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Research Paper

A Study of Fresh Water Riverine Finfish and Shellfish of *Karli* River of Sindhudurg District, Maharashtra, India in View of Their Medicinal, Nutritional and Commercial Importance

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Abstract: This study highlights the nutritional, medicinal, and economic importance of freshwater fish and shellfish from the *Karli* River, Sindhudurg district of Maharashtra, India. Fish contain vital macronutrients and micronutrients advantageous to human health, including omega-3 fatty acids that enhance cardiovascular and cognitive function. The known therapeutic qualities of indigenous fish species illustrate their potential in conventional health practices. Fishing in *Karli* River is a very important way for people in the area to make a living, and there is a lot of demand for it in the market. Freshwater fish also play key ecological roles in riverine habitats by becoming bio-indicators and natural fertilizers. To keep these many benefits, such as the health, nutrition, and economic well-being of the people in the area, it is important to protect and manage the freshwater biodiversity in the *Karli* River in a way that is sustainable.

Keywords: Fresh water fish, *Karli* river, Sindhudurg district, medicinal use, nutritional use, commercial use

Introduction:

Fish flesh has the highest nutritional content of any type of meat. Fish are poikilothermic and aquatic animals in the natural world. They are regionally dispersed in freshwater, saltwater, and estuaries, and they make up the easily available food resources of the food chain. Fish is highly valued by rural dwellers who depend on it for both their food and their livelihood (Prakash and Prakash 2021, Balami et al. 2019).

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Fish have long been prized for their medicinal and dietary benefits. Study based on fish zootherapy could be a good way to find novel substances with medicinal promise. Animals have been utilised as medicine by tribal people in India since ancient times to treat a variety of illnesses (Lohani 2012). The major factors behind the loss of such practices in tribal groups, however, are acculturation and the current generation's perception of traditional medicine as being unscientific (Prakash 2017). The compounds known as nutrients are those that nourish the body and encourage growth. Different foods provide these minerals in varying levels. Both farmed and wild fish can be used as a source of aquatic food (Rajani and Alka 2015).

Fish is a good source of micronutrients like vitamins and minerals as well as macronutrients like proteins, lipids and ash. Immunoglobins, which are found in fish proteins, serve as a defence mechanism against bacterial and viral infections and guard against protein deficiency (Hamada et al. 1995).

The saltwater fish have developed a special strategy for surviving in the high-sodium environment. The ocean's saline water sucks water from a fish's body and the animal continuously loses water via its skin and gills. To make up for this, it consumes a lot of salty water and excretes more salt through its gills. In contrast, freshwater fish retain more salt in their bodies than is found in their aquatic environment. The freshwater fish have minimal need to swallow water because their body is constantly absorbing it through the skin and gills. These fish urinate a lot as a strategy to prevent having too much water in their skin. Fish can also be classified as either fatty or lean depending on how much fat they contain (Chanu et al. 2014).

Many rivers flow through the Konkan region and meet the Arabian ocean there. Fishing is being done in the ocean by many Konkani people. Sea fish are eaten by the Konkani people. Freshwater fishing is accomplished by those who are not near the coast. In the Sindhudurg district, one of the freshwater rivers, the Karli River, flows. Freshwater fishing is accomplished by the locals near this river.

In the current study, we are looking at people who live inland along the Arab Ocean who engage in freshwater fishing and how doing so benefits their diet, their health and their ability to earn a living.

Material and Methods

Study area

The study was carried out in Mandkuli (Latitude :16.0368 Longitude :73.68445) and Kervade village in Kudal, Sindhudurg. Figure 1 depicts the flow of the *Karli* river in the Sindhudurg area. Although the *Karli* river has three heads, the primary sources are the ones that begin in Shivapur and Haldiche Nerur shown in Figure 2. River is known as Savitri when it reaches Mangaon. In *Kudal*, it is referred to as *Bhangsal* and from there until it reaches the Arebian Sea, it is once more referred to as the *Karli* river.

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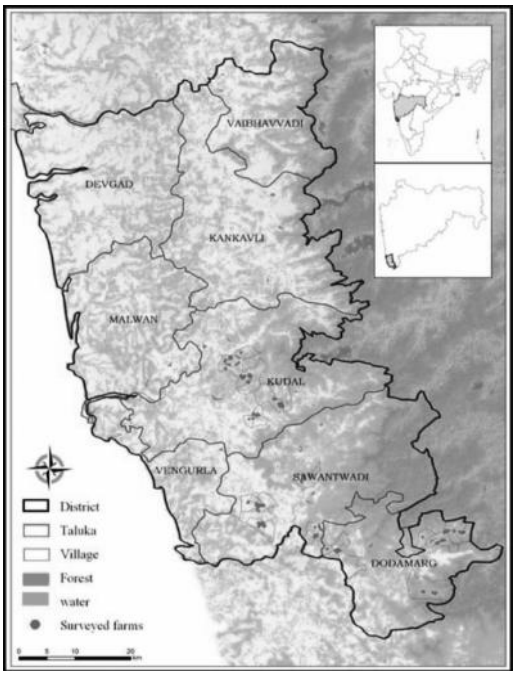

Figure: 1. Map of Sindhudurg District shows the flow of Karli River (Gaikwad et al. 2022)

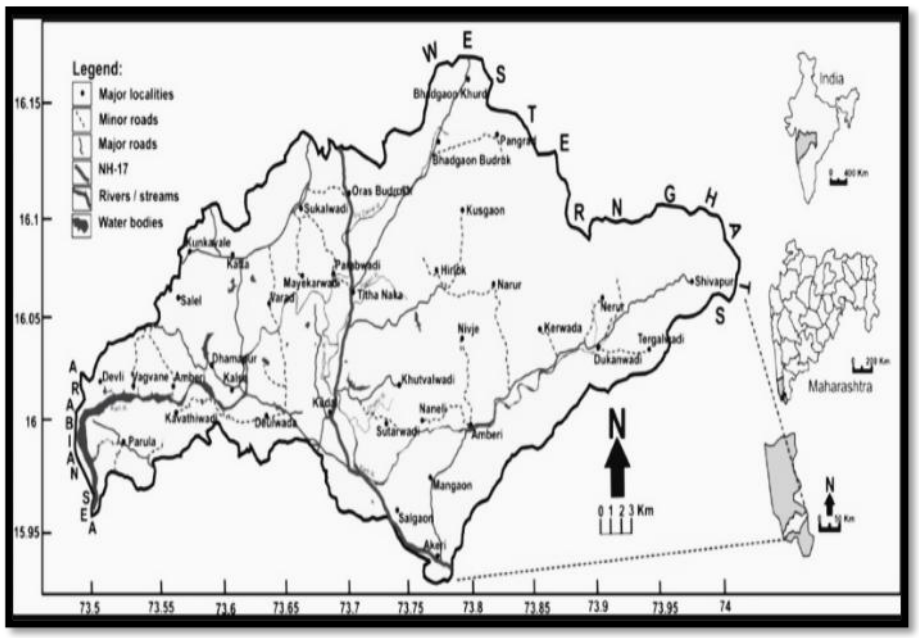

Figure: 2. Map showing origin of Karli River (Gaikwad et al. 2022)

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Sampling

The collected from various locations and identified by in the laboratory (FishBase: https://www.fishbase.se/search.php)

Information was collected on the basis of questionnaire, and a systematic survey was done with the help of local people and through fisherman of Sindhudurg district. The study was conducted over the three seasons of the Indian calendar year. All the collected fish were captured by using cast net, gill net, scoop net, hook and local traps with the help of local communities.

Results and Discussion:

Total 11 species of various fish and shellfish species were collected from various locations (Figure 4). Demand of fresh freshwater fish was high in market. A significant demand of 'Kadi' and 'Maral' among all fish were observed. There was a tribe situated in the riverside village whose main occupation was fishing in the shallow and deep water. They earn their livelihood from this occupation. Deep water fishing was a separate art among them. The tribe was called *'Bhoi samaj*'.

Nutritional value

Nutrition means getting energy by consumption of fish. In order to obtain healthy life, we need to boost our immune system, and this can be obtained by consuming well balanced nutritious food. Fish is one of the best sources of macro and micronutrients. The macro nutrients are proteins, lipids and a very little amount of carbohydrate. Micronutrients like minerals are vital constituents of fish (Bogard et al. 2015; Giri et al. 2010; Jakhar et al. 2012; Venugopal et al. 1996). Fish is considered as nutritional important part for human diet as it contains long chain polyunsaturated n-3 fatty acids, well balanced essential amino acids, vitamins (D_3 & B_{12}), calcium, phosphorus, iodine, copper, selenium and zinc (Tilami and Sampels, 2018). It is also good component of easily digestible protein like methionine & lysine as it is required for overall development of body, repair of tissues, enzymes production & various body processes. Micronutrients which are present in small amounts in fish are also involved in various biochemical reactions, metabolic process required for survival, growth & reproduction (Mohanty 2013).

Medicinal Uses

Considering the nutritional and core importance of fish, Karli riverine fish survey was done to study its medicinal uses as eating fish fight against various types of diseases such as cardiovascular heart diseases, maintains blood pressure, neuro-development in child, normal growth, formation of bones and teeth, synthesis of hemoglobin and prevents the occurrence of anemia, prevents rickets and osteomalacia (Verma and Pathak 2016; Prabhakar and Roy 2009; Ackman and Eaton 1996; Stene et al. 2000). Fish are used in ichthyotherapy techniques for the cleaning of wounds (Grassberger and Hoch 2006). Medicinal uses of freshwater fishes are shown in Table 1.

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Table: 1. Fresh water fish and its medicinal uses.

Sr. No.	Common name	Scientific name	Local name	Medicinal uses
1	Snake head Murrel	*Channa striata and Channa marulius*	Maral	• Antimicrobial • anti-inflammatory • wound healing properties • there are two stones like structure found in the head of fish, use to treat children, those suffering from diarrhea, anemia and weakness
2	Swamp eel	*Monopterus indicus*	Kadi	• Used to cure bronchitis • The slippery substance present on the surface of body, mixed with flour and fed to patients
3	Large snout goby	*Awaous melanocephalus*	Kharchi	• Used to cure asthma • Fish eggs are used to cure disease
4	Sucker fish	*Garra mullya Garra gotlya*	Malava	• High amount of protein, rich in calcium • It is used to cure joint pain • Recipes (Kadhi) made from such fishes are used to enhance the taste loss during fever
5	Spiny eel	*Mastacembelus aramatas* and *Angulia bengalansis*	Vam	• Used to treat asthma
6	Walking catfish	*Clarias batracus*	Mangur	• Antimicrobial • anti-fungal properties present in it
7	Cat fish	*Mystus mulbaricus*	Shengti	• Anticancer properties • Recipes from such fishes are prepared to enhance the taste buds loss during fever
8	Filament barb	*Dawkinsia filamentosa*	Khavle	• Used to treat asthama

Commercial value

Doctors advise eating fish every day because it is abundant in protein and calcium. Fish are in high demand because of this. Fisherman sells both marine as well as freshwater fish in rural markets and the price of fishes is also reasonable (Alemayehu and Tamiru 2019). *Garra mullya* (Sucker fish) sell up to Rs. 100/- (1.21$) per 25 fishes. *Mastacembelus aramatas* (Spiny eel) sells depend on the size of fish such as 100 /- (1.21$) Rs per feet. Figure 3 depicts the local markets need for fresh water fish. Table 3 shows

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that percentage demand of fresh water fish in local market. Fresh water fishes are used as a fertilizer and are ecologically important in streams ecosystems as they provide significant food to people. They are also known as biological indicators of freshwater streams. In monsoon season, they migrate from paddy fields for spawning and provide nourishment to crops by releasing fecal matter. A different term known in Konkan is 'Chadhani Mase'. Adult fish swim against the flow of water through farm, ponds to spawning, at that time freshwater fishing was widespread. Other commercially important species is shown in Table 2.

Table: 2. Other commercially important species

Sr. No.	Scientific name	Family	Local name	Fishing gear used
1	*Catla catla*	*Cyprinidae*	Katla	Cast net, gill net
2	*Rasbora daniconius*	*Cyprinida*	Suti dandkal	Gill net
3	*Scistura denisonii*	*Nemacheilidae*	Lalki	Scoop net, trap
4	*Ompok malbaricus*	*Siluridae*	Shengti	Hook, cast net
5	*Etroplus surantensis*	*Cichlidae*	Kalundra	Cast net
6	*Devario malbaricus*	*Cyprinidae*	Phatuk	Cast net, Hook
7	*Macrobrachium rosenbergii*	*Palaemonidae*	Chingla	Cast net
8	*Oreochromis mossambicus*	*Cichlidae*	Tilapia	Cast net, Gill net
9	*Barytelphusa cunicularis*	*Gecarcinucidae*	Freshwater crab	Trap
10	*Xenentodon cancila*	*Belonidae*	Needle fish	Cast net

Table: 3. Fresh water fish demand in local market species wise percentage

Fish Species	% Demand
Maral	90
Kadi	100
Kharchi	30
Malava	60
Vam	70
Mangur	80
Shengti	40
Khavle	20
Kalundri	70
Freshwater crab	100
Giant freshwater prawn	80

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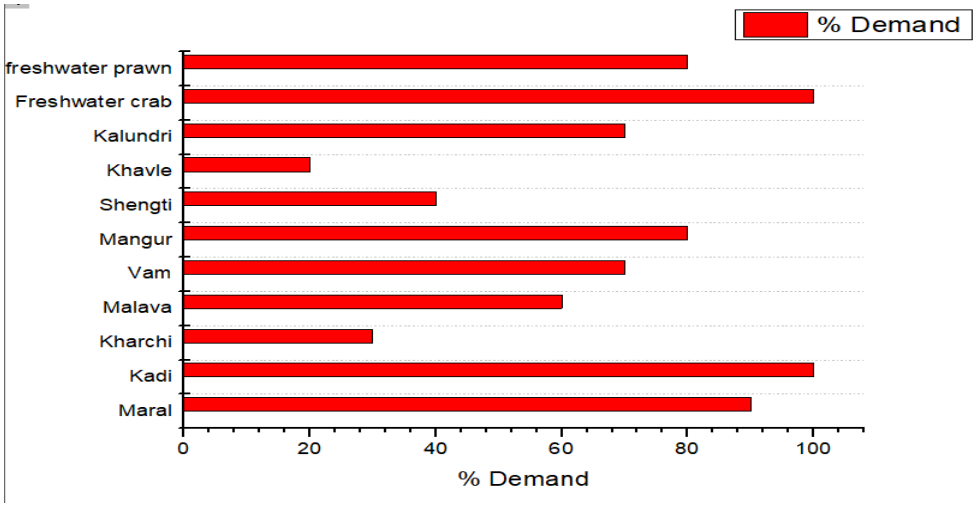

Figure: 3. Demand of freshwater fish in market

The fish population along the Karli river is abundant and diverse and the majority of the species are significant in terms of their commercial, nutritional and recreational value. According to the study's findings, eating fresh water fish is a healthy source of all micro and macronutrients. People living near the Karli river receive considerable income from fishing as a result of the availability of freshwater fish. Fish is a staple of their everyday diet. They are resistant to a variety of ailments as a result. Apart from edible portion, fish can also use as a source of fertilizer. Freshwater fishes are the biological indicators of freshwater riverine system.

Conclusion:

This study underscores the significance of freshwater fish and shellfish from the Karli River in the Sindhudurg region, emphasizing their diverse importance to the local community. The findings indicate that these aquatic resources are essential to the local diet, supplying crucial macro and micronutrients that enhance overall health and disease resistance, while also serving as a substantial source of income that sustains the livelihoods of communities such as the *Bhoi samaj*.

The study primarily examines the various species of fish historically utilized for medicinal purposes. In other words, specialists must acquire further knowledge on various subjects before they may be applied in contemporary medicine.

The distinctive fish species in the Karli River are vital for nourishment, healthcare, commerce, and ecological balance, necessitating their protection. To ensure individuals remain healthy, content, and financially stable, it is essential to manage freshwater resources in a manner that does not harm animals.

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Compliance with Ethical Standards

Conflict of interest: The authors declare that they have no conflicts of interest.

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Dawkinsia filamentosa (Filament barb) & *Oreochromis mossambicus* (Tilapia)

Clarius buttracus (Thigur, *Kharchi*)

Olive barb & Filament barb (*Khavle*)

Monopterus indicus (Kadi, *Kharchi*)

Garra mullya (*Malava*)

Xenentodon cancila (freshwater garfish) & *Ompok malbaricus* (goan catfish)

Macrobrachium rosenbergii (Gaint freshwater prawn, *Chingala*)

Barytelphusa cunicularis (freshwater crab)

Mixed fish species catch by draining small natural ponds near river

Figure: 4. Collected freshwater fishes

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