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Tynjuhbor Jyrwa
Department of Zoology and Applied Aquaculture, Barkatullah University, Bhopal, Madhya Pradesh, India

Oman Leyoo Passah
Superintendent of Fisheries, Department of Fisheries, South West Khasi Hills, Mawkyrwat, Meghalaya, India

Vipin Vyas
Department of Zoology and Applied Aquaculture, Barkatullah University, Bhopal, Madhya Pradesh, India

Anubhuti Minare
Department of Zoology and Applied Aquaculture, Barkatullah University, Bhopal, Madhya Pradesh, India

Corresponding Author:
Tynjuhbor Jyrwa
Department of Zoology and Applied Aquaculture, Barkatullah University, Bhopal, Madhya Pradesh, India

Fish conservation programme (Sanctuaries) in South West Khasi Hills District, Mawkyrwat, Meghalaya

Tynjuhbor Jyrwa, Oman Leyoo Passah, Vipin Vyas and Anubhuti Minare

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Abstract
The present research was conducted to study the present and future status of Fisheries in South West Khasi Hills District, to protect and conserved the different types of fish species and their aquatic environments, to study the different types of fish sanctuaries located in South West Khasi Hills District, to analyze the water quality parameters and to provide information by organizing awareness programmed to the people residents in the rural areas. The fishery resource of South West Khasi Hills District is very vast and roughly comprises of 345.97 km of rivers and streams, 0.5 ha of beels and 205.65 ha of ponds and tanks. The district is well-rich in terms of fauna diversity. Four selected areas of fish sanctuaries are being studied within the district. Results reveals that the fish production has increase and it has reached about 624.63 metric tons as in 2023-2024, and the fish seed production from 2016-17 to 2023-24 is 9,590,820 numbers from both fry and fingerlings, higher production of fish seed was noted in 2023-2024 at around 22,40000 numbers of fish seed was produced. The present of fish sanctuaries in the district has increase the availability of fish species and increase fish production.

Keywords: Fish sanctuaries, indigenous fish species, mahseer, fish seeds production, awareness programme, Mawkyrwat

1. Introduction
South West Khasi Hills District lies in the central part of the State of Meghalaya and is situated between 10′ and 25 degrees, 15′ N latitude and between 90 degrees 41′ and 91 degrees 49′ E longitude. The district comprises an area of about 1,341 Sq. Kms which is 6 percent of the total area of the state. It is bounded by the West Khasi Hills District in the North, East Khasi Hills District in the East, West Khasi Hills District and South Garo Hills District in the West and Bangladesh in the South. South West Khasi Hills District was carved out of the West Khasi Hills District on 3rd August 2012 and the district headquarters is located at Mawkyrwat. It is a mountainous district like other districts of the state with varied natural resources and meandering rivers. South West Khasi Hills District is having a vast fishery resource which roughly comprises of about 345.97 km of rivers and streams, 0.5 ha of beel, 205.65 ha of ponds and tanks. As a vast fishery resource of the state remain untapped till today, its optimum utilization by means of planned development of fishery has been a challenge before us. The Department is striving hard to enhance the fishery status in the district and various developmental programmed have been chalked out to accelerate the growth of Aquaculture. The Fish and Aquatic Conservation programs work together to deliver resilient habitats, healthy fish, connected people, and strong partnerships. From habitat restoration to aquatic invasive species prevention, captive breeding to population assessment and monitoring, our programs are driven by the best advances in science and grounded in collaborative relationships. Fish Sanctuary is a protected area of water where fishing is prohibited or restricted, allowing fish and other aquatic organisms to survive and reproduce without disturbance, fish sanctuaries can be managed by local communities or by other organizations. Meghalaya has around 79 fish sanctuaries in different districts that support a wide variety of fishes, including the chocolate Mahseer and the golden Mahseer etc. Meghalaya's demand for fish exceeds its production despite the state having numerous water bodies, many of which have been polluted due to use of illegal fishing techniques and unscientific mining.

The government, with the dual aim of replenishing aquatic life and filling the demand-supply gap, has introduced Aquaculture Mission under which 54 river sanctuaries across the state have been sanctioned. The sanctuaries are a conservation effort of the Fisheries Department under the Meghalaya State Aquaculture Mission (MSAM) since 2012. The major objectives of Sanctuaries are Conservation of indigenous aquatic fauna through establishment of pocket fish Sanctuary. These sanctuaries are located in natural environments, safe from human interference, and also which already have a diverse stock of Fish Species *viz* Mahaseer, and other indigenous species and in certain case where stock have diminished, fresh stock should have facilities for the creation of water pool in flowing water with a minimum area of 0.1 Ha and 100 running meters and a minimum depth of 1.5-2 meter during the dry season. Under the MSAM, the government has sanctioned Rs 270 lakh for the 54 sanctuaries at a unit cost of Rs 5 Lakh. The assistance to interested community, self-help groups and societies is a 100 percent grant. Many of these sanctuaries, like the one in South West Khasi Hills, are also attracting local and foreign tourists in hordes. Of the 54 sanctuaries established, 51 are functional or in various stages of implementation. The primary objective of a sanctuary is to protect and rejuvenate natural fish stock of the rivers.

2. Methodology

2.1 Experimental site

The present study was carried out in South West Khasi Hills District, Mawkyrwat, Meghalaya, and its four selected fish sanctuaries namely, Ursngikyllut (Rohbah), Photumnew (Mawkyrwat), Shnongkalong (Shnongkalong) and Wahsohstap (Pyndengumjarain).

Fig 1: Ursngikyllut Fish Sanctuary

Fig 2: Photumnew Fish Sanctuary

Fig 3: Shnongkalong Fish Sanctuary

Fig 4: Wahsohstap Fish Sanctuary

2.2 Collection of data

The collection of data for Preparing this project work were based on personal contact, fields surveys, through experimental fishing with a scoop net, cast net, fishing rod, and varieties of locally made traps, fish samples were gathered. Interaction with the local people that live there helped obtain some of the information too, and through discussion with the member of different fishing associations and officers of the department of fishery. The various available information and data were critically analyzed and many positive and negative impacts were derived out from the source so as to impart field information and ideas towards the fishery and aquaculture progress of the state to raise overall productivity following employment oriented. The efforts were also made to include field level information which has its practically and maybe translated to ground reality with the people's participation flow of fund through the government and institutional supports blend with fish base biological entities, technology to support, or synchronization with the fisheries trade and commerce to enhance fish production and up liftmen of socio-economic status of the rural people.

2.3 Water quality parameters

The water samples were collected from each selected fish sanctuaries for analyzing the water quality parameters and was carried out to laboratories for testing. The water's physical and chemical parameters such as temperature, pH, dissolved oxygen, total alkalinity, and total hardness were performed.

2.4 Survey and Implications

This is based on the areas for fish conservation by considering the past, present and future and highlighting the fish

abundance, access to fish and safety of fish by conserving and considering the suppression environment and fishes that have been destroyed or being caught, contaminated and killing many fishes as well as other aquatic living organisms.

2.5 Questionnaire interview
The survey involved interaction with the fishermen, member of different fishing association, and data collection from the staff and the office of superintendent of fisheries.

2.6 Study Duration
The work has been done and completed within six months.

3. Results
3.1 Fish Fauna and fish diversity in South West Khasi Hills District
Meghalaya is blessed with all kinds of natural resources like flora, fauna, minerals which is due for exploitation in the future. The topographic, ecological condition, environmental factors favor aquatic fauna providing facilities of basic natural food and shelter for survival and prolong persistence of their generation in the region. Fish fauna of the district is represented by about 33 species belonging to 9 families. The fish fauna of the district comprises mainly of Indian major carps and exotic Carps and also Mahseers, Murrells etc. The fish diversity in South West Khasi Hills District Rivers is more abundant and diverse during the monsoon season than the dry season. The rivers are raging during the rainy season, which maintains the water quality and pristine. During the dry season, the rivers become sluggish, which causes the water quality to decline and become murky and dirty. This also hides fish habitat areas. The district through the research work conducted has around 33 fish species which is a large number and through the availability of many rivers, streams, pond, tanks and especially Sanctuaries has improved a lot in the maintenance and available of fish species and other aquatic living organisms.

Table 1: Representing order of different species

Serial No	Order	Collected
1.	Cypriniformes	20
2.	Siluriformes	9
3.	Anabantiformes	1
4.	Beloniformes	1
5.	Perciformes	1
6.	Tetradontiformes	1
	Total	33

The present study indicate that 33 fish species were found in various order, where Cypriniformes with 20 order was the abundance among all.

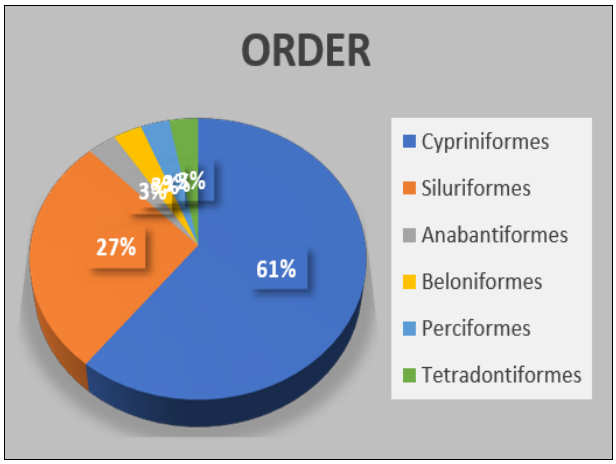

Chart 1: Representing the order of fish species:

Table 2: Based on the survey, the fish species found are mentioned in the table below:

S. No	Family	Genus	Species	Ursngikyllut, F. S	Photumnew, F. S	Shnongkalong, F. S	Wahsohstap, F. S
1.	Cyprinidae	*Amblypharyngodon*	***mola***	+	+	-	+
2.		*Cirrhinus*	*mrigala*	+	-	+	+
3.		*Danio*	*rerio*	+	+	+	+
4.			*dangila*	+	+	+	+
5.		*Devario*	*aeqipinnatus*	+	+	+	+
6.		*Garra*	*lamta*	+	+	-	+
7.			*gotyla*	+	+	+	+
8.		*Labeo*	*calbasu*	+	-	+	+
9.			*gonius*	+	-	-	+
10.			*pangusia*	-	-	-	+
11.			*rohita*	+	-	+	+
12.			*hexastichus*	+	+	+	+
13.		*Puntius*	*chola*	+	+	+	+
14.			*sarana*	+	+	+	+
15.			*shalynnius*	+	+	+	+
16.			*sophore*	+	+	+	+
17.			*ticto*	+	+	+	+
18.		*Neolissocheilus*	*hexagonolepis*	+	+	+	+
19.	Cobitidae	*Botia*	*dario*	+	+	-	+
20.		*Lepidocephalus*	*guntea*	+	+	+	+
21.	Anabantidae	*Anabas*	*testudineus*	-	-	-	+

Note: The sign (+) indicates the presence of fish species whereas, the sign (-) indicate absence of fish species, (F.S-Fish Sanctuary).

Through analysis, the water sample from each water bodies of fish sanctuaries the results shows that it holds a perfect quality which is suitable for survival of various aquatic fishes and other aquatic living organisms. The better water quality shows a better production with rich of nutrients which are sufficient enough for survival of fishes.

Table 4: Water quality parameters:

S. No	Fish Sanctuary	pH	WaterTemp.	Colour	CO_2 mg/L	DO	Total Harness mg/L	Alkalinity	BOD	COD	Cl-	NO3-
1.	Ursngikyllut	7	24.50℃	Clear	4.2	4.2	75	65	3.0	4.8	13.0	3.10
2.	Photumnew	7.5	27℃	-	5.5	4.5	83	72	4.5	5.9	20.8	3.12
3.	Shnongkalong	7.9	26℃	-	5.0	5.5	79	85	5.0	7.0	25.5	4.0
4.	Wahsohstap	8	28℃	-	6.0	5.3	89	71	4.3	6.9	30.2	3.15

3.2 History of Fish Sanctuaries in South West Khasi Hills District

The fish sanctuaries studied include:

- Ursngikyllut Fish Sanctuary (Rohbah).
- Photumnew Fish Sanctuary (Mawkyrwat).
- Shnongkalong Fish Sanctuary (Shnongkalong).
- Wahsohstap Fish Sanctuary (Pyndengumjarain)

3.2.1 Ursngikyllut Fish Sanctuary (Rohbah)

South West Khasi Hills District is richly endowed with lush green undulating hills and hillocks and pristine clear rivers and streams. The district has 3 main rivers flowing through namely the Rilang, Umngi and Kynshi Rivers. The Rilang River boasts of the beautiful and serene fish sanctuary-The Rohbah Fish Sanctuary located near the quiet village of Rohbah which is 10kms from Mawkyrwat and 80 kms from Shillong. The Rohbah Fish Sanctuary is protected from any forms of destruction to Aquatic life by the vision and wisdom of one association: "The Mawthawpdah Area Rilang Fishing Association" (MARFA) which was formed in the year 2004. Responsible persons from 18 villages in and around Rohbah Fish Sanctuary are members of the Association, who took it upon themselves to guard the river stretch and conserve the protected area along Rilang River starts from Them Fish population in the river. Mawthawiang up to Rohbah Village at a stretch of 6 kms, and at Ursngikyllut-Rohbah Village, the declared pool of sanctuary is 300 m × 100 m wide. This stretch was declared by the association as a Fish Sanctuary on the 7th June 2012-a safe haven for fishes to freely feed and propagate. This sanctuary was further developed through the financial assistance of Rs 4, 42,200/-from the Department of Fisheries under Meghalaya State Aquaculture Mission, for the construction of Sausage Dam, View point and Footpath, was officially inaugurated on 29th October 2015. Numbers of Chocolate Mahseer fingerlings were released to mark the inaugural occasion. The main objective of developing the sanctuary is to increase the dwindling fish population of the river, especially the chocolate mahaseer, and to boost tourism in the area. Movement display would be noticed whenever feeds were thrown into the sanctuary and the fishes would come up to the surface to feed, a beautiful and wonderful sight to see. As the fish population has increased, the Sanctuary has attracted many visitors within the state as well as tourists from outside the state and foreign tourists. The most important outcome of the sanctuary is that since 2015 there has been a remarkable increase in the population of the chocolate mahaseer and other species. The reason behind the increase is due to the fact that the sanctuary is a protected habitat where the fishes could safely feed and breed without any human interference. The sanctuary has attracted many visitors to Rohbah village, and with this it has given an opportunity to local youths to be employed as local guides for other places of tourist importance in the district as well as other tourist destinations in the State, thus generating income for the local populace. Besides this, as the MARFA and the communities has constructed Tourist Homestays near the Sanctuary, the locals are also paid to cook for the visitors during their stay. Rohbah Fish Sanctuary is the first sanctuary in the district and it is a forerunner in terms of promoting conservation of the indigenous species in rivers. Other villages throughout the district have started to approach the dept. for protecting the rivers and streams and to conserve aquatic life.

3.2.2 Photumnew Fish Sanctuary (Mawkyrwat)

Photumnew is one of the flowing rivers that arises from Wah Umngi as the main source of water in South West Khasi Hills District. The river is a main source and used mostly for human consumption as drinking water, washing, irrigation, fire and emergency services etc., in almost all the area under Mawkyrwat village. Earlier it is a free-flowing river without any blockage or stop the flowing of water from all barriers. The water is clean and fit for human consumption and other purpose as well. The level of water body is not that high as it flows overly since no construction was made to block or prevent the flowing of water. The water body contain a large number of aquatic species such as fishes, crab, as well as other aquatic organisms. Fish species found are mostly carps*; Neolissochilus hexagonolepis* (Cooper Mahseer or Chocolate mahseer), *Channa Sp*. *Schistura sp.* etc. The river was being dam since the 2007-2008 to prevent and conserve the fish species, for drinking purposes and also to hold the water holding capacity for the future generation prospects. The water level is increasing day by day especially during monsoon season. The construction of dam by done by the member of Mawkyrwat Fishing Association (MFA) in collaboration with Seng Samla Shnong Mawkyrwat. Their main objectives are to conserve the aquatic species i.e. fishes and other aquatic organisms. Earlier it was allowed for washing clothes, bathing and even fishing, but later on there was an impact over these to the water for human used as well as to protect the aquatic life. Therefore, the MFA took a step to implement the rules related to these and that is they are strictly for fishing, washing clothes but for bathing using any soap or shampoo is not allow but only for swimming purposes. The main reasons over these were that overfishing and using unused substances has led to the dead and decreasing of fish species and destroyed their ecological balanced as well. Using detergents or soap to the river has led the water unfit for human consumption as well as it releases chemicals which can affect the fish and other aquatic life. A large number of fish species are able to survive without any destruction or disturbed the ecosystem and water bodies. Fish including Mahseer has increase the number of species as they are able to live and survive in an ecosystem which are high in nutrients value as well as good water quality parameters. The water is clean and with the construction of blockage or barriers it helps to hold the waste that flow through the river and therefore with the maintenance and implementation of various steps to overcome the pollution of water the organization has stand to protect and conserves the water ecosystem for the betterment in the upcoming generations.

3.2.3 Shnongkalong Fish Sanctuary (Shnongkalong)

Shnongkalong is a medium size village located in Ranikor C & RD Block of South West Khasi Hills District in the state of Meghalaya in India. It is situated 9 km away from sub-district headquarter Ranikor (Tehsildar office) and the nearest town is Mawkyrwat and Nongstoin. The Shnongkalong village has a population of 433 of which 226 are males while 207 are females as per Population Census 2011. According to Census 2011 information the location code or village code of Shnongkalong village is 277168. In Shnongkalong village population of children with age 0-6 is 55 which makes up 12.70% of total population of village. Average Sex Ratio of Shnongkalong village is 916 which is lower than Meghalaya state average of 989. Child Sex Ratio for the Shnongkalong as per census is 964, lower than Meghalaya average of 970. As per constitutions of India and Panchayati Raj Act, Shnongkalong Village is administered by Sarpanch (Head of Village) who is elected representative of village. Caste Factor, in Shnongkalong Village, most of the village population is from Schedule Tribe (ST) constitutes 94.23% of total population in Shnongkalong Village. There is no population of Schedule Caste (SC) in Shnongkalong Village of South West Khasi Hills. Work Profile, in Shnongkalong village out of total population. 133 were engage in work activities, 81.95% of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 18.05% were involved in Marginal activity providing livelihood for less than 6 months. Of 133 workers engaged in Main Work, 26 were cultivators (owners or co-owner) while 18 were Agricultural labourers. The Shnongkalong fish sanctuary was constructed by the local people in collaboration with the department of fisheries in South West Khasi Hills District. The department of fisheries has taken a step about this fish sanctuary for conservation of fish's mostly indigenous species and other aquatic organisms. Through this sanctuary, a vast number of fishes are able to breed and reproduce without any interference or disturbance in their aquatic environment. The number of seeds production has increase with a large number of productions. Fish species available include, Chocolate or Copper Mahseer (*Neolissocheilus hexagonolepis),* Rohu *(Labeo rohita),* Catla *(Catla catla),* Common carp *(Cyprinus carpio) etc.* Besides these, minor species include Pethia (*Puntius ticto*), *Puntius sarana, Danio dererio, Danio dangila,* etc. The locals along with the members of fishing association and the department of fisheries took a serious part about this in order to conserved the aquatic fishes and their habitats for sustainable development and generation.

3.2.4 Wahsohstap Fish Sanctuary (Pyndengumjarain)

The Pyndengumjarain village is located in the nearby Wahkaji area with a short distance within South West Khasi Hills District and the village has around approximately 135 household. The fish sanctuary in Pyndengumjarain village also known as Wahsohstap fish sanctuary has been established by a group organization which was then later recognised and initiated by the Department of Fisheries in South West Khasi Hills District, Mawkyrwat. The Fish sanctuary in the village has become one of the best tourist spots, where many people from far-away and nearby area has visited frequently in this place as it has a beautiful sceneries of water crystals in the presence of many fish species. Different types of fish species are found in these sanctuaries with abundant of nutrients in the water body which are the main source of food for aquatic fish and other aquatic organisms. The presence of various fish species has amazed the people in and around that came to visit this fish sanctuary. Fish species with different sizes and shades has been attracted to the visitors, a school of fish shown a large number of fish species available. The main objectives of the organization over this sanctuary are to preserved the indigenous aquatic living organism including Fish, shrimp and so on so forth. The organization has also hired or self-volunteering in order to took care of the area and are strictly prohibited in fishing and capture of the fish species in that particular areas where fish are conserved. In case someone outbreak the rules and law, a strict action has been taken by the organization, the village community according to the rules and regulation implementations.

3.3 Fishery Resources

The Fishery resource of South West Khasi Hills comprises of 345.97 of rivers and streams, 0.5 hectare of beels and 205.65 hectare of ponds and tanks and. South West Khasi Hills being a hilly district, also offers abundant scope for impounding water bodies by erecting lands across hill enclave fed by perennial springs. Such culturable hill enclaves' conservative rate of production, has the potentiality of producing 720 metric tons as against the production of 683 metric tons recorded during the year 2022-23. As a vast fishery resource of the district remains untapped till today its optimum utilization by means of planned development of fishery has been a challenge before us.

Table 5: Water resources in South West Khasi Hills District

Water Resources	Area
Village ponds and tanks	205.65 Ha
Rivers and Streams	345.97 Km
Beels	0.5 Ha

3.4 Riverine fishery resources

There are two important river system in the district, the Umngi and the Kynshi with a number of tributaries. Kynshi, the bigger of the two, rises in the southern slopes of Marpna Peak near Mawmaram village (about 10 Kms from Mairang to Shillong). It follows a westerly course for a considerable distance then takes a sharp bend to the east and enters the plains of Bangladesh at Ranikor. Other important rivers that constitute the drainage system of the district are the Phodphra, Phodsawphew, and Phodritham.

Table 6: Fish fauna and length of rivers in South West Khasi Hills

Name of the river	Length (In Kms)	Dominant fish species
Rilang	92.02 km	*Neolesochilus hexagenolepis Labeo calbasu, Notopterus notopterus*
Kynshi	148.11 km	*L. Calbasu, L. bata, Cyprinus carpio, Mahaseers.*
Umngi	68.8 km	*Labeo gonius, L. dero, L. calbasu, Cirrhinus mrigala, C. reba, Pethia shalynius, P. ticto, Cyprinus carpio, Garra lamta, Barilius barna, Danio rerio, Botia dario.*

3.5 Fish and fish seed production in South West Khasi Hills: The present fish production was 624.63 metric tonnes in 2023-2024, the target is about 650 metric tonnes. From 2016-17 to 2023-24, 3886 metric tonnes of fish was produced from South West Khasi Hills District from both capture and

culture fisheries. The highest production was recorded in the year 2022-23 with a production of 683 metric tonnes. The Government of Meghalaya aims in producing quality fish seed to the fish farmers. In South West Khasi Hills, two government fish seed farms i.e., Macbikol fish seed farm in Ranikor Block and Umbir FRP Hatchery in Ranikor Block were set up to produce fish and fish seed to the fish farmers of the district. From 2016-17 to 2023-24, 9,590,820 numbers of fish were produced from South West Khasi Hills from both Fry and Fingerlings. The highest production was noted in the year 2023-24 in which 22,40000 numbers of fish seed was produced while the lowest production was recorded in the year 2016-17 and 2017-18 in which the production was only 700000 numbers.

Table 7: Fish and fish seed Production in South West Khasi Hills from 2016-17 to 2023-2024

Year	Fish production in metric tons	Fish seed production in numbers
2016-2017	252.20	3,30,000
2017-2018	260.80	7,00,000
2018-2019	450.484	10,00,000
2019-2020	486.54	19,58850
2020-2021	498.13	1951950
2021-2022	630.82	1501000
2022-2023	683	19009000
2023-2024	624.63	22,40000
Total	3886	9,590,820

4. Discussion

Through the research work conducted for a period of 6 months starting from July 2024 to December 2024 in different sanctuaries related to the area and structure, water quality parameter analysis as well as the fish production within the South West Khasi Hills District it shows a great and positive result both in capture and culture fisheries. The highest production was noted in the year 2023-24 in which 22,40000 numbers of fish seed was produced while the lowest production was recorded in the year 2016-17 and 2017-18 in which the production was only 700000 numbers. The availability of the fish sanctuaries has improved a lot over the production of fish species every year. The fish production recorded that a large number of fish species has been detected from various fish sanctuaries, which can increase the economy from the market areas and other sectors. As per the research work conducted, it was found that Ursngikyllut fish sanctuary at Rohbah village has the highest amount of fish production of Mahseer species as the dominant species followed by Wahsohstap fish sanctuary at Pyndengumjarain village, Shnongkalong fish sanctuary and Photumnew fish sanctuary. The reasons were that it's the structure and area and the source of water, the natural food as well as their habitation. Besides, copper mahseer or chocolate mahseer other fish species found include; *Cyprinus carpio* (Common carp), *Labeo rohita* (Rohu), *Labeo calbasu*, *Labeo gonius*, *Hypothalmicthys molitrix*, *Ctenopharyngodon Idella*, *Schistura Sp. Channa* sp. *Puntius ticto*, *Danio rerio*, shrimp etc. Most of these fish species have a low level of production in river areas within the district as compared to the sanctuaries that have been conserves for many fish species from the stage of endangered as well as of extinct. In terms of water analysis, most of the sanctuaries have a suitable and acceptable range of water quality parameters. A slight range differ in each sanctuary due to climatic condition during the research period, including the water temperature and so on. Overall, the great achievement in the entire dissertation work is through the organization of extension program in various villages. The program held in various villages has improve me a lot through extension program related to fish conservation. The villagers including the association or self-help group have taken part and attend the program, in the present of the Headman of the village, the secretary, the fish farmer as well as the students. The feedback attain from the participants shows a good valuable time with the beneficial for both the participants as well as the organizer through the question sessions.

4.1 Constraints

Almost all the inhabitants in the district are fish eaters. At present most of the people relish fish. As such, fish is in great demand. But this demand has not been met so far due to innumerable problems. The demand-supply gap is being met through imports of fish from other States. The state of Meghalaya being located in the North Eastern region of India is a hilly state are similar to each other. The main constraints in augmenting fish production are explained here under.

4.2 Lack of Funds

Lack of Funds is always a major hindrance in any developmental works. The Fisheries department receives a very negligible fund when compared to other departments like Agriculture and Animal and husbandry. The Fisheries department, when compared to other major revenue yielding departments, is insignificant in the state. Thus, with the lack of Funds, the department faces a big hindrance in introducing new developmental programs and other new ventures in the state. A lot of potential resource is waiting for exploitation but with insufficient capital the resources still remain untapped.

4.3 Deforestation

Deforestation has also affected the fish fauna in the state and district as well. The forest area of Meghalaya has been greatly reduced. Deforestation results in heavy siltation of the rivers during heavy monsoon showers, moreover the state is subjected to one of the heaviest showers in the world.

4.4 Geographical location

Most of the fishery resources of Meghalaya as well as South West Khasi Hills are located in regions where transport pose a serious problem. The hilly terrains of the state stand as an obstacle for the departmental authorities to visit these places.

4.5 Awareness

Illiteracy and lack of awareness to popularize fish production throughout the state, diverts people to opt for other production systems which are more expensive compared to fish. Majority of the people are still unaware that fish culture is one of the best ways of self-employment and good source of earning. The lack of scientific knowledge on the part of the people prompts them to indulge in the illegal practice of using dynamite and poison to catch fish at the same time unknowingly destroying the aquatic flora of the region.

4.6 Social problems

Some of the social problems encountered in the development of fishery in the state are religious taboos, superstition. Some people believed that having a fish pond in the living compound brings poverty to the house. These problems must be dealt accordingly and must be abolished from the minds of

the people. Lack of fishermen community in the state is another social problem. The control of major water bodies in the state, not residing with the fishery department also compounds the problems face by the department in the development of fishery.

4.7 Constraint of fish conservation

Main constraints of fish conservation are lack of awareness, water pollution control, poor socio-economic condition of the fishers, poor transportation facilities and so on so forth. But even though, the department of fisheries has taken up against this to go forward over these constraints for the benefits of the different areas within the district. Hence, by joining together, over these it can bring a great result to the different areas especially to increase the production of fish and other aquatic living organisms.

5. Conclusion

Through the research study an attempt has been made to highlight the presents of fish sanctuaries in the district, organizing awareness program related to fish conservation, fisheries resources, water parameter analysis, status of fisheries development, the problems and future prospects and development of fisheries in South West Khasi Hills District. Despite several constraints, the fisheries sector in the state is gradually improving. There is a tremendous potential for the development of cold-water fisheries in the district. Although the district department of fisheries has made major strides in the development of fisheries in the district, it has to intensify efforts for the development, conservation and proper management of the available resources. It will be a wise attempt by the department of fisheries to implement a conducive strategy for the development of fisheries of the state in particular. Although, the present staff have all been trained and are enthusiasm to developed-fisheries, there is need to entrust the organization in this initial phase to have experienced technical staff, so that the young workers translate their enthusiasm into constructive work in organized lines. South West Khasi Hills District has a tremendous fisheries resource. But much is not known about them. Information on the aquatic resources is lacking particularly their ecology. The first and foremost requirement is the resource identification and assessment. Although there are a number of sanctuaries within the district, but still the supplying of fish in the market are not sufficient enough as the number of fish production is quite low but through the capture and culture fisheries sector in the sanctuaries the presence of different fish species has increase annually over time. Hence this can be the good results of fish production and supplying in the market areas and in the district. Due to increasing demand of fishes go with low supply and manifold. Variety of channel members in between harvesters and final consumers, a large price increase continues to grow in this fish marketing chain which is mainly created and influenced by the channel intermediaries. The increase amount of catches by the fishes and effective marketing of produces at appropriate price will help to fetch higher profit from the investment. The present of fish sanctuaries in the state has improve a lot in terms of fish diversity as a large number of different fish species are obtain which help the fish to able to survive without disturbance on the ecosystem for the good production and to withstand from endangered as well as extinct level. The presents of fish species including Mahseer as the main dominant fish species in the particular sanctuaries has create ecological balance as the amount of natural food in the aquatic environment is quite abundance and also the availability of different fish species has improved over time in terms of growth as well as production level. The fisheries department in the district have implements various schemes and sanctions in different villages and locality to improve the production of fish through construction of fish farm in different areas in the villages and also the implementation of hatchery which can improve a lot in terms of fish seeds production. Through the study conducted, it has found that the number of fish seeds production has increase a lot in 2023-2024 at around 22,40000 in numbers. The department also has organized different programs in the district especially to the fish farmers about the production of fish, the implementation of schemes such as construction of new ponds, fish hatchery, fish feeds as well as intervention and discover new area as fish sanctuaries which will be a good culture and conservation of fish species and other aquatic living organisms. South West Khasi Hills comprises of two community & Rulal Development Blocks is a very beautiful and picturesque, not only it is blessed with natural beauty and glandular but enormous fishery resources also. The ichthyofauna of the district is also one of the richest in the country. The principal rivers Kynshi and Umngi along with its tributaries crisscross the whole district forming a network of waterways which offer an ample scope for development of both commercial and recreational fisheries in the district. Abundance awaiting of fish in rivers and streams for human consumption has now become a thing of the past. Today pisciculture has attained a stage of technology where breeding and rearing of fish is carried out in artificially created hydro biological conditions. With the increase in human population, exploitation of fish fauna in their habitats increased manifold. Unconventional fishing, construction of dams and barrages demolished the habitat of fish and prevented their migration. Conscious planning for development of fisheries, therefore, became a necessity for a balance economy and restoration of ecology. On the basis of climatic condition of the district there is a great potential for development of cold-water fisheries. In colder areas of South West Khasi Hills are suitable for adopting fish species like trout, *Mahseers (Tor tor, Tor putitora, Neolissocheilus hexagonolepis).* Like carp culture, there is an immense potential for development of trout fishery in the district. The Khasi, Garo, Hajong and other communities inhabit the district. Since majority of the district population is a tribal population, fish practices like integrated farming (with live stocks) have got a huge potential. However, the state is still lacking in these lucrative fields which can not only provide food to the masses but also generate employment thus lifting or improving the living conditions of the poor. The district has a tremendous fisheries resource but much is not known about them. Information on the aquatic resources is lacking particularly their ecology. The first and foremost requirement is the resource identification and assessment. South West Khasi Hills district is at present, having no hydroelectric project or reservoir. For increasing the productivity of fishes and making certain their livelihood security an efficient fish marketing system is a vital requisite. Though fish market in the district is not competitive in view of the huge gap between demand and supply and also suffering from ill-management, unsatisfactory state of market structure, the fish marketing system in this market is quite efficient Further to achieve the various fisheries activities in the state and to uplift socio-economic status of the rural

people following recommendations/suggestions are regarded suitable while planning the development programmes/ schemes.

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