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Aquaculture practice and production performance of pabda *Ompok pabda* (Hamilton, 1822) in Northern region of Bangladesh

M Afzal Hossain, Hafizur Rahman Dipu and M Rezoanul Haque

Abstract
This study was conducted to observe the aquaculture status of pabda (*Ompok pabda*) at northern region of Bangladesh. A total of 60 randomly selected farmers were interviewed from eight upazilla of Dinajpur district. Results indicate that pabda fish has been commonly cultured as pabda with carp and gulsha; pabda with carp and pabda with carp and tilapia in polyculture system over the study area. Both of private and leased (~100 thousand BDT/ha/yr) ponds are used for pabda polyculture. Farmers applied lime (275 ± 3.91 kg/ha), cow dung (1900 ± 121.34 kg/ha), urea (60 ± 2.86 kg/ha) and TSP (37 ± 2.08 kg/ha) for pond preparation and management of carp and pabda polyculture system. The highest fish production (4718 ± 73 kg/ha/yr) was reported in Carp-Pangas-Tilapia. Despite of the lowest production (3176± 54 kg/ha/yr) from Carp-Pabda-Gulsha polyculture, this polyculture system provided the highest profit (2, 33,889 ± 4,793 BDT/ha/yr). In contrast, Carp-Pangas-Tilapia provided the lowest profit (1, 20,238 ± 5,708 BDT/ha/yr). Good profit from pabda with carp and gulsha was likely associated with better market price and demand of pabda and gulsha in the study area. Overall, the study indicates that pabda polyculture is more profitable and is promising in the study area.

Keywords: Aquaculture, SIS, pabda, carp

1. Introduction
Fish plays an important role in human diets and serves as an irreplaceable source of animal protein for the poor rural households in Bangladesh. Aquaculture and fisheries is the most productive and dynamic sectors that has significant contribution in food security through providing safe and quality animal protein in Bangladesh. Like other common fishes, small indigenous species (SIS) contributes significantly in regards to quality protein and nutrient supply to the poor and pro-poor. Typically, SIS contains large amount of vitamin-A and vitamin-D essential for human bones, skin, eyes and teeth [19]. There are approximately 260 indigenous fresh water fish species in Bangladesh. Of these common fish species, 143 are classified as small indigenous species [13]. Most of the small indigenous species (SIS) are caught from natural waterbodies. Although, SIS was commonly abundant in beels, rivers, haors and baors, current existence of SIS is significantly scarce at natural habitats in Bangladesh.
Ompok pabda locally known as Madhu pabda is a small freshwater catfish which belongs to the family Siluridae of the order Siluriformes [16]. Pabda is high in nutrients containing 100g contains protein 19.2%, fat 2.0%, iron 0.2g, calcium 402 mg, phosphorus 216 mg and water 79.3% [17]. Like other small indigenous species (SIS), pabda are typically found in ponds, lakes, borrow pits, floodplains, oxbow lakes and semi-closed water bodies in Bangladesh (Ahmed 1981) [1] and [18]. Recently, the abundance and distribution of pabda has been noticeably declined from natural habitats due to pollution and agricultural pressure. Therefore, *O. pabda* is listed as endangered fish species in Bangladesh [6]. However, this small indigenous species has got greater attention among the farmers in northern region due to its demand and high market prices.
In particular, pabda culture has some common constrains including the unviability of fry and fingerlings, and cannibalistic behaviors in the early life stage [12]. Therefore, the culture of pabda was not so much popular to the farmers for commercial culture in previous. Recently, artificial breeding of pabda has been developed in India and Bangladesh [4].

As a result, aquaculture of pabda is now being intensified and well-practiced all over the country. Previous several studies demonstrated some aspects of the breeding biology of pabda [4]; [3]. Culture of pabda in research pond is evident in Mymensingh region of Bangladesh [9]; [8]. However, little is known about the existing culture practice and economic feasibility of pabda culture in northern part of Bangladesh. Thus, this study is focused on the observation of the aquaculture practice and identification of cost-benefit of pabda culture at Dinajpur district in northern part of Bangladesh. This will ultimately bring up some insight information and prospects for commercial aquaculture in this region.

2. Materials and Methods

The study was carried out from November 2017 to April 2018 to understand present status and production performance of the commercially important small indigenous fish species pabda in Dinajpur region.

2.1. Selection of the Study Areas

Eight upazilas of Dinajpur district, namely Dinajpur Sadar, Chirirbandar, Parbatipur, Birol, Kaharole, Birganj, Khansama and Bochaganj (Fig. 1) were selected to conduct the study based on the aquaculture development and secondary information available from district fisheries office about the aquaculture practice over the district. Data were collected from randomly selected 60 fish farmers from the study areas considering the following aspects, fish species, sources of fish seed, pond management, feeding practice, fish production and profit from aquaculture practice.

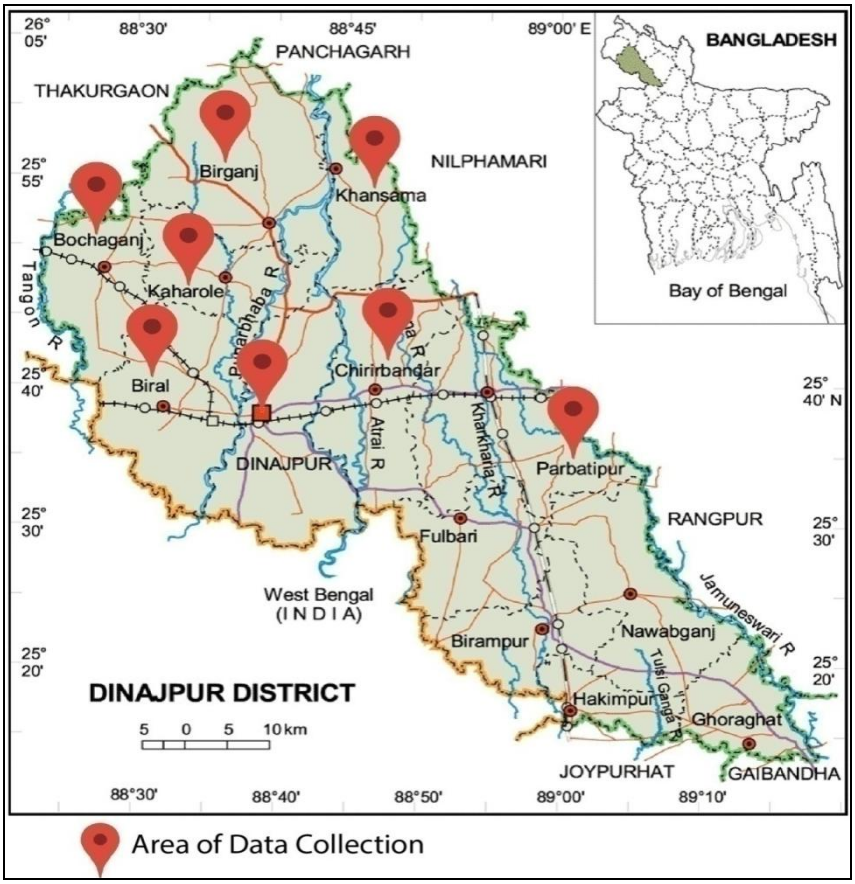

Fig 1: Map of Dinajpur district in Bangladesh showing the study area

2.2. Questionnaire preparation and data collection

A questionnaire was developed to get reliable information from the farmers about current culture practices, management practices, source of fingerlings, water quality management and cost-benefit of fish production. Data were collected from both primary and secondary sources. Primary data were collected from the respondents by direct interview using the questionnaire. The interview schedule contained both open and close ended questions in order to get explanatory answers. The interviews were conducted at farm sites. At the beginning of interview a brief introduction on the study objectives was given to each of the farmers and assured them that all information would be kept confidential. Each question was explained clearly and asked systematically for their sound understanding. The secondary data were obtained from different published literatures and statistical data from Upazila Fisheries Offices, Non-Government Organization (NGO) officials etc.

2.3. Data processing and analysis

After collection of data, they were coded, compiled using the computer software SPSS and analyzed. Some of the data were collected into local units and those data were converted into standard units. All Qualitative data were converted into quantitative numbers by means of suitable scoring whenever necessary. Respondents' views on different issues ranked and converted into quantitative numbers if required after processing, scaling and indexing of the necessary and relevant variables to perform subsequent statistical analyses for drawing inferences. Total farm cost was determined by summarizing of individual cost such as fish stocking, land lease, fertilizer cost, labor cost and other miscellaneous cost

expensed in the farm for each hectare pond for one year. Similarly, total income was determined from the total fish biomass sold from the respective pond size in each year. Thus, the profit of each farm was determined by deducting the total cost from the total income obtained per year.

3. Results and Discussion

3.1. Polyculture status in ponds

3.1.1. Aquaculture system

It was found that all the farmers (100%) in the selected areas usually practiced polyculture system. Results showed that farmers cultured 13 fish species under five polyculture systems namely (i) Carp polyculture; (ii) Carp with pabda and gulsha (iii) Carp with pabda and tilapia; (iv) Carp and pabda, and (v) Carp with pangas and tilapia in the study area. The culture species in the study areas were rohu (*Labeo rohita*), catla (*Catla catla*), mrigal (*Cirrhinus mrigala*), grass carp (*Ctenopharyngodon idella*), common carp (*Cyprinus carpio*), pangas (*Pangasius sutchi*), bighead carp (*Hypophthalmichthys nobilis*), tilapia (*Oreochromis nilotica)*, silver carp (*Hypophthalmichthys molitrix*), bata (*Labeo bata*), kalibaush (*Labeo calbasu*), pabda(O*mpok pabda*) and gulsha (*Mystus cavasius*).Generally 14-17 fish species are cultured in polyculture systems in different combinations in Bangladesh which resemble the findings of the present study (Jahan *et al*., 2018) [7].

3.1.2. Fish seed source

Among 13 popular culture fish species, seeds of catla, kalibaush, pangas, pabda, gulsha were predominantly collected from hatcheries in the study area. The spawn or seeds of rest species were collected either from hatchery or hatchery and/or local fry traders. The results can be supported by a study conducted by [5] who reported the hatchery as main source of fish seeds for aquaculture in the northern region of Bangladesh.

Table 1: Different fish seed sources used for polyculture

Sl. No	Fish species	Percentage of respondent cultivated	Fish seed sources (%)	
			Hatchery seed	Local fry traders
1	Rui	86.6	70.0	30.0
2	Catla	33.3	100.0	-
3	Mrigal	83.3	63.3	36.7
4	Silver carp	68.3	72.0	28.0
5	Bighead carp	40.0	90.0	10.0
6	Bata	71.6	81.2	18.8
7	Common carp	51.6	85.0	15.0
8	Grass carp	41.6	80.0	20.0
9	Kalibaush	21.6	100.0	-
10	Tilapia	55.0	61.0	39.0
11	Pangas	15.0	100.0	-
12	Pabda	50.0	100.0	-
13	Gulsha	23.3	100.0	-

3.2. Pond management system

3.2.1. Pond size

Pond size was categorized into three different types, small (<0.05 ha), medium (0.05-0.10 ha) and large (>0.10 ha).It was found that 51.7% farmers had medium sized pond, 36.7% small and 11.6% had large sized ponds (Table 2). Average pond size was 0.14 ha in present study which can be close to (0.21 ha) reported in other study by Saha (2003) in Dinajpur sadar Upazila [15].

Table 2: Farmers pond size in the study area

Category	Number of farmer (N)	Percentage of farmer (%)
Small	22	36.7
Medium	31	51.7
Large	7	11.6

3.2.2. Fertilizer application

It was found that both organic and inorganic fertilizers were used during pre-stocking and post-stocking management of the culture ponds (Table 4). The purpose of using fertilizers is to grow natural foods for fish by improving the fertility of soil, thereby increasing the yield of fish. In the current study, it was identified that most of the farmers applied lime (275 ± 3.91 kg/ha) and cow dung (1900 ± 121.34 kg/ha) for pond preparation and management. However, farmers also provided urea (60 ± 2.86 kg/ha) and TSP (37 ± 2.08 kg/ha) for pond preparation and management of carp and pabda polyculture in this region. Mohsin *et al.* (2012) [11] recommended the fertilization rate of urea 78.69 kg/ha, TSP 48.07 kg/ha and cowdung2124.69 kg/ha for pre-stocking pond management in Rajshahi and Natore districts. Thus, the fertilization to aquaculture in this region is likely scientific for pond management of carp-pabda culture in this region.

3.2.3. Fish feed

In the current study, it was observed that all farmers (100%) provide commercial and farm made feeds in aquaculture system. The collected data revealed that 70% farmers applied commercial feeds and 30% farmers used both farm made and commercial feeds in the ponds. The most commonly used ingredients for farm made feeds were rice bran, wheat bran and mustard oil cake. Rahman (2014) [14] reported that farmers used fish feed consisting of mustard oil cake, rice bran, wheat bran, fish meal, soy bean meal etc. in their farms. It was found that fish farmers used Mega feeds, Quality feeds, Nourish feeds, Aftab feeds, Lily feeds in the selected areas. Alam *et al.* (2012) [2] reported the application of commercial fish feeds in aquaculture of same manufacturers in different regions of the country.

3.3. Fish production

In the current study, the highest biomass production (4718± 73 kg/ha; Fig. 2) was obtained from carp-pangas-tilapia polyculture, while carp-pabda-gulsha polyculture provided the lowest production (3176± 54 kg/ha; Fig. 2) in the study region. This result can be supported by other study where Kohinoor *et al.* 2006 [10] found 2,986±78 kg/ha fish production in polyculture of *O.pabda* with Indian Major Carps and gulsha tengra (*Mystus cavasius*) in Bangladesh. The lowest fish biomass production from Carp-Pabda-Gulsha polyculture is likely associated due to culture of small indigenous species of fish such as pabda and gulsha instead of pangas and tilpia included in the polyculture system in this current study.

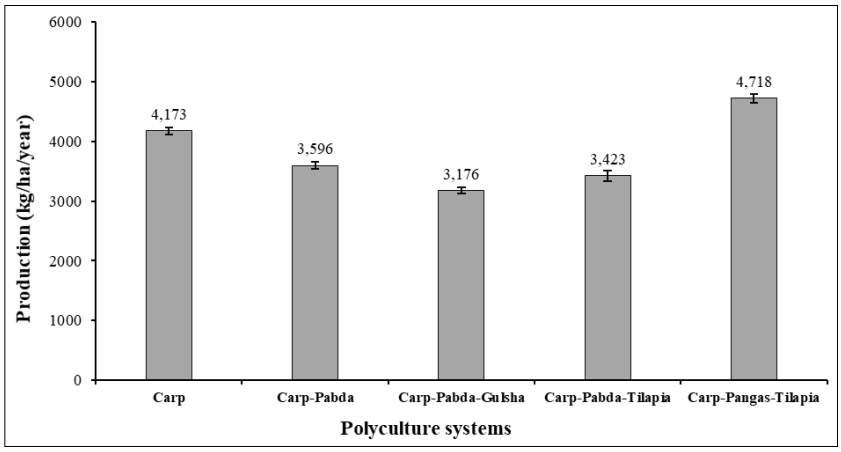

Fig 2: Fish production from pabda polyculture in selected area of Dinajpur district.

3.4. Cost-benefit analysisfrom aquaculture

In the current study, the highest gross annual cost (2, 52,420 ± 2328 BDT/ha/yr; Table 2) of aquaculture was performed in Carp-Pabda-Gulsha polyculture and the lowest total annual cost (1, 63,400 ± 4,657 BDT/ha/yr; Table 2) was found in Carp polyculture in the study area. In case of income, the highest gross income was obtained from Carp-Pabda-Gulsha polyculture and thus, the profit (2, 33,889 ± 4,793 BDT/ha/yr; Fig. 3) was higher than any other polyculture system in the study area. In contrast, the lowest income (1, 20,238 ± 5,708BDT/ha/yr; Table 2) was found from Carp-Pangas-Tilapia polyculture system in the study area. Hossain *et al.* (2013) [5] reported that annual income from pond fish aquaculture practiced in Dinajpur ranged from 0.3 to 15.00 thousand with a mean of 3.538 thousand taka. Results of the present study is likely different to the above study because of variation in pond size and culture practices in most of the ponds. In the current study, better farm profit from Carp-Pabda-Gulsha is more likely associated due to good market price and higher consumer demand of pabda and gulsha in this region.

Table 2: Cost-benefit analysis of different polyculture system in the study region

Polyculture system and respondents(N= 60)	Total cost in BDT/ha/yr (Average ± S.E.)	Total income in BDT/ha/yr (Average ± S.E.)	Profit in BDT/ha/yr (Average ± S.E.)
Carp (N=21)	1,63,400 ± 4,657	3,16,016 ± 7,667	1,52,616 ± 3,639
Carp-Pabda-Gulsha (N=14)	2,52,420 ± 2,328	4,86,309 ± 5,474	2,33,889 ± 4,793
Carp-Pabda-Tiapia (N=8)	2,25,691 ± 2,579	4,22,858± 8,117	1,97,167± 7,116
Carp-Pangas-Tilapia (N=9)	2,51,227 ± 7,900	3,71,466 ± 13,094	1,20,238 ± 5,708
Carp-Pabda (N=8)	2,14,243 ± 7,737	4,20,275 ± 13,794	2,06,031 ± 6,401

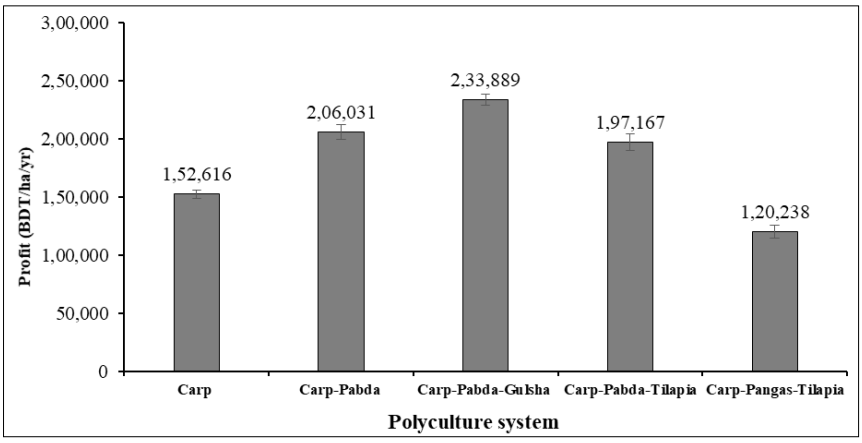

Fig 3: Profit from different aquaculture practice in the study area of Dinajpur district.

4. Conclusion

Current study reveals that Pabda with carp and gulsha polyculture gives the highest profit in this area. In particular, market price is very significant factor in commercial aquaculture. Pabda fetches a relatively higher market price than other species available in the market in this region. Considering its higher market price and consumer demand, pabda polyculture can elevate the overall farm profit. Thus, pabda polyculture can play an important role in food security and provides more economic benefit to farmers at northern part of Bangladesh.

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6. References

1. Ahmed K. Nutritional blindness in Bangladesh Touch. VHSS Newsletter, 1981, 1-2.
2. Alam MK, Habib MAB, Tahmid MS. A survey on commercial fish feed used at Fulpur area in Mymensingh district. Journal of the Bangladesh Agricultural University. 2012; 10(1):175-178.
3. Chakraborty B, Mirza Z, Chakraborty A. Reproductive cycle of the endangered Pabda, *Ompok pabda* (Hamilton-Bouchanan, 1822) in Bangladesh. Asian Fish Sci. 2010; 23:301-320.
4. Chakraborty PP, Chakraborty NM, Mondal SC. Breeding and seed production of butter catfish, *Ompok pabda* (Siluridae) at Kalyani Centre of CIFA, India. Aquaculture Asia Magazine, January-March, 2009, 33-35.
5. Hossain M, Alam MR, Haque MR, Mehbub MF. Study on present status of carp-SIS polyculture in Dinajpur District of Bangladesh. Bangladesh Research Journal Publication. 2013; 9(2):123-130.
6. IUCN Bangladesh. Red List of Bangladesh. Volume 1: Summary, IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, 2015, xvi+122.
7. Jahan H, Parvez I, Kibria ASM. Current aquaculture practices in Dinajpur District: Special emphasis on fish feeds. International Journal of Fisheries and Aquatic Research. 2018; 3(1):35-42.
8. Kohinoor A, Begum M, Hussain M. Culture potentials of gulsha (*Mystus cavasius*) in management under different stocking densities. Bangladesh Journal of Fisheries. 2004; 8:95-100.
9. Kohinoor A, Rahman M, Moniruzzaman H, Chakraborty S. Production performance of pabda (*Ompok pabda*) and gulsha (*Mystus cavasius*) with GIFT strain (*Oreochromis niloticus*) in on-farm management system, 2011. Bangladesh Journal of Fisheries Research. 2012; 15-16:27-36.
10. Kohinoor AHM, Begum M, Hussain MG. Evaluation of different stocking densities of two small indigenous fish, pabda (*Ompok pabda*) and gulsha (*Mystus cavasius*) with Indian major carps in polyculture system. Iranian Journal of Fisheries Science. 2006; 8:57-64.
11. Mohsin ABM, Galib SM, Hossain MA, Islam MN. Cost-benefit analyses of carp polyculture in ponds: a survey study in Rajshahi and Natore districts of Bangladesh. Bangladesh Journal of Environmental Sciences. 2012; 23:103-107.
12. Parameswaran S, Sevaraj C, Radhakrishnan S. Notes on the life history and biology of the cat fish *Ompok pabda* (Hamilton). Journal of the Zoological Society of India. 1971; 23:137-150.
13. Rahman AKA. Freshwater Fishes of Bangladesh, 2nd edition, Zoological Society of Bangladesh, Department of Zoology, University of Dhaka-1000, 2005, 187-188.
14. Rahman MR. Aquaculture practices followed by the fish farmer in Panchagarh sadar upazila. MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, Bangladesh, 2014.
15. Saha MK. A study on fish production technology in North-west Bangladesh. M.S. Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, 2003, 71.
16. Siddiqua KA, Islam MS, Hossain MG, Ahmed ATA. A histological study of the spermatogenesis in *Ompok pabda* (Hamilton-Buchanan 1822). Bangladesh Journal of Fisheries Research. 2000; 4(2):185-189.
17. Siddiqui K, Choudhury SN. A Manual on Pond Pisciculture. The National Institute of Local Government, Dhaka, Bangladesh, 1996, 114.
18. Talwar P, Jhingran A. Inland fisheries of India and adjacent countries. Vol. 2, Oxford and IBH Publishing, New Delhi, 1991.
19. Roos N, Islam MM, Thilsted SH Small indigenous fish species in Bangladesh: contribution to vitamin A, calcium and iron intakes. Journal of Nutrition. 2003; 133:4021S-4026S.