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Major Fisheries Species along with Their Contribution to the National Fishery Production in Bangladesh

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ABSTRACT In Bangladesh, due to its geographical location, fisheries play a significant role in socioeconomic development and food security. The country has 57 major rivers and nearly 118,813 km^2 marine area in the Bay of Bengal. Almost 260 freshwater and 740 marine water fisheries species are found in Bangladesh. There is a lack of studies dealing with species-wise production status and growth rate in Bangladesh. This study is conducted to discover the recent trend of fisheries yield with major species-wise production share and growth rate. The required data have been collected from the website of the Department of Fisheries of the government of Bangladesh. Fisheries yield is increasing in Bangladesh, but the inland culture segment is growing fast compared to inland capture and marine segments as the slope of inland culture is 1.1, higher than inland capture and marine. Species converging in the major carp group are the highest, over 21%, contributor to the national yield. As a single species, the Hilsa takes the maximum production share, around 12%. The contribution of marine species is poor, approximately 15% of the total yield, compared to the potential. Bangladesh may raise the required export diversification based on fisheries resources. To do so, the policymakers of Bangladesh should raise funds for blue economic research, human resource development, and technology import.

Keywords: Fisheries resources; fisheries production; fishery species; importance of fisheries resources; inland fishery production; marine fishery production

INTRODUCTION

Bangladesh is a South Asian overpopulated country. It has 169 million population with 1176 people per square kilometer (PopulationStat, 2023). As an agriculture-dependent emerging country, fisheries have a significant role in its socio-economic development. In 2021, the contribution of the fisheries was 2.5% of the Gross Domestic Product (GDP) of the country (Manik, 2023). Either fully or partially, more than 12% of Bangladeshi depend on fisheries for their livelihood (Department of Fisheries of Bangladesh, 2020). Bangladesh has 355,331,80 households where fisheries households and fisheries landed households are 2.8% and 4.5%, respectively (Ministry of Planning, 2019). Fisheries have a significant contribution to meeting the daily protein demand of Bangladesh, and the protein intake is increasing day by day from the fisheries sources. In regular diet, per capita per day fish intake of the country was 49.5 gm in 2010 which increased to 62.6 gm in 2016 (Bangladesh Bureau of Statistics, 2019). Bangladesh earns foreign currency by exporting fisheries products to over 55 countries (Shamsuzzaman *et al.*, 2017). In 2022, fisheries resources contributed 1.05% of the national export income of the country.

Asian countries are the hotspot of global fisheries and aquaculture. In 2017, Asian countries contributed 91% of the world's aquaculture yield (Tacon, 2020). Bangladesh is high potential in fisheries and aquaculture resources as it has enough water bodies and favorable environments for growing fisheries. The country is called riverine as it has 57 major rivers throughout the country which expand its inland water area (Afroz & Rahman, 2013). Inland water bodies in Bangladesh are close to one-third of its national area (Bishwajit, 2014). The country also has a vast marine area in the Bay of Bengal. Bangladesh is the owner of approximately 118,813 km^2 of water area, nearly 81% of its land area, in the Bay of Bengal (Shuva & Uddin, 2021). The coastal land in Bangladesh is near about 32% of its national land (Parvin *et al.*, 2017).

The fisheries yield trend of freshwater and marine water in Bangladesh showed a production gap from 1985 to 2019 (Sunny *et al.*, 2021). The production trend between freshwater capture and culture exhibited a remarkable yield difference from 2007 to 2019 (Jahid *et al.*, 2021). Inland capture, inland culture, and marine fisheries yield showed an increasing trend from 1984 to 2020 (Deb *et al.*, 2022). Inland and marine water bodies of Bangladesh are rich in fisheries resources and biodiversity. Almost 260 freshwater species are found in Bangladesh (Department of Fisheries, 2023). On the other hand, the country has 740 marine water species in the Bay of Bengal (Habib & Islam, 2020). Catfish showed the highest contribution among all species in the Rajbari, a district of Bangladesh, fish market in 2020 (Nadia *et al.*, 2022).

The above literature indicates the importance of fisheries resources in socioeconomic development and food security in Bangladesh. However, the previous and existing literature regarding the fishery of Bangladesh has highlighted the production, yield capacity, and importance of fisheries in the country rather than the species-wise contribution to the national production. A few pieces of literature indicate the species-wise contribution in a district-level market. There is a lack of studies dealing with species-wise production contribution and growth rate at the national fisheries yield in Bangladesh. So, this study has been conducted to discover the major species-wise

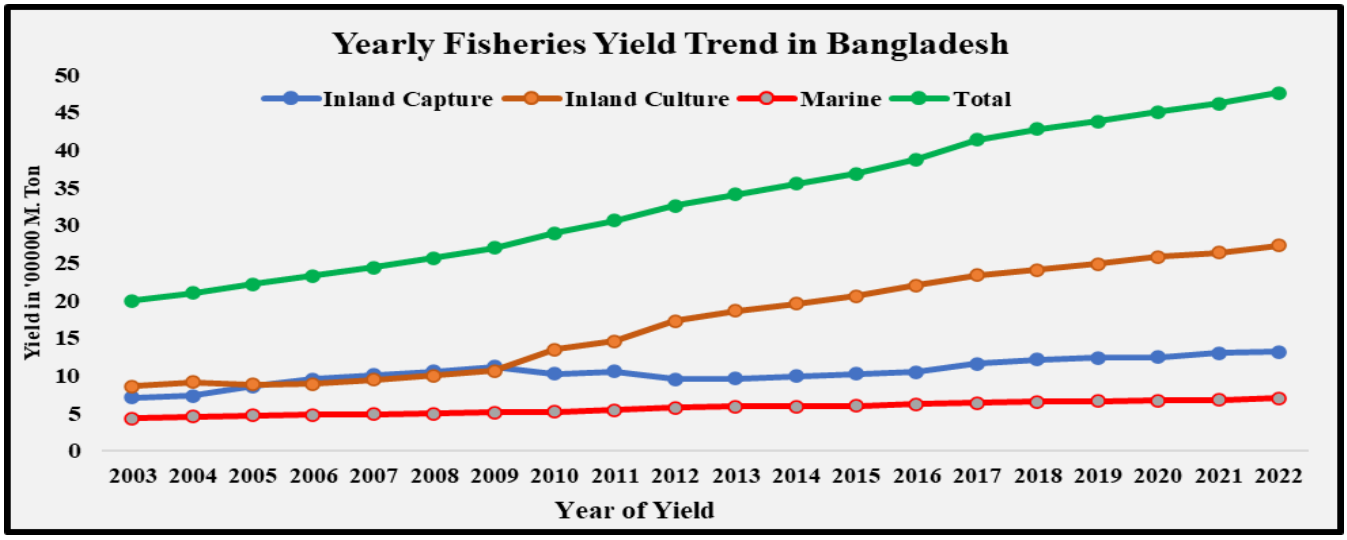

Figure 1. Yearly fisheries production trend in Bangladesh from 2003 to 2022.

production share and growth rate at the national fisheries production in Bangladesh. The proposed study might be helpful for the policymakers of Bangladesh to revise the existing or make new fishery policies in the country. The international and national communities may use this study to understand the species-wise contribution and growth rate to the national fisheries production in Bangladesh.

MATERIALS AND METHODS

This research is conducted based on the secondary data collected from the Department of Fisheries of the government of the People's Republic of Bangladesh. On the website of the fisheries department of the government of Bangladesh, there is the year-wise yearbook of fisheries statistics of Bangladesh. The aggregated production data of inland capture, inland culture, marine, and total from 2003 to 2022 has been collected from the yearbook from FY'2002-03 to FY'2021-22. The yearbook has been prepared based on the fiscal year, so data in the book have been arranged according to the fiscal year. For analysis purposes, data have been rearranged according to the calendar year means data in FY'2002-03 of the yearbook has been considered as the data in 2003, and data in FY'2003-04 has been considered as the data in 2004, and so on. Production data of major species and groups have been picked up from the yearbook of FY'2020-21 and FY'2021-22 to understand the species-wise contribution and growth rate.

In Bangladesh, the fisheries sector is divided into two groups named inland and marine where the inland group is the sum of two sub-groups named inland capture and inland culture. The inland group is also known as the freshwater group. There are no marine culture fisheries in Bangladesh till now, so marine fisheries mean marine capture fisheries. Finally, the fisheries resources in Bangladesh have 3 wings, inland capture, inland culture, and marine, and the total fisheries are the combination of these 3 wings. For analysis purposes, the study used Microsoft Excel.

RESULTS AND DISCUSSION

Figure 1 represented the line graph of aggregate fisheries yield of inland capture, inland culture, marine, and total in Bangladesh from 2003 to 2022. All segments of fisheries production show an increasing trend. In 2003, freshwater capture, freshwater culture, marine water, and national fisheries production of the country were 7.1, 8.6, 4.3, and 20.0 hundred thousand metric tons, respectively, but, after 19 years, in 2022, the production turned to 13.2, 27.3, 7.1, and 47.6 hundred thousand metric tons, respectively.

The inland culture segment is the highest contributory sector in the national fisheries production in Bangladesh. However, the contribution of the inland capture segment was the highest in national production from 2006 to 2009. The production ratio and slope of the fisheries yield data of the country are presented in Table 1. The production ratio is the ratio between the fisheries yield in 2022 and 2003 in the same segment meaning the ratio between inland capture in 2022 and 2003. For example, the production ratio of inland capture fisheries is the ratio of inland capture yield in 2022 and 2003 which is 1.9 meaning the inland capture fisheries yield in 2022 was 1.9 times that of in 2003. The production ratio of total fisheries yield is 2.4 indicates that the total fisheries yield in 2022 was 2.4 times that of 2003.

The slopes of the fisheries yield from 2003 to 2022 indicate all segments of fisheries show an increasing trend. The slope of marine fisheries production is the lowest,

Table 1. Production ratio and slope of fisheries yield in Bangladesh.

Measurement Type	Inland Capture Fisheries	Inland Culture Fisheries	Marine Fisheries	Total
Production ratio	1.9	3.2	1.6	2.4
Slope	0.3	1.1	0.1	1.5

Table 2. Descriptive statistics of the fisheries yield in hundred thousand metric ton.

Statistics	Inland Capture Fisheries	Inland Culture Fisheries	Marine Fisheries	Total Fisheries
Observation #	20	20	20	20
Min	7.1	8.6	4.3	20.0
Max	13.2	27.3	7.1	47.6
Range	6.1	18.7	2.7	27.6
Sum	210.1	343.6	114.0	667.7
Mean	10.5	17.2	5.7	33.4
SD	1.7	6.9	0.8	9.1
CV	16.1	40.1	14.7	27.3

0.1, till now positive, among three groups, inland capture, inland culture, and marine, meaning the marine fisheries yield is increasing in Bangladesh, but the rate of increase is poor compared to the other 2 segments. Bangladesh has huge potential in marine fisheries, but the country is failed to grab the opportunity due to a lack of proper marine policies, research, skilled manpower, and funding. Bangladesh is not having enough success to extract its marine resources from the Bay of Bengal (Manik, 2022).

Table 2 represents the descriptive statistics of the fisheries production in Bangladesh in hundred thousand metric tons from 2003 to 2022. On average, for 20 years of fisheries, yearly inland capture fisheries were 10.5 hundred thousand metric tons, same was 17.2 hundred thousand metric tons for inland culture fisheries, 5.7 hundred thousand metric tons for marine fisheries, and 33.4 hundred thousand metric tons for total fisheries yield. The annual average of freshwater culture production is almost 3 times the average marine yield, and the similar average for freshwater capture yield is nearly 2 times that of marine.

The standard deviation of the freshwater culture fisheries yield is 6.9, higher than the freshwater capture and marine yield, meaning the production of freshwater culture is more fluctuated than freshwater capture and marine.

The above analysis shows the aggregate fisheries yield status in Bangladesh from 2003 to 2022. However, the most vital part of this study is finding the major species-wise contribution to national production along with the growth rate. Major species-wise fisheries yield and share in 2021 and 2022 with the growth rate in 2022 have been presented in Table 3. On the other hand, Table 4 contains the species description where several species converge in a group. For example, there is a species group named Major Carp in Table 3, and Table 4 includes the list of species belonging to the Major Carp group. The major carp contributed 21.3%, the highest among all groups, in the national yield in 2022, and the growth rate of this group is 3.9% higher than the national, 3.0%, growth rate in the same year.

The Pangas and Tilapia are comparatively cheaper than all other species in Bangladesh, so these two species are the major fish intaking sources for the poor population of the country. In 2022, these two species combinedly contributed 17.1%, 8.5%+8.6%, to the national yield. However, the growth rate of Tilapia was 3.9%, higher than the national growth rate, in 2022, but the growth rate of Pangas was 1.0%, lower than the national growth rate, in the same year. The policymakers of the country should enforce to grow the yield of Pangas and Tilapia, especially on Pangas, to maintain the fish intake of the poor people of Bangladesh.

The Hilsa is the national fish of Bangladesh, and it carries the identity and emotion of the Bengali nation. As a single species, its contribution is the highest among all species. The production share of the Hilsa fish was 12.2% in 2021 and 11.9% in 2022. The growth rate of this fish was only 0.2% in 2022, which is very poor compared to the national growth rate. The Hilsa fish not only carries the identity of Bangladesh but also bears a significate socioeconomic value for the country. The livelihood of 2.5 million fishermen in Bangladesh and 0.5 million fishermen in West Bengal of India depends on the Hilsa fishery (Dutta *et al.*, 2021). The government of Bangladesh should revise the existing Hilsa policy, and, if needed, policymakers should launch new policies to boost Hilsa production in Bangladesh.

Bangladesh earns a significant amount of foreign currency by exporting its fisheries resources. Shrimp/prawns and Hilsa are the major contributory species in the fisheries exporting sector, so the growth rate of these species should be higher than the present growth rate. Moreover, the country is going to graduate from the Least Developed Country (LDC) in 2026, and it will lose international trade preferential access in the European and American markets. Its export sector may fall under threat as its high dependency on ready-made garments. The policymakers of Bangladesh should emphasize export diversification to handle the potential threat in the export sector after LDC graduation. In this case, the fisheries sector may be a blessing for the country. Bangladesh may rise its export diversification with the help of the agri-food sector, especially in the fish and seafood sectors (Hobbs *et al.*, 2023). The country allocated 5.9% of its national budget in 2022 to the agriculture and fisheries sectors (Manik, 2023). This allocation in agriculture and fishery is poor compared to the importance of the sectors. The country should increase the national budget allocation in the agriculture and fisheries sectors to build export diversification from the fisheries. Further studies might be conducted for the strategy development techniques to establish a successful export-oriented fishery industry in Bangladesh. As fisheries resources have demand worldwide, and Bangladesh is a potential country in this sector, the government should make new policies for fisheries resources based on species-wise potentiality to empower its economy.

Table 3. Species-wise fisheries yield and growth rate in Bangladesh (in thousand metric ton).

Type	Species/Group in Bangladesh (*Scientific name*)	Yield in 2021	Share% in 2021	Yield in 2022	Share% in 2022	Growth %
Major Inland Species	Major Carp	975.5	21.1	1,013.8	21.3	3.9
	Other Carp	129.2	2.8	133.5	2.8	3.3
	Exotic Carp	517.0	11.2	528.8	11.1	2.3
	Pangas (*Pangasius pangasius*)- catfish	402.3	8.7	406.2	8.5	1.0
	Other Catfish	73.2	1.6	73.6	1.5	0.6
	Snake Head Fish	78.5	1.7	79.3	1.7	1.1
	Live Fish	166.2	3.6	176.7	3.7	6.3
	Tilapia (*Oreochromis niloticus*)	392.1	8.5	407.4	8.6	3.9
	Sarpunti (*Puntius sarana*)	101.9	2.2	104.7	2.2	2.7
	Other Inland fish	625.3	13.5	647.6	13.6	3.6
	Crab (*Scylla Serrata & Scylla Olivacea*)	12.3	0.3	13.4	0.3	8.6
	Cuchia (*Monopterus cuchia*)	9.2	0.2	9.5	0.2	3.2
Both	Hilsa/Illish (*Tenualosa ilisha*)	565.2	12.2	566.6	11.9	0.2
	Shrimp/Prawn	252.0	5.5	261.2	5.5	3.6
Major Marine Species	Sardine (*Sardinella fimbriata*)	34.5	0.7	38.4	0.8	11.3
	Bombay Duck (*Harpadon nehereus*)	71.9	1.6	82.7	1.7	14.9
	Indian Salmon (*Polydactylus indicus*)	0.2	0.0	0.2	0.0	22.1
	Rup/Hail/Foli Chanda (*Pampus argenteus*)	9.2	0.2	11.5	0.2	24.6
	Jew Fish (*Epinephelus itajara*)	48.7	1.1	41.4	0.9	-15.0
	Sea Catfish (*Tachysurus spp.*)	12.2	0.3	14.6	0.3	19.4
	Shark/ Skate / Ray	8.2	0.2	7.0	0.1	-14.7
	Tuna & Tuna like fish	22.1	0.5	9.5	0.2	-57.3
	Other Marine Fish	114.3	2.5	131.4	2.8	14.9
	TOTAL	4,621.2	100.0	4,758.7	100.0	3.0

Table 4. Species description of major species group in Bangladesh.

Species Group	Common Name in Bangladesh (*Scientific name*)
Major Carp	Rui (*Labeo rohita*), Catla (*Catla catla*), Mrigal (*Cirrhinus cirrhosis*)
Other Carp	Kalibaus (*Labeo calbasu*), Bata (*Labeo bata*), Ghania (*Labeo gonius*)
Exotic Carp	Silver Carp (*Hypophthalmichthys molitrix*), Grass Carp (*Ctenopharyngodon Idella*), Common Carp (*Cyprinus carpio*), Mirror Carp (*Cyprinus carpio*), Big Head Carp (*Hypophthalmichthys nobilis*), Black Carp (*Mylopharyngodon piceus)*
Other Catfish	Boal (*Wallago attu*), Air (*Sperata aor*), Rita (*Rita rita*)
Snake Head	Shol (*Channa striata*), Gazar (*Channa marulius*), Taki (*Channa punctatus*)
Live Fish	Koi (*Anabas testudineus*), Shingi (*Heteropneustes fossilis*), Magur (*Clarias batrachus*)
Prawn	Galda (*Macrobrachium rosenbergii*) and Other Inland/freshwater Chingri
Shrimp	Bagda (*Penaeus monodon*) and Other Coastal/ Marine Chingri
Other Inland Fish	Punti (*Puntius sophore*), Chapila (*Gonialosa manmina*), Tengra (*Mystus vittatus*), Papda (*Ompok bimaculatus*), Baim (*Mastacembelus armatus*), Mola (*Amblypharyngodon mola*), and similar types of fish
Pomfret	Rupchanda (*Pampus argenteus*), Hailchanda, Folichanda
Jew Fish	Poa (*Otolithoides pama*), Lambu, Kaladatina etc.

Although the country has a vast marine water area with rich biodiversity in the Bay of Bengal, very limited marine species are contributing to the national fisheries yield. Furthermore, the contribution of these limited species is poor, approximately 15% of the total yield, compared to its potentiality. One of the fundamental reasons behind this poor marine yield is the vague concept in Bangladeshi people regarding seafood. Many species of seafood are considered unconsumable in Bangladesh. To overcome this situation, the government of Bangladesh should launch different campaigns highlighting the benefits of seafood. However, Bangladesh has knowledge, skills, and technical constraints to extract marine resources from the Bay of Bengal. More research regarding the blue economy is mandatory for Bangladesh. Policymakers of the country should allocate more funds to generate knowledge about the blue economy, develop more skilled humans, and import technologies to ensure sustainable utilization of its marine resources.

CONCLUSION

The fisheries yield in Bangladesh is increasing gradually, but this growth is less than the potential. The national fisheries yield was 20.0 hundred thousand metric tons in 2003 which returned to 47.6 hundred thousand metric tons in 2022. The production ratio of 2022 and 2003 was 47.6:20.0 equivalence to 2.4 meaning the yield increased 2.4 times in 20 years. The slope indicates that the growth rate of inland culture fisheries is the highest while the growth rate of the marine fisheries is the lowest among the three segments. The yield of the inland culture group presents the highest fluctuation among the three groups. The species that fall into the major carp group show the highest contribution to the national yield along with a sound growth rate. Although the joint contribution of Pangas and Tilapia is second in total production, the policymakers of the country should emphasize these two species as the species fall into an affordable price range for the poor population of the country.

The species-wise contribution and growth rate in this study have been taken from the yield in 2021 and 2022. So, future studies are required based on the time series data to show a better picture of species-wise contribution. The export sector of Bangladesh may fall under pressure due to LDC graduation after 2026. To handle the future threat, the country should emphasize export diversification. To achieve the required diversification, the fisheries resources might potentially bless Bangladesh. The country has a vast marine water area, almost 81% of its land area, in the Bay of Bengal, but the contribution of the marine species is poor, nearly 15%, to the national production. Due to knowledge, skills, and technological constraints, Bangladesh has not had enough success to extract its marine resource from the Bay of Bengal. More research regarding the blue economy in the Bay of Bengal and awareness campaigns about seafood are needed to boost the production of marine species in Bangladesh. The government of the country should ensure sufficient funds for research, human resource development, and technical assistance to increase its marine fisheries yield.

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AUTHORS' CONTRIBUTIONS

The entire manuscript including ideas, data generation, data analysis, and article preparation, is solely prepared by MHM.

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