
Malpractices in Traditional Fishing In Lower Gangetic Plains: A Rising Threat to Indigenous Fish Diversity

*Thesis Submitted to Midnapore City College
for the Partial Fulfillment of the Degree of
Master of Science (Zoology)*

Submitted by

**Antarip Bera, Miraj Ali Shah, Saikh Ayatulla, Shiuli Patra,
Shreya Chakraborty, Sk. Moniruddin, Soumyadip Santra**

Guided by

Dr. Somanka Sanyal
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Kuturiya, P.O. Bhadutala,
Paschim Medinipur, Pin-721129
West Bengal, India

2023

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2023



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Certificate

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This is to certify that the project report entitled “Malpractices in Traditional Fishing In Lower Gangetic Plains: A Rising Threat to Indigenous Fish Diversity” submitted by Soumyadip Santra (PG/VUWGP29/ZOO-IVS-051), Antarip Bera (PG/VUWGP29/ZOO-IVS-006), Saikh Ayatulla (PG/VUWGP29/ZOO-IVS-035), Miraj Ali Shah (PG/VUWGP29/ZOO-IVS-020), Sk. Monirudin (PG/VUWGP29/ZOO-IVS-045), Shreya Chakraborty (PG/VUWGP29/ZOO-IVS-042), Shiuli Patra (PG/VUWGP29/ZOO-IVS-040), to the Midnapore City College, Midnapore, West Bengal, India during the year of 2023 in partial fulfillment for the award of the degree of M.Sc. in **Zoology** is a bona fide record of project work carried out by him/her under my supervision. The contents of this report, in full or in parts, have not been submitted to any other Institution or University for the award of any degree.

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Declaration

We do hereby declare that the present Master thesis entitled '*Malpractices in Traditional Fishing in Lower Gangetic Plains: A Rising Threat to Indigenous Fish Diversity*' embodies the original research work carried out by me in the Department of Biological Sciences, Midnapore City College, Paschim Medinipur, West Bengal, India under the supervision of Dr. Somanka Sanyal, Assistant Professor of Zoology, Midnapore City College, Kuturia, Paschim Midnapore. No part thereof has been submitted for any degree or diploma in any University.

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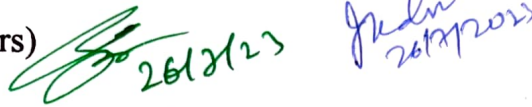
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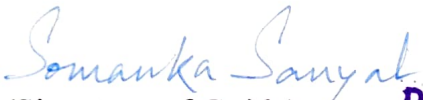
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This project report entitled '*Malpractices in Traditional Fishing in Lower Gangetic Plains: A Rising Threat to Indigenous Fish Diversity*' by Antarip Bera, Miraj Ali Shah, Saikh Ayatulla, Shiuli Patra, Shreya Chakraborty, Sk. Moniruddin, Soumyadip Santra, is approved for the degree of Master of Science (Zoology).

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Abstract

Presently increased use of mosquito-nets in fishing practice has caused a drastic change in the traditional fishing gears and is of global concern. Traditional bamboo-stick made Ghuni (Box-trap used for fishing throughout lower Bengal floodplains having slitwidth of $\geq 3\text{mm}$) is seen to be replaced by Ghuni made up of non-biodegradable nylon Mosquito-nets with smaller mesh size ($\leq 3\text{mm}$). These modern Ghunis are easier to make and cheaper, thus number of Ghuni used by people have also increased than earlier. This study was conducted to identify if there is any significant difference in the number, size and species of fishes and other organisms caught in traditional and mosquito-net Ghuni. 10 samples (24 hours each) from both site by both type of Ghuni keeping other factors constant, indicated that mosquito net Ghuni traps more smaller fishes (high juvenile capture rate), shrimps, juvenile molluscs, crabs and occasionally snakes whereas traditional bamboo-stick Ghuni only traps comparatively bigger fishes and shrimps. Market survey proves people prefers economical mosquito-net Ghuni more, making the traditional bamboo-stick Ghuni obsolete, to expedite the overharvesting of juvenile indigenous shrimps and fishes and other organisms at the breeding and nursing grounds hampering the local biodiversity risking the future food security of the community.

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Chapter 1: Introduction

Chapter 1: Introduction

Flood plains are the most productive ecosystem. It is a home ground of a diverse array of organisms like -micro & macro invertebrates; fishes; amphibians; reptiles and birds. (Sandhya *et al.*, 2019) India, my country is blessed with almost all types of natural resources of water bodies and huge number of fish biodiversity. Paddy field is a natural water resource and fishery in paddy field is one of the most important fisheries in West Bengal.(Das, 2022) Lower Gangetic plain is a delta region resulting from the confluence of the rivers Ganga & Brahmaputra, before they meet the bay of Bengal. This plain situated to the south-east of the middle Gangetic plain of West Bengal. It is a vast plain of West Bengal. Lower Gangetic plain region is more humid. It's large part acts as inundated land for the major part of the year. (Singh, 2012) This lower Gangetic plain is one of the most fertile and thickly populated regions in the World. This region is rich in bio-diversity particularly in aquatic bio-diversity. This flood plain region is the most productive ecosystem. It is a very good biogenic habitat. It is a home ground of a diverse array of organisms like -some plants, micro & macro invertebrates, fishes, amphibians, reptiles, birds & lower and higher mammals.

First, We choose a river basin of lower Gangetic plains as our project work i.e. Rupnarayana River basin which is situated at 22.3975° North Latitude and 87.9538° East Longitude in Howrah District. We select this area as our project site. This river basin is good breeding and nourishing ground for all types of small and big indigenous fishes, shrimps, molluscs, etc. These are biologically sensitive habitat playing the vital role in fish requirement. As they acting as breeding and nourishing ground for fisheries, so they play an important role in rural economy of West Bengal. It is also a good breeding and nourishing ground for those animals which are not economically or commercially important. So, there create a huge biogenic habitat. This basin is mainly or simply Agricultural field. In the season of Monsoon the organisms came to breed in these agricultural fields and lay eggs, produces small off-springs for their next future generations. During this time the adult fishes entered into the agricultural field. They produce small off-springs for their next future generations. Both of them get food and nutrients from the paddy fields. In a simple term, they get nourished from the agricultural

fields. At the end of the Monsoon, when water level decreases then the juvenile and adult organisms came back to the main water stream.

The small juvenile fishes came back to the main stream of the water source at the end of the Monsoon season. During this time local people catch/trap them through their malpractices in the agricultural fields by using traditional ghunis. A decade ago farmers/villagers preferred to use 'A/V' shaped bamboo stick ghuni's locally known as Mugri (Howrah, Purba Medinipur); Muga (Paschim Medinipur) and so on. It is a traditional fishing gear of West Bengal. It is made by bamboo sticks. It has a unidirectional opening for fishing. This type of Mugri is made of chopped bamboo sticks. The bamboo sticks are arranged vertically. The Mugri is a V shaped box trap with a V shaped inlet at one side. The trap is supported with a few rows of split bamboo pieces fixed transversely at regular intervals over which woven split bamboo strip screens are fitted. The trap is vertically set against water current. Small fishes including prawns and crabs moving with current get caught in the trap through the V shaped unidirectional valve specially made to prevent trapped fishes to come out. (Short *et al.*, 2018) There is more than 3 mm gap between two sticks each. It haven't such horizontal sticks. It is much expensive. It's longevity is low as it is made up of bamboo sticks so that it is very much eco-friendly and bio-degradable. The chopped bamboo sticks are arranged in a special manner and bind with a special & unique knots. It costs approx 160-200 rupees in markets where we have surveyed. But, nowadays, People/ Farmers/ Villagers came to use the new Mosquito net Mugri. It is made of bamboo frame design and mosquito net is covered all over the body. The shape and size of the trap remained more or less unchanged. In the modern version of the trap, the main frame was made by joining pieces of bamboo splits (2-3 cm wide) with the help of iron nails. Nylon mosquito netting (≤ 1 mm mesh size) is then tightly wrapped over the bamboo frame to make the trap. Even the valve through which fishes enter into the trap is replaced with netting. (Short *et al.*, 2018) It costs approx 80-100 rupees in markets where we have surveyed. But it's longevity is better than the bamboo stick Mugri. And it is also cheaper than Bamboo stick Mugri. As a result, local people/villagers are attracted to the Mosquito net Mugri and use Mosquito net Mugri's heavily. So, Mosquito net Mugri's rise drastically. These type of Mugris are made up of nylon net so that these are not bio-degradable & also not eco-friendly.

We use these two Mugris for our work for 10 days. And we visit the nearby areas to see how many people use Mugris and what type of Mugris they set up for fishing. We ask some question to them. Mugri is set in such a way that the open end of the trap faces towards paddy fields and the closed end is placed towards deeper water/river. High tide in the river pushes water to paddy field through the canals. Water flows back to the river during the low tide. Small economic fishes like *Chanda* sp, *Puntius* sp, *Chela* sp, *Channa* sp, *Colisa* sp, etc. along with small and medium size prawns and crabs moving along receding water get caught in the trap. The traps are set before high tide sets in and harvested after the water receded from the submerged field to reach the lowest level. (Manna *et al.*, 2008) We set two Mugris in flowing water inside of the agricultural fields which is attached to the river stream. We set two Mugris side by side at the same place and same time, but, in different mouth opening. And we capture fishes in every 24 hours and then we change the direction of each Mugri mouth opening. We do this job for 10 days in every 24 hours of gap. Actually, we do this to nullify all the factors, where just only the capturing of fishes matters. Other factors are not affecting the two same sized Mugris. In a simple sentence, all factors are constant.

The mesh size of Mosquito-net Mugri's are so small that small fishes cannot slip out through the gap of nylon mesh. The mesh on mosquito nets is so fine, the nets risk capturing juvenile fish and eggs, hurting the ecosystem.(Andrews, 2016) But in bamboo stick Mugri, they can easily slip out. The tight-knit mesh makes it impossible for smaller creatures to slip through, there by denying them the chance to mature and breed. The situation is even worse around the source, the use of mosquito net is to catch the fishes of just a centimetre in length in a practice that also damage eggs in shallow areas.(Walker, 2016) As a result Juvenile stages of organisms are destroyed drastically, specially in breeding season.

People /Villagers target to catch only the adult fishes, shrimps, crabs, molluscs which are economically valuable. But, they catch the whole. They only keep the adults and throw the rest on the land due to malpractice. They do not know what to do with the juvenile organisms. They don't know the ecological value of the organisms which are not economically important. So, the Juvenile stage of the aquatic animals of the area are getting destroyed by local people when they malpractice in the breeding season. And as well as when they are using the Mosquito-net Mugri, there is a big chance for the

elimination of Juvenile stage of small indigenous organisms. Removing so many juveniles means there could be fewer fish to catch in the future.(Owens, 2019) “Effectively, if you remove that many juvenile fish, fish populations could just collapse completely. And that’s the kind of negative ecological function of this type of fishing”.(Robinson, 2019) Riverine ecosystems have affected from intense human interference resulting in habitat loss and degradation and as a consequence, many fish species have become highly endangered, especially in rivers.(Ghorai, 2018) However, the way the people are using could have destructive consequences for food security and healthy ecosystem.

We can conclude that the use of mosquito nets for fishing may contribute to food insecurity, greater poverty and the loss of ecosystem functioning.(Jones, 2020)

The key policies likely to influence future impacts of Mosquito Net Fishing are in health, regarding net distribution, and natural resource management regarding restrictions on use. We outline critical directions for research and highlight the need for a collaborative, interdisciplinary approach to development of both localized and broad-scale policy.(Short *et al.*, 2018) The project also bans the use of mosquito nets, enforces a larger minimum mesh size and puts Chambo fishing off-limits for months to give them a chance to breed and grow.(Walker, 2016)

Chapter 2: Literature Review

Chapter 2: Literature Review

Various fish traps made of bamboo and other natural construction materials using indigenous knowledge systems are traditionally employed to catch small economic fishes in low lying areas of West Bengal and Assam. However, in recent years, nylon mosquito netting is gradually replacing bamboo as the main construction materials in case of Mugri, a V shaped trap commonly used in East Midnapur district of West Bengal. The paper gives a comparative account of both the original and modified trap as well as their fish catch composition and cost of construction. In contrast, Dori, a counterpart of Mugri common in neighbouring Assam is still being made of bamboo. The probable causes for the recent change over from bamboo to plastic net as the main construction material in case of Mugri and its implication on fish biodiversity and preservation of the ITK and skill associated with construction of this traditional bamboo trap is discussed in the paper. (Manna & Bhattachariya, 2008)

Over the past 20 years, fish stocks in Lake Malawi have fallen by 90 percent, and without action the drastic decline could result in the permanent loss of both a source of food and employment. A major cause of the problem are mosquito nets, which became an integral part of the local fishing kit some 15 years ago after the government started giving them to mothers free-of-charge to protect against malaria. Their tight-knit mesh makes it impossible for smaller creatures to slip through, thereby denying them the chance to mature and breed. The situation is even worse around the shores, where knight says women and children often use the mosquito nets to catch fish just a centimeter n length in a practice that “also damage eggs laid in the shallow areas.” (Walker, 2016)

Mosquito net fishing is not unique to Mida Creek. The practice has also been reported in other developing nations like Timor-Leste, and is regularly met with harsh criticism. Since the nets are being used for fishing rather than warding off mosquitoes, critics suggest the practice leaves people vulnerable to disease. Others charge that using the insecticide-soaked nets to fish could contaminate waterways. And because the mesh on mosquito nets is so fine, the nets risk capturing juvenile fish and eggs, hurting the ecosystem. (Andrews, 2016)

Mosquito net fisheries was witnessed in a broad range of marine and freshwater habitats and was seen to exploit a wide range of taxa with capture of juvenile fish reported in more than half of responses. (Short *et al.*, 2018)

During the last century, riverine ecosystems have interference resulting in habitat loss and degradation and as a consequence, many fish species have become highly endangered, especially in rivers. (Ghorai, 2018)

Use of small meshed nets was recorded in this region which may lead to imbalances in fish stocks affecting ichthyo-diversity as well as sustainable exploitation of fishes. Creating awareness among the beel fishers on the adverse effects of fine mesh nets on biodiversity was felt necessary. (K M *et al.*, 2019)

Fisheries managers believe use of the nets could damage fish stocks. They believe that fine-meshed netting is not selective and catches juvenile fish before they can grow or breed. In addition, the nets are treated with toxic insecticides. While local communities report declines in the abundance and size of fish, explicit links of cause and effect remain in the research pipeline. Whatever the impact, outright bans on fishing with mosquito nets based on mesh-size are likely to be extremely difficult to enforce and potentially harmful to families now reliant on the practice. (Robinson, 2019)

One of two gear types in which mosquito nets can be utilized, were recorded across ten sites in northern Mozambique where the use of Mosquito nets for fishing is common. Our results indicate a substantial removal of juveniles from coastal seagrass meadows, many of which are commercially important in the region or play important ecological roles. We conclude that the use of mosquito nets for fishing may contribute to food insecurity, greater poverty and the loss of ecosystem functioning. (Jones & Unsworth, 2019)

Floodplain wetlands locally called as beels are biologically sensitive habitats playing vital role in fish recruitment as well as acting as nursery ground for fishes and play an important role in the rural economy of West Bengal. Use of small meshed nets was recorded in this region which may lead to imbalances in fish stocks affecting ichthyodiversity as well as sustainable exploitation of fishes. Creating awareness among the beels fishers on the adverse effects of fine mesh nets on biodiversity was felt necessary. (Sandhya *et al.*, 2019)

India, my country is blessed with almost all types of natural resources of water bodies and huge number of fish biodiversity. Paddy field is a natural water resource and fishery in paddy field is one of the most important fisheries in West Bengal. This paper is written on the basis of my own practical experience. During the last two decades of twenty century, a large amount of fish and prawns were caught from paddy fields and marketed in different fish markets in the district of Purba Medinipur. About 26 varieties of fin fishes and shellfishes (prawns) were caught from the paddy field. From the beginning of the twenty- first century, paddy field fishery has been decreasing and now it stands on the bottom level due to malpractices in paddy culture techniques. (Das, 2022)

Chapter 3: Aims and Objectives

Chapter 3: Aims and Objectives

1. To find out presence of any significant difference between traditional bamboo made Ghuni and modern mosquito net made Ghuni in case of catch.
2. Threat analysis for freshwater ecosystem.
3. To find out the size differences of juveniles between the both Ghunis remaining all the factors constant.
4. What will be the precautions of this current problem and try to figure out the solution.
5. Trying to stop the using of nylon mosquito net and rising awareness among the local people.
6. Try to conserve local indigenous small fishes and also other aquatic organisms.

Chapter 4: Materials and Methods

Chapter 4: Materials and Methods

- **Materials required:**

- | | |
|---|---|
| (a) Bamboo made Ghuni | (e) Camera for photographic documentation |
| (b) Mosquito-net made Ghuni | (f) GPS device |
| (c) Scale for measuring size | (g) Microscope |
| (d) White paper or any white background | (h) Ethanol |

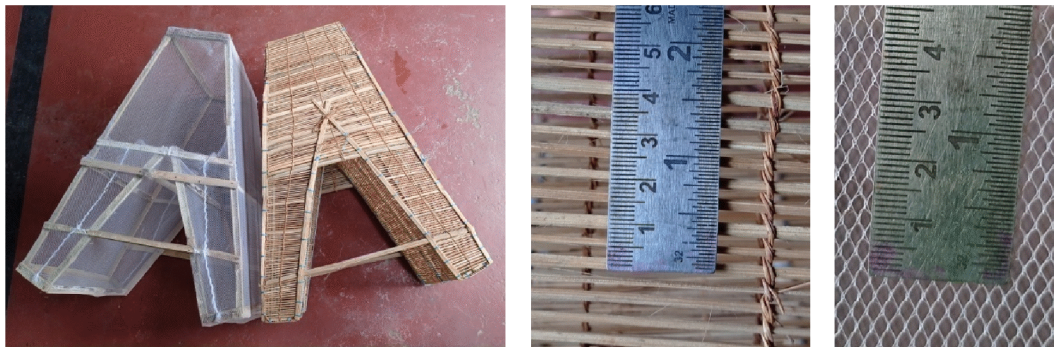


Fig 1: Two types of Ghuni/Mugri and their measurement

Method:

- I. Site selection – We select two river basin where the indigenous fishes breed and traditional fishing takes place, the two river basins are –

- (a) Rupnarayana River basin in Howrah district and

The study site is mainly agricultural field (paddy field) where the fishes breed and baby fishes returns to the main stream.

- II. Study area – We take GPS location of our study area by GPS device (Model: Etrex 10) and put the data in Google Earth software and determine the area of the study site by draw a polygon. The data is as follows -

| River basin | Latitude | Longitude | Altitude (Meter) | Area (Square meter) |
|-------------------|----------------------|----------------------|------------------|---------------------|
| Rupnarayana River | 22.3975 ⁰ | 87.9538 ⁰ | 2.4 | 36,100 |

Table 1: Detail location of our study site



Fig 2: Site 1: Map of Rupnarayana River Basin

III. Traditional fishing by Ghuni – We catches fishes using both type of Ghuni in traditional way. We set the both Ghuni (bamboo made and mosquito-net made) in a same place in both direction and alternate the direction randomly for keep all the factors constant. We set both Ghuni throughout the month and take data from the both Ghuni separately.



Fig 3: Traditional fishing, we alternate the ghuni to constant all the factors

IV. Data collection and Analysis – We set both the Ghuni in 24 hours duration regularly. We collected all the catches from both Ghuni separately and measures all the catches by scale with white background and keep the data separately for further analysis.



Fig 4: Measure all the catch by a centimeter scale

V. Questionnaire method – We take 10 interviews of some local peoples by questionnaire method and noted down who catch fishes from our study sites.

Interview No.

Name: _____ Village: _____
 Age: _____ Date: _____

1. How many years you catch fishes using Ghuni?
Ans:
2. Previously which type of Ghuni you used?
Ans:
3. Now which type of Ghuni you used?
Ans:
4. Which type of Ghuni is more better according to you and why /Why you not use Bamboo stick made Ghuni?
Ans:
5. How many Ghuni(s) you used previously and now how many you used?
Ans:
6. What do you do with small fishes that are caught in Mosquito net made Ghuni?
Ans:
7. What do you do with mollucs that are caught in Mosquito net made Ghuni?
Ans:
8. What do you do with all the others except fishes and mollucs that are caught in Ghuni?
Ans:
9. Which type of fishes are caught in Ghuni ?
Ans:
10. Are you get the same amount of fishes that you got previously?
Ans:
11. Do you know that the nylon mosquito net made Ghuni is harmful than the bamboo stick made Ghuni?
Ans:
12. Have you any idea about the alternate of nylon mosquito net made Ghuni?
Ans:

Fig 5: Questionnaire sample

VI. Market survey – We survey local 5 markets where the fishing gears and the caught fishes are sold, to see the tendency of local people buying which type of fishing gears and which gear is cheaper in market.



Fig 6: Market survey

Chapter 5: Results

Chapter 5: Results

- We want to constant all the factors, but as the water level is directly related with the moon phase, so we noted down moon phase and water direction for both the bamboo stick made ghuni and nylon net made ghuni. We also record the duration of ghuni set in the field. The list is given here -

| Sample No | Date | Time | Direction of Water | Moon Phase |
|-----------|----------|-----------------|--------------------|-----------------------|
| 1 | 26.09.22 | 7pm-7am (12hrs) | Backward | New Visible (1%) |
| 2 | 27.09.22 | 7am-7am (24hrs) | Backward | Waxing Crescent (3%) |
| 3 | 28.09.22 | 7am-7am (24hrs) | Toward | Waxing Crescent (8%) |
| 4 | 29.09.22 | 7am-7am (24hrs) | Toward | Waxing Crescent (15%) |
| 5 | 30.09.22 | 7am-7am (24hrs) | Backward | Waxing Crescent (24%) |
| 6 | 01.10.22 | 7am-7am (24hrs) | Backward | Waxing Crescent (34%) |
| 7 | 02.10.22 | 7am-7am (24hrs) | Toward | First Quarter (45%) |
| 8 | 03.10.22 | 7am-7am (24hrs) | Toward | First Quarter (56%) |
| 9 | 04.10.22 | 7am-7am (24hrs) | Backward | Waxing Gibbous (67%) |
| 10 | 05.10.22 | 7am-7am (24hrs) | Backward | Waxing Gibbous (78%) |

Table 2: Water direction and moon phase for bamboo stick made ghuni

| Sample No | Date | Time | Direction of Water | Moon Phase |
|-----------|----------|-----------------|--------------------|-----------------------|
| 1 | 26.09.22 | 7pm-7am (12hrs) | Toward | New Visible (1%) |
| 2 | 27.09.22 | 7am-7am (24hrs) | Toward | Waxing Crescent (3%) |
| 3 | 28.09.22 | 7am-7am (24hrs) | Backward | Waxing Crescent (8%) |
| 4 | 29.09.22 | 7am-7am (24hrs) | Backward | Waxing Crescent (15%) |
| 5 | 30.09.22 | 7am-7am (24hrs) | Toward | Waxing Crescent (24%) |
| 6 | 01.10.22 | 7am-7am (24hrs) | Toward | Waxing Crescent (34%) |
| 7 | 02.10.22 | 7am-7am (24hrs) | Backward | First Quarter (45%) |
| 8 | 03.10.22 | 7am-7am (24hrs) | Backward | First Quarter (56%) |
| 9 | 04.10.22 | 7am-7am (24hrs) | Toward | Waxing Gibbous (67%) |
| 10 | 05.10.22 | 7am-7am (24hrs) | Toward | Waxing Gibbous (78%) |

Table 3: Water direction and moon phase for nylon net made ghuni

- We measure all the catch by centimeter scale and noted down all the data and put the photographs in different folders in pc. Here are the results of our work –

| Date | Species | Total No. | Average size (cm) |
|----------|-------------------|-----------|-------------------|
| 26.09.22 | Crab | 12 | 2.82 |
| | Shrimp (A) | 1 | 5.5 |
| Data 01 | Shrimp(B) | 47 | 4.1 |
| | Fish | 1 | 3.6 |
| | Total | 61 | |
| Date | Species | Total No. | Average size (cm) |
| 27.09.22 | Crab | 12 | 3.07 |
| | Shrimp (A) | 1 | 6.4 |
| | Fish (Tri eyed) | 8 | 3.56 |
| Data 02 | Shrimp (B) | 33 | 4.16 |
| | Total | 54 | |
| Date | Species | Total No. | Average size (cm) |
| 28.09.22 | Crab | 11 | 2.83 |
| | Fish (Rice) | 1 | 2.6 |
| Data 03 | Fish (Bele) | 2 | 4.9 |
| | Shrimp (A) | 0 | 0 |
| | Shrimp (B) | 78 | 4.71 |
| | Total | 92 | |
| Date | Species | Total No. | Average size (cm) |
| 29.09.22 | Crab | 17 | 2.4 |
| | Fish (Eel) | 1 | 35 |
| Data 04 | Fish (Bele) | 3 | 5.53 |
| | Fish (Daniconius) | 1 | 3.9 |
| | Shrimp (B) | 80 | 5.1 |
| | Shrimp (A) | 1 | 4.7 |
| | Total | 103 | |
| Date | Species | Total No. | Average size (cm) |
| 30.09.22 | Crab | 1 | 3.5 |
| | Fish (Tri eyed) | 1 | 3.5 |
| Data 05 | Shrimp (B) | 11 | 4.92 |
| | Shrimp (A) | 1 | 8 |
| | Total | 14 | |
| Date | Species | Total No. | Average size (cm) |
| 01.10.22 | Crab | 2 | 1.9 |
| | Fish (Tri eyed) | 2 | 3.7 |
| Data 06 | Shrimp (B) | 30 | 4.86 |
| | Total | 34 | |
| Date | Species | Total No. | Average size (cm) |
| 02.10.22 | Crab | 12 | 2.74 |
| Data 07 | Shrimp (B) | 23 | 5.35 |
| | Total | 35 | |
| Date | Species | Total No. | Average size (cm) |
| 03.10.22 | Crab | 13 | 2.78 |
| | Fish (Koi) | 2 | 4.35 |
| | Fish (Rice) | 1 | 2.8 |
| | Shrimp (A) | 1 | 4.2 |
| Data 08 | Shrimp (B) | 34 | 5.6 |
| | Total | 51 | |

| Date | Species | Total No. | Average size (cm) |
|----------|-----------------|-----------|-------------------|
| 04.10.22 | Crab | 2 | 2.55 |
| | Fish (Tri eyed) | 1 | 4 |
| | Shrimp (A) | 1 | 7 |
| Data 09 | Shrimp (B) | 5 | 6.66 |
| | Total | 9 | |

| Date | Species | Total No. | Average size (cm) |
|----------|-------------|-----------|-------------------|
| 05.10.22 | Crab | 2 | 2.1 |
| | Fish (Rice) | 1 | 3.1 |
| Data 10 | Shrimp (B) | 5 | 5.22 |
| | Total | 8 | |

Table 4: Raw data of Bamboo stick made ghuni

| Date | Species | Total No. | Average size (cm) |
|----------|-------------------|-----------|-------------------|
| 26.09.22 | Crab | 8 | 2.475 |
| | Shrimp (B) | 89 | 4.57 |
| Data 01 | Shrimp (A) | 3 | 6.03 |
| | Fish (Bele) | 1 | 5.1 |
| | Fish (Puti) | 1 | 4.4 |
| | Fish (Rice) | 1 | 2.1 |
| | Fish (Daniconius) | 5 | 3.06 |
| | Fish | 1 | 3.4 |
| | Total | 109 | |

| Date | Species | Total No. | Average size (cm) |
|----------|----------------|-----------|-------------------|
| 27.09.22 | Crab | 13 | 2.7 |
| | Shrimp (B) | 133 | 4.03 |
| Data 02 | Fish (Bele) | 2 | 2.6 |
| | Fish (Gourami) | 3 | 5.167 |
| | Total | 151 | |

| Date | Species | Total No. | Average size (cm) |
|----------|--------------------|-----------|-------------------|
| 28.09.22 | Crab | 1 | 2.9 |
| | Shrimp (B) | 237 | 2.49 |
| Data 03 | Shrimp (A) | 2 | 3.75 |
| | Fish (Rice) | 28 | 2.48 |
| | Fish (Knight goby) | 2 | 2.65 |
| | Fish (Puti) | 1 | 2.2 |
| | Fish (Tri eyed) | 1 | 3.8 |
| | Fish (Daniconius) | 1 | 2.5 |
| | Fish (Bele) | 1 | 2.1 |
| | Total | 274 | |

| Date | Species | Total No. | Average size (cm) |
|----------|-------------------|-----------|-------------------|
| 29.09.22 | Crab | 1 | 3 |
| | Shrimp (B) | 154 | 2.96 |
| Data 04 | Shrimp (A) | 1 | 8.5 |
| | Fish (Rice) | 19 | 2.8 |
| | Fish | 1 | 1.3 |
| | Fish (Puti) | 1 | 4.7 |
| | Fish (Tri eyed) | 1 | 4.2 |
| | Fish (Daniconius) | 1 | 3.7 |
| | Fish (Bele) | 2 | 2.6 |
| | Total | 181 | |

| Date | Species | Total No. | Average size (cm) |
|----------|--------------------|-----------|-------------------|
| 30.09.22 | Crab | 1 | 2.5 |
| | Shrimp (B) | 147 | 3.17 |
| Data 05 | Shrimp (A) | 3 | 1.67 |
| | Fish (Rice) | 20 | 3.17 |
| | Fish (Glass) | 1 | 1.6 |
| | Fish (Puti) | 0 | 0 |
| | Fish (Tri eyed) | 1 | 3.9 |
| | Fish (Daniconius) | 1 | 3.3 |
| | Fish (Bele) | 2 | 3.5 |
| | Fish (Gule chengo) | 1 | 13.4 |
| | Fish (Lyata) | 1 | 16 |
| | Total | | 178 |

| Date | Species | Total No. | Average size (cm) |
|----------|--------------------|-----------|-------------------|
| 01.10.22 | Crab | 2 | 2.85 |
| | Shrimp (B) | 93 | 3.26 |
| Data 06 | Shrimp (A) | 0 | 0 |
| | Fish (Rice) | 29 | 3.21 |
| | Fish (Glass) | 0 | 0 |
| | Fish (Puti) | 0 | 0 |
| | Fish (Tri eyed) | 0 | 0 |
| | Fish (Daniconius) | 0 | 0 |
| | Fish (Bele) | 0 | 0 |
| | Fish (Gule chengo) | 0 | 0 |
| | Fish (Lyata) | 0 | 0 |
| | Total | | 124 |

| Date | Species | Total No. | Average size (cm) |
|----------|--------------------|-----------|-------------------|
| 02.10.22 | Crab | 1 | 2.5 |
| | Shrimp (B) | 3 | 4 |
| Data 07 | Shrimp (A) | 0 | 0 |
| | Fish | 1 | 1.7 |
| | Fish (Rice) | 55 | 2.05 |
| | Fish (Glass) | 0 | 0 |
| | Fish (Puti) | 0 | 0 |
| | Fish (Tri eyed) | 0 | 0 |
| | Fish (Daniconius) | 0 | 0 |
| | Fish (Bele) | 0 | 0 |
| | Fish (Gule chengo) | 0 | 0 |
| | Fish (Lyata) | 0 | 0 |
| Total | | 60 | |

| Date | Species | Total No. | Average size (cm) |
|----------|--------------------|-----------|-------------------|
| 03.10.22 | Crab | 0 | 0 |
| | Shrimp (B) | 0 | 0 |
| Data 08 | Shrimp (A) | 0 | 0 |
| | Fish | 0 | 0 |
| | Fish (Rice) | 12 | 1.94 |
| | Fish (Glass) | 0 | 0 |
| | Fish (Puti) | 0 | 0 |
| | Fish (Tri eyed) | 0 | 0 |
| | Fish (Daniconius) | 0 | 0 |
| | Fish (Bele) | 0 | 0 |
| | Fish (Gule chengo) | 0 | 0 |
| | Fish (Lyata) | 0 | 0 |
| Total | | 12 | |

| Date | Species | Total No. | Average size (cm) |
|----------|--------------------|-----------|-------------------|
| 04.10.22 | Crab | 0 | 0 |
| | Shrimp (B) | 2 | 4.1 |
| Data 09 | Shrimp (A) | 0 | 0 |
| | Fish | 0 | 0 |
| | Fish (Rice) | 1 | 1.7 |
| | Fish (Glass) | 0 | 0 |
| | Fish (Puti) | 0 | 0 |
| | Fish (Tri eyed) | 0 | 0 |
| | Fish (Daniconius) | 0 | 0 |
| | Fish (Bele) | 0 | 0 |
| | Fish (Gule chengo) | 0 | 0 |
| | Fish (Lyata) | 0 | 0 |
| | Total | 3 | |

| Date | Species | Total No. | Average size (cm) |
|----------|--------------------|-----------|-------------------|
| 05.10.22 | Crab | 0 | 0 |
| | Shrimp (B) | 1 | 2.3 |
| Data 10 | Shrimp (A) | 0 | 0 |
| | Fish | 0 | 0 |
| | Fish (Rice) | 9 | 2.08 |
| | Fish (Glass) | 0 | 0 |
| | Fish (Puti) | 3 | 1.8 |
| | Fish (Tri eyed) | 1 | 4 |
| | Fish (Daniconius) | 1 | 2.3 |
| | Fish (Bele) | 0 | 0 |
| | Fish (Gule chengo) | 0 | 0 |
| | Fish (Lyata) | 0 | 0 |
| | Total | 15 | |

Table 5: Raw data of Nylon Net made ghuni

- We arrange all the raw data in tabular form and create a graph on the basis of the tabular data. The tabular data and the following graphs are as follows -

| FISH (TOTAL) | | | | |
|--------------|----------|--------|----------|------|
| | BAMBOO | | NET | |
| DATE | TOTAL NO | SIZE | TOTAL NO | SIZE |
| 26.09.2022 | 1 | 3.6 | 9 | 3.36 |
| 27.09.2022 | 8 | 3.56 | 5 | 4.14 |
| 28.09.2022 | 3 | 4.13 | 34 | 2.51 |
| 29.09.2022 | 5 | 11.098 | 25 | 2.89 |
| 30.09.2022 | 1 | 3.5 | 27 | 4.02 |
| 01.10.2022 | 2 | 3.7 | 29 | 3.21 |
| 02.10.2022 | 0 | 0 | 56 | 2.04 |
| 03.10.2022 | 3 | 3.83 | 12 | 1.94 |
| 04.10.2022 | 1 | 4 | 1 | 1.7 |
| 05.10.2022 | 1 | 3.1 | 14 | 2.17 |

Table 6: Total fish and their average size caught in both Ghuni/Mugri

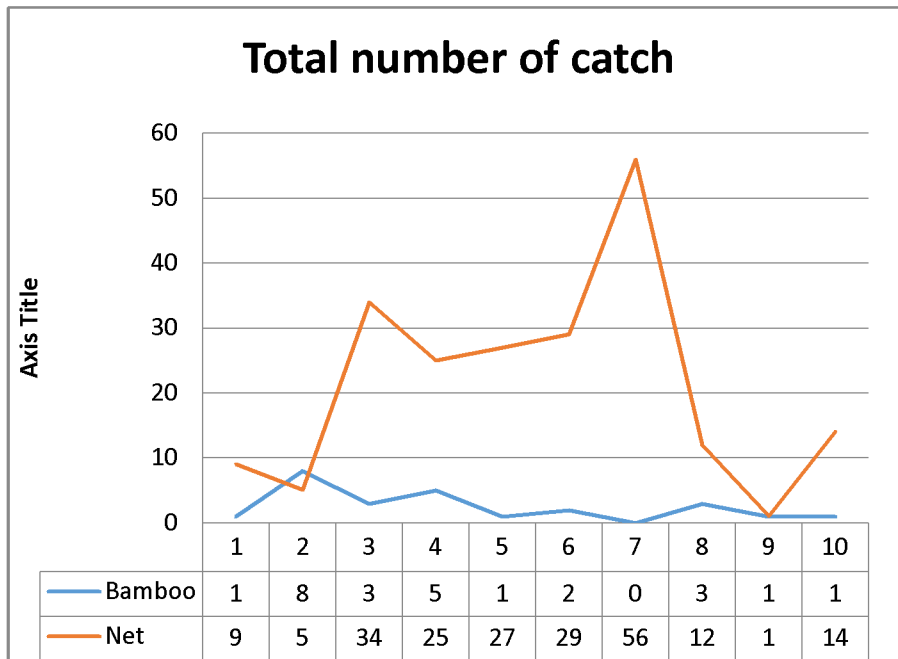


Fig 7: Graph shows the total number of fishes in both Ghuni/Mugri

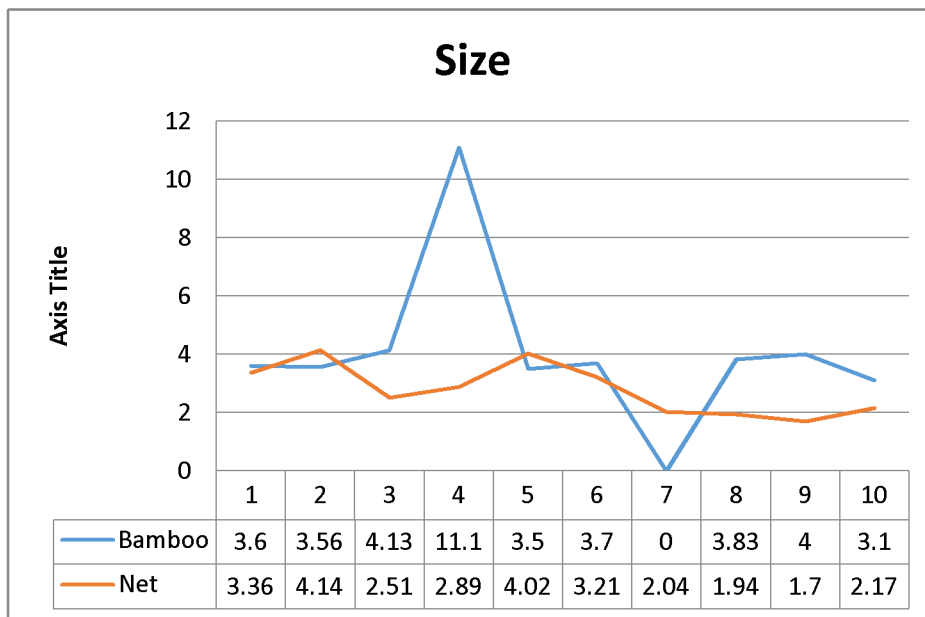


Fig 8: Graph shows the average size of fishes catch in both Ghuni/Mugri

| CRAB | | | | |
|------------|----------|------|----------|-------|
| | BAMBOO | | NET | |
| DATE | TOTAL NO | SIZE | TOTAL NO | SIZE |
| 26.09.2022 | 12 | 2.82 | 8 | 2.475 |
| 27.09.2022 | 12 | 3.07 | 13 | 2.7 |
| 28.09.2022 | 11 | 2.83 | 1 | 2.9 |
| 29.09.2022 | 17 | 2.4 | 1 | 3 |
| 30.09.2022 | 1 | 3.5 | 1 | 2.5 |
| 01.10.2022 | 2 | 1.9 | 2 | 2.85 |
| 02.10.2022 | 12 | 2.74 | 1 | 2.5 |
| 03.10.2022 | 13 | 2.78 | 0 | 0 |
| 04.10.2022 | 2 | 2.55 | 0 | 0 |
| 05.10.2022 | 2 | 2.1 | 0 | 0 |

Table 7: Total crab and their average size caught in both Ghuni/Mugri

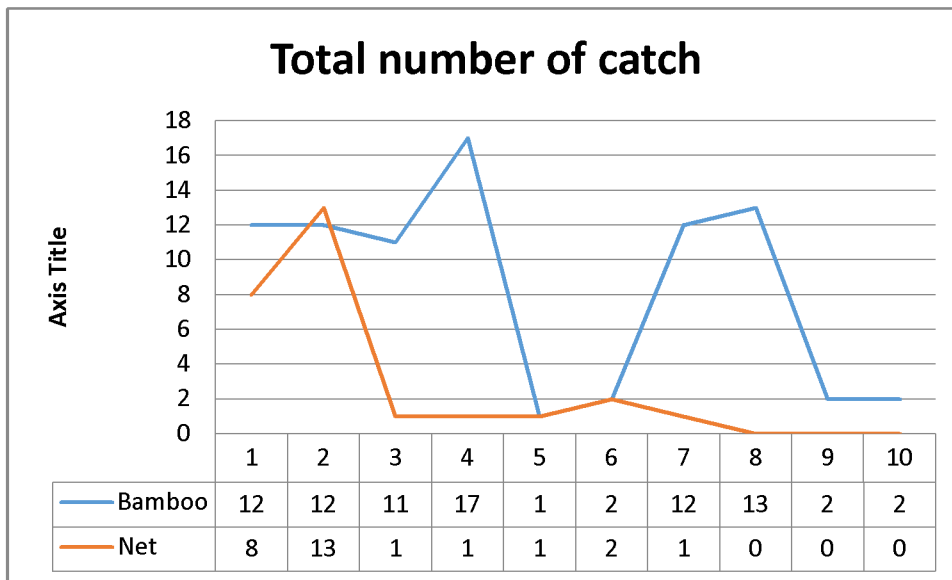


Fig 9: Graph shows the total number of crabs in both Ghuni/Mugri

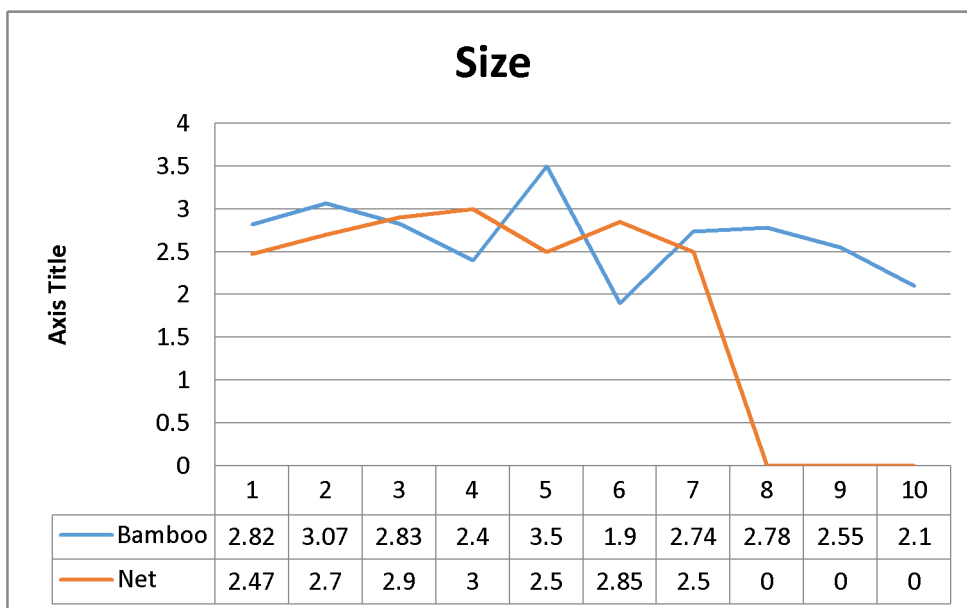


Fig 10: Graph shows the average size of crabs in both Ghuni/Mugri

We take 5 interviews of local people who are habituated to catch fishes from our study site. We set a questionnaire of 12 questions and trying to find out which ghuni they prefers, what do they do with the rest of their catches, how many ghunis they are set, and many more. The 5 five interviews is as follows -

| | |
|---|---------------------------------|
| Interview No. ...1.... | |
| Name: Amit Manna | Village: Benapur (South) |
| Age: 42 | Date: 06.11.22 |
| 1. How many years you catch fishes using Ghuni? | |
| Ans: 8 | |
| 2. Previously which type of Ghuni you used? | |
| Ans: Bamboo made Ghuni, also with mosquito net ghuni. | |
| 3. Now which type of Ghuni you used? | |
| Ans: Mostly mosquito net Ghuni. | |
| 4. Which type of Ghuni is more better according to you and why /Why you not use Bamboo stick made Ghuni? | |
| Ans: Mosquito net Ghuni because I can catch more fishes. | |
| 5. How many Ghuni(s) you used previously and now how many you used? | |
| Ans: I used 2/3 ghunies , now I use 5/6 Ghunies. | |
| 6. What do you do with small fishes that are caught in Mosquito net made Ghuni? | |
| Ans: Take it to home / market. | |
| 7. What do you do with mollucs that are caught in Mosquito net made Ghuni? | |
| Ans: Throw on ground. | |
| 8. What do you do with all the others except fishes and mollucs that are caught in Ghuni? | |
| Ans: Throw on ground. | |
| 9. Which type of fishes are caught in Ghuni ? | |
| Ans: Bele, Lyata, Puti etc. | |
| 10. Are you get the same amount of fishes that you got previously? | |
| Ans: No, now we get more fishes. | |
| 11. Do you know that the nylon mosquito net made Ghuni is harmful than the bamboo stick made Ghuni? | |
| Ans: Yes. | |
| 12. Have you any idea about the alternate of nylon mosquito net made Ghuni? | |
| Ans: No | |

Fig 11: Interview No.1

Interview No. ...2....

Name: Ramshankar Maity

Age: 48

Village: Benapur (South)

Date: 07.11.22

1. How many years you catch fishes using Ghuni?

Ans:10

2. Previously which type of Ghuni you used?

Ans: Bamboo made Ghuni.

3. Now which type of Ghuni you used?

Ans: Mostly mosquito net Ghuni.

4. Which type of Ghuni is more better according to you and why /Why you not use Bamboo stick made Ghuni?

Ans: Mosquito net Ghuni because I can catch more fishes.

5. How many Ghuni(s) you used previously and now how many you used?

Ans: I used 1/2 ghunies , now I use 4 Ghunies.

6. What do you do with small fishes that are caught in Mosquito net made Ghuni?

Ans: Take it to home / market.

7. What do you do with mollucs that are caught in Mosquito net made Ghuni?

Ans: Throw on ground.

8. What do you do with all the others except fishes and mollucs that are caught in Ghuni?

Ans: Throw on ground.

9. Which type of fishes are caught in Ghuni?

Ans: Bele, Lyata, Puti, Chanda etc.

10. Are you get the same amount of fishes that you got previously?

Ans: No, now we get more fishes.

11. Do you know that the nylon mosquito net made Ghuni is harmful than the bamboo stick made Ghuni?

Ans: Yes.

12. Have you any idea about the alternate of nylon mosquito net made Ghuni?

Ans: No

Fig 12: Interview No.2

Interview No. ...3....

Name: Prabhakar Majhi

Age: 39

Village: Benapur (South)

Date: 08.11.22

1. How many years you catch fishes using Ghuni?

Ans: 18

2. Previously which type of Ghuni you used?

Ans: Bamboo made Ghuni.

3. Now which type of Ghuni you used?

Ans: mosquito net Ghuni.

4. Why you not use Bamboo stick made Ghuni?

Ans: because I can catch more fishes by the help of Mosquito net Ghuni.

5. How many Ghuni(s) you used previously and now how many you used?

Ans: I used 2/3 ghunies , now I use 5/6 Ghunies.

6. What do you do with small fishes that are caught in Mosquito net made Ghuni?

Ans: Take it to market.

7. What do you do with mollucs that are caught in Mosquito net made Ghuni?

Ans: Take it to market.

8. What do you do with all the others except fishes and mollucs that are caught in Ghuni?

Ans: Throw on ground.

9. Which type of fishes are caught in Ghuni ?

Ans: Bele, Lyata, Puti, Koi, Chanda etc.

10. Are you get the same amount of fishes that you got previously?

Ans: No, now we get more fishes.

11. Do you know that the nylon mosquito net made Ghuni is harmful than the bamboo stick made Ghuni?

Ans: Yes.

12. Have you any idea about the alternate of nylon mosquito net made Ghuni?

Ans: No.

Fig 13: Interview No.3

Interview No. ...4....

Name: Sorbeshwar Bera

Age: 55

Village: Benapur (North)

Date: 09.11.22

1. How many years you catch fishes using Ghuni?

Ans: 30

2. Previously which type of Ghuni you used?

Ans: Bamboo made Ghuni.

3. Now which type of Ghuni you used?

Ans: Mostly mosquito net Ghuni also with bamboo made ghuni.

4. Why you not use Bamboo stick made Ghuni?

Ans: Mosquito net Ghuni because I can catch more fishes. And bamboo stick ghuni can easily be broken, cant easily repaired.

5. How many Ghuni(s) you used previously and now how many you used?

Ans: I used 2/3 ghunies , now I use 5 Ghunies.

6. What do you do with small fishes that are caught in Mosquito net made Ghuni?

Ans: Take it to home / market.

7. What do you do with mollucs that are caught in Mosquito net made Ghuni?

Ans: Take it to market.

8. What do you do with all the others except fishes and mollucs that are caught in Ghuni?

Ans: Throw on ground.

9. Which type of fishes are caught in Ghuni ?

Ans: Bele, Lyata, Puti, Koi, techokha, chengo etc.

10. Are you get the same amount of fishes that you got previously?

Ans: No, now we get more fishes.

11. Do you know that the nylon mosquito net made Ghuni is harmful than the bamboo stick made Ghuni?

Ans: Yes.

12. Have you any idea about the alternate of nylon mosquito net made Ghuni?

Ans: No.

Fig 14: Interview No.4

Interview No....5.....

Name: Amal Maity

Age: 28

Village: Benapur (North)

Date: 10.11.22

1. How many years you catch fishes using Ghuni?

Ans: 7

2. Previously which type of Ghuni you used?

Ans: Mosquito net Ghuni.

3. Now which type of Ghuni you used?

Ans: Mostly mosquito net Ghuni.

4. Which type of Ghuni is more better according to you and why /Why you not use Bamboo stick made Ghuni?

Ans: Mosquito net Ghuni because it costs less than bamboo stick ghuni.

5. How many Ghuni(s) you used previously and now how many you used?

Ans: I used 2/3 ghunies , now I use 4 Ghunies.

6. What do you do with small fishes that are caught in Mosquito net made Ghuni?

Ans: Take it to home.

7. What do you do with mollucs that are caught in Mosquito net made Ghuni?

Ans: Throw on ground.

8. What do you do with all the others except fishes and mollucs that are caught in Ghuni?

Ans: Throw on ground.

9. Which type of fishes are caught in Ghuni ?

Ans: Bele, Lyata, Puti etc.

10. Are you get the same amount of fishes that you got previously?

Ans: No, now we get more fishes.

11. Do you know that the nylon mosquito net made Ghuni is harmful than the bamboo stick made Ghuni?

Ans: Yes.

12. Have you any idea about the alternate of nylon mosquito net made Ghuni?

Ans: No.

Fig 15: Interview No.5

Market Survey:

- We do survey five nearby markets to see how many Ghuni/Mugri is selling in per market and which type of ghuni/mugri is more demanding to local people.
- The five markets are – a) Nuntia, b) Benapur, c) Naul, d) Deorah, e) Ghoraghata
- The survey report is as follows –

| Name of market | No. of Bamboo stick made ghuni | No. of mosquito net made ghuni |
|----------------|-----------------------------------|-----------------------------------|
| Nuntia | 10 | 150 |
| Benapur | 0 | 100 |
| Naul | 50 | 200 |
| Deorah | 30 | 130 |
| Ghoraghata | 0 | 80 |

Table 8: Market survey report of ghuni selling in market

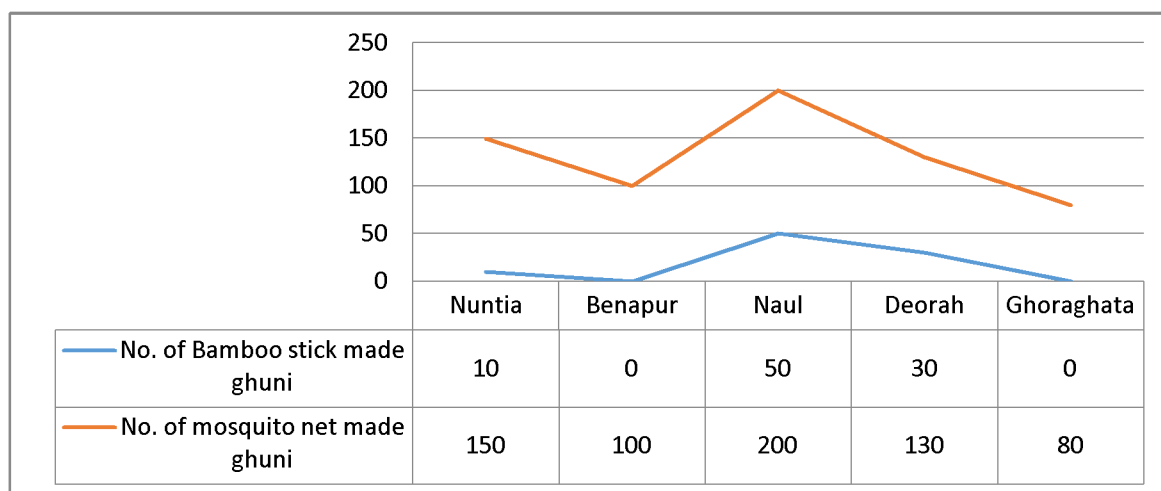


Fig 16: Graph shows the market survey report

Chapter 6: Discussion

Chapter 6: Discussion

- The graph clearly indicates that the number of catch in mosquito net made Ghuni/Mugri is higher than bamboo stick made Ghuni/Mugri.
- The average size of catch in mosquito net made ghuni/mugri is much smaller than bamboo stick made ghuni/mugri.
- During our study we found that not only the economically important species is trapped, snakes, frogs, water bugs also trapped in ghuni and they are also killed by the people.



Fig 17: Some other aquatic, semi-aquatic organisms trapped into mosquito net made Ghuni/mugri

- Not only the adult individuals are trapped into mosquito net ghuni, a huge number of juveniles are also trapped into mosquito net made ghuni and the worst thing is the killing practices of all catches by local people. We got a huge number of juvenile molluscs in mosquito net made ghuni. During our study we set only one mosquito net made ghuni but in our study area 250 ghunis were set everyday. So how much juvenile molluscs are killed in a season, we can not imagine.



Fig 18: Huge number of juvenile molluscs ($\leq 1\text{mm}$) trapped into mosquito net made Ghuni/mugri

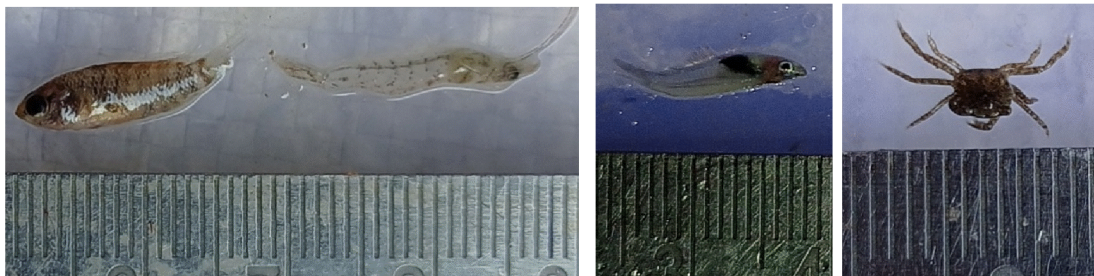


Fig 19: Juvenile Blue Badis, shrimp, rice fish and crabs also trapped in mosquito net made ghuni

- In market survey we found that the number of mosquito net ghuni acquire the whole market, and the demand of mosquito net ghuni is too much higher than the bamboo stick made ghunui.
- After completing five interview we became to know that the local people are more interested in mosquito net made ghuni rather than bamboo stick made ghuni, due to it's low cost, low maintenance, long lasting, more catch than the bamboo stick made ghuni.
- Local people are less aware about this malpractices.
- No similar kind of work has been reported from our state or country so far.

Chapter 7: Conclusions

Chapter 7: Conclusions

- Our study indicates that the mosquito net made ghuni have immense effect on the population of aquatic organisms including native fishes, shrimps, crabs and all others.
- Chambo fishing off – limits for months to give them a chance to breed and grow.
- There are another option to save juvenile organisms. There are another type of net made ghuni but have larger mesh size. Juvelines can slip out from this mesh. If the people use this type of net instead of mosquito net, then we hope it will save more juveniles which will contribute to the conservation of aquatic fauna and their ecosystems.

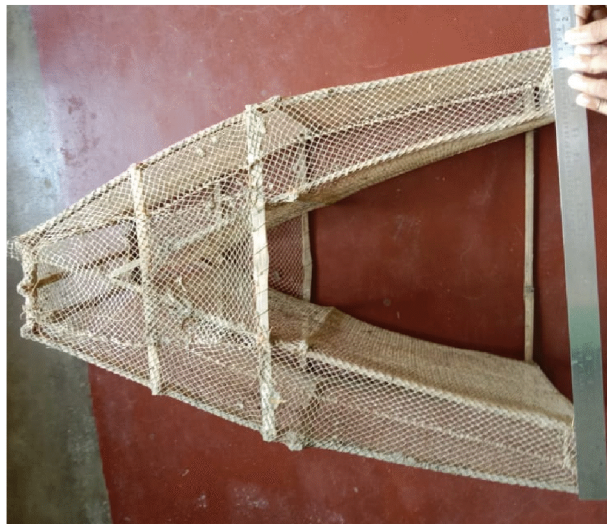


Fig 20: Net made ghuni with larger mesh size



Fig 21: Juvenile fish is stuck in mosquito net made ghuni (left side)
Juveniles can slip out through the net with larger net made ghuni (right side)

Chapter 8: Future Scope

Chapter 8: Future Scope

- Try to keep back the bio-degradable fishing gears instead of non bio-degradable materials.
- Try to conserve the native indigenous aquatic organisms which are not only economically important but ecologically important also; by maintaining the proper fishing gears and maintain their mesh size and stopping the ongoing malpractices like through all the catch in land after taking the needs.
- Want to raise awareness about the impact about the malpractices in fishing tradition.
- Support sustainable practices.
- We will work towards finding a balance between economic development and environmental conservation to combat the malpractices of fishing tradition and its negative impact.
- Want to do this work in different places and different river basins more flawlessly.
- If we get any funding then want to do the study in coming monsoon season in different river basin and try to evaluate the immense effect of the nylon mosquito net instead of bamboo stick.
- If I think this in a broad scale then I'll convert this work as my Ph.D. research work in future.

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