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GENERAL SURVEY ON CERTAIN HELMINTH PARASITES INFECTING SOME NILE FISHES AT EL-MANSOURA, EGYPT.

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ABSTRACT

The present investigation deals with certain helminth parasites which infect the freshwater fishes in the Nile River and its common tributaries at Dakahlyia Governorate near El-Mansoura city, Egypt.

The examined fishes were identified as *Bagrus bajad* ; *B.docmac; Synodontis schall; S. serratus; Mormyrus caschive; Barbus bynni; Lates niloticus* and *Labeo niloticus.* These fishes were investigated monthly after weighing and measuring them and most of their internal organs were examined for helminth parasites.

The following trematodes were recorded: *Acamthodtomum absconditum; Haplorchoides cahirinus; Phyllodistomum aegyptiacus;* metacercariae of *Diplostomum* sp ; of *Neodiplostomum* sp and of *Posthodiplostomum* sp. Moreover, two nematode species were reported, namely: *Spinitectus moraveci* and *Capillaria yamagutii.* Meanwhile, no cestode parasites were recorded in this study.

Out of 400 collected fishes, 349 were found to harbour one or more types of parasites. The general infection rate was 87.25%. The infestation rate was highest in *Bagrus baiad* (97.7%) followed by *Bagrus docmac* (93.33%), while the lowest rate was recorded in *Barbus bynni* (69.7%).

It was noticed that single infection was recorded for trematodes and nematodes in hostfishes. Double infection was not detected in *Barbus bynni* and was very rare in other fishes except *B. bajad* and *B. docmac.*

The relation between fish host parameters (body length, weight and sex) and each of the prevalence and intensity of infection were

studied in the present investigation. A significant correlation was found between the host length and infection prevalence, between the host weight and prevalence and between the host sex and intensity of infection, while insignificant relation was recorded between the host length or weight and intensity; and between host sex and prevalence of infection.

INTRODUCTION

In order to follow up the present status of parasitic helminthes infesting freshwater fishes in Egypt, it was important to deal with them as two groups:

1- Studies concerned with incidence and seasonal dynamics.
2- Studies concerned with taxonomy and morphology of the parasites.

The first group was dealt by many authors such as; Imam (1971); El-Naffar and Saoud (1974); Moravec (1975); Fahmy *et al.*,(1976); Moravec (1977); Wannas (1977); Tadros *et al.*,(1978); Imam *et al.*,(1979); Noor El-Din (1981); Sahlab (1982); El-Naffar *et al.*,(1983); Abu El-Hag (1985); Negm El-Din (1987); El-Naggar and Khidr (1987); Khidr (1990) and Hagras *et al.*,(1995).

From the above review, it was clear that the incidence and seasonal dynamics of the parasitic fauna of the freshwater fishes in Dakahlyia Governorate attracted less attention of helminthologists. Therefore, this work was planned to study the parasites of certain freshwater fishes (other than *Clarias* spp. and *Tilapia* spp) through a complete year. The selected fishes also have high economic importance.

MATERIALS AND METHODS

Eight species of fishes belonging to four orders and five families had been collected from the Damietta branch of the River Nile and its tributaries at a distance about 20 kilometers around El-Mansoura City, Dakahlyia Governorate, Egypt. These fishes were identified using the references of Wheeler (1985); Holden-Day (1988) and Bishai & Khalil 1997)

The host fishes were *Bagrus bajad*; *Bagrus docmac*; *Mormyrus caschive*; *Labeo niloticus*; *Barbus bynni*; *Synodontis schall*; *Synodontis serratus* and *Lates niloticus*.These fishes were brought alive to the laboratory, followed by taking brief notes on their identification; sex and date of collection. Each fish was weighed and measured from the anteriormost end of the head until the base of the caudal fin (standard length).

The examined host fishes were divided into three length classes: class I (up to 15 cm), class II (from 16- 20 cm) and class III (over 21 cm). Also, they were divided into three weight classes; class I (up to 20 gm), class II (from 21-160 gm) and class III (over 161 gm).

The host fishes were then dissected and their different internal organs were isolated in separate Petri-dishes containing saline solution (0.6- 0.9% NaCl). The organs examined were; the alimentary canal (oesophagus, stomach, intestine and rectum), ovaries, testes, kidneys, air sacs, muscles and the eyes. Each organ was opened by a fine scissor and left in the saline solution for some time with occasional shaking.

Using the dissecting microscope, the helminth parasites were detached from the tissues. The collected worms were cleaned by washing several times in saline solution and counted.

Permanent preparations of the helminth parasites were done by using different fixatives such as formol saline and 70% ethyl alcohol and different stains such as alum-carmine and aceto-carmine for trematodes, while the nematodes were prepared by lactophenol-trichrome stain method.

Statistical analysis were done to evaluate the results such as t-test and one way of variances (ANOVA test).

RESULTS

A total of 400 specimens from local freshwater fishes belonging to 8 species namely: *Bagrus baiad; B. docmac; Synodontis schall; S serratus; Mormyrus caschive; Barbus bynni; Labeo niloticus* and *Lates niloticus* were examined for endoparasites. Results of this examination revealed that these host fishes were parasitized by helminthes belonging to Digenea and Nematoda, while the cestode parasites were not detected in the examined fish species. The digenetic trematodes which were found in this study were represented by: *Acanthostomum absconditum* Looss, 1901; *Haplorchoides cahirinus* Looss, 1896; *Phyllodistomum aegyptiacus* n.sp; metacercariae of *Diplostomum* sp; *Neodiplostomum* sp. and of *Posthodiplostomum* sp. Besides, two nematodes were identified namely: *Capillaria yamagutii* Tadros and Mahmoud, 1968 and *Spinitectus moraveci* Boomker and Puylaert, 1994.

Micro-habitat of Parasites:

As illustrated in Table (1), the digenetic trematodes were collected from the various examined organs of the fishes and distributed as follows: *A. absconditum* and *Haplorchoides cahirinus* from in the stomach and intestine of *Bagrus bajad* and *B. docmac* *Phyllodistomum aegyptiacus* from the testes and ovaries of *B. bajad; B. docmac; Synodontis schall; Synodontis serratus* and *Lates niloticus*. The metacercariae of both *Diplastomum* and *Neodiplostomum* from the eyeball of all the examined fishes, while the metacercariae sp of *Posthodiplostomum* sp were collected from other organs than the eyes of *Barbus bynni* and *Labeo niloticus*.

Moreover, the nematode parasites were collected as follows: *Capillaria yamagutii* from the intestine of *Bagrus bajad, Mormyrus caschive* and *Lates niloticus*. Finally, specimens of *Spinitectus moraveci* were collected from the stomach of *B. bajad; B. docmac; Synodontis schall; Synodontis serratus* and *Lates niloticus*.

General Prevalence:

Table (2) and Figure (1) show that the general prevalence of infection was highest in *B. bajad* (97.7%), while the lowest was recorded in *Barbus bynni* (69.7%).

Community structure:

Table (3)and Figure (2) illustrate the percentages of infection of trematodes that were higher than those of nematodes in all examined fishes. The highest infection of trematodes was in *Barbus bynni* (100%), while the lowest one was in *Bagrus bajad* (77.95). Moreover, the highest infection of nematodes was recorded in *B.bajad* (22.05). while no nematodes were detected in *Barbus bynni* (0.0%).

Combination of major groups of parasites (Table 4 and Fig.3)

A) Single infection:

The single infection of trematodes was recorded in all examined fishes with a minimum percentage (77.95) in *B. bajad*, and a maximum percentage (100%) in *Barbus bynni* with the total percentage of 87.67%. The nematodes single infection were found in all the examined fishes except *Barbus bynni*. Their minimum percentage was 2.94% in *Synodontis schall*, maximum percentage was 22.05% in *B. bajad* and a total percentage 12.32%. It was noticed that the total percentage of single infection of nematodes was much lower than that of trematodes in all of the examined fishes except in genus *Bagrus* which had highest percentages (22.05% in *B. bajad* and 21.42% in *B. docmac*).

B) Double infection :

In the present study, double infection represented by nematodes and trematodes was very low in all the examined fishes except *Bagrus bajad* and *B. docmac* which had the highest values of double infections. The minimum and maximum percentages were 2.94% in *Synodontis schall* and 27.6% in *Bagrus bajad* respectively. This double infection was not detected in *Barbus bynni.*

There was no triple infection, as the cestodes were not recorded in this investigation.

Relation between the host length and prevalence of infection:

As illustrated in Table (5) and Figure (4), there are minor differences in the prevalence of helminth infection in the different host length classes. Hosts of class II are somewhat more susceptible to infection followed by hosts of class III and then class I. The higher and lower prevalence of length class II were 40.0% in May and September and 28.57% in March respectively. The maximum and minimum prevalence for host length class III were 41.37% and 26.66% in January and in May respectively. Furthermore, the hosts of length class I presented the lowest prevalences in six months. The maximum and minimum prevalence for this class were 39.13% and 24.14% in April and in January respectively.

One way ANOVA test revealed that there are highly significant differences in prevalences of helminthes among the three length classes of the examined hosts (DF=35, F-ratio=106.82, F-probability < 0.0001).

Relation between the host length and intensity of infection:

Table (6) and Figure (5) revealed the effect of host length on the intensity of infection thrugh the period of study. The minimum and maximum intensity of host length class I were 2.59 in February and 5 in November respectively, while those of class II were 2.5 in July and 3.86 in April respectively. Moreover, the minimum and maximum intensity of class III were 2.38 in July and 6 in December respectively. It was concluded that the intensities of infection of the three classes are nearly similar along the period of study with minor differences.

One-way ANOVA test revealed insignificant differences in the intensities of infection among the three length classes of the examined fishes.

Relation between the host weight and prevalence of infection:

The effect of host weight on the prevalence of infection was illustrated in Table (7) and Figure (6). It was obviously noted that the prevalence of host weight class III, had the lowest values during the period of study with minimum and maximum values 10.34 in November and 21.8 in February respectively. The prevalence of host weight class I, was the highest in most of months of study with minimum and maximum values 36.6 in May and 55.17 in November respectively. Moreover, the minimum and maximum values of prevalence of class II were 10.34 in November and 21.8 in February respectively.

One way ANOVA test revealed that there are highly significant differences in the prevalences of infection among the three weight classes of the examined hosts (DF=35, F-ratio=96.96, F-probability = 0.0001).

Relation between the host weight and intensity of infection:

Table (8) and Figure (7) show that the intensities of the host weight classes had low values. These values were nearly similar to each other allover the period of study except in four months (March, April, May and December) where the hosts of weight class III had the highest values. The minimum and maximum values of intensities of the three classes were; 2.67 in February and 5 in November for class I; 2.08 in May and 4.22 in August for class II and 2.25 in June and 6.5 in May for class III respectively.

One-way ANOVA test revealed insignificant differences in the intensities of infection among the three weight classes of the examined host fishes.

Relation between the host sex and prevalence of infection

The effect of sex of the host fishes on the prevalence of infection was illustrated in Table (9) and Figure (8). It was clear that the prevalence in males was 100% in January, February, September and December, while it was 100% for females in October and December only. The minimum prevalences in males and females were 69.2 in April and 50% in March respectively. In most of the year, the prevalence of males was slightly higher than of females.

T-test statistical analysis reveals that there are non-significant differences between the prevalences of the infected males and females of the examined host fishes.

Relation between the host sex and intensity of infection

The intensities of infection of male and female fishes are illustrated in Table (10) and Figure (9). The intensities in males were higher than in females allover the period of study, except in two months (March and September) where those in females were higher than in males. The minimum and maximum intensities were 3.67 in September and 6.13 in November for males and 2 in October and 6.33 in March for females respectively.

Statistically, t-test revealed significant differences between males and females of the infected fishes.

DISCUSSION

In the present study, three adult digenean species, two adult nematode ones, and three metacercariae of digeneans were collected. The digenean parasites were *Acanthostomum absconditum* Looss, 1901; *Haplorchoides cahirinus* Looss, 1896; *Phyllodistomum aegyptiacus* n. sp., *Diplostomum* sp; *Neodiplostomum* sp. and *Posthodiplostomum* sp. The nematode parasites were *Spinitectus moraveci* Boomker and Puylaert, 1994; *Capillaria yamaguti* Tadros and Mahmoud 1968.

During the period of study, two freshwater fishes *Bagrus bajad* and *B. docmac* were found to harbour all the above mentioned parasite species except *Posthodiplostomum* sp. in *B. bajad* and *Posthodiplost-omum* sp. and *Capillaria yamaguti* in *B. docmac*. These host fishes had the highest prevalence (97.69% in*B. bajad* and 93.33% in *B. docmac)*. Such results agreed with Fahmy & Selim (1959); Moravec (1977) and Shalaby *et al.*, (1987).

Analysis of the parasites in the present investigation (Tables 1&11) indicates that these species can be roughly divided into four groups according to the degree of their host specificity: Group I strictly specific species occurring only in two hosts (*Posthodiplostomum* sp., *Acanthostomum absconditum* and *Haplorchoides cahirinus)*. Group II including species parasitizing three host species (*Capillaria yamaguti*). Group III the parasites infecting five host fish species (*Neodiplostomum* sp.; *Phyllodistomum aegyptiacus* and *Spinitectus moraveci)*. Group IV those infect all the examined host fishes (*Diplostomum* sp.).

Comparison among the above groups revealed that the freshwater genus *Bagrus* was specific host for the parasites *A. absconditum* and *H. cahirinus* in Egypt in accordance with Imam *et* *al.*, (1991) and Arafa *et al.*, (2002). The two host species *B. bynni* and *L. niloticus* were specific hosts for *Posthodiplostomum* sp. Moreover, the metacercariae of *Diplostomum* sp. have a wide range of host specificity as they were recorded from all of the examined fishes in the present study. These metacercariae were also reported previously from other fishes such as *Tilapia* spp. and *Clarias* spp. These results indicate that metacercariae have low host specificity that are considered to offer successful life cycles to these metacercariae which have to pass through three hosts; two intermediate hosts (snail and fish) and a final host (fish-eating birds) during their life cycles. These results are in agreement with Kawai and Yamoto (1936); Ito et al., (1967); Soh *et al.*, (1976) and Shalaby *et al.*, (1987).

It was concluded that the Nile fishes act as second intermediate hosts of some trematodes since most of these fishes specially those in the Nile tributaries are living near the shore where the first intermediate hosts (snails), as well as fishes are living where the infection with cercariae is facilitated. Such findings may help in the control of such trematodes. These results support the study of Shalaby *et al.*, (1987).

The present study revealed that some of the examined fishes harboured a little number of parasites than others, in agreement with Rekharani and Madhavi (1985) who stated that the disappearance of some parasite species in fishes has been directly related to fluctuating salinity conditions because the infecting stages of the parasites and their intermediate hosts are mostly stenohaline. Moreover, Kennedy *et al.*, (1986) stated that the number of parasite species that a fish species harbours varies widely from one host to another and from locality to another.

Interaction between fishes, & terrestrial birds and mammals influences the parasite fauna of fish as stated by Wisniewski (1958); Chubb (1963); Esch (1971); Esch *et al.*, (1975) and Cone & Anderson (1977). This interaction is reflected in the present investigation by the presence of large number of helminthes using the examined fishes as intermediate hosts in case of the diplostomatid metacercariae.

The increase in the prevalence of helminth parasites may be also related to the increased foraging activity by fish responding to better feeding conditions which may increase their exposure to cercariae of trematodes in the nearshore littoral zone of the Nile and its branches, where the snails (the intermediate hosts) primarily occur, in accordance with Albert & Curtis (1991).

The prevalence of helminth parasites in this study increases with the increase in length of fishes and there is a highly significant difference in the prevalence among the three classes of host fishes in accordance with Muzzall (1980), while there is an insignificant difference in the intensities of the length classes of fishes as observed by Muzzall (1982) and Muzzall *et al.*, (1990). The increased prevalence with increasing in fish length may be due to the increase and growth of the interenal organs of the hosts leading to the increase in the surface areas of infection as suggested by El-Naggar & Khidr (1986); Khidr (1990) and Hagras *et al.*, (1995) or could be due to the exposure time of infection (Muzzall *et al.*, 1990). The increase of fish number in the habitat may increase the infection and the number of parasites as recorded by Muzzall *et al.*, (1990).

The highly significant differences in prevalence between weight classes of host fishes are contrary with Muzzall *et al.*, (1990) but agree them in the case of intensities of the different weight classes where there are non-significant differences.

Marcogliese *et al.*, (2001) found positive relationships between abundance of *Diplodistomum* spp and fish length, mass, gonad mass, condition index and gonadosomatic index. In the present investigation, there is an insignificant difference in the prevalence between males and females, while there is significant difference in their intensities.

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Table (1): Microhabitat distribution of the helminth parasites in the examined freshwater fishes.

Examined Hosts fishes	Examined parasites	Infected organs
(A) family: Bagridae	*Diplostomum*	Eye
	Neodiplostomum.	Eye
	Acanthostumum	stomach + intestine
Bagrus bayad	*Haplorchoides*	st + inte
	Phyllodistomum.	Testis + ovary
	Cappillaria	Intestine.
	Spinitectus	stomach
Bagrus docmac	*Neodiplostomum.*	Eye
	Diplostomum	Eye
	Acanthostumum	stomach + intestine
	Haplorchoides	stomach + intestine
	Phyllodistomum	Testis + ovary
	Spinitectus	stomach
(B) Family: Syonodontidae *Synodontis schall*	*Diplostomum*	Eye
	Phyllodistomum .	Ovary + Testis
	Spinitectus	Stomach
S. serratus	*Diplostomum*	Eye
	Phyllodistomum.	Ovary + Testis
	Spinitectus	stomach
(C) Family: Mormyridae	*Diplostomum*	Eye
Mormyrus caschive	*Capillaria*	Intestine.
(D) Family: Cyprinidae	*Neodiplostomum.*	Eye
Barbus bynni	*Diplostomum*	Eye
	Posothodiplostomum	All organs
	Neodiplostomum	Eye
Labeo niloticus	*Diplostomum*	Eye
	Posothodiplostomum	Liver + Kidney + Muscles
(E) Family: Centropomidae	*Diplostomum*	Eye
	Neodiplostomum	Eye
Lates niloticus	*Phyllodistomum*	Ovary + Testis
	Capillaria	Intestine.
	Spinitectus	Stomach

Table (2): General prevalence of infection in the examined hostes.

Examined host fishes	Number Examined	Postitive	
		number	%
Bagus bayed	130	127	97.69
B. docmac	15	14	93.33
Synodontis schall	82	68	82.93
S. serratus	30	26	86.67
Mormyrus caschive	20	15	75
Barbus bynni	33	23	69.7
Labeo niloticus	47	39	82.98
Lates niloticus	43	37	86.05
Total	400	349	87.25

Table (3): The community structure of the helminth parasites infected the examined freshwater fishes:

Examined host fishes	Number Examined	positive No.	%	Infections: Trematodes No.	%	Nematodes No.	%	Cestodes No.	%
Bagus bayed	130	127	97.69	99	77.95	28	22.05	0	0
B. docmac	15	14	93.33	11	78.57	3	21.43	0	0
Synodontis schall	82	68	82.93	66	97.06	2	2.94	0	0
S. serratus	30	26	86.67	25	96.15	1	3.85	0	0
Mormyrus caschive	20	15	75	12	80	3	20	0	0
Barbus bynni	33	23	69.7	23	100	0	0	0	0
Labeo niloticus	47	39	82.98	35	89.74	4	10.26	0	0
Lates niloticus	43	37	86.05	35	94.59	2	5.41	0	0
Total	400	349	87.25	306	87.68	43	12.32	0	0

Table (4): Single and simultaneous double and triple infection in the studied freshwater fishes:

Examined host fishes	Number of infected fishes	Single: Trematode No.	%	Single: Nematode No.	%	Single: Cestode No.	%	double: Tre.+ Nema. No.	%	double: Trema+ Ces. No.	%	double: Nema+ Ces. No.	%	triple: Tri.+ Nema+ Ces. No.	%
Bagrus bayad	127	99	77.95	28	22.05	0	0	35	27.56	0	0	0	0	0	0
B. docmac	14	11	78.57	3	21.43	0	0	3	21.43	0	0	0	0	0	0
Synodontis schall	68	66	97.06	2	2.94	0	0	2	2.94	0	0	0	0	0	0
S. serratus	26	25	96.15	1	3.85	0	0	1	3.85	0	0	0	0	0	0
Mormyrus caschive	15	12	80	3	20	0	0	1	6.67	0	0	0	0	0	0
Barbus bynni	23	23	100	0	0	0	0	0	0	0	0	0	0	0	0
Labeo niloticus	39	35	98.74	4	10.26	0	0	4	10.26	0	0	0	0	0	0
Lates niloticus	37	35	94.5	2	5.41	0	0	2	5.41	0	0	0	0	0	0
Total	349	306	87.68	43	12.32	0	0	48	13.8	0	0	0	0	0	0

Table (5): Relattion between the hosts length and the prevalence of infection

Months	Total Exam	Total infect	%	Length classes: Class I No	%	Class II No	%	Class III No	%
Jan	30	29	96.6	7	24.14	10	34.48	12	41.37
Feb	33	32	97	9	28.12	11	34.37	12	37.5
March	26	21	80.7	8	38.09	6	28.57	7	33.3
Apr	33	23	69.7	9	39.13	7	30.44	7	30.43
May	40	30	75	10	33.33	12	40	8	26.66
Jun	33	29	87.8	9	31.03	11	37.93	9	31.03
Jul	35	29	82.8	9	31.03	11	37.93	9	31.03
Aug	36	28	77.7	8	28.57	10	35.72	10	35.7
Sept	32	30	93.7	9	30	12	40	9	30
Oct	38	36	94.7	12	33.3	14	38.89	10	27.7
Nov	31	29	93.5	9	31.03	11	37.93	9	31.03
Dec	33	33	100	11	33.33	13	39.39	9	28.125

Class I (up to 12 cm)
Class II (13- 20 cm)
Class III (over 21 cm)

Table (6): Relation between the host length and the intensity of infection

Months	Total Exam	Total infect	Length classes								
			Class I			Class II			Class III		
			Inf. Host	no. of worm	intensity	inf. Host	no. of worm	intensity	inf. Host	no. of worm	intensity
Jan	30	29	10	35	3.5	12	40	3.33	7	18	2.57
Feb.	33	32	17	44	2.59	10	33	3.3	5	14	2.8
March+A64	26	21	9	38	4.22	9	26	2.89	3	10	3.3
April	33	23	10	30	3	8	31	3.86	5	17	3.4
May	40	30	14	37	2.6	11	30	2.73	5	28	5.6
Jun	33	29	11	30	2.73	11	36	3.27	7	27	3.86
July	35	29	11	33	3	10	25	2.5	8	19	2.38
Agust	36	28	14	40	2.86	9	30	3.3	5	17	3.4
Sept.	32	30	12	41	3.42	12	40	3.3	6	30	5
Octob.	38	36	15	52	3.47	15	45	3	6	29	4.83
Novemb.	31	29	10	50	5	11	42	3.82	8	40	5
Decem.	33	33	15	56	3.73	13	40	3.08	5	30	6

Class I (up to 12) cm Class II (13-20) cm Class III (over 21c m)

Table (7): Relation between the host weight and prevalence

Months	Total Exam	Total infect.	%	weight classes					
				Class I		Class II		Class III	
				No	%	No	%	No	%
Jan	30	29	96.6	15	51.7	10	32.25	4	13.8
Feb	33	32	97	15	46.8	10	31.25	7	21.8
March	26	21	80.7	10	47.6	8	38.09	3	14.28
Apr	33	23	69.7	10	45.45	9	40.9	4	17.4
May	40	30	75	11	36.6	15	50	4	13.33
Jun	33	29	87.8	10	34.48	14	48.27	5	17.24
Jul	35	24	82.8	10	41.6	10	41.6	4	16.66
Aug	36	28	77.7	11	39,28	13	46.42	4	14.28
Sept	32	30	93.7	15	50	10	33.33	5	16.66
Oct	38	36	94.7	16	44.44	14	38.88	6	16.66
Nov	31	29	93.5	16	55.17	10	34.48	3	10.34
Dec	33	33	100	17	53.13	11	34.37	5	15.15

Class I (up to 90 gm.) Class II (91- 160gm). Class III (over 161gm).

Table (8): Relation between the host weight and the inensity of infection

Months	Total Exam	Total infect	weight classes								
			Class I			Class II			Class III		
			inf Host	no of worm	intensity	inf Host	no of worm	intensity	inf Host	no of worm	intensity
Jan	30	29	12	45	3.75	12	38	3.17	5	21	4.2
Feb	33	32	15	40	2.67	14	30	2.14	3	9	3
March	26	21	10	37	3.7	9	27	3	2	10	5
April	33	23	11	38	3.45	9	25	2.78	3	17	5.67
May	40	30	16	51	3.19	12	25	2.08	2	13	6.5
Jun	33	29	11	39	3.55	10	29	2.9	8	18	2.25
July	35	29	12	40	3.33	10	32	3.2	7	20	2.86
Agust	36	28	12	43	3.58	9	38	4.22	7	24	3.43
Sept	32	30	14	51	3.64	11	30	2.73	5	21	4.2
Octob	38	36	16	56	3.5	14	41	2.93	6	31	5.17
Novemb	31	29	10	50	5	10	39	3.9	9	30	3.33
Decem	33	33	15	54	3.6	13	40	3.08	5	31	6.2

Class I (up to 90 gm) Class II (91-160 gm) Class III (over 161 gm)

Table (9):Relation between the host sex and prevalence of infection

Month	Males			Females		
	No. Eex	No. Infect	%	No. Ext	No. infect	%
Jan	22	22	100	8	7	87.5
Feb	25	25	100	8	7	87.5
Mars	20	18	90	6	3	50
April	26	18	69.2	7	5	71.4
May	32	25	78.13	8	5	62.5
Jun	26	23	88.5	7	6	85.7
Jul	26	22	84.6	9	7	77.8
Augst	26	19	73.07	10	9	90
Sept	27	27	100	5	3	60
Oct	28	26	92.85	10	10	100
Nov	24	23	95.8	7	6	85.7
Dec	28	28	100	5	5	100

Table (10): Relation between the host sex and the intensity of infection

Months	Total Exam	Total infec	Males			Females		
			Inf. Host	no. of worm	intensity	inf. Host	no. of worm	intensity
Jan	30	29	24	144	6	5	30	6
Feb.	33	32	25	130	5.2	7	23	3.29
Mars.	26	21	18	90	5	3	19	6.33
April	33	23	18	100	5.56	5	23	4.6
May	40	30	25	112	4.48	5	15	3
Jun	33	29	23	109	4.74	6	13	2.17
July	35	29	22	152	6.91	7	21	3
Agust	36	28	19	101	5.32	9	30	3.33
Sept.	32	30	27	99	3.67	3	13	4.33
Octob.	38	36	26	111	4.27	10	20	2
Novemb.	31	29	23	141	6.13	6	30	5
Decem.	33	33	27	152	5.63	6	35	5.83

Parasite / *Host*	A.absco-nditum	H.cahir-inus	P.aegypti-acus	*Diplosto-mum*	*Neodiplo-stomum*	*Posthodiplo - stomum*	*S.mora-veci*	*C.yam-agutii*
B. bayad	+	+	+	+	+	-	+	+
B.docmac	+	+	+	+	+	-	+	-
S. schall	-	-	+	+	-	-	+	-
S. serratus	-	-	+	+	-	-	+	-
Barbus bynni	-	-	-	+	+	+	-	-
Mormyrus caschive	-	-	-	+	-	-	-	+
Labeo niloticus	-	-	-	+	+	+	-	-
Lates niloticus	-	-	+	+	+	-	+	+

Table (11): Host-specificity of the examined parasites.

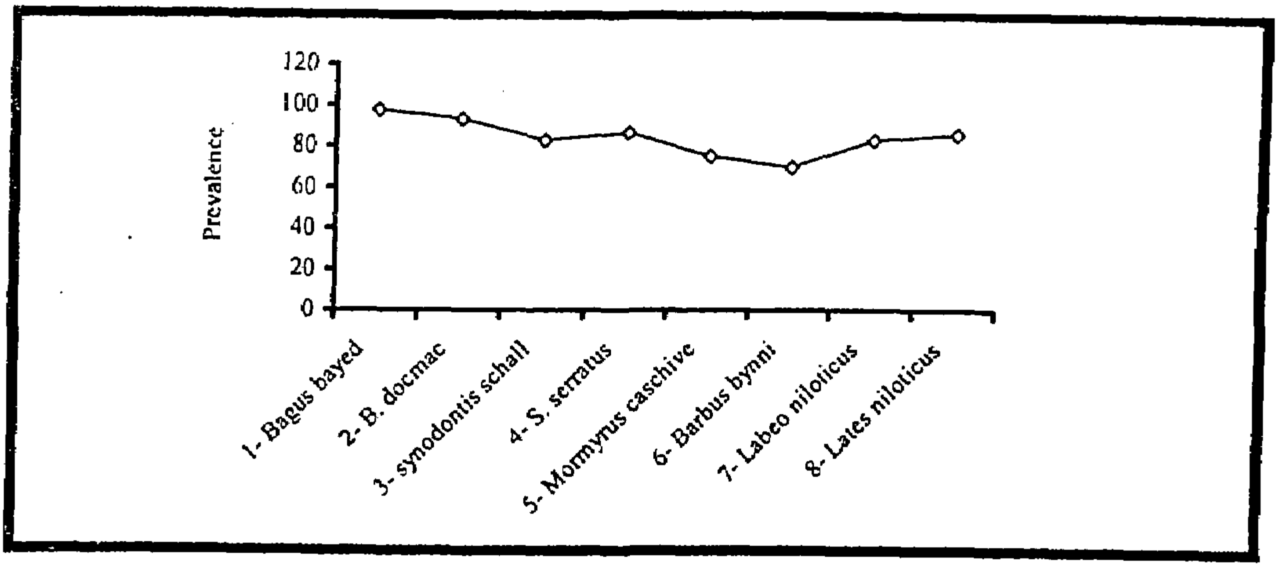

Fig. (1): General prevalence of infection in the examined hosts.

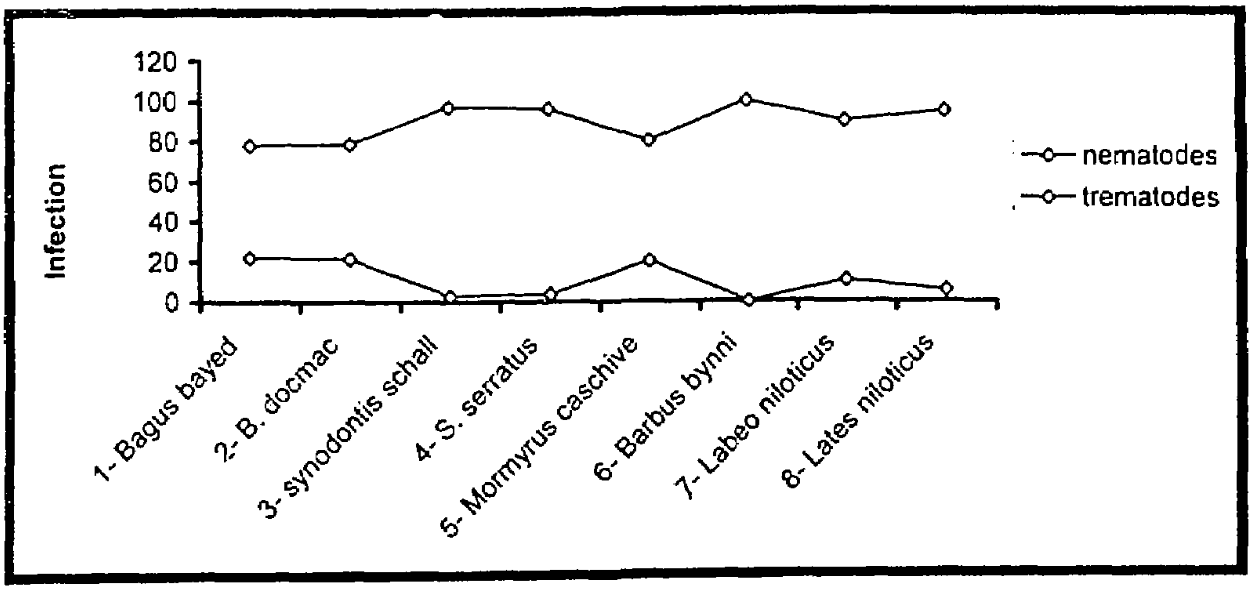

Fig. (2): the community structure of the helminth parasites infected the examined fresh waterfishes.

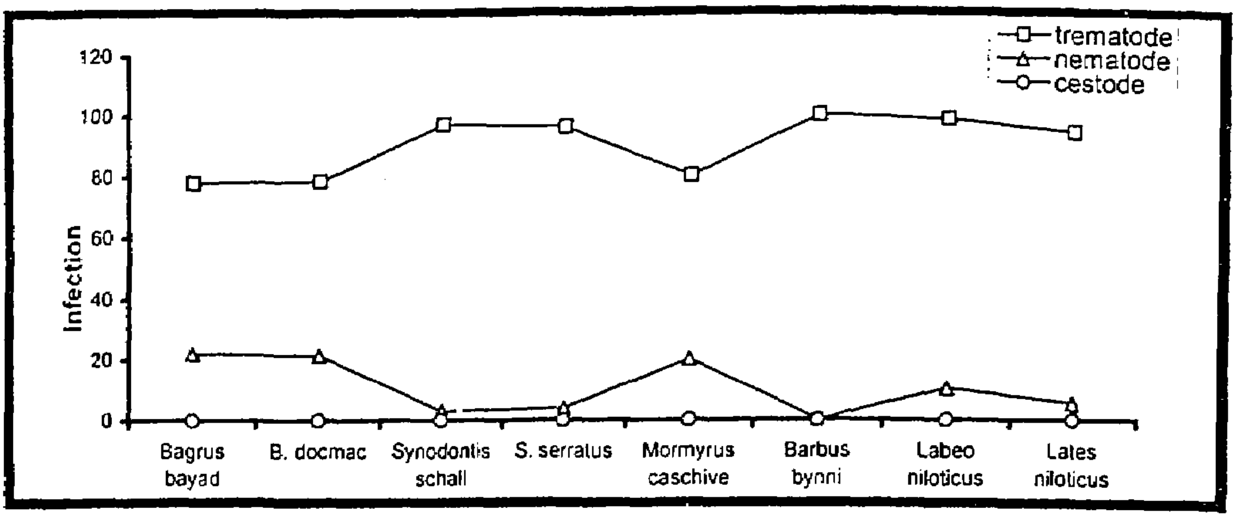

Fig. (3a): Single infection in the studied freshwater fishes:

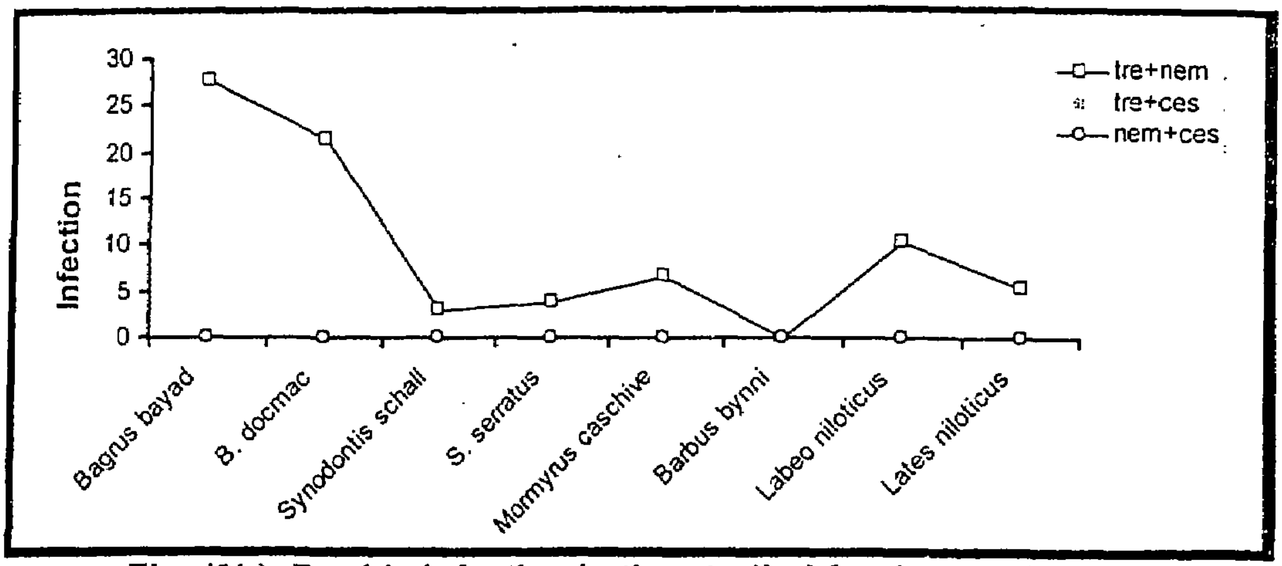

Fig. (3b): Double infection in the studied freshwater fishes.

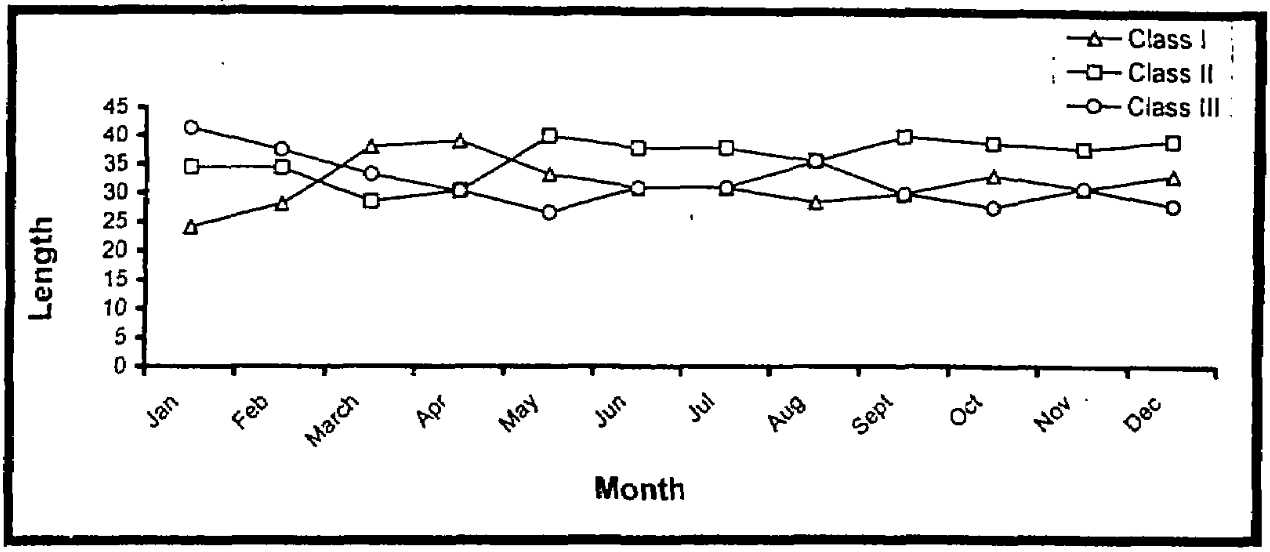

Fig. (4): Relation between the host length and prevalence of infection.

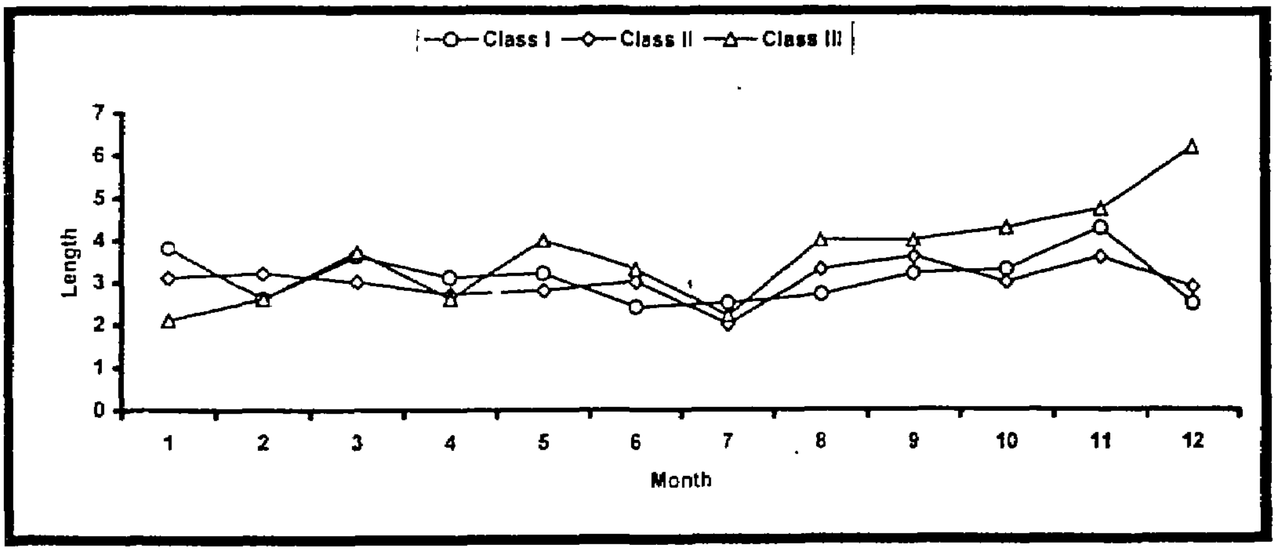

Fig. (5): Relation between the host length and intensity of infection

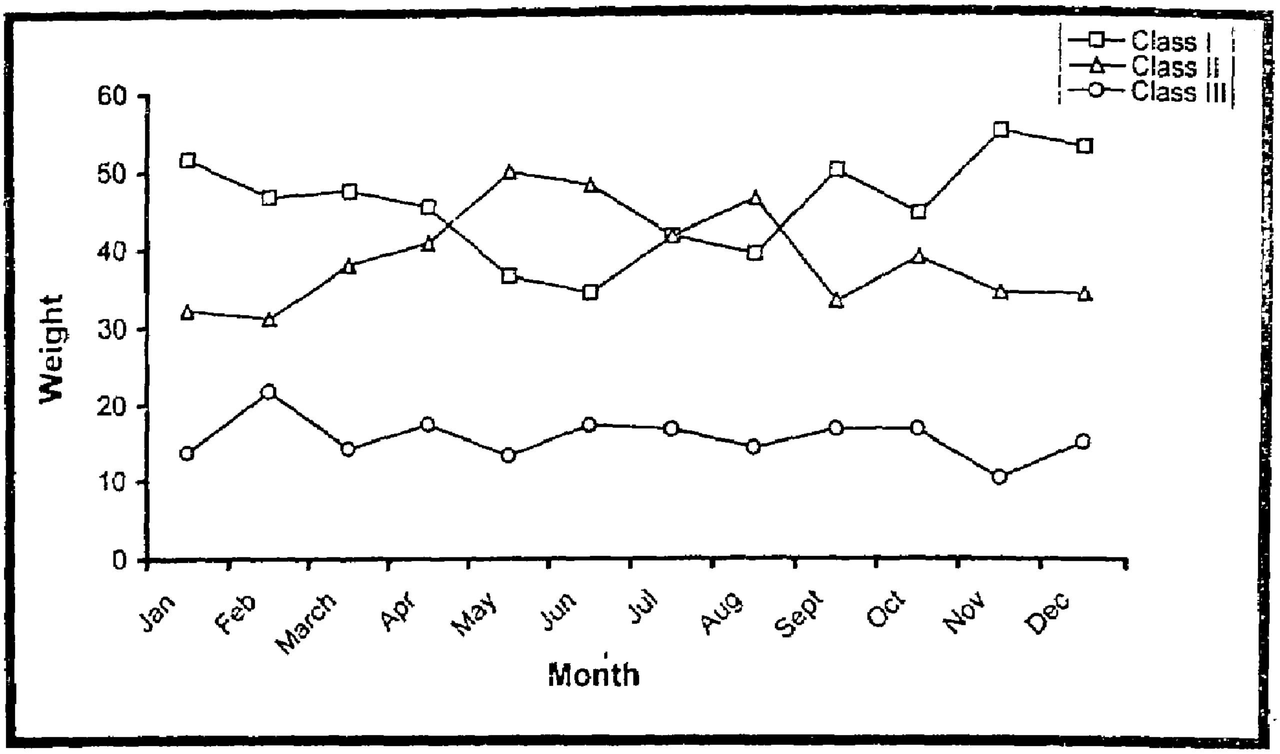

Fig. (6): Relation between the host weight and prevalence

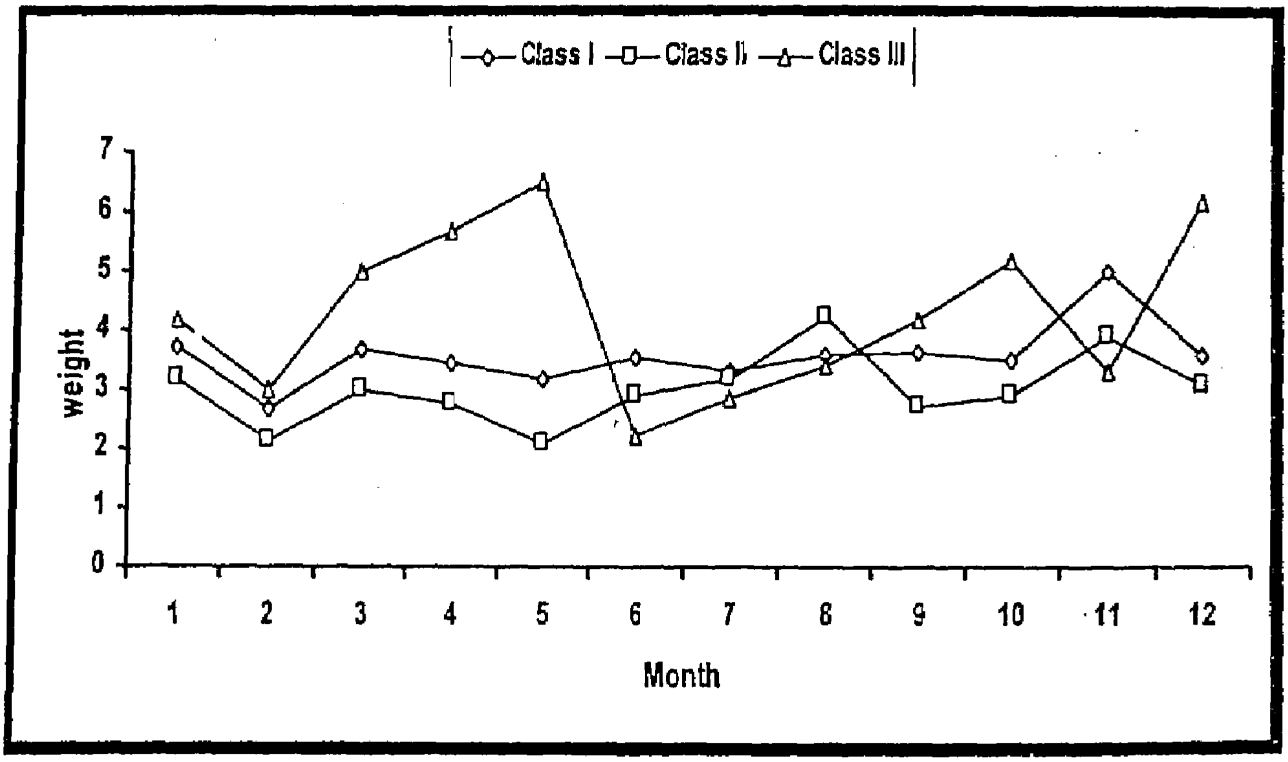

Fig. (7): Relation between the host weight and the intensity of infection.

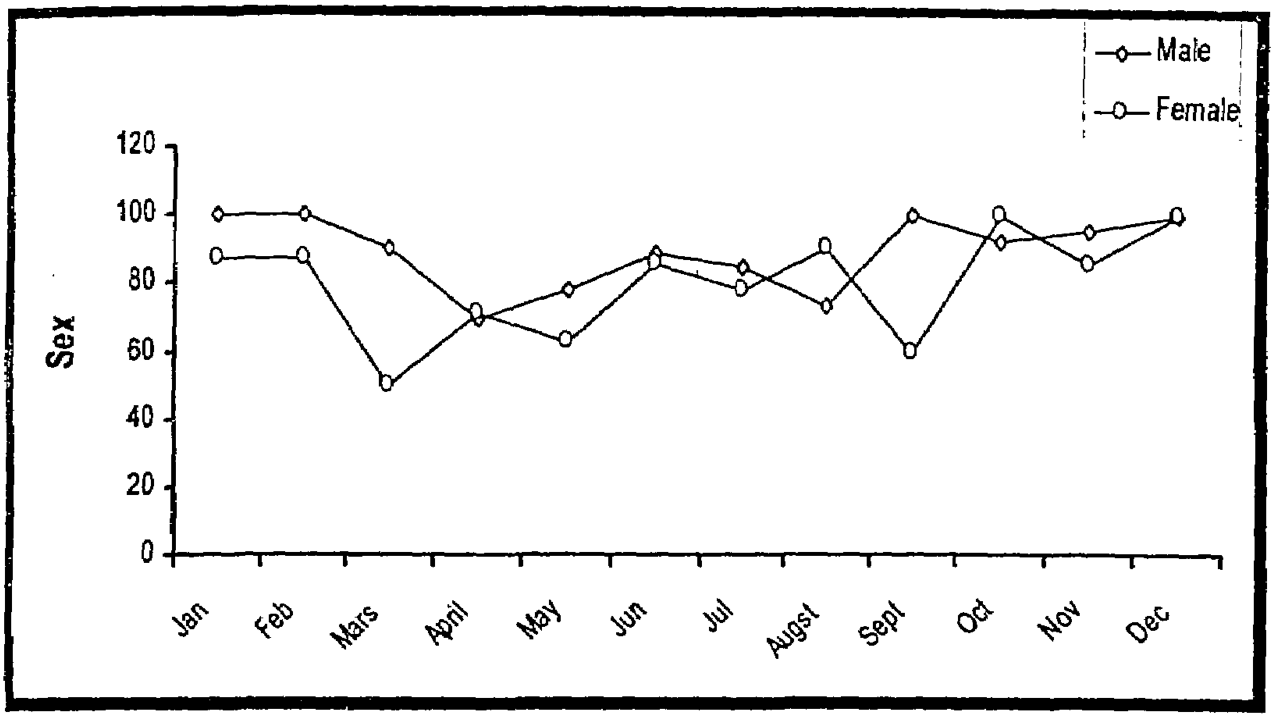

Fig (8): Relation between the host sex and prevalence of infection.

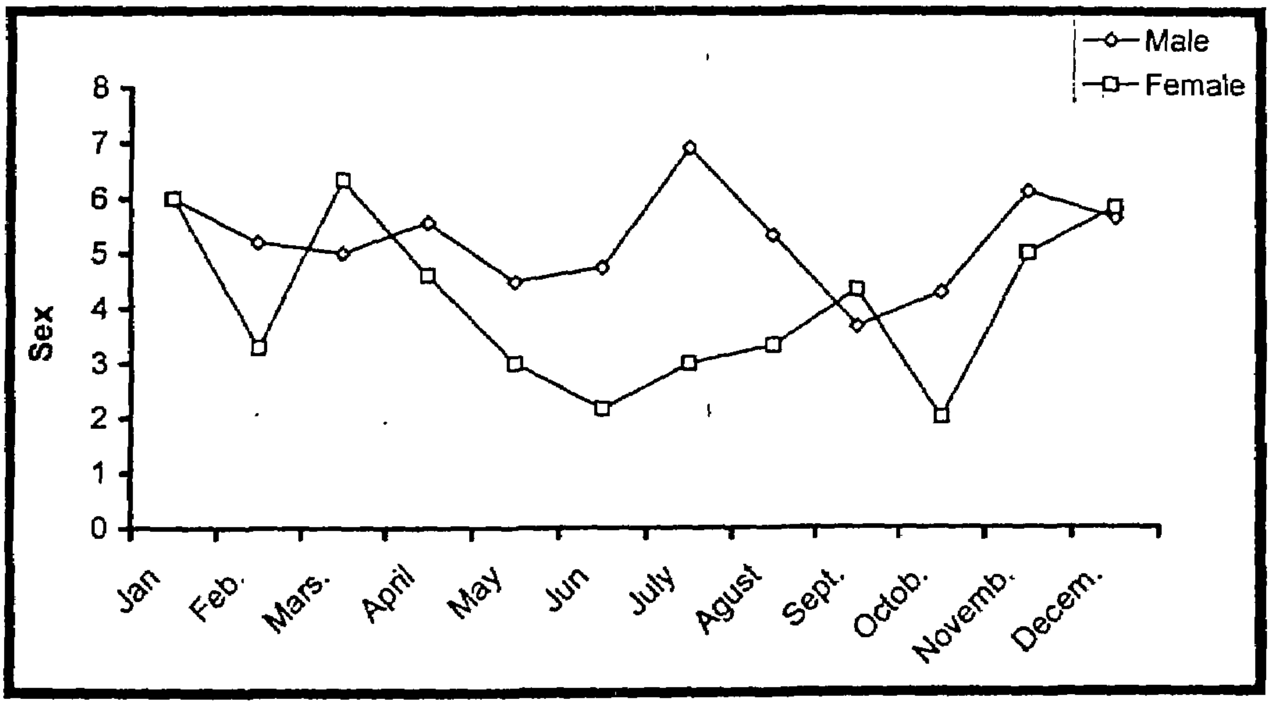

Fig. (9): Relation between the host sex and the intensitv of infection