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Prevalent Fish Diseases in the Carp Polyculture System of Assam

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ABSTRACT

The present study was undertaken to find out the incidence of different disease in the freshwater aquaculture system in three districts *viz.,* Nagaon, Morigaon and Sonitpur of Assam. A total of 293 ponds of varying size were surveyed during the disease outbreak cases and fourteen different diseases were recorded with the highest intensity of ulcerative disease (28.01%) followed by red spot/haemorrhages (18.82%). The prevalence percentage recorded in the 3 districts on monthly basis were 18.84, 14.10, 2.70, 2.51, 2.93, 27.90, 3.27, 2.55, 2.14, 1.54, 1.62, 1.99, 5.60 and 2.25 per cent for red spot/haemorrhage, tail rot/fin rot, dropsy, popeye, gill rot, ulceration, scale erosion, anal protrusion, pinhead, lordosis/ scoliosis, argulosis, protozoan infection, cotton wool disease and ventral reddening, respectively. Month-wise prevalence of disease recorded in the district during study revealed that highest incidence of disease was recorded in the month of January (24.93%) followed by December (23.02%) and February (18.39%). Species wise prevalence of disease revealed that Mrigal was the most susceptible species with incidence of 54.44% followed by Catla (43.33%), Rohu (41.11%), Silver carp (38.89%) Puntius (33.33%), Common carp (28.89%), Gonius (27.78%), Bata (26.67%), Reba (19.99%), both Grass carp and *L. calbasu* (13.33%). The analysis of variance (ANOVA) revealed that there was marginal significant difference in districts with respect to diseases occurrence (P=0.051) which indicated an almost uniform pattern of incidence of diseases. However, the affected species of fishes were highly significant ($p<0.01$) from each other.

Key Words: Argulosis, Disease, Incidence, Prevalence, Ulceration.

INTRODUCTION

As the aquaculture development is heading globally towards increasing intensification and commercialization, the likelihood of occurrence of major disease related problems is also increasing. The aquaculture industry has been experiencing infectious diseases with varied etiology such as viruses, bacteria, fungi, parasites and other undiagnosed and emerging pathogens (Altinok *et al*, 2008; Subashkumar *et al*, 2006; Klesius *et al*, 2006). Even a single bacterial pathogen like *Aeromonas hydrophila* has been reported to be responsible for causing mass mortalities of 30-70 per cent in rearing carp ponds (Shankar *et al*, 2000). Among the diseases, bacterial disease are the limiting factors for a fish culture which may causes a range of problems ranging from sporadic mortalities to mass mortalities and growth retardation.

The disease is a major constraint in harnessing the maximum production from aquatic bodies in terms of fish flesh. It is the expression of a complex interaction between the host (fish), pathogen (bacteria/virus) and environment (pond soil and water quality). Unlike the land-based farming system, the disease problem in aqua farming is very much complicated and critical due to three-dimensional nature of culture system where the dynamic interaction of biotic and fauna comprising the host and opportunistic pathogens and abiotic factors exists (Vijayan, 2008). The abiotic factors mainly the water and soil quality variables are determining factors for disease outbreaks which

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ultimately affect the growth and survival of fishes. Disease has become one of the major limiting factors in the aquaculture production in India specially with the recent highlighting an increase in the aquaculture practice to uplift the socio-economic condition of rural poor and at the same time to accomplish the protein deficiency of the rural folk, using the technologies appropriate to their resource base, rural small marginal farmers is practicing mostly extensive or semi-intensive low cost farming of aquatic organisms. A common disease of freshwater fishes are ulcers including epizootic ulcerative syndrome (EUS), septicaemia disease, tail and fin rot, gill rot, dropsy, various type of fungal, parasitic and protozoan disease (Choudhury, 1997). Ulcer type of disease including most dreaded EUS disease are often confusing for their clinical signs and causative agents are observed with varied intensity throughout the year both in culture and feral fishes.

MATERIALS AND METHODS

Sample collection

In the present investigation, a total number of 2659 of diseased fish having clinical signs and symptoms were collected from the different fish farms of the study area. Samples consisted of moribund fishes irrespective of species with clinical signs were brought to the Fish Disease Diagnostic Unit of College of Fisheries, AAU, Raha, Assam. Fish samples with clinical signs of ulcer, haemorrhages, red spot, dropsy were packed in insulated boxes with gel ice packs during transportation from the sampling site to the laboratory. Fishes with clinical symptoms were used within 3 to 4 hours for analysis and detection of pathogens.

Prevalence of diseases

Apart from collecting fishes with clinical signs and symptoms for isolation and identification of pathogens, samples with a parasitic infestation, pinhead, lordosis/ scoliosis etc. were also collected and recorded to have an overall idea of prevalent fish disease in the area under study. During the survey, an attempt was also made to record different fish diseases and incidences separately for each districts. Moreover, month wise and species wise incidence of disease was also recorded.

Analysis of data was done by IBM SPSS Statistic ZO and JMP 10 of SAS 9.3 statistical software. The main descriptive statistics included frequency, %, mean and SD with a 95% confidence interval. While inferential statistics included 't' test, ANOVA one way and two-way 'F' test, Pearson correlation and simple linear regression with associated 't' test as described by Snedecor and Cochran (1968).

RESULTS AND DISCUSSION

Prevalence of infected ponds

A total of 2659 numbers of infected fishes from 293 number of culture ponds from three districts (Nagaon, Morigaon and Sonitpur) with clinical

Table 1. Prevalence (%) of infected ponds in 3 districts

Pond Area (ha)	Nagaon(n=105)			Morigaon (n=98)			Sonitpur (n=90)			Total (n=293)		
	Count	%	95% CI	Count	%	95% CI	Count	%	95% CI	Count	%	95% CI
<0.2	50	47.6	38.3-57.1	47	48.0	38.3-57.7	45	50.0	39.9-60.1	142	48.5	42.8-54.2
0.2-0.4	30	28.6	20.8-37.8	32	32.7	24.2-42.4	29	32.2	23.5-42.4	91	31.1	26.0-36.6
>0.4	25	23.8	16.7-32.8	19	19.4	12.8-28.3	16	17.8	11.2-26.9	60	20.5	16.3-25.5

Table 2. Prevalence of fish disease and incidences observed in carp polyculture system.

District	Nagaon				Morigaon				Sonitpur				Overall			
	Incid-ences	%	95%CI		Incid-ences	%	95%CI		Incid-ences	%	95%CI		Incid-ences	%	95%CI	
			Lower	Upper			Low-er	Upper			Lower	Upper			Low-er	Upper
Anal protrusion	65	6.5	5.21	8.32	0	0.00	0.00	0.43	0	0.00	0.00	0.49	65	2.45	1.92	3.10
Argulosis	117	11.87	9.99	14.03	120	13.43	11.36	15.83	72	9.23	7.39	11.47	309	11.62	10.46	12.89
Cotton Wool Disease	80	8.11	6.57	9.98	54	6.04	4.66	7.81	15	1.92	1.17	3.15	149	5.60	4.79	6.54
Dropsy	20	2.03	1.32	3.11	30	3.35	2.36	4.76	22	2.82	1.87	4.23	72	2.71	2.16	3.40
Gill rot	29	2.94	2.06	4.19	21	2.35	1.54	3.57	28	3.59	2.50	5.14	78	2.93	2.36	3.65
Lordosis/ Scoliosis	14	1.42	0.85	2.37	15	2.91	1.02	2.75	12	1.54	0.88	2.67	41	1.54	1.14	2.09
Pin head	10	1.01	0.55	1.86	20	3.14	1.45	3.43	27	3.46	2.39	4.99	57	2.14	1.66	2.7
Pop eye	20	2.03	1.32	3.11	26	2.91	1.99	4.23	21	2.69	1.77	4.08	67	2.52	1.99	3.19
Protozoan infection	15	1.52	0.92	2.49	21	2.35	1.54	3.57	17	2.18	1.37	3.46	53	1.99	1.53	2.60
Red spot/ haemorrhages	180	18.26	15.97	20.79	154	17.24	14.91	19.86	167	21.41	18.68	24.43	501	18.84	17.40	20.37
Scale erosion	20	2.03	1.32	3.11	28	3.13	2.18	4.49	39	5.00	3.68	6.76	87	3.27	2.66	4.02
Tail rot/fin rot	135	13.69	11.69	15.98	105	11.75	9.81	14.04	135	17.31	14.81	20.12	375	14.10	12.83	15.48
Ulceration	281	28.50	25.77	31.40	268	30.01	27.10	33.10	196	25.13	22.21	28.29	745	28.02	26.34	29.76
Ventral reddening	0	0.00	0.00	0.39	31	3.47	2.46	4.89	29	3.72	2.60	5.29	60	2.26	1.76	2.89

signs and symptoms were collected. Ponds surveyed in each district were divided into three categories *viz.* <0.2 ha, 0.2 -0.4 ha. and >0.4 ha. according to Faruk *et al,*(2004). Prevalence percentage of infected ponds in each districts are presented in the (Table 1) with a confident interval at 95% of each category of ponds.

The classification of aquaculture ponds into small, medium and large ponds revealed that about 50 % farmers were holding small ponds (<0.2 ha), followed by 31% medium (0.2-0.4 ha) and 20 % large (>0.4 ha) ponds.

Prevalence of disease

While visiting the fish farm, fish species with different diseases like pinhead, scoliosis, lordosis and parasitic infection were also recorded to study the overall prevalence in each district under study. The assessment of prevalence was made based on the externally visible clinical signs and symptoms and parasites isolated from external surfaces of fish. In addition, internal examination of organs of fishes was also carried out to confirm the clinical symptoms of the infection. Overall pooled prevalence and incidence observed in carp polyculture system for the districts under studies are presented (Table 2 and Fig.1).

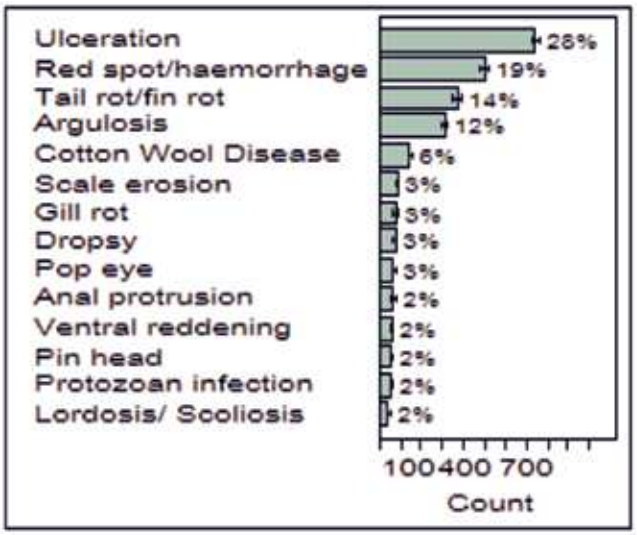

Fig 1.Fish disease and incidences in the three districts

In Nagaon district fish diseases and incidences (Table 2) were recorded 6.59, 11.87, 8.11, 2.03, 2.94, 1.42, 1.01, 2.03, 1.52, 18.26, 2.03,13.69 and 28.50 per cent for anal protrusion, argulosis, cotton wool disease, dropsy, gill rot, lordosis/ scoliosis, pinhead, Popeye, protozoan infection, red spot/haemorrhages, scale erosion, tail rot/fin rot and ulceration, respectively. It was observed that ulceration was a most prevalent disease with a total of 281 incidences (28.49%) followed by red spot/haemorrhages with 180 incidences (18.25%) and tail rot/fin rot 135 (13.69%). The incidence of argulosis was 117(11.86%).

In Morigaon district fish diseases and incidences (Table 2) were recorded13.43, 6.04, 3.35, 2.35, 2.91, 3.14, 2.91,2.35, 17.24, 3.13, 11.75, 30.01 and 3.47 per cent for argulosis, cotton wool disease, dropsy, gill rot, lordosis/scoliosis, pin head, popeye, protozoan infection, red spot/haemorrhages, scale erosion, tail rot/fin rot, ulceration and ventral reddening, respectively. Ulceration was the dominant disease with a total incidence of 268 (30.01%) followed by red spot/haemorrhages154 (17.24%) and argulosis with an incidence of 120 (13.43%).

Similarly, in Sonitpur district, the disease and incidences (Table 2) were recorded 9.23, 1.92, 2.82, 3.59, 1.54, 3.46, 2.69, 2.18, 21.41, 5.00, 17.31, 25.13 and 3.72 per cent for argulosis, cotton wool disease, dropsy, gill rot, lordosis/ scoliosis, pin head, popeye, protozoan infection, red spot/haemorrhages, scale erosion, tail rot/fin rot ulceration and ventral reddening , respectively. Ulceration was also observed to be dominant fish disease with an incidence of 196 (25.12%) followed by haemorrhage/ red spot 167 (21.41%) and tail rot/fin rot with an incidence of 135 (17.31%) respectively.

It was observed that the overall diseases and incidences in the three districts recorded were 2.45, 11.62, 5.60, 2.71, 2.93, 1.54, 2.14, 2.52, 1.99, 18.84, 3.27, 14.10, 28.02 and 2.26 per cent for anal protrusion, argulosis, cotton wool disease, dropsy, gill rot, lordosis/scoliosis, pin head, popeye, protozoan infection, red spot/haemorrhages, scale erosion, tail rot/fin rot ulceration and ventral reddening, respectively. The overall prevalence of different disease in three districts under study revealed that ulceration was found to be highly significant among fish diseases with a prevalence of 28.01 per cent followed by red spot/haemorrhages, tail rot/fin rot and argulosis with a prevalence of 18.84, 14.10 and 11.62 per cent, respectively.

Month wise prevalence of diseases

The record of fish diseases from three different districts during the study period are presented in the (Table 3). The prevalence and incidence of various diseases for the districts during the study were more or less equal. Samples of diseased fish and sampling site recorded during the study of prevalence are presented in the (Fig. 2 & 3). The monthly records of prevalent diseases with 95% CI for the entire districts under study are presented in (Table 3).

Monthwise prevalence of disease recorded in the district during study revealed that highest incidence of disease was recorded in the month of January (24.93%) followed by December (23.02%) and February (18.39%).

Table 3. Month wise incidence of fish disease in 3 districts

Month	Disease incidences (numbers)	Per cent	95%CI	
			Lower	Upper
June 16	9	0.34	0.18	0.64
July 16	21	0.79	0.52	1.20
August 16	38	1.43	1.04	1.96
September16	122	4.59	3.86	5.45
October 16	143	5.38	4.58	6.30
November16	358	13.46	12.22	14.81
December16	612	23.02	21.46	24.65
January17	663	24.93	23.33	26.61
February17	489	18.39	16.96	19.91
March17	157	5.90	5.07	6.87
April 17	34	1.28	0.92	1.78
May 17	13	0.49	0.29	0.83
Total	2659			

Fig. 2. Diseased fish

Fig. 3. Sampling site

The monthwise incidence of fish disease recorded in fish ponds during study revealed that the argulosis, myxoboliasis were found throughout the year. However, dropsy, lordosis/scoliosis and pinhead were also found throughout the year but with an exception of one or two months. Hossain *et al,* (2007) also found a similar result in Bangladesh with the highest prevalence of disease in the month of December and lowest incidence in the month of June with a record of fifteen diseases in the water bodies of Bangladesh. Highest incidence recorded with Trichodiniasis (92%) was in the month of July and lowest by whirling disease (13%) in the month of February. Shome *et al,* (2005) had reported the occurrence of dropsy in Meghalaya during August when the temperature and humidity ranged between 25-30°C, and 80 and 90 per cent, respectively. In contrast, the prevalence of dropsy in the present study was recorded in almost all the month of the year. The highest incidence of ulcerative disease, red spot/haemorrhages, tail rot/fin rot was highly significant during November to February. The reasons may be due to stress caused by undesirable water quality and reduction in the volume of water which may be considered as a predisposing factor for

Table 4. Species wise prevalence of fish diseases in the districts under study.

Affected fishes	Nagaon (n=30)	Marigaon (n=30)	Sonitpur (n=30)	Overall average (%)
Catla (*C. catla*)	12 (40.00)	13(43.33)	14 (46.67)	43.33 B
Rohu (*L.rohita*)	13 (43.33)	12 (40.00)	12 (40.00)	41.11 B
Mrigal (*C.mrigala*)	15 (50.00)	18(60.00)	16 (53.33)	54.44 A
Silver carp (*H. molitrix*)	13 (43.33)	12 (40.00)	10 (33.33)	38.89 BC
Grass carp (*C.idella*)	3 (10.00)	5 (16.66)	4 (13.33)	13.33 F
Common carp (*C. carpio)*	8 (26.67)	10 (33.33)	8 (26.67)	28.89 D
Reba (*C.reba)*	6 (20.00)	5 (16.66)	7 (23.33)	19.99 EF
Gonius*(L.gonius)*	9 (30.00)	10 (33.33)	6 (20.00)	27.78 D
Puntius (*Puntius* species*)*	10 (33.33)	12 (40.00)	8 (26.67)	33.33 CD
Bata *(L.bata)*	10(33.33)	8 (26.67)	6 (20.00)	26.67 DE
L. calbasu	4 (13.33)	5 (16.66)	3 (10.00)	13.33 F
	ab*	a*	b*	

(Figures in the parentheses indicates percentage) n= samples

**ab Nagaon district is statistically similar to Morigaon and Sonitpur, a* Morigaon district is statistically different from Nagaon and Sonitpur, b* Sonitpur district is statistically different from Nagaon and Morigaon.*

the onset of diseases. The state of Assam including entire north-eastern states of India experiences severe cold during November- February. Moreover, no rainfall was recorded during the period, as a result, fish remain in a severe stressful condition and make more prone to diseases. Species-wise prevalence of fish diseases and overall percentage are presented in (Table 4).

From the (Table 4), it is clear that Mrigal was the most susceptible species with incidence of 54.44% followed by Catla (43.33%), Rohu (41.11%), Silver carp (38.89%) Puntius (33.33%), Common carp (28.89%), Gonius (27.78%), Bata (26.67%), Reba (19.99%), both Grass carp and *L. calbasu* (13.33%).

The analysis of variance (ANOVA) revealed that there was marginal significant difference in districts with respect to diseases occurrence (P=0.051) which indicated an almost uniform pattern of incidence of diseases. However, the affected species of fishes were highly significant ($p<0.01$) from each other. It further depicted that Nagaon district was statistically similar to Morigaon and Sonitpur($P>0.05$), but Morigaon and Sonitpur were statistically different ($P<0.05$). There were significant differences between the affected species ($P<0.01$) in the three districts. Among the affected fishes, highest incidence (54.44%) was recorded in mrigal which was significantly different from all other species ($P<0.05$). However, Catla (43.33%), Rohu (41.11%) and Silver carp (38.89%) were statistically similar ($P>0.05$). Silver carp was statistically similar with Puntius ($P>0.05$) while Common carp (28.89%), Gonius *(*27.78%), Puntius (33.33%) and Bata *(*26.67%) were statistically similar (P>0.05).

CONCLUSION

The data recorded on the general prevalence of fish diseases in Indian Major Carps, minor carps and exotic carps of the three districts revealed very interesting facts on nature and distribution pattern of fish diseases in the three districts. Analysis of the data indicated that fourteen different diseases like red spot/haemorrhage, tail rot/fin rot, dropsy, popeye, gill disease, ulcer, scale erosion, anal protrusion, pin head, lordosis/scoliosis, argulosis, protozoan infection and cotton wool disease had been recorded during the study. The overall prevalence of different diseases in three districts indicated that ulceration was dominant among fish disease with a prevalence of (28.01%) followed by red spot/haemorrhages (18.84%), tail rot/fin rot (14.10%) and argulosis (11.62%). Among the parasitic diseases,ectoparasitic diseases like dactylogyrosis caused by monogenean parasite and argulosis caused by copepod parasites were found to be persistent throughout the period of study.

The month wise prevalence of diseases recorded in the districts revealed that highest incidence of disease was recorded in the month of January (29.52%) followed by December (20.95%) and February (18.65%). During other months of the year prevalence of incidence of disease was also recorded but the intensity was low. Species-wise prevalence of different diseases in the districts showed that Mrigal (*Cirhinnus mrigala*) was highly vulnerable to infection (54.44%) followed by catla (*Catla catla*) (43.33%). It is urgently felt that utmost care is taken during the month of December, January and February so as to reduce the mass mortality of fishes in the carp polyculture system.

REFERENCES

Altinok I, Kayis S and Capkin E (2008). *Pseudomonas putida* infection in rainbow trout. *Aquaculture* **261**: 850-855.

Faruk M A R, Sarkar M J A and Kabir M B (2004). Economic loss from fish diseases on rural freshwater aquaculture of Bangladesh. *Pakistan J Biol Sci* **7(12)**: 2086-2091

Hossain M D, Hossain M K and Rahman M H (2007). Water quality parameters and incidence of fish disease in some water bodies in Natore, Bangladesh. *J life Earth Sci* **2**(2):27-30.

Klesius P H, Evans J J, Shoemaker C, AYehH, Goodwin A E, Adams A and Thompson K (2006). Rapid detection and identification of *S. iniae* using a monoclonal antibody based indirect fluorescent antibody technique. *Aquaculture***258**: 180-186.

Shankar K M, Mohan C V, Anil T M and Vidya R (2000). Monoclonal antibodies in fish and shell fish health management in India. *Naga*, the ICLARM Quarterly **23**(4): 10 - 12.

Shome R, Shome B R, MazumderA, Kumar A, Rahman H and BajarBarua K M (2005). Abdominal dropsy of disease in major carps of Meghalaya: Isolation and characterization of *A. hydrophila. Current Sci* **88**(12):1897-1899.

Snedecor G W and Cochran W G (1968). *Statistical Methods.* 6th Edition, Oxoford and IBH publishing Co., New Delhi.

Subashkumar R, Thayumanavan T, Vivekanandhan G and Lakshmanaperumalsamy P (2006). Multiple antibiotic resistant, haemolytic and proteolytic activity of *Aeromonashydrophila* isolated from acute gastroenteritis in children. *Indian J Med Res* **123**: 61-66.

Vijayan K K (2008). *Relevance of disease management with special reference to sustainable fisheries and mariculture*,220-224p. In: Impact of Climate Change on Indian Marine Fisheries. (Eds.Vivekannandan, E and Jayasankar, J), CMFRI publication, CMFRI, Cochin. India.

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