
Total	1426	2074	2838	4694	4009	792	1577	17410	100	1502	2156	2884	4624	4052	756	1675	17649	100
%	8.2	11.9	16.3	27.0	23.0	4.5	9.1			8.5	12.2	16.3	26.2	23.0	4.3	9.5		

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ديناميكية تعداد قواقع الماء العذب وعلاقة ذلك بالعوامل البيئية في محافظة الاسماعيلية ، مصر

جمال القاضي- محمود فرج- حمدي الشرباصي- ياسر البدري

قسم وقاية النبات - كلية الزراعة- جامعة قناة السويس -٤١٥٢٢ الاسماعيلية- مصر

الاسماعيلية احدي محافظات اقليم قناة السويس ، وهي تقع في الشمال الشرقي لمصر. في هذه الدراسة تم تقسيم محافظة الاسماعيلية الي سبعة مناطق هي: مدينة الاسماعيلية – التل الكبير – القنطرة شرق – القنطرة غرب – فايد – القصاصين – أبو صوير. تم اجراء حصر وكذلك التعداد الشهري لقواقع الماء العذب في المناطق السبقة في الفترة من يوليو ٢٠٠٧ وحتي يونيو ٢٠٠٩ في أنظمة مختلفة من الماء العذب. أشارت النتائج الي وجود سبعة أنواع تنتمي الي خمس فصائل واثنين تحت طائفة جميعهم ينتمون الي طائفة البطنقدميات. من ٣٥٠٥٩ فرد من القواقع تم تجميعهم خلال عامين كاملين ، ٢٩٢٩ فرد للنوع ثيودوكس نيلوتكس (٨,٣٥ %) و ٤٢٣٠ فرد للنوع بيلاميا انكولر (١٢,٠٦%) و ٥٧٢٥ فرد للنوع لانسيتس كارينتس (١٦,٣٢%) و ٩٣١٢ فرد للنوع ميلانودس تيوبكيولاتا (٢٦..٥٧%) و ٨٠٦١ فرد من النوع كليوباترا بليومدس (٢٢,٩٩%) و ١٥٤٨ فرد من النوع بيومفلاريا الكسندرينا (٤,٤١%) و ٣٢٥٢ غرد للنوع بولايني ترنكاتس (٩,٢٧%). كما اشارت النائج الي ان منطقة القنطرة شرق كانت هي الاعلي تعدادا ٦٧٠١ فرد ، بينما كان اقل تعداد تم تسجيلة في منطقة ابو صوير ٣٥١٩ فرد خلال عامين كاملين. تم تسجيل بعض المعايير الحيوية في مناطق تربية قواقع الماء العذب.