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Status of biosecurity in commercial aqua farms in Mymensingh and Jashore districts

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Abstract. Proper biosecurity practices are vital to maintain healthy fish stock in an aqua farm. Biosecurity issues in commercial aqua farms in Bangladesh are not well understood yet and the term is quite new to the farmers. In order to provide baseline information on the status of biosecurity in commercial aqua farms, questionnaire interview was carried out with 100 fish farmers in Mymensingh and Jashore districts. The status of biosecurity was evaluated through some set criteria like farm protection, management of fish seed, feed, water and sanitation and disinfection systems. The overall biosecurity status of the study areas was quite satisfactory. Most of the farmers used deep tube-well water in their farms, majority of them (84%) dried nets before using, their feed storage condition and monitoring was quite satisfactory. Farmers controlled pest by covering their ponds by polythene and nets. Some poor biosecurity measures that were evidenced in the study areas included poor fencing and farm boundary, use of foot bath facilities (7%) and use of protective clothing by farm personnel (3%). Only few farms had restriction on visitors (11%). The most common clinical sign of disease in fishes included ventral reddening, fin rot, reddish lesion and ulcerative lesion in the study areas. Farmers never confirmed these disease outbreaks in laboratory. The present study revealed that the biosecurity problems in commercial aqua farms existed and it is thus recommended that emphasis should be given to train farmers about measures and practices related to aqua farm biosecurity.
Key words: Biosecurity, Aquafarms, Mymensingh, Jashore

Introduction

Biosecurity in aquaculture is a new concept to protect aquatic animals from infectious diseases. It is a set of procedures and measures used in aquaculture to prevent or limits the introduction and spread of disease within or between farms. Since treatments of diseases of aquatic animals are not always effective and cause environmental hazards, effective biosecurity is the key to proper health management and disease prevention. Biosecurity measures can be employed to manage risks to an acceptable level (Johansen *et al.* 2011). Good biosecurity practices can support animal welfare, farm productivity, environmental sustainability, product quality, trade and ultimately profitability (ASC 2012). Commercial fish farming is a profitable business and it is expanding rapidly throughout Bangladesh. Shing *Heteropneustes fossilis*), koi (*Anabas testudineus*) and gulsha (*Mystus cavasius)* are high value fishes that are cultured commercially in high stocking densities throughout the country, particularly in Mymensingh and Jashore districts. Density associated stress and other husbandry risks thus greatly increase the threat of infections. Aqua farmers could use a variety of biosecurity measures to prevent disease in their fish (Piper *et al.,* 1982; Plumb 1994, Winton 2002). Successful fish health management begins with prevention of disease rather than treatment. Prevention of fish disease is accomplished through good water quality management, nutrition, and sanitation. Without this foundation it is impossible to prevent outbreaks of opportunistic diseases. The demands for high quality aquaculture products make control of diseases increasingly important. Good biosecurity

programs are the vital to maintaining healthy animals and to reducing the risk of acquiring disease in aquaculture facilities. However, there is hardly any scientific information available regarding biosecurity in aquaculture of Bangladesh. Therefore, the objective of the present study was to understand the status of biosecurity in commercially aqua farms in Mymensingh and Jashore districts.

Materials and Methods

***Data collection methods*:** Fifty farmers from each district were randomly selected for data collection. Primary data were collected from farmers through questionnaire survey. A set of preliminary questionnaire for the commercial fish farmers was prepared for questionnaire interview. The questionnaire focused mainly on general farming information, culture strategy, types of farms, pond description, biosecurity issues including protective boundary system, fry management, water management, feeding management, sanitation and disinfection systems, biosecurity status of farm personnel, disease and health management. The preliminary questionnaire was tested at the field level and then the final set questionnaire was developed. The data were tabulated in the computer and raw data were entered in spread sheet of the Microsoft Office Excel program to analyze data.

Results

***Culture strategy*:** Biosecurity status of commercial aqua farms culturing high value fishes in Mymensingh and Jashore districts were studied. Majority of the farmers (65%) practiced polyculture of gulsha with shing and koi whereas only 11% practiced monoculture of koi and 24% practiced both polyculture and monoculture (Fig. 1). Gulsa and shing were cultured together with carps i.e. rohu, catla, mrigal, carpio and bata in polyculture system. Farmers used to collect fry of gulsa, shing and koi of 0.2-0.5 g size from local hatchery. All farmers prepared their ponds before releasing fry. They prepared their ponds through dyke repairing, liming, mechanical mud removal and removing of undesirable species. The stocking density of fish varied in Mymensingh and Jashore region. The stocking density of koi was much higher than that of gulsa and shing both in Mymensingh and Jashore region. Average stocking density of gulsa polyculture was 192081.93 (fry/ha), average stocking density of shing polyculture was 195497.85 (fry/ha) and average stocking density of koi monoculture was 557063.85 (fry/ha) (Table I). The stocking density of gulsa and koi were higher in Jashore than Mymensingh while stocking density of shing was higher in Mymensingh than Jashore.

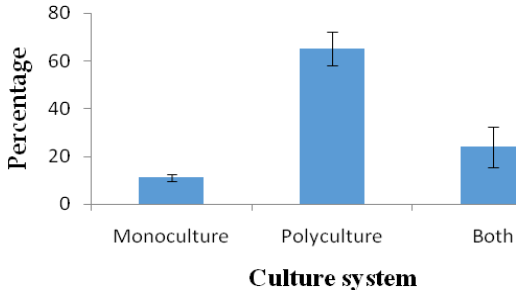

Fig. 1. Culture system of fish

Table I. Stocking density (fry/ha) of fish in the study area

Species	Mymensingh n=50	Jashore n=50	Average
Gulsa polyculture	191819.15±38614.51	192344.7±36757.52	192081.93±37686.02
Shing polyculture	197600±43090.55	193395.7±35428.4	195497.85±39259.48
Koi monoculture	536568.10±35196.65	577559.6±66067.4	557063.85±50632.03

Biosecurity issues

Farm protection: Protection of farms is important from biosecurity point of view. Farm protection included farms having boundary wall or fencing, restriction on visitors, gate and use of footbath. It was found that 50% farm had protective boundary in Mymensingh and 48% in Jashore with an average of 49% (Table II).About 26% fish farm had their own gates in Mymensingh and 24% in Jashore with an average of 25% (Table II). Only 10% farms had some restriction to visitors in Mymensingh and 12% in Jashore. An average of only 7% farms used foot bath before entering into the farms (Table II).

Table II. Farm protection (%) in the study areas

Measures	Mymensingh n=50	Jashore n=50	Mean ± SD
Boundary wall/fencing system	50	48	49 ± 1.41
Restriction on visitors	10	12	11 ± 1.41
Gate	26	24	25 ± 1.41
Foot bath	6	8	7 ± 1.41

n= number of respondents.

Fry management: Average 74% farmers stocked disease free fry collected from reliable hatcheries (Table III).Though majority of them (89%) acclimatized fry before releasing in ponds, their internal quarantine facilities were very poor (11%) (Table III).

Water management: About 68% farms used deep tube well water and majority of them (79%) monitored water quality regularly (Table III). Also, average 49% farmers had water exchange facilities.

Table III. Fry (%) and water management(%) in the study areas

Measures	Mymensingh n=50	Jashore n=50	Mean ± SD
Stocking disease free fry	76	72	74 ± 2.83
Internal quarantine	10	12	11± 1.41
Acclimatization	92	86	89 ± 5.66
Use of good water sources	70	66	68 ± 2.83
Water quality monitoring	76	82	79 ± 4.24
Water exchange facilities	50	48	49± 1.14

Feed management: All the farms used commercial pleated feed. Regular inspection of feed in the study areas was good and average 91% farmers used to inspect their feeds in quite regularly (Table IV). Also, majority of them (97%) monitored the feeding performance of fish. Average 42% famers were satisfied with the protein percentage of feed and 56% had quite good storage facilities in their farm premises.

Table IV. Feed management systems (%)in the study areas

Measures	Mymensingh n=50	Jashore n=50	Mean ± SD
Inspection of feed	90	92	91 ± 1.41
Monitoring of feeding	96	98	97 ± 1.41
Protein level	40	44	42 ± 2.83
Good storage condition	54	58	56 ± 2.83

n= number of respondents.

Sanitation and disinfection: It was found that over 80% farmers dried their nets and disinfect equipment like buckets routinely. They generally used potassium permanganate as disinfectant. However, majority of the farmers (91%) shared equipment and nets among themselves as well as within ponds in their own farm (Fig. 2). Average 77% of them also washed their transport vehicle quite regularly. Disposal of dead fish due to disease or other reason is an important biosecurity issue and it was fond that average 66% farmers were keen to dispose dead fish properly. About 48% farmers were able to control pest in their farms. Grazing of livestock was found common in 22% farms of the study area. However, only 14% farms had sanitary latrine for the workers (Fig. 2).

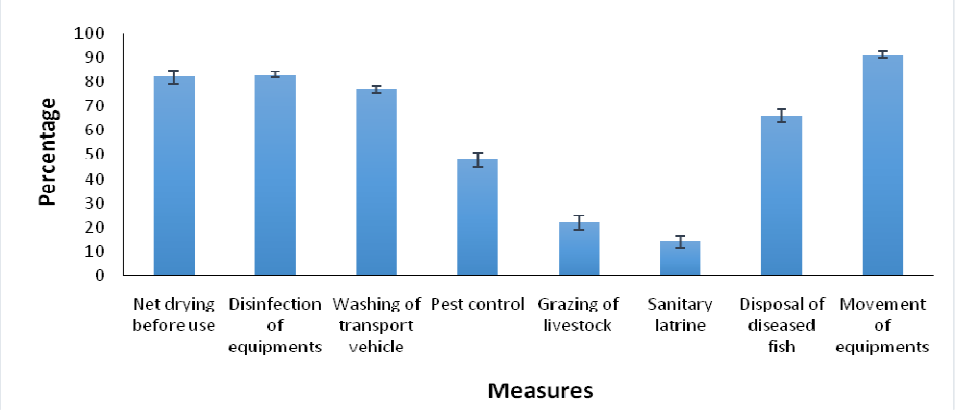

Fig. 2. Status of farm sanitation and disinfection (%) in the study areas.

Farm personnel: Educational qualification of workers is very important to understand and maintain biosecuruty issue in a farm. Educational qualification of farm personnel was found poor. Average only 25% workers were SSC passed and only 29% farm personnel had the opportunity to participate in training programs relating to fish culture. Though use of separate protective clothing during work is important for workers to prevent disease, only 3% had such type of arrangement from the farm. Record keep by farm personnel was found very poor (22%). Regular hand wash by the workers was not common in farms of both the study areas (Table V).

Table V. Biosecurity status of farm personnel in the study areas (%)

Measures	Mymensingh n=50	Jashore n=50	Mean ± SD
Good qualification	20	30	25± 7.07
Participation in training program	26	32	29± 4.24
Use of protective clothing	2	4	3± 1.41
Record keeping	20	24	22 ± 2.83

n= number of respondents.

***Diseases of fish*:** The most common clinical signs of diseases found in the study areas were ventral reddening (75%) followed by ulcerative lesion (69%), fin rot (52%), whitish appearance of fish (38%) and extended belly (33%). Farmers never confirmed theses in laboratory (Fig. 3 and Plate 1).

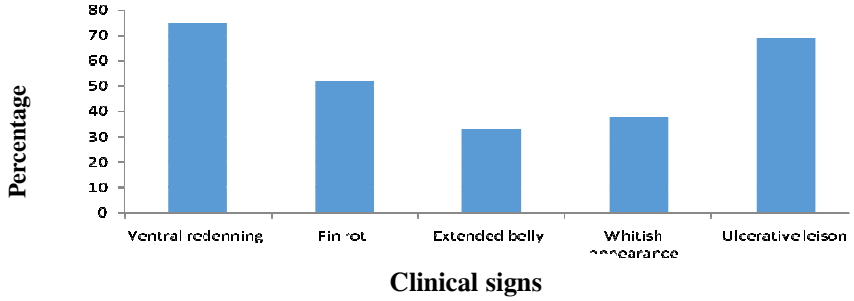

Fig. 3. Clinical signs of diseased fish (%)in the study areas.

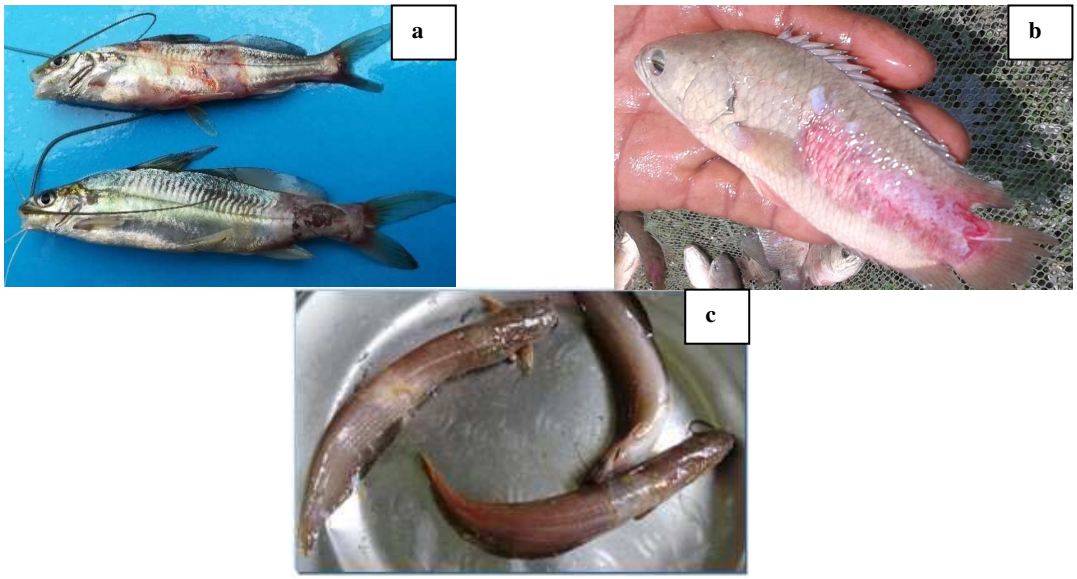

Plate 1. Disease affected fish a) Gulsa with ulcerative lesion over body surface and caudal region, b) Koi with deep red ulcerative lesion on body surface, c) Shing with whitish appearance on the body surface.

Discussion

Biosecurity status of aqua farms were examined through analyzing some set criteria. Though the commercial farmers did not have good understanding of biosecurity procedure still some reputed farmers were found trying to maintain the biosecurity status of their farms. Farm boundary is an essential part of a commercial fish farm to secure a successful biosecurity program. It protects people and animals to enter in the farm premises. Restrictions of movement into fish farms were not a common practice. It was observed that only a few farms maintained this measure while most of the farms did not have this facility. In the visited areas some farm had gate but the percentage was less in Jasore compare to Mymensingh. Only, few farms were found having any foot bath facilities before entering into farms. In the study areas, using of protective clothing was rare. Faruk *et al*. (2012) also got similar results in case of fish hatchery biosecurity. Most of the farms were found having no sanitary latrine facilities except some well-established large scale fish farms in the study area.

Sadler *et al*. (2007) stated that it is very important to protect the entry of predators or pests into the farms as these could act as carrier of disease to other farms. Birds are major predators or pests in aquaculture farms. In the study areas, many farmers were found controlling pest. There is evidence that birds can transmit bacteria and viruses through their droppings. Birds can also drop fish from one body of water into another. In the present study, various aquatic birds were seen around fish farms and most of the farmers were found trying to control the predatory birds like king fisher, pankouri, herons while some farmers were unable to control this because of large size of the farm. Farmers tried to control predatory birds by hanging polythene in horizontal ropes over the ponds. Good water source is a pre-requisite for successful commercial aquaculture operation. From the biosecurity point of view, it is very important to supply contamination free water into the aqua farm. Pillay (1992) reported that fish farms have to be based primarily on access to surface or underground sources of water. In the present study, it was observed that the farmers were very much aware about the water sources and most of the farmers used ground water by using deep tube well and shallow tube well. This made the farms to keep the water at the expected level during pre-monsoon and post monsoon period. In a similar study, Mony (2012) observed that most of the hatchery provides of good quality water in their hatchery. They usually used underground water using deep tube well. Parvin (2011) observed that most (83.3%) of the commercial fish farmers supplied ground water into the ponds.

In the study areas, majority of the farmers measured water quality parameters of their ponds on weekly basis. Parvin (2011) observed that all the commercial fish farmers measured water quality by measuring temperature, dissolved oxygen, transparency, pH, ammonia and alkalinity. Commercial farmers were very much aware about the water quality and they tried to maintain water quality properly. However, some farmers did not have any water quality measurement kits, so they measured water quality through eye estimation from their own experience. Sometimes they took assistance from the fish feed and medicine company representatives who visited the farmer's pond and helped to measure the water quality parameters. Some farmers often called the extension workers to solve their problems and then they measured the water quality and necessary suggestions were given to them. From biosecurity point of view, it is very important to collect and stock disease free fry in a farm. Farmers generally collected fry or fingerling locally. In a study, Faruk *et al*. (2012) mentioned that though some farm owners keep

the newly collected brood in separate tank they actually did not maintain proper quarantine procedure. Treatment of fry before releasing into the pond is an essential part of biosecurity of commercial fish farm. But in the study area it was found that most of the farmers are not aware enough in this regard.

It was observed that most of farmers disposed diseased fishes from their ponds. Some farmers mentioned that they tried to collect dead and moribund fishes from their ponds and buried under soil. Sometimes dead fishes were taken by wild animals such as dogs, cats, foxes etc. Besides that, the children from the adjacent villages picked up the moribund fishes for consuming. Delabbio *et a1.* (2004), reported that routine collection of dead fish should be one of the most commonly used biosecurity measures in aquaculture. It was found that almost all the farmers used commercial pelleted feed which were bought from different fish feed companies and most of the commercial farms had good feed storage facilities and they tried to maintain the storage conditions properly. Most of the farmers stocked the feeds in the store room above the ground level on the wooden or bamboo made rack to avoid contamination. They also tried to maintain proper ventilation facilities in the store room to keep feeds in good and fresh condition. From the biosecurity point of view, it is very important to use separate equipment for separate ponds. But in the present study, it was observed that the farmers did not follow this biosecurity rules properly. Most of the farmers used rented nets for catching of fishes rather than their own net. Though many of the farmers had the ability to possess their own net, they were not interested to buy nets for their farms as they needed to hire labor for operating, drying and maintaining of it. Net drying is very much important for maintaining hygienic condition of farms. In the study areas routine drying of fish net was quite satisfactory. Most of the farmers were found not to disinfect their equipment like plastic baskets, aluminum pots and transporting vehicles like manual van, pickup van and truck. Sadler and Goodwin (2007) mentioned that for the best results in killing pathogens, one must clean, disinfect and dry equipment before it is used elsewhere on or off the farm.

All the commercial farms had disease problem to some extent. Major clinical signs were ventral reddening, ulcerative lesion, fin rot, whitish appearance and extended belly. Disease monitoring is one of the most important biosecurity measures in fish farms. Almost all the farmers were found to monitor disease condition of fishes in their ponds quite regularly. In conclusion, the present study identified a number of biosecurity problems in commercial fish farms. It is thus important to aware farmers about basic farm level biosecurity principles through training. Also, government should develop national biosecurity strategy for aqua farms for sustainable and safe aquaculture production.

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