

Traditional knowledge associated with fish harvesting practices of *War Khasi* community of Meghalaya

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The paper reports and analyses the findings of Traditional Ecological Knowledge associated with fish harvesting practices of *War Khasi* community, a sub tribe of *Khasi*, inhabiting southern slopes of Meghalaya. The study area has a forested landscape and harbours dense network of streams and rivers, viz. Wah Umsong, Wah Umsi, Wah Umshrei, Wah Umkhat, Wah Durit and Wah Umjar. These rivers and their associated water bodies are impregnated with a variety of fish and other aquatic life forms, which constitute a sizable part of the diet of local people. The *War Khasi* community has evolved several traditional fish-harvesting practices, locally known as *Buh Kroh*, *Riam Kriah*, *Riam Khohka*, *Riam Kyllong*, *Ring Khashiar*, *Buh Ruh* and *Bia Dohpieh*. The study revealed that these methods are most suited to local conditions, help in perpetual fish harvest and conservation of aquatic biodiversity of the region. The paper discusses the ecological and biodiversity value of these practices in the light of recent policy decisions of local communities concerning conservation of aquatic resources of region and other biodiversity enriching and livelihood enhancing practices of these communities.

Keywords: Traditional Ecological Knowledge, Ethnobiology, Fish harvesting, *War Khasi*, Meghalaya

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Fish has been an important part of human food since time immemorial. Art and science of fish harvesting have been evolved by the fishermen communities and passed on from generation to generation. Hill and mountain fisheries have received ample attention of the ichthyologists of India and Nepal¹⁻⁶. Hill regions of Northeastern India is considered as one of the hot spots of fresh water biodiversity however, there is a glaring lack of data on the ecology of fishes of Northeastern hill regions of India⁷⁻⁹. Traditional Knowledge (TK) and practices can play a great role in enhancing our understanding for conservation of fishes and other aquatic life of hill streams. Study and documentation of TK is needed for devising conservation strategies suitable to local conditions. The study analyses the TK associated with fish harvesting practices of *War Khasi* community of Meghalaya, with an emphasis on developing conservation strategies.

The area is situated in southern part of Meghalaya between 25°7'-25°18' N latitude and 91°-92°E longitude covering an area of about 1,350 sq km. The region receives a high rainfall. Mean annual rainfall ranges from 6,000-10,000 mm. The altitude ranges between 100-1,200 m from msl. *War Khasi*, a tribal community having long tradition of forest

conservation, inhabits the area¹¹. People gather a variety of edibles from forests and water bodies, which include fish, frog, crustaceans, molluscs, wild meats, tubers and wild vegetables. Their staple diet is rice, fish and meat. The area is impregnated with a network of rivers and streams. The important rivers include: Wah Umsong, Wah Umsi, Wah Umshrei, Wah Durit, Wah Jar and Wah Umkhat; besides small streams and their tributaries. The ethnoecological survey was conducted in 9 villages, viz. Nongkwai, Wahlakhiat, Myllat, Mawlat, Mawkria, Wahlynnngdoh, Mawpran, Nongkhlieng and Nongsder near Dawki about 80 km south of Shillong (Fig. 1).

Methodology

Various participatory research tools such as group discussion, semi-structured interviews, key informant survey and on-site observation were used to acquire insight into the fish harvesting practices followed by the community. Attendance of the fishing sites allowed us to observe directly the construction of structures and procedures followed in harvesting of the fishes and other edible aquatic fauna. The plants used as baits, fish foods and in construction of structures were collected and identified with the help of Flora of Assam¹⁰. The fishes were identified with the help of Zoological Survey of India, Shillong.

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Results

War Khasi community possesses a wealth of knowledge related to ethnofisheries techniques. The community has evolved a number of techniques for harvesting fishes. These techniques are specialized according to structure and size of stream, season and species of fish intended to be harvested. Edible animals collected from forest streams and rivers are given in Table 1. The methods and materials used in case of some important fish harvesting practice observed during the study are as follows:

Riam Kriah

Riam Kriah in a local language is known as basket trap (*riam*- making a trap and *kriah*- basket). *Riam Kriah* is used specifically for harvesting *Garra lissorhynchus* McClelland. This practice is used in the month of April-July, when *Garra lissorhynchus* McClelland. migrate from lower to upper course of the river for breeding. For making this type of trap, a suitable site is selected, where a 60° inclined-block of approximately 1m height and 5-10 m breadth depending upon the size of the steam, made of bamboo mesh and tree branches used as pillars is constructed (Fig. 2). *Phyrnium* leaves and *Musa* stem are used to seal the interstitial spaces especially at the base of the construction. The structure so formed is called *Kriah*. Two holes are made on either side of the *Kriah*, where an elongated basket with a trap locally known as, *Ka Shit*, is fitted (Fig. 3). Since fish usually moves at the bottom of water, it has to pass through these holes and get entrapped on their way upstream.

The basket with the trapped fish is kept over night and collected in the evening of the following day. Keeping in mind that this type of harvesting is practiced especially during the breeding seasons, this type of fish harvesting is allowed only in small streams never in bigger rivers where the fish breeds. On an average 2-3 kg fish/day/*Kriah* is obtained.

Riam Khohka

This is similar to *Riam Kriah*, but this type of trap is made for the fishes migrating down stream, the size of this structure is 6m length, 0.5m height and 0.5m wide (Fig. 4). In order to bring about a strong flow of water current a depression is made on one corner, where an elongated trap is set up in the opposite direction and this whole structure is known as *Riam Khohka*. Since, most of fish species breed in shallow water (upper course), during post-monsoon, when seasonal streams start receding due to drying up the fishes migrate downstream and get trapped in *Riam Khohka*. An average amount of fish harvested from this type of construction ranges from 2-10 kg/day.

Buh Kroh

Buh Kroh in local language mean ‘making home for the fishes’. It is the most important type of fish harvesting method practiced by majority of the villagers of the area and is considered as the most sustainable method of fish harvesting. This method is of three types depending upon the season: *Kroh tlang* is prepared in the month of January-February; *Kroh pyrem* is prepared in the month of March-April and

Table 1 — Fishes and other edible animals collected from South Meghalaya

Plant name	Local name	Season of collection	Name of river
<i>Neolissocheilus hexagonolepis</i> McClelland (Katli)	<i>Kha-saw</i>	Whole year	Umsong, Umsi, Umshrei, Durit, Umjar and Umkhat
<i>Neolissocheilus</i> sp. Unidentified	<i>Kha shi-iar</i> <i>Kha shbiar</i>	Dec-January Whole year	Umsong and Umsi Umsong, and Umsi
<i>Anguilla bengalensis bengalensis</i> Gray (Indian long fin eel)	<i>Kha bsein</i>	Whole year	Umsong, and Umsi
<i>Cyprinus carpio</i> Linn. (Common carp)	<i>Kha bten</i>	May-August	Umsong and Umsi
<i>Garra lamta</i> Hamilton-Buch. (Lamta Garra)	<i>Dohkew</i>	Whole year	Umsong, Umsi, Umshrei, Durit, Umjar and Umkhat
<i>Garra lissorhynchus</i> McClelland (Khasi Garra)	<i>Doh sher</i>	Whole year	Umsong, Umsi, Umshrei, Durit, Umjar and Umkhat
<i>Lepidocephalus caudofurcatus</i> Tilak & Husain (Tilak loach)	<i>Syngkai</i>	Whole year	Umsong, Umsi, Umshrei, Durit, Umjar and Umkhat
<i>Channa orientalis</i> Bloch & Schneider (Asiatic snakehead)	<i>Doh thli</i>	Whole year	Umsong, Umsi, Umshrei, Durit, Umjar and Umkhat
Unidentified	<i>Kha shyrimit</i>	Whole year	Umsong, Umsi, Umshrei, Durit, Umjar and Umkhat
<i>Pseudecheneis sulcatus</i> McClelland (Sulcatus catfish)	<i>Briang</i>	Whole year	Umsong, Umsi, Umshrei, Durit, Umjar and Umkhat
<i>Crangon crangon</i> Linn. (Brown Shrimp)	<i>Shymbrong</i>	Whole year	Umsong, Umsi, Umshrei, Durit, Umjar and Umkhat
<i>Uca</i> sp. (Crab)	<i>Ka tham</i>	Whole year	Umsong, Umsi, Umshrei, Durit, Umjar and Umkhat

Kroh synrai is prepared in the month of October-November. *Kroh tlang* is made in slow water current areas, because during this period of the year the water being cold, fishes prefer to stay in holes, while the *Kroh pyrem* and *Kroh synrai* are made in strong water current areas because during these months of the year the water is warmer and fishes like to move around. First, the area is cleared by removing the pebbles and cobbles to make the place smooth and flat leaving only fine sand in the bottom, the diameter of this structure ranges from 1-3m depending on the size of stream (Fig. 5). Three pebbles are placed in a triangular pattern supporting a flat slab stone known as *Mawpyniap* (killing stone), in such a way that a room of about three inches is formed. Then, a number of stones are systematically placed around and on top of *Mawpyniap*. This is followed by placing three layers of stones of various dimensions. The fourth layers are made by smaller stones. This artificially made hole provides a better place for thriving of fishes than the natural ones. The structure is kept in place undisturbed until the stones turn brownish due to growing of mosses over them. When this happens, the *Kroh* is considered ready for harvesting. Harvesting of fishes present inside the *Kroh* is locally known as *Ka Sad Kroh*, meaning harvesting of fish from the *Kroh*. More than two people are needed for this purpose. A thin and white cloth locally known as *Nep Sala* or a mosquito-net is usually used for this purpose (Fig. 6). The *Kroh* is encircled by *Nep Sala*/mosquito net, where small stones are placed on the periphery of the cloth so as to make the cloth immovable by the water current. This is followed by removing all the stones of *Kroh* till they reach the *Mawpyniap*, then this cloth is brought nearer to the *Mawpyniap*, which is then removed and the fishes present there are then collected. Average yield of fish is 2-5kg/*kroh*/harvest, and as many as ten different types of fish species ranging from few grams to half kg weight are caught. In this method an artificial habitat is constructed for fishes and when they grow to a harvestable size they are harvested. Thus, this method promotes growth and does not interfere in the natural life cycle of the fishes.

Riam Kyllong

In this type of fish harvesting, an enclosure is made in the water, where baits are kept. This enclosure is made in such a way that there should not be any hole either from the side or at the base of the structure. The walls of the enclosure are made of bamboo using tree

branches as supporting material and from the side of the structure. Big stones are tied up to make the construction strong and heavy so that it can support and resist the water current. *Musa* stem and *Phrynium* leaves are used to block if there is any hole at the base of the structure. The entrance is made with a special door kept open and suspended in the air with the help of a rope tied to the hut built just nearby the enclosure. The size of this structure is usually in the range of 3-4 m breadth and 7-8m length and 1 m height above the water surface (Fig. 7). Inside the enclosure, the bottom is made flat and smooth by removing all the stones and pebbles. Three to four ropes are tied just above the water level in this enclosure where baits are tied (Fig. 8). For about 3-4 weeks the fishes are fed at least once a day. The fish foods include plants viz. *Hodgsonia hiteroclita* (Roxb.) Hook. f. & Thomson. (leaf), *Collocasia esculenta* (Linn.) Schott. (corm), *Boehmeria malabarica* Wedd. (leaf), *Datura stramonium* Linn. (leaf) and *Coix lachryma-jobi* Linn. (fruit). Within 3-4 weeks the fishes get habitual and start visiting the structure during night time to feed on the baits. After about a month one night the fishermen cut the rope which closes the door thus all the fishes get trapped inside the enclosure which are then collected. The enclosure is used 3-4 times for this type of fish harvest. 10-25 kg of fish is caught each time.

Ring Khashiar

This in local language means 'pull the fish' (*ring*-pull and *khashiar*-fish). This fish harvesting technique is used in case of only one type of fish, locally known as *Khashi-iar* (*Neolissocheilus* sp.). Every year during the months of December and January, this fish breeds in the corners of the river. Noticing this, the fishermen prepare a trap locally known as *Ring Khashiar*. In this technique, the area is first cleared by removing the stones and making the riverbed smooth by filling up with fine sand. This area is then surrounded by stones in the form of a circle of 1 m², where an entrance is made opposite to the river current. Then water from all directions of this trap is allowed to flow in but fishes can only enter this trap through the entrance. During nighttime, *Neolissocheilus* sp fish enter this trap and the fishermen close the entrance and place a basket in the mouth of the entrance to catch the fish.

Buh Ruh

Knowing that every year *Garra lamta* Hamilton-Buchanan comes to breed in a particular site of the river, the local people adopt a particular method for trapping this fish species. In this method, a hole is made on the riverbed. Thereafter, number baskets at about 30 cm gap from each other are placed in these holes in an inclined position with respect to the river current. It is learnt from the fishermen that this particular fish comes and breeds in the baskets placed by the fishermen. In this way the fishes get trapped. Depending on the year, the amount of *Garra* harvested varies from 10-40 kg/harvest/fishermen. This method promotes breeding of fishes and harvest does not adversely affect the natural population of the fish as only the grown up individuals are trapped and in the end a large population of fingerlings are

produced. The baskets (*Ka Ruh*) used are generally 60 cm in length and 30 cm diameters at the mouth (Fig. 9).

Krang Wah

This is in local language means ‘drying out the river’. This method is also practiced in Arunachal Pradesh, where it is called as-*Shibok Penam*¹². In this method, the riverbed is diverted to another side/channel by blocking its direction using stones, logs and leaves of plants. These results in the reduced water flow or complete drying of the river course. If the river is not completely dried, sedation of fishes is done by using extracts of plants (Table. 2). However, the local village councils have banned this practice in the major rivers of the area as they have realized the adverse impact of this practice on the sustenance of river fisheries.

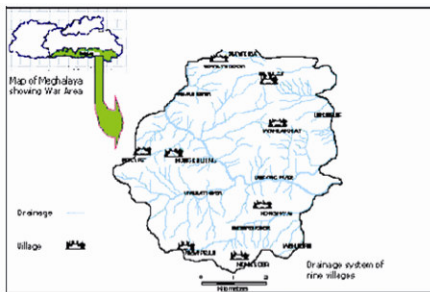


Fig.1 Location map of the study area

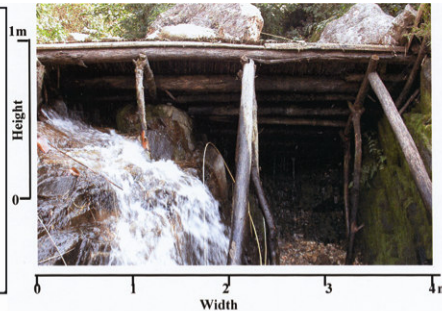


Fig.2 Riam Kriah

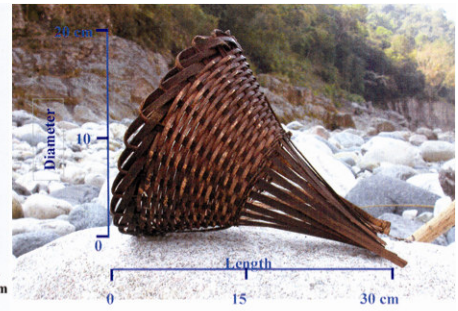


Fig.3 Ka Shit

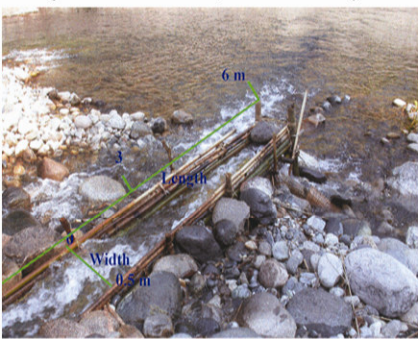


Fig.4 Riam Khohka

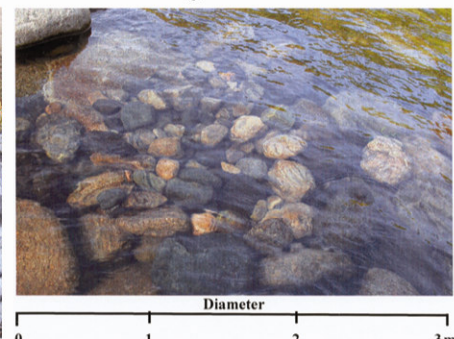


Fig.5 Kroh



Fig.6 Sad Kroh

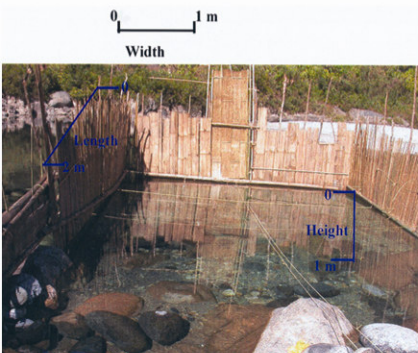


Fig.7 Riam Kyllong



Fig.8 Riam Kyllong showing fish foods



Fig.9 Ka Ruh

Table 2 — Plants used for fish sedatives and their mode of application

Plant name	Local name	Part used	Mode of Application
<i>Acacia pennata</i> Willd.	<i>Pli Bha</i>	Root	Fine crushed root
<i>Acer oblongum</i> Wall.	<i>Soh Shoh Dohkha</i>	Fruit	Fine crushed ripe fruits
<i>Aesculus assamica</i> Griff.	<i>Soh Kharat</i>	Young leaf	Fine crushed young leaves
<i>Anamirta cocculus</i> (L.) Wight & Arn.	<i>Sohlulow</i>	Fruit	Fine crushed ripe fruits
<i>Gynocardia odorata</i> R. Br.	<i>Sohliang</i>	Bark	Crushed bark mixed with lime
<i>Melodorum bicolor</i> Hk.f.&Th.	<i>Pli Sniang</i>	Root	Fine crushed root

Table 3 — Plants used as baits for fish harvesting

Plant name	Local name	Plant parts used	Harvesting method
<i>Artocarpus integra</i> (Thunb.) Merr.	<i>Soh phan</i>	Fruit	<i>Riam Kyllong</i> and hook fishing
<i>Boehmeria malabarica</i> Wedd.	<i>Thynrait</i>	Young leaf	<i>Riam Kyllong</i> and hook fishing
<i>Coix lachryma-jobi</i> Linn.	<i>Sohriew</i>	Seed	<i>Riam Kyllong</i>
<i>Collocasia esculenta</i> (Linn.) Schott.	<i>Shriew</i>	Cooked corm	<i>Riam Kyllong</i> and hook fishing
<i>Datura stramonium</i> Linn.	<i>Not known</i>	Leaf	<i>Riam Kyllong</i>
<i>Ficus sarmentosa</i> Wall.	<i>Sohnalang</i>	Fruit	Hook fishing
<i>Hodgsonia heteroclita</i> (Roxb.) Hook. f. & Thomson.	<i>Sohmynthar</i>	Leaf	<i>Riam Kyllong</i>
<i>Litsea citrata</i> Nees.	<i>Sohsyng</i>	Fruit	Hook fishing
<i>Mahinot esculenta</i> Crantz.	<i>Phan dieng</i>	Rhizome	<i>Riam Kyllong</i>
<i>Trichosanthes lepiniana</i> (Naud.) Cogn.	<i>Soh Myngkhong</i>	Leaf	<i>Riam Kyllong</i>
<i>Viburnum foetidum</i> Wall.	<i>Sohlang</i>	Fruit	Hook fishing

Table 4 — Traditional fishing methods and their conservation implications

Fishing methods	Conservation implications
<i>Riam kria</i>	Allowed only in small streams. The catch is small; reasonable stock of fish of almost all size is maintained.
<i>Riam khohka</i>	The size of harvest is small; no use of extraneous substance.
<i>Buh kroh</i>	The natural habitat is enriched for promoting growth of fish. Generally, only incremental fish biomass is harvested; negligible effect on the river system.
<i>Riam kyllong</i>	Fishes are fed over a period of time and only larger fishes are harvested.
<i>Ring khashiar</i>	Only a very small number of fishes get trapped. A good number escape thus a viable population is maintained.
<i>Buh ruh</i>	The catch is small; does not adversely affect the fish community structure.
<i>Krang wah</i>	Considered unsustainable by the community hence prohibited in major rivers.
<i>Bia dohpieh</i>	Frogs are caught manually hence the catches are small; do not affect the viability of natural population of frog in the area.

Bia Doh Pieh

This is the traditional method of catching frogs, locally known as *Dohpieh*. This is usually done during night time where fire is made by burning bamboo. The reflection of light makes the frogs immobile and they are easily caught by hand.

Harvested fishes cannot be kept raw for long time; it has to be dried immediately within 3-5 hrs of harvesting. Drying is usually done by inserting a pointed stick made of bamboo into the fish body. The fish thus pierced are hanged over the fire. This is usually done if the fishermen stay in the field. Whereas, at home water is first boiled in a pot with salt and turmeric, and then the fish is boiled for 3-5 minutes. The semi-cooked fish is kept on a flat basket locally known as, *kria thad dohkha*. This basket is kept over the wooden rack (*mynding*) hanging over

the fire hearth. Due to the heat of the fire and effect of smoke, the fish remain preserved and can be used up to one month. *War Khasi* people have rich knowledge of ethnofisheries. They derive most of their protein diet requirement from the wild source. The *War Khasi* people use 6 plants as sedative for fish harvesting and 11 plants are used as baits (Tables 2 & 3).

Discussion

The study revealed that the community under study has thorough knowledge of the habit, habitat, reproductive behaviour, food preferences and life cycle of the fishes found in the region. The communities also have a very good understanding of the plants that can be used as sedatives or as baits for catching the fishes. During recent years, they have taken several decisions pertaining to management and

conservation of stream fishes. These include ban on chemicals and explosives for catching the fish in the streams. The village durbars do not allow fishing in bigger rivers during breeding seasons of the fishes. The fishing is done on a small scale mostly for self consumption to maintain the stock and prevent from over harvesting. The decisions of village councils are respected by every member of the community. Thus, the fishes are considered as a community resource on which every member of the community has equal right but no one has ownership. The community control over the resource has helped in perpetuation and conservation of the river fishes of *War Khasi* region of Meghalaya.

The traditional fish harvesting techniques are generally sustainable as they operate under regulations framed by the community (Table 4). The study revealed that the people in this area are quite conscience to protect their biological resources, which is reflected in the recent decisions of village councils. The valuable ethnoecological knowledge and community control of fish harvesting is in place since time immemorial and is passed on from generation to generation by word of mouth. However, as human population increases, in future it is likely that the social sanctions and regulations may erode leading to unsustainable harvest of fishes. Therefore, concerted actions are needed to sensitize the local masses about the diversified fisheries in the region and judicious exploitation and conservation of this vital resource of the region using modern scientific methods.

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