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INCIDENCE AND ECOLOGY OF FRESHWATER SNAILS IN BEHERA PROVINCE

(With 3 Fig. & 4 Tables)

By

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نسبة حدوث قواقع المياه العذبه والعوامل البيئيه المؤثره عليها فى محافظة البحيره

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محمد دياب

فى هذه الدراسه تم تجميع ١٥ نوع من قواقع المياه العذبه فى خمسة مناطق مختلفه من محافظة البحيره حيث تم تصنيف هذه الأنواع وهى :-

بيومفيلاريا الكسندرينا - بولينياس كنتورتاس - بولينياس ديبوفسكى - بولينياس اينيسى - بلانوربيس فيليبى - فايزة اكيوتا - لمنيا كايويدى - لمنيا الكسندرينا - هيليسوما دورى - كليوباترا بوليمويدمس - كليوباترا سيكلوستمويدس - ميلانيا تيوبركيولاتا - فيفيبارا يونيكولار - نيريتينا نيلوتيكا - ولانيستاس بولتينى .

وقد تم تسجيل نسبة حدوث كل من هذه القواقع على مدار فصول السنه الأربعه حيث وجدت النسبة مرتفعه فى فصل الربيع يتبعه فى ذلك فصل الخريف ثم الشتاء بينما كانت أقل نسبه فى فصل الصيف.

كما تم دراسة العوامل البيئيه (الطبيعيه الحقليه) المؤثره فى تواجد هذه القواقع من حيث درجة الحراره - الضوء - عمق المجرى المائى وكذلك درجة (الأس) الهيدروجينى (pH).

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SUMMARY

Fifteen snail species related to classes *Pulmonata* and *Prosobranchia* have been collected from five different localities in Behera province. *Pulmonata* snails represented by *Biomphilaria alexandrina, Bulinus contortus, Bulinus dybowski, Bulinus innesi, Planorbis philippi, Physa acuta, Lymnaea caillaudi, Lymanaea alexandrina* and *Helisoma duryi*. *Prosobranchia* snails represented by *Cleopatra bulimoides, Cleopatra cyclostomoides, Melania tuberculata, Vivipara unicolor, Neritina nilotica* and *Lanistes boltini* have been collected. Seasonal incidences of snails were high in spring followed by autumn and winter while decreased in summer. Factors affecting snails population were also studied (under field conditions), including water temperature, light, water depth and hydrogen ions concentration (PH).

INTRODUCTION

Snails have been known to play an important role as intermediate hosts for helminth parasites of man, animals, birds and fishes. Out of the six classes of molluscs, the most important ones were those related to freshwater, Gastropoda and Bivalvia.

In Egypt, studies on different freshwater snails have been carried out on the various provinces including lower and upper Egypt *(EL-EMAM and ROUSHHDY, 1981; NADA, 1983; HASSAN* et al., *1984 and TAHA, 1992)*.

Although Behera province has a wide water resources of large irrigation system adjacent to the Rosetta branch of the River Nile, freshwater snails had the attention of few authors and detailed studies were still obscured. Thus, it was found essential to enquire on some properties of the distribution and seasonal incidence as well as factors affecting the snail population of freshwater snails represented by those inhabiting Behera province and it's different localities.

MATERIAL and METHODS

1. Collection of snails :

Snails and aquatic plants have been collected allover a year during a period extending from October, 1991 to September,

1992. The collection was from water bodies of five different villages belonging to five districts in Behera province including Shobrakhit, Edfina, Damanhour, Abo El-Matamir and Kom-Hamada. Each area was subjected to study once per month.

Temperature, depth and hydrogen ions concentration (pH) of water bodies were estimated (under field conditions) during the period of conducting this work.

Samples were collected by using a simple net. The net consisted of a metal ring of 36 cm length and 30 cm width attached with a wire net of 16 mesh per inch. The metal ring can easily connected with metal handle of 7 seperated metal pipes each measuring 35 cm in length and these can be connected with each other by a screw to give a total length of 2.45 meters.

2. Identification of snails :

The collected snails were washed thoroughly and cleaned from mud, debris and ciliates.. Then, classified according to the shell morhpology described by *EL-GINDY (1960) and Malek (1984).*

Tables and histograms are used to display the obtained results.

RESULTS

1. Distribution and incidence of the revealed snails :

A total of 15 snail species have been collected from five different localities in Behera province. Nine of these species were related to *Pulmonata* snails while the remaining species were related to *Prosobranchia* snails. The former snail species were represented by *Biomphilaria alexandrina, Bulinus contortus, Bulinus dybowski, Bulinus innesi, Planorbis philippi, Physa acuta, Lymnaea caillaudi, Lymnaea alexandrina* and *Helisoma duryi.* The later *Prosobranchia* snails included *Cleopatra bulimoides Cleopatra cyclostomoides, Melania tuberculata, Vivipara unicolor, Neritina nilotica* and *Lanistes bolteni.*

In different studied districts, it was found that the incidence was higher in Shobrakhit followed by Abo El-Matamir, Kom-Hamada and Edfina respectively. The lowest incidence was in Damanhour (Table 1 and Fig. 1).

Generally, the seasonal incidence was the highest in spring season followed by autumn and winter while decreased to be the lowest in summer season (Table 2 and Fig. 2).

Detailed data concerning the distributions and seasonal incidences of the collected snails are displayed in Table (1) and Table (2) respectively.

2. Factors affecting snails population :

Regarding the effect of water temperature on snails population (Table 3 and Fig. 3), it was found that spring season was included in the optimum temperature required for breeding and reproduction of snails. The number of *Pulmonata* snails were found to increase during cold season to reach their peak during spring (optimum) season while being sharply decreased during the hot season reaching their minimum in autumn season (Table 2). *Prosobranchia* snails began to increase in spring towards the hot season and reached their maximum during autumn while markedly decreased during the cold season (Table 2).

Studying the effect of the day light on snails population, it was observed that in autumn season, young snails began to appear. This also occurred in winter where the young snails predominated as shown in *Lanistes bolteni, Lymnaea alexandrina* and *Vivipara unicolor* snails (i.e. the egg production was not affected by the decreased day light period during these seasons). On the other hand, in spring season, when the day light period increases, it was noticed that oviproduction on the collected aquatic plants was also present. In summer season, when the day light period reached its maximum, young snails and egg masses were also present.

The mean pH value allover the study was 7.4 in the investigated areas except in Abu El-Matamir where the pH was 7.6. It was also observed that the pH increased to 7.6 during the winter closure. *Pulmonata* snails as *Biomphilaria alexandrina, Physa acuta, Bulinus species* and *Lymnea species* were collected from the main and small canals as well as narrow ditches where pH ranged 7.2 - 7.6. *Prosobranchia snails* were collected from small canals and ditches where the mean pH was 7.4.

Prosobranchia snails such as *Melania, Vivipara* and old *Cleopatra* were found on muddy and sandy bottom. It was observed that *Pulmonata* snails like *Biomphilaria, Bulinus, Planorbis* and *Physa* besides, *Prosobranchia* snails as *Cleopatra species* and *Lanistes bolteni* (especially young ones) were found hanging to the water plants near the water surface in small canals and ditches. *Lymnaea* and sometimes *Physa* and/or *Planorbis* were present on the surface water between floating plants or

floating free in narrow canals, ditches and small drains, especially their terminals.

Snails population competition was observed in Abu El-Matamir and Shobrakhit where the bilharzial vectors (*Biomphilaria* and *Bulinus*) sharply decreased in number in the same month during which *Helisoma duryi* was collected. Also, especially in Abu El-Matamir, an inverse relation between *Biomphilaria alexandrina* and *Melania tuberculata* was clearly observed (Table 4).

DISCUSSION

It was generally observed that the population dynamic of different snails was variable in various investigated localities (Table 1 and Fig. 1).

Regarding the seasonal incidence of the collected snails, *Biomphilaria alexandrina* reached it's peak incidence during spring season, decreased in winter, autumn and summer respectively. This agreed with *NADA (1983)* and *TAHA (1992)* who mentioned that the maximum incidence was during spring.

Bulinus contortus was few, recording the maximum during winter and decreased gradually in autumn, summer and spring seasons. On the other hand, a relatively higher incidence was shown by *Bulinus dybowski* which was collected in large numbers during spring season. This meets the data obtained by *NADA (1983)* but differs with *STRICKLAND and ABDEL-Wahab (1990)* who quoted that the greatest number was during summer (June and July) and *EL-EMAM and ROUSHDY (1981)* who mentioned that the peak was in winter (January). *WHO (1956)* stated that *Bulinus trancatus* in Northen Egypt produces two or more generations each year where the warm season is longer. In 1973, *WHO* again stated that *Bulinus trancatus* distributed throughout Egypt, in the Nile itself and in Rosetta and Damiatta branches. This together with our results and that mentioned by previously mentioned authors can explain the wide range incidence of *Bulinus* snails and we can conclude that the *Bulinus* snail has the ability to survive the effect of the flactuating temperature in different seasons.

Planorbis philippi predominated in spring season, sharply decreased in summer followed by autumn and began to increase in winter towards the spring. This incidence was in agreement with *NADA (1983)* who mentioned that the most of the collected snails was during spring while he quoted that it was absent in winter and summer.

The highest number of the collected snails in the present work was that of *Physa acuta* which decreased in summer towards the autumn while increased in winter to reach the greatest incidence in spring. This confirms the results obtained by *NADA (1983) and TAHA (1992)* who recorded the same seasonal arrangement in Sharkia and Beni-Suef provinces respectively.

For *Lymnaea caillaudi*, the same peak incidence was recorded in winter and summer while decreased in spring and autumn seasons. *Lymnaea alexandrina* showed high incidence in winter, decreased in spring and autumn while being lowest in summer. These incidences coincided with *HASSAN et al. (1984) and TAHA (1992)* although they recorded the lowest incidence of *Lymnaea caillaudi* in summer season.

Helisoma duryi was recently recorded in Egypt some years ago from small canals in a very limited area in Qalubia province by *PFLUGER and ROUSHDY (1980)*. Firstly recorded from the Nile coarse by *ROUSHDY and EL-EMAM (1981)* along six kilometers of the western bank of the River Nile. They recorded its high incidence during June and July. In our study, *Helisoma duryi* was found in few numbers 23(0.08%) and recorded only in August. This incidence can meet with that recorded by *ROUSHDY and EL-EMAM (1981)* and we can conclude that this snail predominates during the summer months.

The incidence of *Cleopatra bulimoides* and *Cleopatra cyclostomoides* was high in autumn followed by summer while decreased during spring and winter seasons. This differs with *NADA (1983) and TAHA (1992)* who mentioned that *Cleopatra* population was high during spring and summer. This variation in our results and the mentioned authors may attributed to the different ecological factors in the studying areas.

Melania tuberculata was collected in a large number during autumn and decreased gradually in winter towards the spring and summer. *NADA (1983)* recorded the higher incidence during spring and autumn while the lowest number was in summer.

Vivipara unicolor recorded a higher incidence in summer which decreased in autumn, spring and winter seasons respectively. This was identical with *TAHA (1992)* who obtained the same incidence arrangement..

Neritina nilotica, in the present work, predominated during winter and autumn respectively while was absent in both spring and summer. Agreeing with *NADA (1983)* except for the high incidence he recorded in spring.

Lanistes boltini snails had their peak during winter followed by spring, autumn and summer respectively. *NADA (1983)*

mentioned that the incidence was high in autumn followed by spring and decreased in summer and winter seasons.

In respect to the factors affecting the snails population in the areas under investigation, it was clear that the temperature had a great effect on the snail population. Our results displayed that spring followed by autumn season lie in the optimum temperature required for breeding and reproduction of snails. Inspite of the clearence carried out in three regions under investigation, *Pulmonata* snails were found to reach their maximum incidence in spring season while *Prosobranchia* snails reached their peak in autumn. These results were in agreement with *VAUGHN (1944)* who found that the temperature of 20°C being the optimum constant for snail growth and this temperature was recorded in spring and autumn. *PHILIPPI (1970)* reported that growth and reproduction activities of *Physid* snails was greatest in spring while there was considerable mortalities during summer. Besides, *Biomphilaria alexandrina* had been reported to prefer water temperature in the range 18-22°C *(GOHAR and EL-GINDY, 1961).*

In the present investigation, it was observed that the oviproduction process was not affected by the length of the day light period. Most snails present in winter were young (juvinile). In summer season, the collected old snails were many, while young ones were few. These results coincided with *DESCHIEN and BIJAN (1956) and ROBERT (1967)* who mentioned that oviproduction of snails is not affected by increasing the period of day light and darkness has no harmfull effect on it.

The average pH recorded in this study was slightly alkaline (7.2-7.6) and near to that recorded by *ABDEL-GHANI (1955)* and to the mean pH given by *EL-EMAM and ROUSHDY (1981).*

The relation of snails to the water depth was also observed where *Biomphilaria alexandrina* and *Bulinus species* were widely distributed in small canals and ditches. *Bulinus snails* were relatively more than *Biomphilaria* in the main canals. They were found clinging to water plants near the surface or in the bottom. This was identical with *WHO (1957)* which stated that the bilharzial snails have been recorded in shallow water near the surface. *Lymnaea species* and sometimes *Physa acuta and Planorbis philippi* were seen floating on the surface. The same observation was recorded by *GOHAR and El-GINDY (1961)* who explained that *Lymnaea snails* needed a high rate of oxygen consumption and *Philippi (1970)* who observed that *Physa species* came to the surface water regularly for aerial breething.

On the other hand, *Melania Tuberculate, Cleopatra species and Lanistes boltini* were usually found crawling on muddy and sandy bottom of small canals and ditches. *BEDDING and HAMADA (1982)* mentioned that these snails were commonly seen crawling in mud along the bank of water canals and channels.

An inverse ralation was observed between *Helisome duryi* and bilharzial snails (*Biomphilaria and Bulinus)* [Table, 4]. This relation confirms the competition phenomena between such snails already mentioned by *FRANDSEN and MADSEN (1979) and JAUBERT and DEKOCK (1990).* It could be concluded that this observation may be considered as one of the biological control measures of bilharzial snail vectors. The same relation was also observed between *Melania Tuberculata and Biomphilaria alexandrina* in *ABU El-Matamir* district and this was also observed by *MCCULLOUGH and MALEK (1984) and POINTER* et al. *(1989)* who stated that *Melania tuberculata* has a competitor effect on *Biomphilaria snails. MADSEN (1982)* suggested that the competition with *Biomphilaria* might be based on food competition or the competitor snail might predate on *Biomphilaria* egg masses.

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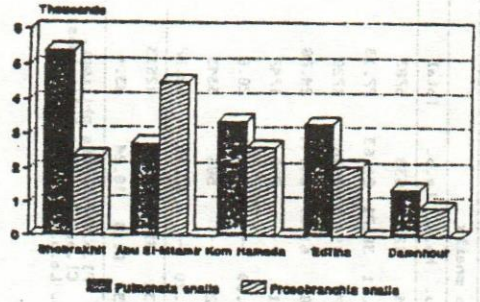

Fig.(1): Incidence of the revealed snails in five different centers in Behera province

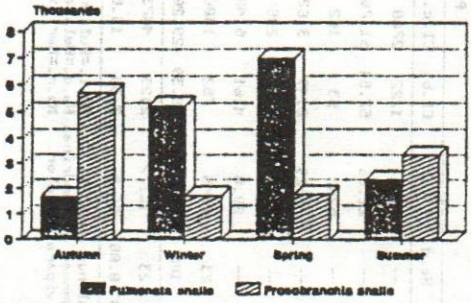

Fig.(2): Seasonal incedence of the revealed snails

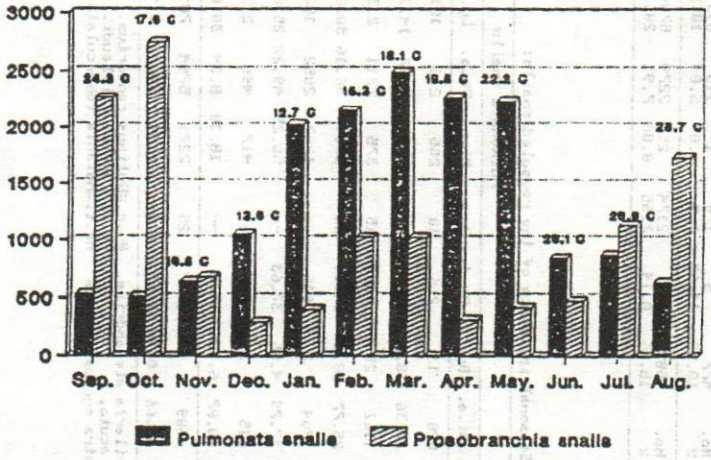

Fig.(3): Incidence of the revealed snails in relation to water temperature.

Table(1): Incidance of the revealed snails in 5 different centers in Behera province.

Centers		Pulmonata snails									Prosobranchia snails						Total
		Bi.a.	Bu.c.	Bu.d.	Bu.i.	Pl.p.	Ph.a.	Ly.c.	Ly.a.	He.d.	Cl.b.	Cl.c.	He.t.	Vi.u.	Ne.n.	La.b.	
Shobrakhit	No.	1879	12.00	625	1.0	275	2223	384	12.0	1.00	271	481	19	302	--	1306	7791
	%	41.67	27.91	28.75	4.0	12.07	38.37	54.16	1.67	4.35	12.75	10.75	1.73	16.46	--	44.27	27.06
Abu El-Mtanir	No.	452	9	342	8.0	575	1239	95	5	22	559	2131	906	134	20	782	7279
	%	10.02	20.92	15.73	32	25.23	21.38	13.40	0.70	95.65	26.31	47.64	82.36	7.31	64.52	26.51	25.28
Kom-Hamnada	No.	817	12	798	4.0	22	1256	46	426	--	184	1352	126	718	--	255	6088
	%	18.12	27.91	36.71	16.0	0.97	21.68	6.49	59.50	--	8.66	30.23	11.45	38.71	--	8.64	20.07
Edfina	No.	884	5	235	11	1292	478	119	270	--	933	399	39	385	10	323	5383
	%	19.61	11.63	10.81	44.0	56.89	8.25	16.78	37.71	--	43.90	8.92	3.55	21.0	32.26	10.95	18.70
Damnhour	No.	477	5	174	1	115	598	65	3	--	178	110	10	303	1	284	2324
	%	10.58	11.63	8.0	4.0	5.04	10.32	9.17	0.40	--	8.38	2.46	0.91	16.52	3.22	9.63	8.07
Total	No.	4509	43	2174	25	2279	5794	709	716	23	2125	4473	1100	1834	31	2958	28785
	%	15.66	0.14	7.55	0.08	7.91	20.12	2.46	2.48	0.08	7.38	15.54	3.82	6.37	0.10	10.24	

Table (2): Seasonal incidence of the revealed snails:

Season		Pulmonata snails										Prosobranchia snails							Total
		Bi.a.	Bu.c.	Bu.d.	Bu.i.	Pl.p.	Ph.a.	Ly.c.	Ly.a.	He.d.	Total	Cl.b.	Cl.c.	He.t.	Vi.u.	Ne.n.	La.b.	Total	
Autumn	No	828	13	266	10	285	236	101	32	--	1691	1222	2760	427	644	12	638	5703	7394
	%	18.36	30.23	12.24	40	9.0	4.07	14.25	4.47	--	22.86	57.51	61.70	38.82	35.11	38.71	21.63	77.13	
Winter	No	1162	25	742	15	375	2211	213	499	--	5242	53	162	323	147	19	1016	1720	6962
	%	25.77	58.14	34.13	60	16.45	38.16	30.04	69.69	--	75.29	2.49	3.62	29.36	8.02	61.29	34.44	24.70	
Spring	NO	1704	2	810	--	1282	2852	182	154	--	6994	98	245	273	341	--	790	1747	8741
	%	37.79	4.65	37.63	--	56.25	49.22	25.67	21.51	--	80.0	4.61	5.48	24.82	18.59	--	26.78	28.0	
Summer	No	815	3	348	--	417	495	213	3	23	2345	752	1306	77	702	--	506	3343	5688
	%	18.07	6.98	16.0	--	18.30	8.54	30.04	0.42	100	41.22	35.39	29.20	7.0	38.28	--	17.15	58.77	
Total	No	4509	43	2147	25	2279	5794	709	716	23	16272	2125	4473	1100	1834	31	2950	12513	28785
	%	15.66	0.14	7.55	0.09	7.91	20.12	2.46	2.48	0.08	56.5	7.38	15.54	3.82	6.37	0.10	10.24	43.4	

Bi.a.=Biomphilaria alexandrina. Bu.c.=Bulinus contortus. Bu.d.=Bulinus dybowski. Bu.i.=Bulinus innesi. Pl.p.=Planorbis philippi.
Ph.a.=Physa acuta. Ly.c.=Lymnaea caillaudi. Ly.a.=Lymnaea alexandrina. He.d.=Helisoma duryi. Cl.b.=Cleopatra bulimoides.
Cl.c.=Cleopatra cyclostemoides. He.t.=Melania tuberculata. Vi.u.=Vivipara unicolor. Ne.n.=Neritina nilotica. La.b.=Lanestis bolteni.

Table (3): Incidence of the revealed snails in relation to water temperature.

Season	Month	Av.water temperature	Number of collected snails			Total
			Pulmonata	Prosobranchia	Total	
Autumn	September	24.3	534	2270	2804	
	October	17.6	511	2750	3261	7394
	November	16.8	646	683	1329	
Winter	December	13.6	1057	295	1352	
	January	12.7	2028	400	2428	6962
	February	15.3	2157	1025	3182	
Spring	March	18.1	2487	1022	3509	
	April	19.8	2271	310	2581	8741
	May	22.2	2236	415	2651	
Summer	June	26.1	842	474	1316	
	July	26.9	867	1134	2001	5688
	August	28.7	636	1735	2371	

Table(4):The population competition between Schistosoma vectors,Helisoma duryi and Melania tuberculata in Abu El-Mtamir and Shobrakhit districts.

Month	Abu El-Mtamir				Shobrakhit		
	Biomphilaria alexandrina	Bulinus species	Helisoma duryi	Melania tuberculata	Biomphilaria alexandrina	Helisoma duryi	Melania tuberculata
September	19	13	--	70	260	--	--
October	9	7	--	181	182	--	--
November	62	33	--	12	43	--	16
December	83	90	--	18	106	--	--
January	93	113	--	5	194	--	--
February	23	18	--	282	149	--	--
March	38	10	--	242	171	--	--
April	13	8	--	3	280	--	3
May	49	15	--	17	212	--	--
June	18	26	--	18	49	--	--
July	41	20	--	38	112	--	--
August	4	3	22	20	121	1	--