Disease and Health Management of Farmed Exotic Catfish *Pangasius hypopthalmus* in Mymensingh District of Bangladesh

MD. A. R. FARUK

Department of Aquaculture, Bangladesh Agricultural University
Mymensingh-2202, Bangladesh

ABSTRACT

The study was carried out to examine the status of disease and health management practices in *Pangasius hypophthalmus* in Mymensingh District of Bangladesh during the period from April 2004 to March 2005 using questionnaire interview and participatory rural appraisal tools such as focus group discussion (FGD). Financial losses of farmers due to fish disease was also determined. A total of 100 fish farmers were interviewed and six FGD sessions were conducted. The most prevalent symptoms of disease as reported by the farmers were red spot, followed by anal protrusion, tail and fin rot, pop eye, dropsy and gill rot. Other conditions like cotton wool type lesion, ulceration and white spot were also reported but with lower incidence. This study indicated that there were economic losses of approximately 3.6% of farmers' total yearly income from fish production due to ill-health. These losses varied among different farm categories. This study also highlighted health management problems of *P. hypophthalmus* farming which include lack of technical knowledge of farmers on fish health and disease, lack of assistance from government and non-government organizations, unavailability of appropriate therapeutants and lack of knowledge on their application. In conclusion, the present study provided valuable information on disease and health management in *P. hypophthalmus* in Bangladesh based on field data. In order to develop sustainable pangasius culture in both Bangladesh and within the Southeast Asian region, more research is needed for proper identification and characterization of pathogens and for the development of farmer-oriented disease control and health management packages.

Faruk, Md. A.R. 2008. Disease and health management of farmed exotic catfish *Panagasius hypopthalmus* in Mymensingh district of Bangladesh, pp. 193-204. *In* Bondad-Reantaso, M.G., Mohan, C.V., Crumlish, M. and Subasinghe, R.P. (eds.). Diseases in Asian Aquaculture VI. Fish Health Section, Asian Fisheries Society, Manila, Philippines. 505 pp.

Corresponding author: Md. A. R. Faruk, hasin96@yahoo.com

INTRODUCTION

Pangasius hypophthalmus (Sauvage) is a fast-growing fish, which has recently become a vey popular food fish and valuable aquaculture species in South-East Asia. The fish is extensively cultured by commercial fish farms in Thailand, India and Myanmar. The fish, popularly known as 'Thai pangas', was introduced to Bangladesh from Thailand during the 1990s and has since developed into a very popular species amongst fish farmers and consumers. The fish proved to be a great success in Bangladesh aquaculture and is at present the only catfish species used for commercial aquaculture in the country (Rahman *et al.,* 2005). Two types of culture systems have been practiced in Bangladesh for *P. hypophthalmus* farming: monoculture (following intensive culture strategy) and polyculture (following semi-intensive culture strategy). In the polyculture systems the production of *P. hypophthalmus* is about 10-12 tons/ha. In the case of the intensive commercial culture, production is about 25-30 tons/ha with animal protein rich diets and water exchange (BFRI, 1998). The last few year achieved rapid development on *P. hypophthalmus* farming in Mymensingh District of Bangladesh. Farmers have been converting their rice fields into *P. hypophthalmus* farms for quick profit. Presently, in Mymensingh District, there are about 1,364 pangasius farms covering an area of 774 ha producing 19,203 tons fish per year (DoF, 2003).

Although *P. hypophthalmus* as an air-breather is very able to tolerate poor water quality conditions compared to other freshwater fish species, there are some reports about diseases affecting this species. Aeromonads, notably *Aeromonas hydrophila*, are the most significant problem noted in the literature (Subagja *et al.,* 1999). Ferguson *et al.,* (2001) first described an important disease, Bacillary Necrosis, of Vietnamese *P. hypophthalmus*, which Crumlish *et al.,* (2002) later identified to be caused by *Edwardsiella ictaluri*. Currently in Bangladesh, disease is also the major problem restricting *P. hypophthalmus* farming in the country. However, due to lack of diagnostic support and appropriate therapeutants, farmers are suffering from increasing financial losses due to diseases. As a consequence, the price obtained for this species is decreasing and the livelihood of farmers is under threat. This study was carried out to examine the status of disease and health management practices of *P. hypophthalmus* in Mymensingh District of Bangladesh.

MATERIALS AND METHODS

Study area

The study was conducted in three selected *upazilas* (local administrative unit – Mymensingh District is consists of 11 *upazilas*) in Mymensingh District namely Trishal, Bhaluka and Muktagacha (Figure 1) where the highest cluster of *P. hypophthalmus* farms are located.

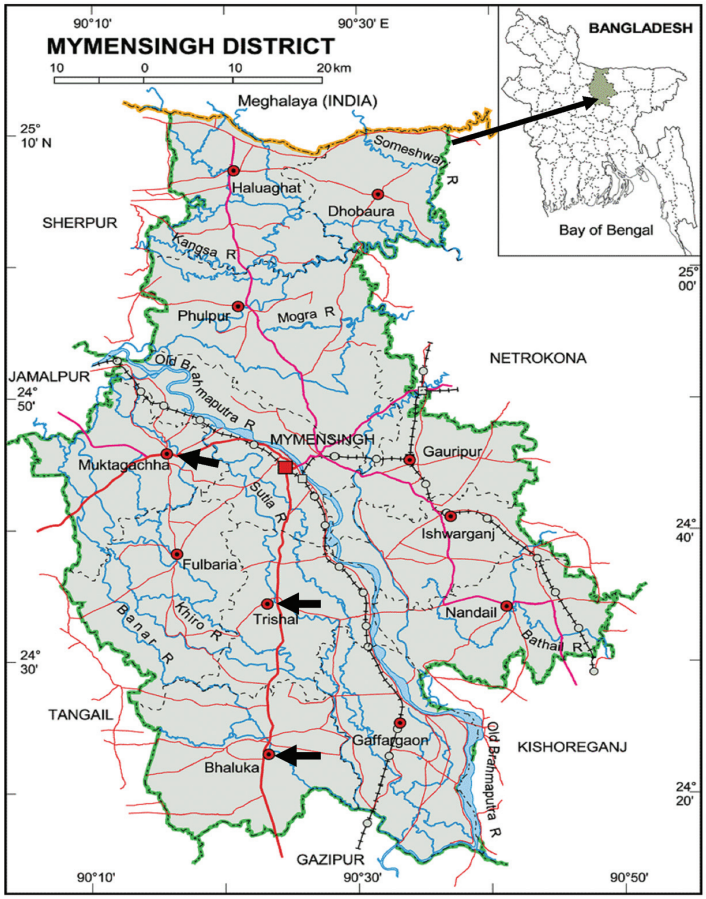

Figure 1. Map of Mymensingh District. Arrows show study areas.

Data collection

Data was collected through the questionnaire interview and participatory rural appraisal (PRA) with fish farmers. For questionnaire interview, a set of preliminary questionnaire was prepared. This was pilot-tested with a few *P. hypophthalmus* farmers of each representative location and necessary modifications were made based on their feedback. Simple random sampling method was followed for the interview. A total 100 farmers having different farm size were interviewed. The questionnaire was divided into several sections. The first section focused on general farming and farmer's information, the second section on pond preparation information, the third one covered information related to fish stocking and pond management, and the final section focused on fish health and disease problems, their economic loss, management interventions used to control disease. This section was used only when the farmers reported health problems in their ponds.

PRA tools including focus group discussion (FGD) was conducted with farmers to get an overview of particular issues concerning fish health. Six FGD sessions in different

upazilas were conducted where each group size was between 6 and 12 farmers. Cross check interviews were conducted with key informants such as District Fisheries Officer, Upazila Fisheries Officer (UFO) and NGOs working in aquaculture.

RESULTS

Farmers category

All together, data from 100 farmers were analysed. The survey split farmers into three catagories depending on their pond area. The first category comprised of small farmers having less than 0.5 ha pond area which represented about 45% of the total farmers interviewed (Table 1). The second category was medium farmers who had pond areas between 0.5 and 1.0 ha, and the third category was larger farmers having pond areas over 1.0 ha. The medium and large category farmers represented 35% and 20%, respectively.

Table 1. Summary of the respondents with different pond categories.

Pond category (ha.)	Trishal	Bhaluka	Muktagacha	Total
	n=40	n=33	n=27	n=100
<0.5	20	10	15	45
0.5-1.0	12	13	10	35
> 1.0	8	10	2	20

n:sample size

Farmer's age, family, experience and education

All the farmers interviewed were male with an average age of 37 years and an average family size of 6 (Table 2). The average years of experience with *P. hypophthalmus* farming by the farmers was 5 years. About 44% farmers had education up to high school level (under ten class) followed by Secondary School Certificate (ten class) (29%) and Higher Secondary Certificate (twelve class) (20%). Only few respondents (7%) had graduation degrees. When the farmers' were aked about the reasons for fish culture, majority of the farmers (71%) reported that they culture fish for income and 29% farmers reported that they culture fish for both income and food.

Table 2. Average age, family size and experience of the respondents.

Pond category (ha)	Average age (yr)	Average family size (no)	Average experience (yr)
<0.5	37	6	4
0.5-1.0	36	5	5
> 1.0	38	7	6
Overall average	37	6	5

Pond preparation and stocking

Of the 100 interviewed farmers, 70 respondents said that they used only lime during pond preparation, 25 respondents used lime and cow dung and only 6 farmers used lime, cow dung and some inorganic fertilizers like urea and triple super phosphate. About 62 farmers reported that they do not remove undesirable species from their ponds before stocking fingerlings of *P. hypophthalmus* and 38 farmers said that they remove undesirable species by using netting. Few farmers dried their ponds before stocking. The average pond preparation cost which include mainly the costs of application of lime, fertilizer and netting was about Tk1,910/ha (1US$ = 68 Bangladesh Taka = Tk). All the interviewed farmers practiced monoculture of *P. hypophthalmus*. The average stocking density of fish was 39,581 fingerlings/ha and average stocking cost was Tk 55,852 (US$821.35)/ha (Table 3).

Table 3. Stocking density and stocking cost.

Pond category (ha.)	Average stocking density (fingerling/ha)	Average stocking cost (Tk/ha)
<0.5	37,213 (± 7193)	52,226 (± 18170)
0.5-1.0	41,515 (± 7017)	55,555 (± 9265)
> 1.0	40,014 (± 3757)	59,774 (± 12516)
Overall average	39,581 (± 5989)	55,852 (± 13317)

* Values in parenthesis are ± standard deviation of mean, 1 US $= 68 Tk

Treatment used by the farmers before fry stocking

About 84 respondents reported that they do not use any pretreatment prior to stocking the fish in the pond and only 16 respondents reported that they dip their fish in potassium permanganate or salt solution before being released into the ponds.

Fish health problem and management

During the present survey, the areas for data collection were selected mostly on the basis of having previous disease history. When farmers were asked whether they had fish health problems in their ponds, the majority (98%) of the farmers said they had problems during previous years or the year before and only 2 respondents indicated that they did not find any disease in their ponds. The average prevalence of ill-health was about 7.2% in a production cycle. The highest prevalence was found with small-scale farmers (7.6%) followed by medium (7.2%) and large scale farmers (6.7%). Farmers reported about 3.4% mortality of their fish in a single production cycle due to ill health (Table 4). Ninety-six farmers reported that they found disease during winter season in their ponds and only four farmers reported that they found disease in rainy season.

Table 4. Prevalence of health problem and mortality of fish.

Pond category (ha.)	Disease prevalence (%)	Mortality (%)
<0.5	7.6	4.0
0.5-1.0	7.2	3.3
> 1.0	6.7	3.0
Average	7.2	3.4

Type of health problems

When farmers were asked about the kind of health problems and clinical signs in their ponds, a range of conditions was reported by the farmers according to their occurrence. The most prevalent symptom of health problem was red spot (19.1%) followed by anal protrusion (18.9%), tail and fin rot (14.3%), pop-eye (12.5%), dropsy (10.9%) and gill rot (9.0%). Other conditions like ulceration, cotton wool type lesion and white spot were also reported by the farmers but with lower incidence (Figure 2). Clinically diseased *P. hypophthalmus* with ulceration and fin rot is shown in Figure 3.

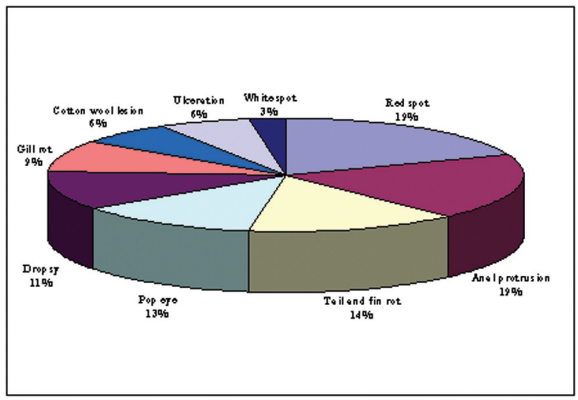

Figure 2. Type of symptom of diseases (% occurrence) of *Pangasius hypophthalmus* in Mymensingh District of Bangladesh.

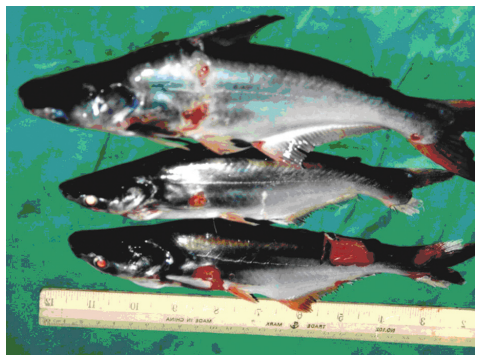

Figure 3. *Pangasius hypophthalmus* with ulceration and fin rot collected from farmer's pond.

Response of farmers to disease problems

Only 10% of farmers said that they go to the government extension officers to report diseases and for seeking advice from them while 80% farmer does not go to extension officer for advice. Generally, most of the farmers turned to other farmers for advice when disease occurred in their ponds and applied a range of treatments. About 82% farmers treated their fish after occurrence of diseases in their ponds. A diverse number of treatments were reported, many in multiple combinations. Liming was the most common treatment followed by application of salt, potassium permanganate, antibiotics, pesticides and insecticides. Of the antibiotics, oxytetracycline and tetracycline were commonly used by most of the farmers. During FGD sessions it was observed that farmers indiscriminately used chemicals for disease control without knowing their effect. It was also found that farmers were under pressure by the pharmaceutical companies to buy their products.

Disease control cost

Average disease control cost per production cycle was Tk 4,285/ha which included prevention cost (Tk 2,827/ha) and treatment cost (Tk 1,458 ha) (Table 5). Costs of preventive measures include the cost of pond drying, addition of water, use of lime before disease outbreak and removal of water turbidity; while treatment cost include the cost of chemicals used for treating after occurrence of fish diseases.

Table 5. Disease control cost (Tk/ha), of *P. hypophtalmus.*

Pond category (ha.)	Prevention cost (Tk/ha)	Treatment cost (Tk/ha)	Total (Tk/ha)
<0.5	2342 (± 786)	1220 (± 1106)	3,562 (± 1892)
0.5-1.0	2433 (± 548)	1447 (± 847)	3,880 (± 1395)
> 1.0	3705 (± 753)	1707 (± 709)	5,412 (± 1462)
Average	2827 (± 696)	1458 (± 2662)	4,285 (± 3358)

*Values in parenthesis are ± standard deviation of mean, 1 US$= 68 Tk

Fish production

Fish production varied with different farmers category. Farmers were asked about their expected production when they had no disease problems and the actual production obtained due to disease problems at the end of the production cycle. Large category farmers had the highest average expected production (Tk 656,031/ha) followed by medium (Tk 620,649/ha), and small farmers (Tk 588,126/ha). Average actual production, that the farmers received after selling fish at the end of the production cycle was also highest in large category farmers (Tk 633,636/ha) and the lowest was in small-scale farmers (Tk 565,022/ha) (Table 6).

Economic losses due to ill-health

The results of the study indicated that there are average economic losses of Tk 21,500/ ha to farmers from fish health problem. These losses varied with the size of farms. The economic loss was estimated by the differences between the expected production and actual production, here prevention and treatment cost of fish diseases was not calculated. The highest average loss as high as Tk 23,104/ha was found with small-scale farmers followed by large (Tk22,395) and medium scale farmers (Tk18,999) (Table 6 and Figure 4). The average estimated loss was 3.6% of the total yearly income from fish production to farmers.

Table 6. Fish production (Tk/ha) and economic loss (Tk/ha) in the study area.

Farm category (ha)	Expected production (Tk/ha)	Actual production (Tk/ha)	Economic loss (Tk/ha)	Percentage of actual production
<0.5	588,126	565,022 (± 126938)	23,104 (± 10435)	4.1
0.5-1.0	620,649	601,650 (± 116008)	18,999 (± 5424)	3.1
> 1.0	656,031	633,636 (± 101092)	22,395 (± 7892)	3.5
Average	621,602	600,102 (± 114679)	21,500 (± 7917)	3.6

**Values in parenthesis are ± standard deviation of mean, 1 US$= 68 Tk*

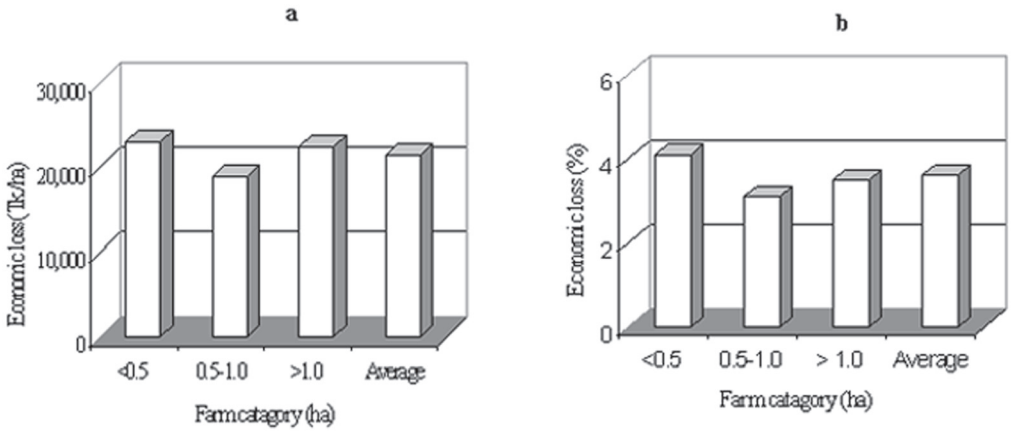

Figure: 4. Economic losses of ~~of~~ fish farmers due to ill-health of *Pangasius hypophthalmus*. (a) Economic loss (Taka/ha). (b) Economic loss percentage of actual production.

Problems in fish health management

Farmers faced several problems when they encountered particular disease in their ponds which include lack of appropriate support from government and non government organizations (49%), lack of knowledge on fish health and disease (35%), unavailability of medicine (10%) and lack of training facility about fish disease treatment (6%).

Importance of fish disease to farmers

About 46% of farmers mentioned ill-health of fish as a major problem in fish culture while 22% considered it as a moderate problem, 21% of farmers as minor and 11% of farmers mentioned that they do not think disease a problem.

DISCUSSION

Aquaculture in Bangladesh is growing rapidly with respect to both the quantity and variety of species. Aquaculture production has shown a sharp annual average growth of 28% from 0.12 million tons to 0.66 million tons during the period 1984-1985 to 1999-2000 (Mazid, 2002). Diseases of fish are one of the major constraints resulting from intensification of aquaculture and may eventually become a limiting factor to the economics of a successful and sustainable aquaculture industry. The present study identified a range of clinical signs of diseases and conditions of *P. hypophthalmus* farming in Bangladesh as was reported by the farmers according to their occurrence. The most prevalent symptom of disease was red spot, followed by anal protrusion, tail and fin rot, pop eye, dropsy, gill rot, cotton wool type lesion and ulceration. Similar conditions were also reported in the rural carp culture by several authors (Faruk *et al*., 2004a; DoF, 2002; Mazid, 2001; Amin, 2000).

Prevalence of fish disease has negative economic impact on aquaculture. A global estimate of disease losses to aquaculture by World Bank in 1997 was in the range of US$3 billion per annum (Subasinghe *et al.,* 2001). The results of this study indicated that the cost of ill-health of fish was approximately 3.6% to the income of fish farmers from fish production and this loss varied slightly according to the size of farms. Small-scale farms suffered from highest economic losses than large-scale farms. In a recent study on the economic impact of fish diseases on rural freshwater aquaculture Bangladesh, Faruk *et al.,* (2004a) reported average loss of farmers due to fish disease was 14.0% of total fish production. They conducted the survey mainly on farmers practicing carp polyculture. Similarly, Brown and Brook (2002) reported that average loss for farmers due to fish disease was 18.5% of total average yearly income from fish production. Thus, it is clear that the impact of diseases of *P. hypophthalmus* on production was less than those of carp polyculture system. Small-scale farmers have very little knowledge in fish culture and they are reluctant to use any new technologies. Consequently, their production per hectare was low and the losses were high. On the other hand, since large farmers invested more in fish culture, they tended to feed and monitor fish health more regularly.

Economic losses from diseases are likely to increase as aquaculture expands and intensifies. Assessing the impact of disease in aquaculture systems is not easy, as only acute losses are recognized and quantified. Chronic mortalities and poor growth caused by disease are generally not recognized. In order to quantify disease losses, farmers should be able to identify disease as the reason for crop loss, slow growth or poor harvest (Mohan and Bhatta, 2002). Therefore, it is important to train farmers to carry out field-level diagnosis and assess the likely impact of diseases.

In the present study, the reporting of diseases by fish farmer was found very low which is due to the lack awareness of farmers about fish disease and also the lack of reporting places or diagnostic laboratory from where farmers can get advice and other support services. As

a consequence there were severe lack of prevention, diagnosis and treatment. According to fish farmers, most of the diseases mainly occurred during the winter season. During this time when the water level of farmer's pond become very low and the water quality also become very poor that the fish immune system are suppressed due to low temperature. As a result fish become more susceptible to disease. Therefore, farmers could be suggested to take some preventive measures at the beginning of the winter season which include, application of lime and salt, disinfecting of equipment, addition of water, etc. (Faruk *et al*., 2004b).

Farmer responses to disease problems generally involved application of chemicals, with little understanding of their effectiveness, when better results might have been obtained by changes in management practices. They learned about the treatment they used from other farmers, chemical and feed sales persons, hatchery owners and from themselves. The advice received from feed and chemical sales persons may have been biased and which generally involve the sale promotion of chemicals. Advice from government extension services and NGOs was low, indication that efforts are required to increase their profile in this particular area.

In the present study, farmers were found to practice only few health managemant techniques which included application of lime during pre-stocking pond preparation, removal of undesirable species by netting, periodic removal of gases by manual dredge on the pond bottom, periodic checking of fish health condition and some times disinfection of nets and other equipment.

The study identified some problems faced by the farmers in fish health management which included lack of technical knowledge on fish health management, lack of assistance from government and non-government organizations, unavailability of appropriate therapeutants, lack of knowledge on the application of therapeutants, pressure on farmers from pharmaceutical companies and chemical sales person, indiscriminate use of chemicals, low quality chemicals and financial problem. Therefore, in order to sustain the industry in Bangladesh few recommendations could be made which include training of farmers and extension agents on simple diagnostic procedures and effective therapies, awareness creation among farmers on fish health management, legislation development on the safe use of chemotherapeutic agents for prevention and control, establishment of diagnostic centers and support service.

In conclusion, culture of *P. hypophthalmus* in freshwater pond has become very popular and economically beneficial among rural fish farmers of Bangladesh. However, diseases are among the most common and serious problems in *P. hypophthalmus* farming and is responsible for substantial source of monetary loss to farmer. There is no systematic and in-depth research on this particular area from which rural farmers could be benefitted. The present study provided some valuable information based on field data and there is a need to verify this under laboratory condition. In order to develop sustainable pangasius culture in both Bangladesh and within the southeast Asian region, more research is needed for proper identification and characterization of pathogens and development of farmer-oriented disease control and health management packages.

ACKNOWLEDGEMENTS

The study was carried out with financial assistance from the WorldFish Center. The author is grateful to the WorldFish Center for their kind support. The author is also grateful to all the farmers who participated in the survey and PRA activities.

REFERENCES

Amin, M. N. 2000. Impact of fish diseases on fish culture in northern region of Bangladesh. Rural Development Academy, Bogra, Bangladesh. 28 pp.

BFRI (Bangladesh Fisheries Research Institute).1998. Studies on the stress factor in relation to the disease of freshwater fishes. Research progress report. Bangladesh Fisheries Research Institute. Freshwater Station, Mymensingh, Bangladesh.

Brown, D. and Brooks, A. 2002. A survey of disease impact and awareness in pond aquaculture in Bangladesh, the Fisheries and Training Extension Project- Phase II, pp. 85-93. *In* J.R. Arthur, M.J. Phillips, R.P. Subasinghe, M.B. Reantaso and I.H. MacRae. (eds.). Primary Aquatic Animal Health Care in Rural, Small-Scale, Aquaculture Development. *FAO Fish. Tech. Pap.* No. 406.

Crumlish, M., Dung, T.T., Turnbull, J.F., Ngoc, N.T.N. and Ferguson, H.W. 2002. Identification of *Edwardsiella ictaluri* from diseased freshwater catfish, *Pangasius hypophthalmus* (Sauvage), cultured in the Mekong Delta, Vietnam. *J. Fish Dis.* 25:733–736.

DoF (Department of Fisheries). 2002. Fish Fortnight Compendium. Department of Fisheries, Matsha Bhaban, Dhaka, 121 pp.

DoF (Department of Fisheries). 2003. Fish Forth Night Sangkalan-2003. Department of Fisheries, Mymensingh. 109 pp.

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

Faruk, M.A.R., Alam, M.J., Saeker, M.M.R. and Kabir, M.B. 2004b. Status of fish disease and health management practices in rural freshwater aquaculture of Bangladesh. *Pakistan J. Biol. Sci.* 7(12):2092-2098.

Ferguson, F.W., Turnbull, J.F., Shinn, A., Thompson, K., Dung, T.T. and Crumlish, M. 2001. Bacillary necrosis in farmed *Pangasius hypophthalmus* (Sauvage) from the Mekong Delta, Vietnam. *J. Fish Dis*. 24:509-513.

Hassan M.R and Ahmed, G.U. 2002. Issues in carp hatcheries and nurseries in Bangladesh, with special reference to health management, pp.147-164. *In:* J.R. Arthur, M.J. Phillips, R.P. Subasinghe, M.B. Reantaso and I.H. MacRae. (eds.). Primary Aquatic Animal Health Care in Rural, Small-Scale, Aquaculture Development. *FAO Fish. Tech. Pap*. No. 406.

Mazid M.A. 2001. Fish Diseases and Prevention. Bangladesh Fisheries Research Institute. Mymensingh-2201. 36 pp.

Mazid, M.A. 2002. Development of Fisheries in Bangladesh: Plans and Strategies for Income Generation and Poverty Alleviation. 176 pp.

Mohan, C.V. and Bhatta, R. 2002. Social and economic impacts of aquatic animal health problems on aquaculture in India, pp.63-75. *In* J.R. Arthur, M.J. Phillips, R.P. Subasinghe, M.B. Reantaso and I.H. MacRae. (eds.). Primary Aquatic Animal Health Care in Rural, Small-Scale, Aquaculture Development*. FAO Fish. Tech. Pap*. No. 406.

Rahman, M.M., Islam, M.S., Halder, G.C. and Tanaka, M. 2005. Cage culture of sutchi catfish, *Pangasius sutchi* (Fowler 1937): effects of stocking density on growth, survival, and yield and farm profitability. *Aquaculture Research* 1-7.

Subagja, J, Slembrouck, J., Hung, L.T. and Legendre, L. 1999. Larval rearing of an Asian catfish *Pangasius hypophthalmus* (Siluroidei Pangasiidae): analysis of precocious mortality and proposition of appropriate treatments. *Aquat. Living Resour.* 12 (I):37-44.

Subasinghe, R.P., Bondad-Reantaso, M.G. and McGladdery, S.E. 2001. Aquaculture development, health and wealth, pp. 167-191. *In* R.P. Subasinghe, P. Bueno, M.J. Phillips. C. Hough, S.E. McGladdery and J.R. Arthur (eds.). Aquaculture in the Third Millennium Technical Proceedings of the Conference on Aquaculture in the Third Millennium, Bangkok, Thailand, 20-25 February 2000. NACA, Bangkok and FAO, Rome.