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Fishery Sector Of Assam: Recent Trends And Prospects

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Abstract: The North-Eastern state of Assam is famous for its scenic beauty and unique natural endowments. The state has two major rivers, Brahmaputra and Barak Rivers along with its tributaries. Thus after agricultural activities, fishery activities play a very significant role in the generation of income and employment opportunities especially in the rural areas of the state. In the year 2019-20, the state's production of fish seeds in has also increased by 67% and contributes around 18.24% in the total production of fish seeds production of the country. Again, the country's fish production is around 104.37 lakh tonnes, while the state of Assam produced 3.73 lakh tonnes contributing only 3.57% of total fish production of the country.The state also ranks 5th position in the consumption of fish. The fishery resources of the state include rivers and canals, medium and large reservoirs, beels or ox bow lakes or derelict water, any other rivers and canals (paddy) covering area of around 482000, 1096, 77250, 154650 and 462382 hectares respectively. Hence, this paper is an effort to show the recent trends in the fishery sector of the state and suggest some measures for the overall development of the sector.

1. INTRODUCTION

The state of Assam, also known as the "Land of mighty Brahmaputra" is famous for its scenic beauty, unique natural endowments and appreciable potential which are yet to be explored The state is located between 24° 08'N and 27° 59'N latitudes and 89° 42'E and 96° 01'E longitudes, covers a total area of 78,523 sq. Km. The two main rivers of the state, Brahmaputra and Barak river has 73 and 11 tributaries respectively. The Brahmaputra rolls down the plain of Assam east to west for a distance of 640 km up to Bangladesh border, while the Barak has a total length of 225 km and it drains the southern part of the state (Envis Centre, Assam, 2016). Out of the total geographical area in the state, 10.5% area is occupied by surface water bodies, of which 6503 sq km is held by all the river systems including the mighty Brahmaputra and 1748 sq km by natural wetlands including seasonal and permanent waterlogged, marshy areas and both natural and man-made reservoirs, ponds and tanks of size more than 2.5 hectares (Chutia et al., 2018). Hence, fishery sector is one of the prominent sectors of the state which generates a huge income and employment opportunities. Moreover, fish farming has always been one of the common activities in the rural areas of the state.In the year 2019-20, between 2015-16 and 2019-20, fish production in the state has increased from 2.94 lakh tonnes to 3.73 lakh tonnes, registering an increase of 26.8% and the contribution of the state to the total fish production of the country is only 3.57%. Besides, the state has ranked 5th position in the consumption of fish with 11.72kg per capita consumption (Handbook on Fishery Statistics, 2020). But the state is not able to meet the demand of the consumer for fish and hence import it from other states. For instance in the year 2018-19, the

state imported 12641 tonnes of fishes from other states to satisfy the demand of the consumers (Statistical Handbook of Assam,2019). Hence, although significant measures are undertaken by the state government for the development of the fishery sector of the state, yet this sector is yet to meet its full potential.

REVIEW OF LITERATURE

Few studies have focused on the trends in the fishery sector of India as well as Assam. For instance, Chutia et al. (2018) explained thatthe North-Eastern state of Assam has shown 1.58 times increase in fish production from 2005 to 2017 which is higher than the country's increase in production during the same period. The fish seed production of Assam is 5678 million nos. for the 2015-16 year. The author further noted that although the state is endowed with abundant water bodies, it continues to reel from shortfall of fish supply since production during 2016-17 is 2.94 lakh tonnes, while the demand is 3.36 lakh tonnes a year. In a similar study,Debnath et al.(2020) described that fish and shellfish production in 2017-18 from capture fisheries and aquaculture being around 12.6 million tons of which the state Assam contributed approximately 2.6 % to the total production of India. The author also noted that the state has shown a 3.05 times increase in fish seed production from 2000 to 2014, and 2.06 times increase in fish production from 2000 to 2018 but couldn't satisfy the consumer demand for fish and imported 11,357 tons of fish from other states. Again, according to Gogoi et al. (2015), despite the vast aquatic resources, Assam yet to reach self-sufficiency in fish production in respect of economic as well as minimum nutritional requirement of 11kg/person because scientific fish farming/fishing is carried out only in 5% of the total water resource area.Ghosh (2015) noted that about 45% of the country's total fish production comes from inland fisheries including the fresh water fisheries like tanks and ponds, rivers, irrigation canals, reservoirs and freshwater lakes; and the estuarine fisheries like estuaries, delta channels, back waters, lagoons and coastal lakes. The author further noted that the total area of tanks and ponds in the country is estimated at 20.2 lakh hectares (of which only 8 lakh ha or 37.50% is exploited for pisciculture), 27359 km length of rivers, 1, 45,928 km length of irrigation canals, 21 lakh hectares of reservoirs and small lakes and 26 lakh hectares of brackish waters near the sea coasts. As per Biswas et al. (2015), the state of Assam is the home for over 300 fish species ranging from tiny colourful wetland species to gigantic catfishes of the Brahmaputra,out of which 40% of them are potential ornamental fish species. The author has made an attempt to examine the current status of exploitation, conservation and management practices of ornamental fishes in the northeast India. Again, Hussain (2019) noted that in the year 2015,there are about 267 different species of ornamental fish that are found in Northeast India, out of which Assam has the largest number of around 217 species.

However this paper has made an attempt has been made to explore the current status of fishery sector of Assam such as fish production, fish seed production, fishery resources, ornamental fisheries etc. between the year 2015-16 and 2019-20, and also suggest some measures for the upliftment of fishery sector of the state.

1. Objectives

The main objectives of this paper are:

i) To explore the present status of fishery sector of Assam such as fish production, fish seed production, fishery resources, gender-wise fishermen population and ornamental fishing.

ii) To suggest some measures for the development of fishery sector of the state.

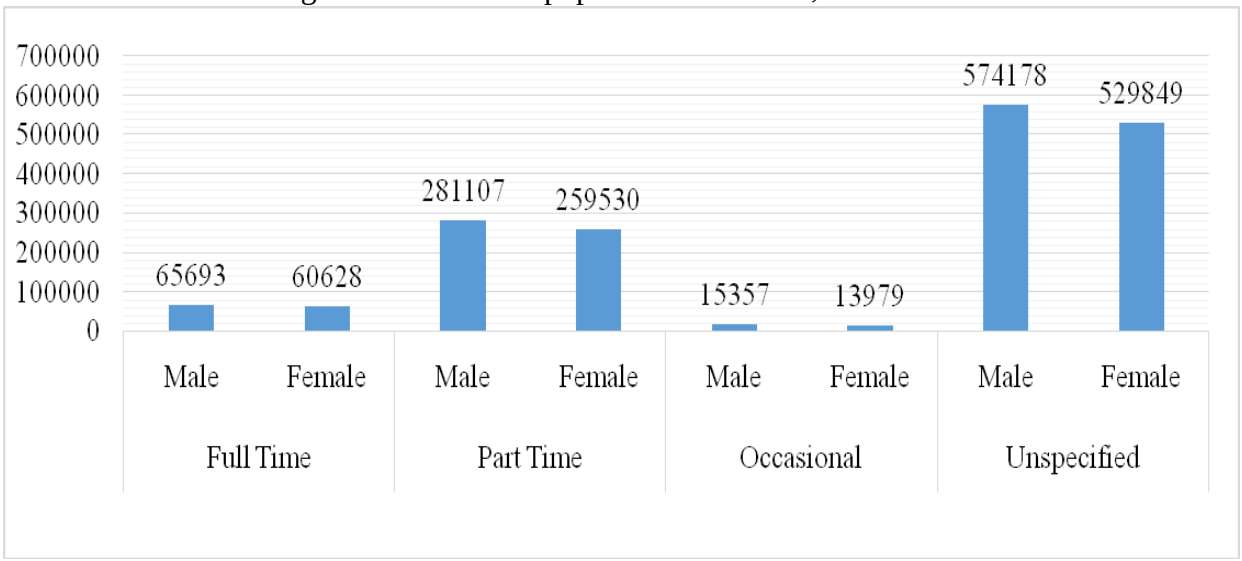
2. METHODOLOGY

This paper is quantitative as well as qualitative in nature. It is based on secondary sources which consist of reports and surveys of Department of Fisheries Ministry of Fisheries, Animal Husbandry & Dairying Government of India, Directorate of Economics and Statistics, Government of Assam etc. The study also extracts data from other secondary sources such as books, journals, newspapers, research papers and other internet sources.

Gender-wise Fishermen Population of Assam

In India, during 2019-20, fishermen population is around 2,80,63,537 which comprises of fish farmers, fish workers and fishers, out of which 44% are female and rest 56% are male (including both inland and marine fishermen) (Handbook on Fishery Statistics, 2020) .In the state of Assam, fishermen population is around 25,24,106 out of which 36% are female and 64% are male. People involved in fishing are categorized in three groups: people those catch fishes for daily use, people belonging to the fishing community and dependent on fishing for their livelihood and rural entrepreneur (Leaseholders) (Gogoi et al., 2015). Furthermore, fishermen population of the state can also be categorised as full time, part time, occasional and unspecified in which 48% are female and 52% are male in each of the categories respectively.

Figure-5: Fishermen population of Assam, 2019-20



Source:Handbook on Fishery Statistics, 2020

Fishery Resources of Assam

The Indian fishery resource is comprised of both marine as well as inland water sector(Chutia et al., 2018). The marine sector is comprised of 8118 km of long coastline, 2.02 million sq. Km of the Exclusive Economic Zone (EEZ) and 530,000 sq. Km continental shelf, while inland water resources comprise ofrivers & canals (2,52,431.48 km), reservoirs covering (40.3 lakh hectares), tanks & ponds (92 lakh hectares), Flood plain lakes/derelict waters (4.81 lakh hectares), brackish water (10.6 lakh hectares) and others (9.63

lakh hectares)(Handbook on Fishery Statistics, 2020).The fishery resource of the state of Assam is limited only to inland water bodies covering around 7 lakh hectares which are quite less in comparison to the total fishery resources of the country (Handbook on Fishery Statistics, 2020). Figure-1 shows the fishery resources of the state which include rivers and canals, medium and large reservoirs, beels or ox bow lakes or derelict water, any other rivers and canals (paddy) covering area of around 482000, 1096, 77250, 154650 and 462382 hectares respectively. Table-1 shows the districts of Assam occupying highest and lowest number of fishery resources such as beel fisheries, ponds and tanks, derelict water, forest fisheries, river fisheries and others (paddy). The district occupying maximum number of beel fisheries is Kamrup (209) followed by Cachar district (198) and Sivsagar district (172), while Baksa district (12) occupies the least number followed by Karbi-Anglong (15) and Chirang district (16). Regarding the number of ponds and tanks in the state, Nagaon district (53075) occupies the maximum number followed by Cachar (36459) and Hailakandi district (35307), while Dima Hasao district (1298) has the least number followed by Chirang (3155) and Dhemaji district (5100). Again, considering the number of derelict water, Dima Hasao district (648) has the maximum number followed by Nalbari (515) and Jorhat district (478), but Darrang district (62) occupies the least number followed by Lakhimpur (68) and Goalpara district (70). Again, with respect to the number of forest fisheries, Cachar district (313) occupies the highest number followed by Kamrup (3) and Dibrugarh district (4). As per the number of river fisheries, Kamrup district (74) occupies the highest number followed by Cachar district (45) and Sivsagar district (35), but on the otherhand, Chirang district occupies the least number Dibrugarh (4), Jorhat (4), Dima Hasao (4) and Hailakandi district (4). Regarding other (paddy) fishery resources, Morigaon district (8027) occupies the highest area followed by Dima Hasao (1550) and Bongaigaon district (666), while Chirang district (1) occupies the lowest number followed by Lakhimpur (57) and Darrang district (69). Table-2 shows the districts of Assam occupying highest and lowest area of fishery resources. With respect to the area covered by beel fisheries, Nagaon district (9919 hectares) occupies the largest area followed by Cachar (7945 hectares) and Dhubri district (5372.8), but Karbi-Anglong district (49 hectares) occupies the lowest area followed by Chirang (122 hectares) and Baksa district (142 hectares). Regarding ponds and tanks, Cachar district (8563 hectares) occupies the maximum area followed by Hailakandi (6703 hectares) and Nagaon district (6364 hectares), while Dima-Hasao district (110 hectares) occupies the least area followed by Chirang (465 hectares) and Bongaigaon district (978 hectares). Again, as per the area covered by derelict water, Nagaon district (23578 hectares) followed by Jorhat 1192.5 (hectares) and Dhubri district (11713.46 hectares), but on the other hand, Dima-Hasao district (37.41 hectares) covers the lease area followed by Chirang (150 hectares) and Morigaon district (203.53 hectares). Regarding forest fisheries, Golaghat district (1720 hectares) occupies the maximum area followed by Morigaon district (955 hectares) and Nagaon district (800 hectares), but Lakhimpur district (16.7 hectares) occupies the least area followed by Goalpara (20 hectares) and Chirang district (275hectares). Again with respect to area covered by river fisheries, maximum area is covered by Jorhat district (39204 hectares) followed by Tinsukia (26100 hectares) and Dhubri district (23900 hectares)., while Karbi-Anglong district (210 hectares) occupies the least area followed by Dibrugarh (254 hectares) and Morigaon district (327 hectares). Regarding other (paddy) fishery resources, Nagaon district (104910 hectares occupies the highest area followed by Dibrugarh (98879.8 hectares) and Jorhat district (63797 hectares), but Baksa district (290 hectares) covers the least area followed by Karimganj (380 hectares) and Bongaigaon district (825 hectares).

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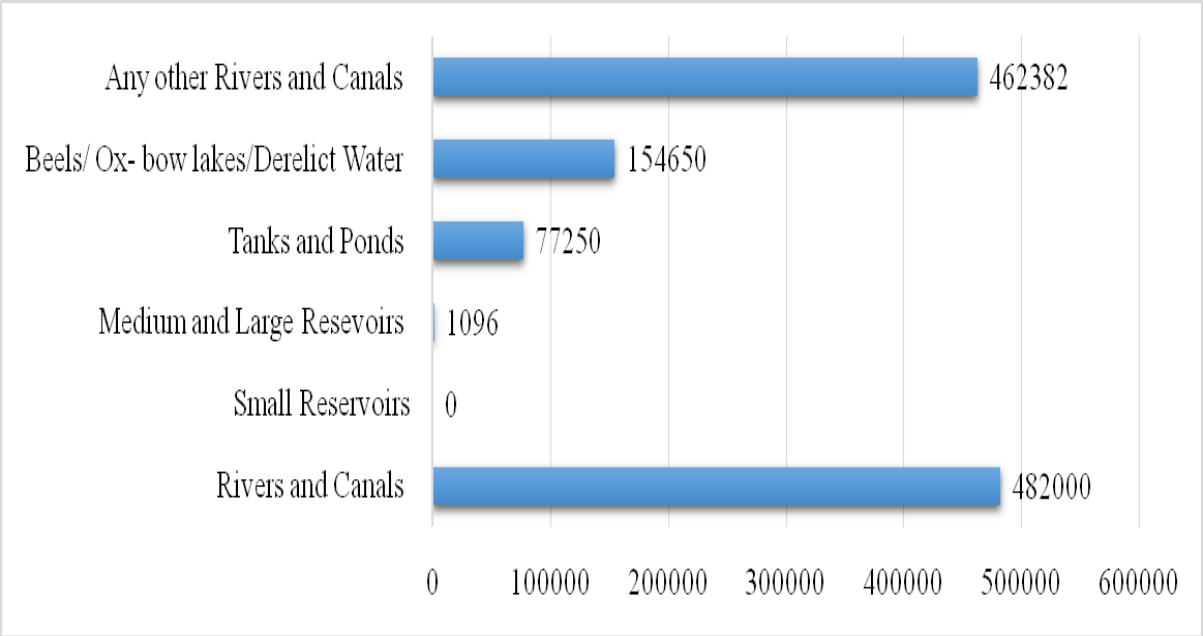
Figure-1:Fishery Resources of Assam



Source:Handbook on Fishery Statistics, 2020

Table-1: District-wise Maximum and Least Number of Fishery Resources

Fishery Resources	District Occupying Maximum Numbers	District Occupying Least Numbers
Beel Fisheries	Kamrup	Baksa
Ponds and Tanks	Nagaon	Dima-Hasao
Derelict Water	Dima-Hasao	Darrang
Forest Fisheries	Cachar	Lakhimpur
River Fisheries	Kamrup	Chirang
Others (Paddy)	Morigaon	Chirang

Source:Statistical Hand Book of Assam, 2019

Table-2: District-wise Maximum and Least Area of Fishery Resources

Fishery Resources	District Occupying Largest Area	District Occupying Least Area
Beel Fisheries	Nagaon	Karbi-Anglong
Ponds and Tanks	Cachar	Dima-Hasao
Derelict Water	Nagaon	Dima-Hasao
Forest Fisheries	Golaghat	Lakhimpur
River Fisheries	Jorhat	Karbi-Anglong

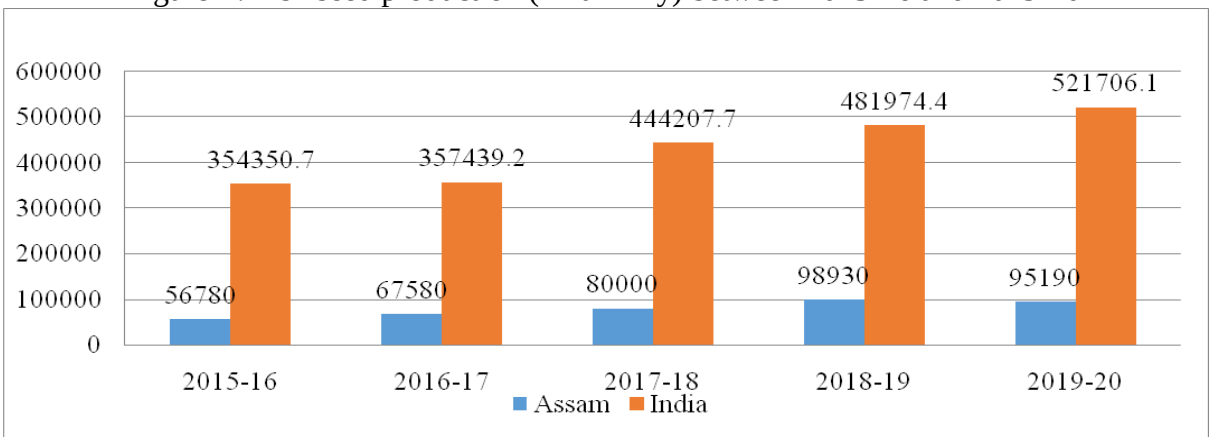
Others (Paddy)	Nagaon	Baksa

Source: Statistical Hand Book of Assam, 2019

Fish Seed Production in Assam

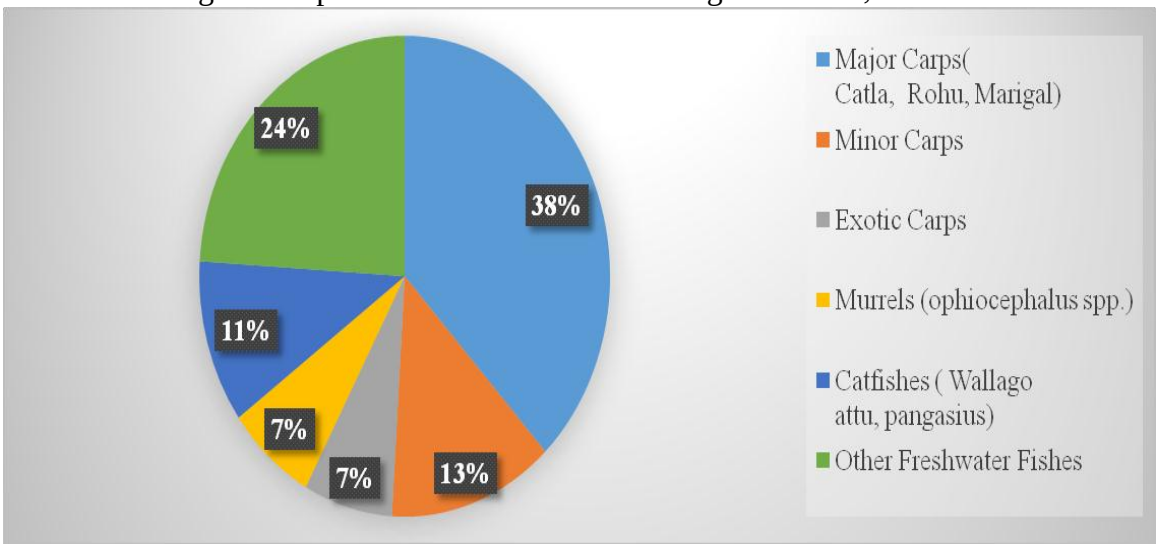
The growth of the fish depends on the quality of fish seeds (Debnath et al., 2020). The author noted that the time sequence of induced breeding for silver carp and grass carp during April, followed by catla, rohu, and mrigal, although there is no hard and fast rule. Chinese circular hatchery, AAU model carp hatchery, portable carp hatchery, breeding hapa, mini bundh, etc are popular technologies adopted by the farmers to produce good quality seeds (Debnath et al., 2020) . Figure-2 shows that between 2015-16 and 2019-20, feed seed production in India has increased considerably by 42.22%. During the same period, production of fish seeds in Assam has also increased by 67%. In the year 2019-20, contribution of Assam in the total production of fish seeds is 18.24%. Moreover, Assam has become the first state in the Northeast region of India to attain self-sufficiency in fish seed production (InsideNe, 2020). Figure-3 shows that with respect to Species-wise inland fish landings, Assam produces 38% of major carps (catla, rohu. Marigal), 13% of minor carps, 11% of catfishes (wallato attu., pangasius), 7% of exotic carps, 7% of murrels (ophiocephalus spp.) and rest 24% of other fresh water fishes.

Figure-2: Fish seed production (in lakh fry) between 2015-16 and 2019-20



Source: Handbook on Fishery Statistics, 2020

Figure-3: Species-wise Inland Fish landings in Assam, 2019-20



Source:Handbook on Fishery Statistics, 2020

Fish Production in Assam

India ranks second in aquaculture and third in fisheries production. Fish production increased from 7.52 lakh tonnes in year 1950–51 to 125.90 lakh tonnes in year 2018–19, increase in seventeen times(Wikipedia,2021).The inland capture fisheries resources include a riverine length of 201496 km (including the tributaries, and irrigational canals), 3.52 million ha of small and large reservoirs and 1.2 million ha of floodplains, etc. and hence the total area available for the inland fishery is estimated at 8.24 million ha excluding rivers and canals (National Fishery Policy Draft, 2020). Figure-2 shows thatbetween 2015-16 and 2019-20, fish production in India has increased considerably by 45.7%, from 71.62 lakh tonnes to 104.37 lakh tonnes. In the state of Assam, during the same period of time, fish production has increased from 2.94 lakh tonnes to 3.73 lakh tonnes, registering an increase of 26.8%. The contribution of the state to the total fish production of the country is only 3.57% which is quite less considering the existence of vast potential and natural resources present in the state. Table-3 shows district-wise production of fish between 2017-18 and 2018-19, although data of 2019-20 is not available. In the year 2018-19, district producing highest fish is Nagaon district (43969.55 tonnes) followed by Cachar district (32277 tonnes) and Kamrup district (22124.61 tonnes). But, district producing lowest fish is Dima Hasao (362.70) followed by Chirang (1242 tonnes) and Udalguri district (2135 tonnes). Again, between 2017-18 and 2018-19, districts showing considerable improvement in fish production are- Karbing Anglong (despite being a hilly region), Jorhat and Nagaon district with an increase in growth rate of fish production by 5%, 4.8% and 0.8% respectively. On the other hand, there has been a decrease in growth rate of fish production in Morigaon, Sivsagar and Dhubri district by 0.2%, 0.3% and 0.4 % respectively.

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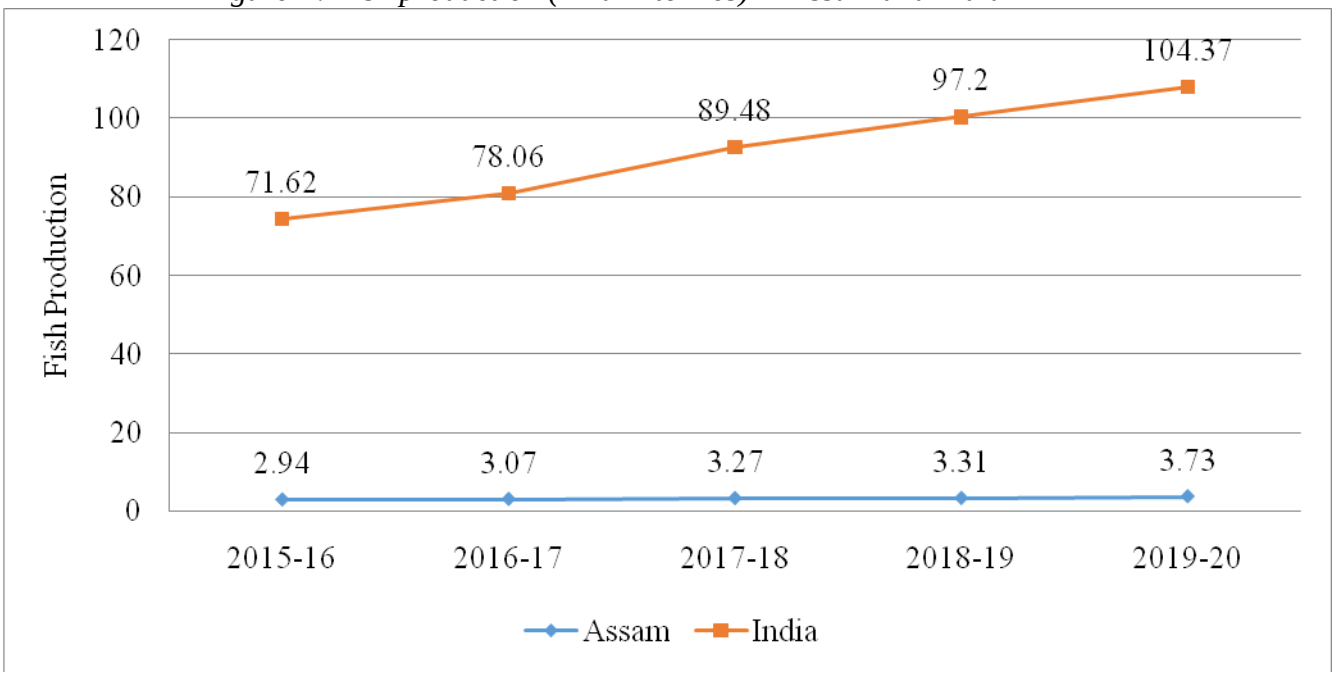
Figure-4: Fish production (in lakh tonnes) in Assam and India



Source:Handbook on Fishery Statistics, 2020

Table-3: Fish Production (in tonnes) in Assam between 2017-2018 and 2018-2019

Districts	2017-18	2018-19
Kokrajhar	6438	6820.48
Goalpara	8485	8527.43
Morigaon	21472	16765.91
Sonitpur	11813	12541.30
Dhemaji	5088	5240.41
Dibrugarh	11125	14465.49
Jorhat	12626	18779.29
Karbi-Anglong	491	2974.95
Cachar	31030	32277.00
Hailakandi	11364	11948.55

Chirang	1383	1242.00
Nalbari	13206	13421.00
Darrang	10344	11415.70
Dhubri	19104	10681.05
Barpeta	19762	21304.57
Nagaon	40647	43969.55
Lakhimpur	12789	12989.80
Tinsukia	13818	14150.90
Sivasagar	16479	11040.41
Golaghat	8074	8097.60
Dima-Hasao	142	362.70
Karimganj	13895	13018.64
Bongaigaon	7899	7900.00
Kamrup	20922	22124.61
Baksa	6766	6905.00
Udalguri	2100	2135.00
Total	327262 tonnes	331099.34 tonnes

Source: Statistical Hand Book of Assam, 2019

Ornamental Fishery

The ornamental fishes are one of the essential components of fisheries which are colourful and attractive having some specific colour patterns (Debnath et al., 2020, p.630). They are mainly kept in the aquarium, which has become a significant income source for many people's (Chutia et al., 2018). In India, while the value of the domestic market for the ornamental fishery is estimated at about Rs. 500 crores, the activity is limited to some specific areas in West Bengal, Tamil Nadu, Maharashtra, North-eastern States and the Islands (National Fishery Policy Draft, 2020). Among the northeastern states, Assam has the largest number of ornamental fish species (217) followed by Arunachal Pradesh (167), Meghalaya (165), Tripura (134), Manipur (121), Nagaland (68), Mizoram (48) and Sikkim (29) (Husssain, 2019). In Assam, the most potential ornamental fishes commonly found in such beels are Trichogaster spp., Botia spp., Channa spp., Lepidocephalichthys spp., Badis pp., Nandus nandus, Amblypharyngodon mola and Puntius spp etc., majority of which are mostly dominated by the colourful murrels (Channa spp.) and other air breathing forms which can withstand high water temperature, low oxygen level and highly turbid water (Biswas et al., 2015). The state has 78 registered Commercial Units and 22 registered production units of ornamental fish (Statistical Hand Book of Assam, 2019). The district having highest number of commercial units dealing with ornamental fish is Kamrup (10) followed by Nagaon (5) and Sonitpur (5), Jorhat (5) districts, Again district having highest number of production units is Kamrup (5) followed by Nagaon (2) and Jorhat (2) districts.

Suggestions

In Assam, demand for fish is more than its supply.The state has adopted various schemes such as Matsya Jagaran –Ghare Ghare Pukhuri Ghare Ghare Maach for expansion of fish culture area and generation of self- employment opportunities, Seed Bank Programme to make fish seeds available in the form of fingerlings and expansion of fish seed rearing area, Majuli Development Programme for enhancing production of fish along with diversified products like pig, selection of Matsya Mitras, beneficiary training, providing insurance under Blue Revolution Scheme etc.(Fishery Department, Government of Assam, 2018). But in spite of several schemes adopted by the state, the overall production of fish is quite less. In order to boost fish production and overall development of the fishery sector of the state, some of the measures which need to be adopted are as follows:

i) **Start-ups with technology based solution:**In Assam, various start-ups with technology based solution should be set up locally by providing opportunities to the educated youth of the state resulting in innovation and development.

ii) **Digital market for fishery:** Development of online market platforms is evitable to connect buyers directly with the fishers. To achieve this, fishermen of the state should be trained free of cost to use online marketing platforms through various programmes and awareness campaigns. Moreover, online fish delivery service can also be initiated to providefish items on the doorsteps of the consumers.

iii) **Recreational fishing:**Assam is famous for its scenic beauty and hence is one of the tourist attractions of the country. Hence, boosting of recreational fishing and eco-tourism by the government with the help of local communities will in turn generate income and employment opportunities for the people especially the rural youth of the state.

iv) **Recycling of fish waste:**Fish waste can be recycled which will not only curb pollution but can even become a source of revenue to the state. For instance Oppili (2019) noted that at first the waste should be ground, three reagents would then be added and kept for three days after which the solid and liquid materials from the ground. The author further noted that80% of the waste gets converted into oil, another 10% will become solid waste. On one hand, the oil can be used in aquaculture farms which would enhance the growth of fish or shrimps, which in turn will help in reducing the consumption of feed and on the other hand, the solid waste is used as manure for raising saplings, vegetables and other trees (Oppili,2019).

v) **Encourage and empower local entrepreneurs:** The government should take initiative along with private enterprises, NGOs, SHGs etc. to encourage and empower local communities as well as local entrepreneurs including women for their increased participation in fishery related entrepreneurial activities especially in the rural and remote areas of the state. To achieve this, soft loan on long term basis, training for skill development and technological knowledge awareness programmes on women rights, entrepreneurship and business process should be adopted.

vi) **More scope for ornamental fishing:** Although the state of Assam has adopted ornamental fishing and has wide varieties of such species, yet the state still has less number of production units and commercial units dealing with such fish species. Hence, ornamental fish being high in demand, the government should focus on increasing the production and commercial units.

3. CONCLUSION

In Assam fishery activities has always remained a major source of livelihood for the people of the state generating considerable amount of income and employment opportunities. Although the state has adopted various schemes for the development of the fishery sector yet the overall production of fish in the state is quite less which in turn has resulted in shortage of supply compared to the demand for fish. For instance, in the year 2019-20, Assam contributed only 3.57% of total fish production of the state which is quite less compared to Andhra Pradesh and West Bengal which have contributed 34.5% and 15.5% respectively (Handbook on Fishery Statistics, 2020). Moreover, fishermen insured under Blue Revolution scheme have decreased from 164939 in 2015-16 to 142716 in 2019-20. Hence, the government along with private enterprises, SHGs, NGOs and local communities should come together and boost fishery activities by identifying places having high potential of fishing especially in the rural and remote areas of the state, promoting awareness campaigns, increase in the number of fishermen under the insurance cover, training the rural youths and proper implementation of the present schemes. Thus, all the possible measures should be rolled out for boosting and overall improvement of the fishery sector of the state.

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