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Aquaculture Drugs Used for Fish and Shellfish Health Management in the Southwestern Bangladesh

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ABSTRACT

Aquaculture is a fast-growing food production sector. However, intensification of aquaculture has led to increasing use of various drugs and chemicals, detrimental to aquatic ecosystems. The present study was carried out to know the existing situation of different aquaculture drugs used in fish and shellfish health management in aquaculture activities. Data was collected through questionnaire interview, personal contact, market survey and Participatory Rural Appraisal (PRA) like Focus Group Discussion (FGD) with fish and shellfish hatchery owners, nursery and culture farmers and retailers of aqua medicine and representatives of pharmaceutical companies. A range of chemicals including antibiotics were found existing in the market. Fish health management and disease treatment were the major areas where majority of such chemicals have been used. Other uses included pond preparation and management, growth promotion and improvement of water quality to enhance pond productivity. Commonly found traditional and new chemicals in health management included geotox, green zeolite, zeolite, zeocare, lime, mega zeo, bio aqua, gastrap, aquanone, zeo-fresh, zeo prime are used for the pond preparation and water quality management. Bio-ox, best oxygen, oxygen plus, oxyflow, oxygold, oxygrow, oxylife, oxymax, oxymore and oxyplus are the available chemicals for increasing oxygen concentration in pond or gher. Acimox(vet) Powder, Bactitab, Chlorsteclin, Cotrim-Vet, Fish cure, Orgacycline-15%, Otetra vet power 50, Oxin WS, Oxysentin 20%, Ranamox, Renamycin and Sulfatrim were antibiotics widely used in the study area. The present study also identified the problems associated with the use of aquaculture drugs which included lack of knowledge regarding use of chemicals, appropriate dose, method of application and indiscriminate use of chemicals in southwestern Bangladesh.

Key words: Antibiotics, aquaculture drug, chemicals, disinfectants, health management, Bangladesh

INTRODUCTION

Aquacultural production in Bangladesh is increasing day by day through intensification (Al Mahmud *et al*., 2012; Ahmed *et al*., 2012). The role of fisheries sector to national economy has

always been significant and main source of animal protein, employment opportunities, food security, foreign incomes and socio-economic improvement (Siddiq *et al*., 2013). This sector contributes 4.39% to GDP and 22.76% to agricultural GDP. Fish supplements to about 60% of our daily animal protein intake. About 10% of the population is dependent directly and indirectly on the fisheries for their living (DoF, 2013).

It has already been renowned as a vital income and employment-generating sector in Bangladesh, cheap sources of healthy food for the population of the country (Ali *et al*., 2014). Total fish production in our country during the 2011-2012 was about 3.26 million metric tons of which 2.68 million metric tons were produced from freshwater including culture fisheries and 0.05 million metric tons from marine water including shrimp (DoF, 2013).

Successful aquaculture is now depending on the chemicals (Faruk *et al*., 2008) which have been used in various methods for centuries (Subasinghe *et al*., 1996). Aquaculture drugs are significant components in health management of aquatic animals, pond construction, soil and water management, improve aquatic productivity, feed formulation, manipulation of reproduction, growth promotion and processing and value addition of the final product (GESAMP, 1997; Subasinghe *et al*., 1996). A variety of other drugs are also used in aquaculture for health management of fish apart from antibiotics. Some common chemicals include sodium chloride, formalin, malachite green, methylene blue, potassium permanganate, hydrogen per oxide and glutaraldehyde (Plumb, 1992).

In Bangladesh, commonly used aquaculture drugs are lime, rotenone, various forms of inorganic and organic fertilizers, phostoxin, salt, dipterex, antimicrobials, potassium permanganate, copper sulphate, formalin, sumithion, melathion etc. (Phillips, 2000; Hasan and Ahmed, 2001; Brown and Brooks, 2002; DoF, 2002; Faruk *et al*., 2005). A range of disease could be found in farmed aquatic animals in Bangladesh (Karim and Stellwagen, 1998; BFRI, 1999; Faruk *et al*., 2004). Farmers are using a range of chemicals and antibiotic for the treatment of diseased fish and shellfish. Also, pharmaceutical companies and chemical sellers are influencing fish and prawn farmers to buy their products. The farmers have been using these chemicals without knowing their requirements and effectiveness.

No appropriate study have been carried out on the use of drugs in aquaculture especially in Khulna and Bagerhat district, southwestern Bangladesh. The present investigation was aimed to provide some information on the uses of drugs in aquaculture of southwestern Bangladesh. The specific objectives included in this study were to make a list of drugs used in aquaculture, dose and the existing problems associated with the use of aquaculture drugs.

MATERIALS AND METHODS

Study area: Data for the present study was collected from different upazillas in Khulna and Bagerhat district where aquaculture clusters are located (Fig. 1). The mainly preferred area were the fish farm, shrimp and prawn gher, feed shop and the aqua shops.

Methodology: Both primary and secondary data were used during the study. For gathering data, combinations of several survey techniques were adopted. The data were collected over eight months from January to August, 2013 in Khulna and Bagerhat district. These were the well-known area for the culture of fish and shellfish.

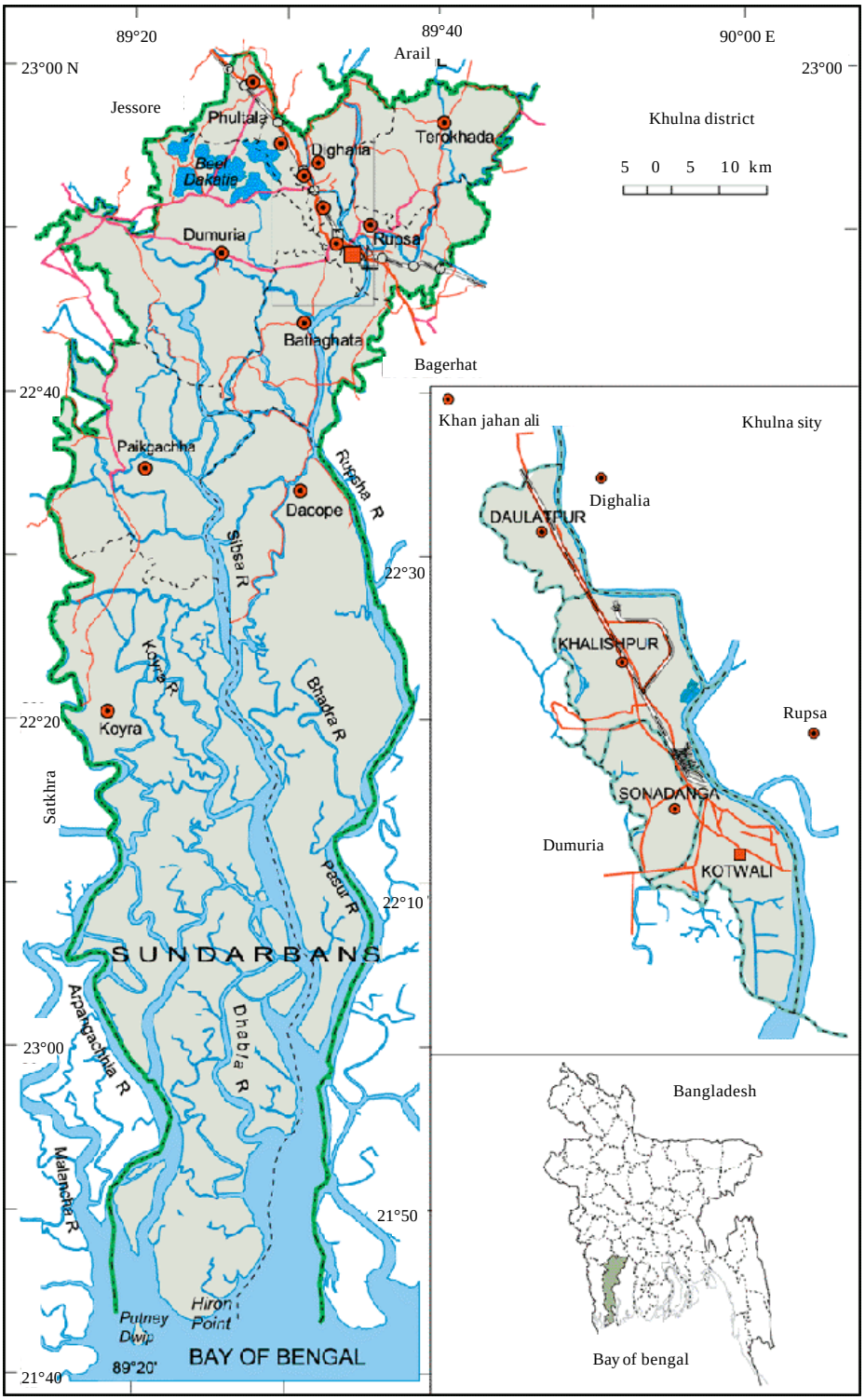

Fig. 1: Map of the study area

Secondary data collection: Secondary source of information consist of published material such as journals, textbooks, newspaper etc. Moreover, appropriate government and non-government organizations as like Fish Inspection and Quality Control (FIQC) office. The existing problems associated with the use of aquaculture drugs were also collected from the secondary source.

Primary data collection: Field surveys were used for the collection of primary data. For the confirmation of the secondary data, primary data was used also. By using questionnaire interviews and direct observations, primary data were gathered for this survey. Primary data were collected through questionnaire interview with hatchery owner, culture farm, chemical seller, medical representative of Pharmaceuticals Company. During visiting the hatcheries, nurseries and culture pond, the elements that were considered with importance about chemicals and fish toxicants are purpose of use of chemicals or toxicants, variation in methods of application, effectiveness of chemicals or toxicants, side effect of chemicals and toxicants, variation in applied dose of chemicals or toxicants, ban on chemicals or toxicants by the government, price and availability of the chemicals, specific remark and recommendation of the chemicals.

Questionnaire interviews: The questionnaire form was filled in by interviewing from 45 hatcheries or gher owner, 35 chemical sellers and 20 medical representatives of Pharmaceuticals Company directly from the study area. Questionnaire was examined in the field before interviews.

Focus Group Discussion (FGD): For this study, one of the PRA tool such as Focus Group Discussion (FGD) was conducted with hatcheries or gher owner, 35 chemical sellers and 20 medical representatives of Pharmaceuticals Company fish farmers. In this study, FGD was used to get an overview of particular issues such as the existing problems associated with the use of aquaculture drugs. A total of 5 FGD sessions was conducted where each group size of FGD was 6-8 people. FGD session was held in front of hatchery or gher, representative offices, chemical sellers shop etc.

Crosscheck interviews: After collecting the data through questionnaire interviews and FGD, crosscheck interviews were conducted with Upazila Fisheries Officer, Assistant Fisheries Officer, relevant NGO workers, hatchery owner, chemical seller and medical representative of Pharmaceuticals Company at their offices or home.

Data processing and analysis: The data was analyzed using tabular and descriptive statistical techniques. The summary tables were prepared in accordance to the objective of the study. Data collected from various sources was entered into a data base system using Microsoft office Software. The processed data were transferred to a master sheet from which classified tables were prepared revealing the findings of the study. At each stage of survey data sheets were compared with original data sheets to ensure the accuracy of data entered.

RESULTS AND DISCUSSION

The aquaculture drugs available in the market used at different stages of aquatic animal health management like pond preparation, growth promotion, increasing oxygen concentration, disinfectant, probiotic and fish and prawn disease treatment have been collected. Fish disease treatment was the major area where sufficiently of such compounds were used. The local animal feed and chemical shops are the main sources of such compounds.

Table 1: Chemicals used for pond preparation and water quality management

Trade name	Active ingredients	Dosage form	Manufacturer
Aquanone	Rotenone	5-7 kg acre^{-1}	Square
Bio aqua	Extract of Uka cidizera tree	2 mL/100 dec	Eon animal health products
Gastrap	Lactic acid bacillus, *Bacillus subtilis*, amilase, cellulose, lipase	200 g acre^{-1}	Square
Geotox	SiO_2, Al_2O_3, Fe_2O_3 CaO, MgO, Na_2O	For 3-6 ft water 20-25 kg/100 dec	Novartis pharmaceuticals
Green zeolite	SiO_2, Al_2O_3, Fe_2O_3 CaO, MgO, Na_2O	20-25 kg/100 dec (pond preparation), 10-15 kg/100 (during culture)	Organic pharmaceuticals
Lime	CaO, $Ca(OH)_2$	Spread with water 6-10 ppm	Chemical seller
Mega zeo	SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O, Mn	For 3-6 ft water 20-25 kg/100 dec	ACI animal health
Zeocare	SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O	200 g acre^{-1}	Nature care
Zeo-fresh	Sio_2, Al_2O_3, Fe_2O_3, CaO, MgO, LoI, K_2O	20-24 kg acre^{-1}	Square
Zeolite	SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O	20-30 kg acre^{-1}	Syngenta
Zeo prime	Sio_2, Al_2O_3, Fe_2O_3, CaO, MgO, LoI, K_2O	20-24 kg acre^{-1}	SK+F

Table 2: Chemicals used for disinfectant

Trade name	Active ingredients	Dosage form	Manufacturer
Aquakleen	Tetradesile trimethyle amonium bromide, aminonitrogen	24 kg acre^{-1}	Square
BKC	Benzal konium chloride	Spread with water 0.5 ppm	Chemical seller
Bleaching	Chlorine	60 ppm	Chemical seller
EDTA	Sodium thio sulphate	0.1-1 ppm	Chemical seller
Efinol	Efinol	5-8 g/1000 L water	Eon animal health products
Formalin	38% formaldehyde	1-3 ppm	Chemical seller
Water clear	Sodium thio sulphate	2-3 L/100 dec	Organic pharmaceuticals
Omicide	Benzil ammonim chloride+urea	200 mL acre^{-1}	Lion overseas

Chemicals used for pond preparation and water quality management: A wide variety of traditional as well as new compounds were seen in the market which are being used to pond preparation and refining water quality of fish pond. The list of such chemicals with their active ingredients, prescribed dose and Manufacturer Company are shown in Table 1.

Aquaculture drugs like geotox, green zeolite, zeolite, zeocare, lime, mega zeo, bio aqua, gastrap, aquanone, zeo-fresh, zeo prime are used for the pond preparation and water quality management. Aquanone are used for controlling unwanted fishes as well as other harmful aquatic animals.

Chemicals used as disinfectant: There are many disinfectants that are widely used in many spheres of aquaculture. They are used both in hatchery, grow-out systems and ponds mainly for equipment cleaning, to maintain hygiene and in some cases to eradicate disease. The disinfectants that, listed in Table 2, were available in the market during the study.

Aquakleen, BKC, bleaching, EDTA, efinol, formalin, water clear, omicide were the used drugs for disease treatment. Formalin is also used to control protozoan disease. BKC (Benzal Konium Chloride) used for controlling bacterial disease and Efinol can also be used as stress resistance. The fish farmers used a variety of chemicals in the treatment of disease or to avoid its occurrence.

Chemicals used to increase oxygen concentration: Most chemicals are used for the purpose of oxygen supply. Several chemicals were seen readily available in the chemical shops to use for

Table 3: Chemicals used for oxygen supply

Trade name	Active ingredients	Dosage form	Manufacturer
Bio-ox	Sodium carbonat, H_2O_2 10%	2.5-5 g $acre^{-1}$	ACI animal health products
Best oxygen	Sodium percarbonate	200-250 g $acre^{-1}$	Univet Ltd
Oxygen plus	O_2 Promoter	250-500 g $acre^{-1}$	Avon animal health
Oxyflow	H_2O_2 10%	250-350 g $acre^{-1}$	Novartis pharmaceuticals
Oxygold	Sodium percarbonate	200-250 g $acre^{-1}$	Fishtech Ltd
Oxygrow	O_2 promoter	500 g $acre^{-1}$	Century Agro Ltd
Oxylife	Oxygen precursors	400 g $acre^{-1}$	Square
Oxymax	H_2O_2 10%	250-500 g $acre^{-1}$	Eon animal health products
Oxymore	Sodium carbonat peroxyhydrat	250-500 g $acre^{-1}$	SK+F Bangladesh Ltd
Oxyplus	Na_2O_2+AlOH Na_2O_2 -90%	500 g $acre^{-1}$	Navana animal health

Table 4: Chemicals used for disease treatment

Trade name	Active ingredients	Dosage form	Manufacturer
Albez	Doxycyclin, colistine sulphate + vitamin premix + mineral	200-250 g $acre^{-1}$	Univet Ltd
Eco- solution	Eco-solution	200-250 g $acre^{-1}$	Fishtech Ltd
Malthion	Malthion	500 g $acre^{-1}$	Century agro Ltd
Registrol	Betain, calcium, P, Vit-C	5-10 mL kg^{-1} feed	Square
Salt	NaCl	1-3 g kg^{-1} feed	Square

increasing dissolved oxygen in fish and shellfish pond. bio-ox, best oxygen, oxygen plus, oxyflow, oxygold, oxygrow, oxylife, oxymax, oxymore and oxyplus are the available chemicals for increasing oxygen concentration in pond. Oxydizing agent, hydrogen peroxide are the major active ingredients of such chemical (Table 3).

In the present study, it was found that some of the above chemicals are also used to eliminate hardness and poisonous gases e.g. oxyflow. Some chemicals like oxymax and oxy plus also support in preventing diseases in fish and shellfish.

Chemicals used for disease treatment: In the aquaculture activities, there are different chemicals are for treating fish disease. These types of chemical are displayed in Table 4.

From above chemicals in Table 4, eco-solution is effective for viral diseases. Melathion and salt are useful for eradication of external parasites as well as fungal diseases.

Antibiotics used for disease treatment: Acimox (vet) Powder, Bactitab, Chlorsteclin, Cotrim-Vet, Fish cure, Orgacycline-15%, Otetra vet power 50, Oxin WS, Oxysentin 20%, Ranamox, Renamycin and Sulfatrim are antibiotics with different trade names were seen in the market as well as used by the fish farmers which are shown in Table 5. The active ingredients of such antibiotics are mainly Oxytetracycline, Chloro-tetracyclin, Amoxicillin, Co-trimoxa zole, Sulphadiazine and Sulphamethoxazole.

All of these antibiotics are effective against bacterial disease. According to the leaflet, Oxysentin 20% and Orgacycline-15% are also effective against EUS. It was also mentioned that Chlorsteclin plays vital role in growth promotion as well as effective against some disease like dropsy, tail and fin rot, gill rot of fish etc.

Chemicals used as growth promoter: There are different chemicals found in the chemical shops which are used as growth promoter as well as to rise production included Megavit Aqua, Aqua

Table 5: Antibiotics used for disease treatment

Trade name	Active ingredients	Dosage form	Manufacturer
Acimox(vet) powder	Amoxiciline (Trihydrate)	1 g/1 kg feed	ACI animal health
Bactitab	Oxytetracyclin 20%	50 g kg^{-1} b.wt. 5-7 days	ACI animal health
Chlorsteclin	Chlortetracycline	200-300 g/100 kg feed (5-7 days)	Novartis pharmaceuticals
Cotrim-vet	Sulphamethoxazole + Trimethoprime	0.50 mg kg^{-1} b.wt	Square pharmaceuticals
Fish cure	Chloro-tetracyclin HCl	500 g/100 kg feed (3-5 days)	Rals agro Ltd
Orgacycline-15%	Chlorotetracycline	200-300 g/100 kg feed (5-7 days)	Organic pharmaceuticals Ltd
Otetra vet power 50	Oxytetracycline	Mixed with feed; 11-16 g/100 kg b.wt	Square pharmaceuticals
Oxin WS	Oxytetracycline 20%	50 mg/kg b.wt	Navana
Oxysentin 20%	Oxytetracline HCl BP	100-200 g/100 kg feed, 5-7 days (For treatment)	Novartis pharmaceuticals
Ranamox	Amoxicillin trihydrate	28-40 g/100 bd of fish, 10 days. continuously	Renata pharmaceuticals Ltd
Renamycin	Oxytetracycline	28-42 g/100 kg feed, 10 days.	Renata pharmaceuticals
Sulfatrim	Sulphadiazine and trimethoprim	50 g/kg b.wt. 5-7 days	Square pharmaceuticals

Boost, Aqua Savor, Vitamin premix, Fibosoel, Grow fast, Orgavit auqa, AQ-Cell, AQGrow-G, Fish vita plus, AQ Grow-L, Nature Aqua GP, Vitamix, F Aqua, ACmix and many more. Aqua boost contains immunostimulant which enhance non-specific immunity in fish.

Problems in use of aquaculture drugs: The present study identified several problems associated with the use of aquaculture drugs which included lack of knowledge regarding use of chemicals, lack of knowledge of application of chemicals and antibiotics, indiscriminate use of chemicals, lack of knowledge about residual effect and expiry date and lack of diagnostic facilities for proper disease diagnosis.

CONCLUSION

Disease treatment in aquaculture can be of great value when chemicals are used properly but mismanagement of these can lead to a countless damage of production. Considering the present situation, it can be assumed that with the further advancement of the aquaculture industry in Bangladesh, particularly in systems undergoing intensification, the applications of chemicals would be increased. The present study described the existing status of aquaculture drugs used in fish and shrimp health management by the fish and shrimp farmers. By the survey, farmers did not have proper knowledge about the chemicals they were using especially those were available in the markets known by their trade names only. However, policy makers, researchers and scientists should work together in addressing the issues of drugs used in aquaculture with the view to decrease the negative impacts. Therefore, there is a necessity for better understanding of chemical uses in aquaculture management and initiative should be taken both by the government and nongovernment organizations.

REFERENCES

Ahmed, S., A.F.M. Arifur Rahman, M.G. Mustafa, M.B. Hossain and N. Nahar, 2012. Nutrient composition of indigenous and exotic fishes of rainfed waterlogged paddy fields in Lakshmipur, Bangladesh. World J. Zool., 7: 135-140.

Al Mahmud, N., M.D. Robiul Hasan, M.B. Hossain and M.H. Minar, 2012. Proximate composition of fish feed ingredients available in Lakshmipur region, Bangladesh. Am. Eur. J. Agric. Environ. Sci., 12: 556-560.

Ali, M.M., M.B. Hossain, M.H. Minar, S. Rahman and M.S. Islam, 2014. Socio-economic aspects of the fishermen of Lohalia River, Bangladesh. Middle-East J. Sci. Res., 19: 191-195.

BFRI, 1999. Fish diseases: Prevention and control. Circular Leaflet No. 6. Bangladesh Fisheries Research Institute, Bangladesh, pp: 1-7.

Brown, D. and A. Brooks, 2002. A Survey of Disease Impact and Awareness in Pond Aquaculture in Bangladesh, the Fisheries and Training Extension Project-Phase 11. In: Primary Aquatic Animal Health Care in Rural, Small Scale and Aquaculture Development, Arthur, J.R. (Ed.). FAO, California, USA., pp: 85-93.

DoF, 2002. Fish fortnight compendium. Department of Fisheries, Dhaka, Bangladesh, August 2002, pp: 44-45.

DoF, 2013. National fish week 2013 compendium. Department of Fisheries, Ministry of Fisheries and Livestock, Government of the People's Republic of Bangladesh, Dhaka, pp: 1-144 (In Bengali).

Faruk, M.A.R., M.J. Alam, M.M.R. Sarker and M.B. Kabir, 2004. Status of fish disease and health management practices in rural freshwater aquaculture of Bangladesh. Pak. J. Biol. Sci., 7: 2092-2098.

Faruk, M.A.R., M.M. Ali and Z.P. Patwary, 2008. Evaluation of the status of use of chemicals and antibiotics in freshwater aquaculture activities with special emphasis to fish health management. J. Bangladesh Agric. Univ., 6: 381-390.

Faruk, M.A.R., N. Sultana and M.B. Kabir, 2005. Use of chemicals in aquaculture activities in Mymensingh area, Bangladesh. Bangladesh J. Fish, 29: 1-10.

GESAMP, 1997. Towards safe and effective use of chemicals in coastal aquaculture. GESAMP Reports and Studies No. 65. IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP, Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection, FAO, Rome, Italy, pp: 1-40.

Hasan, M.R. and G.U. Ahmed, 2001. Issues in Carp Hatcheries and Nurseries in Bangladesh with special Reference to Health Management. In: Primary Aquatic Animal Health Care in Rural, Small-Scale, Aquacultural Development, Arthur, J.R., M.J. Phillips, R.P. Subasinghe, M.B. Reantaso and I.H. MacRae (Eds.). FAO, Rome, pp: 147-164.

Karim, M. and J. Stellwagen, 1998. Final report on fourth fisheries project: Shrimp aquaculture (preparatory phase for national development program). Department of Fisheries, Ministry of Fisheries and Livestock, Bangladesh.

Phillips, M., 2000. The Use of Chemicals in Carp and Shrimp Aquaculture in Bangladesh, Cambodia, Lao PDR, Nepal, Pakistan, Sri Lanka and Viet Nam. In: Use of Chemicals in Aquaculture in Asia: Proceedings of the Meeting on the Use of Chemicals in Aquaculture in Asia 20-22 May 1996, Tigbauan, Iloilo, Philippines, Arthur, J.R., C.R. Lavilla-Pitogo and R.P. Subasinghe (Eds.). Southeast Asian Fisheries Development Center, Philippines, ISBN-13: 9789718511497, Pages: 75-86.

Plumb, J.A., 1992. Disease Control in Aquaculture. In: Disease in Asian Aquaculture, Shariff, I.M., R.P. Subasinghe and J.R. Arthur (Eds.). Fish Health Section, Asian Fisheries Society, Manila, Philippines, pp: 3-17.

Siddiq, M.A., M.I. Miah, Z.F. Ahmed and M. Asadujjaman, 2013. Present status of fish, fishers and fisheries of Dogger Beel in Hajigonj Upazila, Chandpur, Bangladesh. J. Aquatic Sci., 1: 39-45.

Subasinghe, R.P., U. Barg and A. Tacon, 1996. Chemicals in Asian Aquaculture: Need, Usage, Issues and Challenges. In: Use of Chemicals in Aquaculture in Asia, Arthur, J.R. (Ed.). Southeast Asian Fisheries Development Center, Aquaculture Department, Iloilo, Philippines, pp: 1-6.