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POPULATION DENSITY OF HELMINTHS IN DUCKS: EFFECTS OF HOST'S AGE, SEX, BREED AND SEASON

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ABSTRACT

A study was conducted to investigate the population density of helminth parasites in domestic ducks (*Anas boschas domesticus*) in relation to host's age, sex, breed and seasons of the year from March 2002 to May 2003. A total of 300 ducks were collected from different villages of Netrokona and Mymensingh districts of Bangladesh and autopsied to collect the parasites and counted to determine the population density of parasites. Off 300 ducks examined, 290 (96.66%) were infected with 17 species of helminth parasites in which 11 species were trematodes, 4 were cestodes and 2 nematodes. Among the parasites, density of cestodes was the highest (33.15±5.26), followed by trematodes (5.98±1.32); and nematodes (2.95±0.68). Mean density of parasites increased with the increase of age (young: 21.23±1.09, adult: 26.18±2.14 and old: 27.87±2.98) while the mean density of most of the helminth parasites was higher in female ducks (31.35±4.72) than in males (27.52±3.32). Indigenous ducks (33.72±3.61) were infected with the highest load of helminths than Khaki Campbell breed (29.61±4.32) of ducks. Mean density of most trematodes (5.42±0.80) were highest in winter season whereas mean density of all cestodes (48.43±4.85) and nematodes (4.13±1.76) were highest in summer. The present study suggests that age, sex, breed of ducks and seasons of the year influence the parasitic infection to a greater extend.

Key words: Population density, helminths, duck, Bangladesh

INTRODUCTION

The duck fulfill a great proportion of protein deficiency in people of Bangladesh in the form of meat and eggs and also acts as a tool of poverty alleviation in Bangladesh. Ducks contribute 1642 million eggs and 163 million ton meat per year (1999-2000) in our country (Anon, 2001). Although geographical location, sub-tropical climatic condition of Bangladesh is suitable for duck habitation and her water lodged and low-lying areas are also favorable for duck rearing, but this environment also favors the growth, multiplication, development, survival and spread of the parasites. As a result, almost all of the ducks suffer from parasitic diseases (Farjana *et al.*, 2004) which affect the growth and production performance of ducks in Bangladesh (Anisuzzaman *et al*., 2005). The system of management, the nutritional status, the ecology of the parasites and their host-parasite relationship exert significant effect on the occurrence of the helminth infection in ducks. Ahmed (1969), Fariduddin (1975), Qadir (1979) and Islam *et al.* (1988) have undertaken a number of studies on parasitism in ducks of Bangladesh. But the population density of helminths of ducks in relation to their age, sex, breed and season of the year in Bangladesh was not studied yet clearly. So, the present study was designed with a view to find out the effect of the age, sex, breed of ducks and seasons of the year on the population density of helminth parasites in ducks.

MATERIALS AND METHODS

A total of 300 ducks were purchased from local markets or directly from farmer's houses and from different small-scale farm located in different areas of Netrokona and Mymensingh districts during the period from August 2002 to May 2003. Ducks were categorized into three age groups such as young ducks (< 6 months), adult (>6 months to 1 year) and older ducks (> 1 year). Both male and female ducks of two breeds namely Khaki Campbell and indigenous/deshi ducks were examined.

The experimental period was divided into three prominent seasons such as monsoon (July to October), winter (November to February) and summer (March to June). Collection and identification of parasites were done in The Parasitology Laboratory of Bangladesh Agricultural University. Ducks were autopsied to collect and record the helminth parasites; and collected parasites were counted for determination of population density. Trematodes and cestodes were identified by preparing permanent slides and nematodes were studied by preparing temporary slide adding one drop of lactophenol (Cable, 1957). In all cases, parasites were identified through detailed morphological studies following the keys and description given by Yamaguti (1958, 1959 and 1961), Wardle and McLeod (1952), Yorke and Meplestone (1962), Skrjabin (1964). For statistical analysis the "*t*" test was used to analyze data by using SPSS statistical package.

RESULTS AND DISCUSSION

A total of 300 ducks were examined, of which 290 (96.66%) were infected by one or more different species of helminths. Seventeen species of helminths were identified which included 11 species of trematodes (*Echinostoma revolutum, E. paraulum, E. robustum, Echinochasmas beleocephalus, Echinoparyphium recurvatum, Hypoderaeum conoideum, Psilochasmas oxyurus, Catatropis verrucosa, Tracheophilus cymbius, Amphimerus anatis* and *Metorchis orientalis*), 4 species of cestodes (*Hymenolepis coronula, Hymenolepis lanceolata, Schillerius longiovum* and *Fimbriaria fasciolaris*) and 2 species of nematodes (*Amidostomum anseris* and *Echinuria uncinata*) (Table 1).

Table 1. Density of helminths of domestic ducks of Netrokona and Mymensingh districts of Bangladesh

Species of parasites	Location	Parasite density	
		Range	Mean± SD
Trematodes			
Echinostoma revolutum	small intestine, large intestine	1-9	4.28±2.47
Echinostoma paraulum	large intestine	1-4	2.00±1.41
Echinostoma robustum	small intestine	1	1.00±00
Echinochasmas beleocephalus	caeca, small intestine	1-3	1.34±0.61
Echinoparyphium recurvatum	small intestine	1-2	1.33±0.58
Hypoderaeum conoideum	small intestine	1-12	4.52±2.73
Psilochasmas oxyurus	caeca, small intestine	1-18	6.28±4.77
Catatropis verrucosa	caeca	1-20	7.15±3.81
Tracheophilus cymbius	trachea, bronchi	1-4	1.25±0.62
Amphimerus anatis	liver	2-17	5.85±3.76
Metorchis orientalis	liver, bile duct	2-15	6.32±3.25
Total		**1-20**	**5.98±1.32**
Cestodes			
Hymenolepis coronula	small intestine	12-110	66.65±22.47
Hymenolepis lanceolota	small intestine	8-49	36.84±11.28
Schillerius longiovum	small intestine	3-64	23.95±13.91
Fimbriaria fasciolaris	small intestine	4-43	16.21±8.29
Total		**3-110**	**33.15±5.26**
Nematodes			
Amidostomum anseris	gizzard	1-4	2.75±0.93
Echinuria uncinata	gizzard	1-8	3.46±1.68
Total		**1-8**	**2.95±0.68**

Among the parasites, density of cestodes was the highest (33.15±5.26), followed by trematodes (5.98±1.32) and nematodes (2.95±0.68). Soulsby (1965) found thousands of hymenolepids per bird, which is an agreement with present findings while all recovered cestodes are hymenolepids. More parasitic burden of cestodes in ducks might be explained by their scavenging feeding of vector hosts of cestodes. There is a paucity of literature regarding the burdens of trematodes, but the present findings of several species of trematodes infection at a time in one individual duck is supported by Soulsby (1965). The lower burden of trematodes than cestodes might be due to the molluscan intermediate hosts which are not available at a large quantity in all seasons. The reason for lower burden of nematodes is that one nematode egg can develop into only one adult. (Urquhart, 1996). Among cestodes, the highest load was counted in case of *H. coronula* infection (66.65±22.47) whiles the mean parasitic burden of *F. fasciolaris* was the lowest (16.21±8.29). On the other hand, incase of trematodes, the highest density was recorded in *C. verrucosa* (7.15± 3.81) infection and *E. robustum* was found only in a single case and infected with only a single parasite (Table1).

Mean density of helminths increased with the increase of age, where the highest density was found in older ducks (27.87±2.98) followed by adult (26.18±2.14) and young (21.23±1.09) ducks (Table 2). There was a significant variation in the densities of *H. conoideum* (P<0.05), *P. oxyurus* (P<0.01), *H. coronula* (P<0.01) and *S. longiovum* (P<0.05) among three age group of ducks. Among other parasites, mean density increased with the increase of age in three age groups of ducks, but in case of *E. beleocephalus*, *C. verrucosa*, *H. lanceolata* and *A. anseris*, mean density was the highest in the adult (6 months to 1 year) ducks (Table 2). Islam *et al.* (1988) reported significant difference in the densities of *Echinostoma* spp. and *H. coronula* among three age groups of ducks (same age grouping with present study) where mean density of *Echinostoma* spp. increased with the increase of age. But in case of *H. coronula*, the mean density was higher in younger and older age groups and lower in middle age group ducks which is a contrast to the present finding. The increased density of parasites with increasing age may result from the increased exposure of ducks to external environment. Higher density of helminths in older group of ducks might be due to loss of body resistance in advanced age (Tizard, 1996).

Table 2. Age-wise densities of helminth parasites in ducks

Name of parasites	Mean density ± SD			Significant value (2-tailed)
	<6 months (n = 60)	6 mo - 1yr (n = 130)	>1yr (n = 110)	
E. revolutum	2.40 ± 1.09	4.38 ± 0.56	7.25 ± 2.44	0.080
E. paraulum	00 ± 00	1.00 ± 00	2.67 ± 1.35	0.257
E. robustum	00 ± 00	00 ± 00	1.00 ± 00	0.423
E. beleocephalus	00 ± 00	4.50 ± 2.29	3.01 ± 0.79	0.199
E. recurvatum	00 ± 00	1.50 ± 0.13	2.00 ± 1.04	0.192
H. conoideum	4.78 ± 0.91	5.23 ± 0.54	6.9 ± 1.16	0.014*
P. oxyurus	8.55 ± 1.03	9.31 ± 2.58	10.51 ± 0.79	0.002**
C. verrucosa	2.05 ± 0.21	8.07 ± 3.02	4.75 ± 1.43	0.104
T. cymbius	1.00 ± 00	2.39 ± 0.65	1.51 ± 0.70	0.057
A. anatis	2.00 ± 0.53	2.59 ± 1.21	8.31 ± 3.49	0.166
M. orientalis	00 ± 00	8.21 ± 0.14	13.58 ± 5.72	0.137
H. coronula	65.01 ± 3.95	79.10 ± 5.13	70.14 ± 4.52	0.003**
H. lanceolota	35.03 ± 0.71	49.00 ± 14.73	22.12 ± 6.38	0.064
S. longiovum	18.58 ± 2.89	39.36 ± 10.89	25.50 ± 0.72	0.050*
F. fasciolaris	00 ± 00	20.53 ± 5.07	23.62 ± 12.83	0.185
A. anseris	00 ± 00	2.52 ± 1.26	1.33 ± 0.12	0.220
E. uncinata	00 ± 00	3.38 ± 0.03	4.05 ± 2.17	0.187
Total	21.23 ± 1.09	26.18 ± 2.14	27.87 ± 2.98	0.062

n = Number of ducks examined, ** P<0.01, *P<0.05.

Among recorded parasites, mean density of all parasites was significantly (P<0.05) higher in female ducks (31.35±4.72) than males (27.52±3.32) except *E. paraulum, A. anatis, M. orientalis, H. coronula* and *A. anseris* (Table 3). It is very difficult to explain the reasons behind the variation in the mean densities among two sex groups. It may be laying of eggs by the females without getting proper household balanced nutritional supply, they lack in immune status to combat the parasitic infection; and some hormonal influence may be associated with this. The mean density of helminths was higher in indigenous ducks (33.72±3.61) than Khaki-Campbell (29.61±4.32) ducks (Table 4). Higher densities of parasites in indigenous ducks might be some genetic factor. Besides, Khaki Campbell ducks were mostly collected from organized farm and they were supplied with relatively more balanced ration. Generally malnourished individuals are more susceptible to any parasitic infection and carry more parasites (Soulsby, 1982; Ruff and Norton, 1997; Permin and Hansen, 1998).

Table 3. Sex-wise densities of helminth parasites in ducks

Name of parasites	Mean density ± SD		Significant value (2 tailed)
	Male (n = 150)	Female (n = 150)	
E. revolutum	3.67 ± 0.64	4.58 ± 2.23	0.070
E. paraulum	2.67 ± 1.18	1.00 ± 00	0.272
E. robustum	00 ± 00	1.00 ± 00	0.500
E.s beleocephalus	4.39 ± 0.53	5.03 ± 0.45	0.043*
E. recurvatum	00 ± 00	1.50 ± 1.06	0.500
H. conoideum	7.05 ± 0.09	7.32 ± 0.51	0.012*
P. oxyurus	10.66 ± 2.32	9.79 ± 0.61	0.027*
C. verrucosa	8.76 ± 2.43	12.20 ± 3.35	0.104
T. cymbius	1.29 ± 0.57	2.10 ± 0.96	0.149
A. anatis	9.06 ± 4.97	2.03 ± 1.31	0.360
M. orientalis	13.91 ± 6.25	5.05 ± 2.71	0.278
H. coronula	70.39 ± 14.22	50.27 ± 9.41	0.105
H. lanceolota	40.03 ± 3.56	45.07 ± 5.25	0.038*
S. longiovum	25.43 ± 1.86	28.07 ± 6.36	0.031*
F. fasciolaris	15.50 ± 3.05	24.11 ± 6.01	0.135
A. anseris	2.12 ± 0.40	1.55 ± 0.14	0.098
E. uncinata	3.35 ± 1.91	2.91 ± 1.31	0.045*
Total	27.52±3.32	31.35±4.72	0.068

n = Number of ducks examined, * P<0.05.

Among three seasons, mean density of trematodes found highest in winter (5.42±0.80) followed by monsoon (3.68±0.57) and summer (3.22±0.34) (Table 5). There was a significant (P<0.05) variation of mean density of *E. revolutum, E. beleocephalus, P. oxyurus, C. verrucosa, H. coronula, S. longiovum, A. anseris* and *H. lanceolata* (P<0.01) among three seasons. Among the helminths, mean density of most trematodes like *E. revolutum* (8.41±2.57), *E. paraulum* (2.50±0.86), *E. robustum* (1.00±00), *E. beleocephalus* (3.97±0.89), *E. recurvatum* (2.00±1.00), *H. conoideum* (8.06±2.82), *P. oxyurus* (9.30±1.51) and *T. cymbius* (1.00±0.00) was the highest in winter season but that of *C. verrucosa* (13.12±3.50) and *A. anatis* (7.79±4.46) was the highest in monsoon; and only *M. orientalis* (10.78±3.39) was found the highest in summer. The highest density of trematodes may be influenced by the availability of snail intermediate hosts. Usually snails are available in monsoon when ducks are feed on snails, get infected with metacercaria of trematodes, but usually trematodes take sometime to become adult in final host.

Table 4. Breed-wise densities of helminth parasites in ducks

Name of parasites	Mean density ± SD		Significant value (2 tailed)
	Indigenous duck (n = 180)	Khaki Campbell (n = 120)	
E. revolutum	4.48 ± 2.57	2.17 ± 1.63	0.213
E. paraulum	2.25 ± 1.59	00 ± 00	0.500
E. robustum	1.00 ± 00	00 ± 00	0.500
E. beleocephalus	5.15 ± 1.23	3.00 ± 1.50	0.163
E. recurvatum	1.25 ± 0.88	00 ± 00	0.500
H. conoideum	5.33 ± 1.71	4.90 ± 0.30	0.027*
P. oxyurus	9.86 ± 2.31	8.10 ± 1.24	0.062
C. verrucosa	9.39 ± 1.58	2.87 ± 0.53	0.311
T. cymbius	2.00 ± 0.61	1.25 ± 0.53	0.144
A. anatis	10.90 ± 2.77	6.97 ± 1.71	0.138
M. orientalis	12.21 ± 6.49	3.00 ± 1.63	0.345
H. coronula	77.81 ± 9.95	63.73 ± 7.71	0.063
H. lanceolota	48.72 ± 7.95	37.96 ± 5.32	0.078
S. longiovum	27.71 ± 19.04	00 ± 00	0.500
F. fasciolaris	22.93 ± 4.22	16.96 ± 3.66	0.095
A. anseris	2.50 ± 1.76	00 ± 00	0.500
E. uncinata	4.53 ± 2.21	1.71± 0.08	0.500
Total	33.72±3.61	29.61±4.32	0.086

n = Number of ducks examined, *P<0.05.

So, adult helminths were found in ducks in winter. But the reason behind the highest mean density of *C. verrucosa* in monsoon is not clear though snails and fresh water fishes are the intermediate hosts of this parasite; and it is difficult to explain the reason of the highest density of *A. anatis* in monsoon and *M. orientalis* in summer because life cycles of these parasites are not clearly known (Soulsby, 1982).

Mean density of all cestodes and nematodes was the highest in summer season (48.43±4.85 and 4.13±1.76), which were followed by monsoon (41.74±6.39 and 2.14±0.67) and winter (38.40±2.11 and 1.96±0.43), respectively (Table 5). Fresh water copepods among which *Cyclops* is the intermediate host of *H. coronula* and *F. fasciolaris;* and water flea *Daphnia* acts as intermediate host of *E. uncinata (*Soulsby, 1982). In winter, water is minimum in *haor*, *bills* and ponds appearing the fresh water crustaceans available to ducks. That is why ducks get easily infected with *H. coronula*, *F. fasciolaris* and *E. uncinata* in winter which become adults in summer. For most hymenolepid cestodes, beetles acts as intermediate host (Rahman *et al*, 1996).

Beetles or other arthropods are available at the beginning of the summer and ducks may be infected with metacestodes which become adults in late summer. Highest parasitic load incase of *A. anseris* in summer is an agreement with Anisuzzaman *et al.* (2006). The highest parasitic load of all cestodes and nematodes in summer may also be influenced by the scarcity of feeds of ducks in late winter and early summer, that is why malnourished individuals harbour relatively higher parasitic burden (Permin and Hensen, 1998; Ruff and Norton, 1997).

The present study suggests that age, sex and breed of ducks and season of the year influence the parasitic burden to a greater extend.

Table 5. Season-wise densities of helminth parasites in ducks

Name of parasites	Mean density ± SD			Significant value (2-tailed)
	Monsoon (n = 50)	Winter (n =150)	Summer (n = 100)	
Trematodes				
E. revolutum	6.11 ± 2.36	8.41 ± 2.57	5.07 ± 1.70	0.022 *
E. paraulum	1.00 ± 00	2.50 ± 0.86	1.00 ± 00	0.095
E. robustum	00 ± 00	1.00 ± 00	00 ± 00	0.423
E. beleocephalus	3.00 ± 1.40	3.97 ± 0.89	2.05 ± 0.97	0.033 *
E. recurvatum	00 ± 00	2.00 ± 1.00	1.00 ± 00	0.223
H. conoideum	2.52 ± 0.61	8.06 ± 2.82	5.20 ± 0.90	0.085
P. oxyurus	7.41 ± 0.98	9.30 ± 1.51	5.88 ± 1.17	0.017 *
C. verrucosa	13.12 ± 3.50	9.40 ± 2.21	6.12 ± 0.69	0.042 *
T. cymbius	1.23 ± 0.09	1.00 ± 00	2.50 ± 0.35	0.064
A. anatis	7.79 ± 4.46	3.27 ± 1.41	4.36 ± 0.54	0.114
M. orientalis	8.03 ± 4.61	00 ± 00	10.78 ± 3.39	0.188
Total	**3.68±0.57**	**5.42±0.80**	**3.22±0.34**	**0.070**
Cestodes				
H. coronula	66.10 ± 7.04	49.19 ± 5.79	78.30 ± 6.43	0.018 *
H. lanceolota	37.51 ± 2.99	27.09 ± 3.11	44.07 ± 5.34	0.005 * *
S. longiovum	22.13 ± 1.14	26.11 ± 2.75	28.00 ± 6.15	0.019 *
F. fasciolaris	00 ± 00	18.60 ± 2.03	22.53 ± 4.19	0.187
Total	**41.74±6.39**	**38.40±2.11**	**48.43±4.85**	**0.063**
Nematodes				
A. anseris	1.40 ± 0.60	2.37 ± 0.51	3.51 ± 0.87	0.027 *
E. uncinata	2.23 ± 0.47	1.31 ± 0.32	4.39 ± 1.25	0.055
Total	**2.14±0.67**	**1.96±0.43**	**4.13±1.76**	**0.162**

n = Number of ducks examined, **P < 0.01, *P < 0.05.

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REFERENCES

1. Ahmed S (1969). Survey on type of helminths commonly found in country ducks. *Pakistan Journal of Veterinary Science* 3: 110-112.
2. Anisuzzaman, Alim MA, Rahman MH and Mondal MMH (2005). Helminth parasites in indigenous ducks: seasonal dynamics and effects on production performance. *Journal of Bangladesh Agricultural University* 3: 283-290.
3. Anisuzzaman, Farjana T, Alim MA, Khan MAHNA and Mondal MMH (2006). Amidostomiasis in indigenous ducks of Bangladesh: prevalence and pathology. *Bangladesh Veterinary Journal* 40: 1-9.
4. Anon. (2001). *Statistical Pocket Book of Bangladesh.* Bangladesh Bureau of Statistics (Statistics Division), Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.
5. Cable RM (1957). *An Illustrated Laboratory Manual of Parasitology*. Burgess Publishing Co., Minnesota. pp. 105-131.

6. Fariduddin M (1975). A survey of helminth parasites on ducks in the Dhaka District of Bangladesh. *MSc Thesis*, Department of Parasitology, Bangladesh Agricultural University, Mymensingh, Bangladesh.
7. Farjana T, Alim MA, Das PM and Mondal MMH (2004). Helminth infection in ducks at free range and semi intensive farming in two districts of Bangladesh. *Bangladesh Veterinary Journal* 38: 125-134.
8. Islam MR, Shaikh H and Baki MA (1988). Prevalence and pathology of helminth parasites in domestic ducks of Bangladesh. *Veterinary Parasitology* 29: 73-77.
9. Permin A and Hansen JW (1998). *Epidemiology, Diagnosis and Control of Poultry Parasites.* Food and Agricultural Organization of the United Nations, Rome. pp. 160.
10. Qadir ANMA (1979). Helminth parasites of domestic ducks (*Anas boschas domesticus*) of Mymensingh district, Bangladesh. *Bangladesh Veterinary Journal* 13: 43-45.
11. Rahman MH, Ahmed S and Mondal MMH (1996). An Introduction to Helminth Parasites of Animals and Birds in Bangladesh. 1st edn., Seba Printing Press, Dhaka.
12. Ruff MD and Norton RA (1997). Nematodes and Acanthocephalans, *In*: Calnek BW, Barnes HJ, Beard CW, McDougald LR and Saif YM (Eds), *Diseases of Poultry.* Iowa State University Press, Iowa. pp. 815-849.
13. Skrjabin KI (1964). *Keys to the Trematodes of Animals and Man*. English edn., University of Illinois Press, Urbana, USA.
14. Soulsby EJL (1965). *Textbook of Veterinary Clinical Parasitology*, Vol. I Helminths. 1st edn., Blackwell Scientific Publications, Oxford, London.
15. Soulsby EJL (1982). *Helminths, Arthropods and Protozoa of Domesticated Animals*. 7th edn., Bailliere Tindall and Cassell Ltd., London. pp. 979-1019.
16. Tizard IR (1996). *Veterinary Immunology*: *An Introduction.* 5th edn., WB Sounders Company, USA. pp. 531.
17. Urquhart GM, Armour J, Duncan JL, Dunn AM and Jennings FW (1996). *Veterinary Parasitology*. 2nd edn., Blackwell Science Ltd., Oxford, London. p. 102.
18. Wardle RA and Mcleod JA (1952). *The Zoology of Tapeworms*. University of Minnesota Press, Minnepolis, USA.
19. Yamaguti S (1958). *Systema Helminthum*. Vol. I, *The Digenic Trematodes of Vertebrates.* Interscience Publishers Inc., New York, USA.
20. Yamaguti S (1959). *Systema Helminthum*. Vol. II, *The Cestodes of Vertebrates*. Interscience Publishers Inc., New York, USA.
21. Yamaguti S (1961). *Systema Helminthum*. Vol. III, *The Nematodes of Vertebrates*. Interscience Publishers Inc. New York, USA.
22. Yorke W and Meplestone PA (1962). *The nematode parasites of vertebrates*. Hafner Publishing Company, New York.