

Journal of Wetlands Ecology

Wetland Friends of Nepal (WFN)
http://www.nepjol.info/index.php/jowe
ISSN: 2091-03632

Short Note

Traditional Fishing Methods of Bhutan

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Published in November 2012

Abstract

Traditional fishing techniques, practiced in all parts of Bhutan, are described and compared with techniques reported from Nepal. While a wide range of techniques is found in Bhutan, the number is significantly smaller than that from Nepal. For example, six kinds of net are reported from Nepal, but only one from Bhutan. However, the difference in number may reflect in part the limited scope of the present study. At the same time, several techniques appear unique to Bhutan, and others, while similar to their Nepali equivalents, use different materials - plant-derived poisons are an example. Some techniques may have been brought by ancient immigrants from Tibet, with more recent introductions from lowland India and, most recently, from Nepal.

Key words: Indigenous fishing methods, Bhutan, mountains, terai

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INTRODUCTION

There appears to be no published information on the methods the Bhutanese use to catch fish, apart for a brief reference by Gyeltshen (2002) to the use of "hooks or spoons", despite the evident interest in fishing found throughout the country. For relevant information one must turn to Nepal, for which country Shrestha (1981, 1999) and Yadav (2002) have described a substantial number of techniques. Other authors who have described fishing methods from the Himalaya include Negi and Kanwal (2009) for the Garwal region of Uttarakhand; Srivastava, Sarkar and Patiyal (2002) for the Kumaon of Uttarakhand; Acharjee and Barat (2010) for Darjeeling; and Nath and Dey (2000), and Dutta and Bhattacharjya (2008) for Arunachal Pradesh. Similar studies for neighbouring Hill regions and terai include those by Atkinson (1974), Kafuku (1968), Rajbansi (1976), Tynsong and Tiwari (2008), Gurumayum and Choudhury (2009), and Lalthanzara and Lalthanpuii (2009). Hornell (1924) describes methods used in the Ganges, as do Joseph and Narayanan (1965) for the Brahmaputra in Assam, and Sharma (2001), and Pravin *et al.* (2011) for Assam in general. Goldschmidt (1957) mentions equipment used in southern India, and Manna *et al.* (2011) describe both fishing gear and craft used along the length of the southern river Krishna. Hora (1950) describes catching fish by hand in India.

In view of the lack of published information on Bhutanese fishes, combined with a general interest in and knowledge of fishes on the part of Sherubtse students, a short study involving the B.Sc. Year II Biology students was made of the local fishes and fishing techniques. This paper describes traditional Bhutanese fishing techniques, some introduced techniques, and local methods of preserving fish for food. Each student, in the capacity of co-author, contributed at least one technique.

MATERIAL AND METHODS

The study was conducted as a class exercise by the senior author and the 10 senior students during Zoology Year II class time at Sherubtse Degree College, Kanglung, Eastern Bhutan. Each technique presented in the group was discussed at length, and validated

by the group as a whole. Each technique was described under the following headings whenever the necessary information was available:

- (1) Name of the technique in the local languages (Dzongkha, Sharchop, Nepali, Hindi);
- (2) Description of the technique, including materials, equipment and procedures;
- (3) Precise purpose of the technique;
- (4) The species of fish caught (local and scientific names);
- (5) Location in Bhutan where the technique is practised;
- (6) Time of the year when practiced;
- (7) Specific aquatic habitat where practiced;
- (8) Cultural origin of the technique.

A short description of traditional Bhutanese methods of preserving the fish for food was included with the exposition on fishing techniques. A comparison of Bhutanese fishing techniques with those from Nepal described by Shrestha (1981, 1999) completed the study.

RESULTS AND DISCUSSION

A. Nets

(a) Cast Net (Sharchop - Chong; Dzongkha - Dao; Nepali - Jal; Hindi - Jal)

The net is traditionally handwoven from cotton thread of one mm or more in diameter. Nylon thread is sometimes used. Mesh size varies between nets, but is usually fine enough to hold even small fish. The net is circular in shape, and is typically two metres in diameter when intended to be used by a single fisherman, as is usual in Bhutan. However, the net may be considerably larger if it is designed to be used by more than one person. A rope 6-7 metres long is attached to the centre (or top end) of the net in order to cast it. A second rope is threaded around the perimeter of the net approximately 5 cm from the open wide end. The free 5 cm of net is then turned up inside the body of the net and stitched approximately every 15 cm to the outer mesh. Continuous pockets are thus formed around the bottom edge of the net which serve to confine the trapped fish. Stones may be tied to the perimeter of the net to weight it. More commonly, cylindrical lead balls 2-3 cm long and weighing more than 100 gms are threaded onto the perimeter rope approximately 10 cm apart. The weights are necessary for throwing the net, enable it to sink quickly, and close the open end when the net is retrieved with the catch.

The net may be thrown blindly, or over visible fish, usually large ones. However, it is often used at night, when the fish are less disturbed by the presence of the fisherman. Usually fishing is done from knee-deep water. The fisherman ties the free end of the throwing rope to his left wrist (right-handed fishermen). Then half of the net is gathered over the left forearm, with the open weighted end left hanging free. With the open end grasped in the right hand, the right arm, aided by the quick turning of the body from left to right, flings the spread net over the water. After the net settles it is slowly pulled to the fisherman so that the weighted base of the net is drawn to a single point, thereby confining the fish. Then the fisherman carefully gathers the net with the fish on to his arm. Captured fish are removed and put in a bamboo basket called "Phurlung".

Species caught include *Catla catla*, *Garra gotyla*, *Pseudecheneis sulcatus*, *Schizothorax richardsonii*, Phokley and Sungoori, the last two being the Nepali names of otherwise unidentified species.

The cast net is used throughout Bhutan, but requires still water. It probably originated in India or Nepal, where it is more common.

B. Basket Traps

(a) Bamboo/Stick Trap (Sharchop - Sor; Nepali - Thokray, Dhariya)

In one version a piece of bamboo 15-20 cm in diameter and 4-5 metres long is used to make the trap. One end of the bamboo should have an intact node. A number of full-length longitudinal splits are cut from the opposite end to, but not through, the node end. The free ends are tied with string to a bamboo ring approximately one metre in diameter to hold them firmly apart. Additional rings of progressively decreasing diameter are fixed along the length of the trap to produce a rigid conical shape.

Alternatively, the trap may be constructed from individual sticks. The sticks are bound together at one end, and the trap shaped, as with the bamboo version, by adding rings of graduated diameters along its length.

Both large and small rivers are fished with this trap. However, the water current must be very fast, and there should be a sharp fall in the water level, such as a small waterfall or rapids. The trap is set immediately below the waterfall or rapids, with the open end facing upward into the current. It is held in position by means of ropes tied from the open end to the shore, and the lower end is tied to stones on the river bottom. Fish that fall or are swept into the trap are unable to swim out against the current.

This technique is used mainly in summer, during the breeding (migratory) season. It catches any fish of suitable size. However, the most commonly caught species is *Schizothorax richardsonii*.

(b) Box Trap (Sharchop - Dom)

A wall is built at the riverside enclosing part the river. An entrance hole is retained to allow water and fish to enter. Fermented wheat used for wine-making is put in the trap to attract the fish. When fish enter, the hole is closed and the fish caught by hand.

C. Nooses, Rods, Lines and Hooks

(a) Noose (Sharchop - Shong; Nepali - Monie)

A single hair from a horse's tail is threaded through one or two earthworms and tied to form a loop at the end of a stick about one metre long. The fixed loop so formed has a diameter of 3-4 cm. The loop is then placed in the water and, when a fish is felt to be taking the bait, is jerked out bringing the fish with it. Only small fish, with a maximum length of 10 cm, are caught this way. This technique appears to be used mainly in eastern Bhutan, from Mongar to Tashigang, in the fast streams. The ethnic origin of the method is not known.

(b) Noose on Bamboo Pole

At Tashi Yangtse a variation of the noose method using a long bamboo pole as a fishing rod is commonly used. Poles 5-7 metres long are typically used. Thin line approximately the length of the pole is attached to the pole end, and a noose is formed at the free end of the line. Bait is fixed to the noose to attract the fish.

(c) Rod, Line and Hooks

A tapered bamboo or branch two to six metres in length is used for the rod. Thin white string approximately twice the length of the rod is first attached to the base of the rod. It is then run to the tip and also attached there, leaving the remaining half free. The two attachment points ensure that if a fish breaks the rod, the line and fish can still be recovered. At the end of the free half of the line about fifteen cm of lighter line is used to attach a sinker (e.g., a stone). The lighter sinker line enables the fisherman to sacrifice the sinker but not the remainder of the line should the weight jam in the river bottom. One or more hooks are attached to separate pieces of line about 30 cm long. These short lines are then attached to the main line, starting at the bottom so that the lowermost hook hangs just below the sinker. Additional hooks, when used, are tied about 15 cm apart up the main line.

Worms are the best bait, and are threaded on the hook to cover the metal, leaving part of the worm beyond the point of the hook where it is free to move. The baited line is gently placed in the water so that the sinker just rests on the bottom. The fisherman then waits for a strike. This kind of fishing is done during summer, preferably in early morning, late afternoon, and during the night.

D. Poisons (Nepali - Bikkh; Dzongkha - Duug; Hindi - Jaher)

(a) Lime (Nepali - Chuuna)

This method is used for stagnant ponds and still pools of small volume (e.g., about 15 m x 15 m x 1 m depth). The lime, about 1/4 tin, is mixed with water in a container and poured into the water. Poisoned fish are collected by hand.

(b) Plant Products

Several species of plants provide commonly used fish poisons, including *Schima wallichii* (Hepali - Chilauney), *Artemisia* sp. (Nepali - Paati) and *Xanthoxylem nepalensis* (Nepali - Timbur). As with lime, these poisons are used in small, still ponds and pools.

The plant parts used as poisons differ between plant species. With *S. wallichii* the sawdust serves as the poison, which is spread on the surface of the water (approximately 15 kg per 25 square metres of pool). In *Artemisia* sp. and *X. nepalensis* the fruit is cut into pieces and crushed on a flat stone to make a paste when mixed with water. One kg of paste is used per square metre of pool. As with lime, the poisoned fish are collected by hand.

Generally the poisons, regardless of their nature, kill all the fish in the pool. However, species of particular interest include *Garra gotyla*, *Channa gachua*, *Mastacembelus armatus*, *Catla catla* and *Semiplotus semiplotus*. Because ponds so treated may remain barren of fish (and other animals) for some time, fishermen may restock them with fingerlings. Poisoning is used mostly in southern Bhutan.

E. Miscellaneous techniques

(a) Bush-trap Method (Nepali - Jhar Paso)

Small bushes, generally climbers, are formed into a bundle. The bundle is placed at one end of a small, shallow pool or stagnant pond. It is then carefully rolled to the opposite end of the pool, pushing the fish with it, where they are collected. Usually only small fish, including small species and individuals *Heteropneustes*, *Ophiocephalus* and *Catla*, are caught with this method.

The bush-trap method is common in the plain areas of southern Bhutan. It is used mainly by the children and women of the rural population.

(b) Stoning Method (Khengkha - Gonchung)

Large stones are thrown upon others in the water. Fish sheltering beneath the bombarded stones are crushed or stunned, allowing them to be easily collected. This technique is restricted to small stony streams, and is used mainly in southern Bhutan. Children commonly play with this technique; adults use it only rarely, and then mainly to obtain bait fish.

(c) Rubber Strap - Harpoon Method (Nepali - Jhir)

A bamboo cylinder approximately 20 cm long and 2-3 cm in diameter is fitted with a rubber band (15 cm long x 3 cm wide x 1 cm thick) which is used to fire a metal harpoon. This technique is used for larger, relatively inactive species (e.g., *Heteropneustes*, *Ophiocephalus*), in clear, still pools, ponds and lakes. The fisherman stalks a stationary fish through the water and shoots it. This technique is practiced mainly in the south, primarily by children.

(d) Chemical Explosive Method (Dzongkha - Ahdhurn or Bam chapn)

TNT is the explosive used. Clear, deep pools with slow-flowing water are selected for this technique. The explosive is ignited and thrown into the pool. Immediately after the explosion, several men enter the water to collect the floating fish.

This is a deadly technique, killing many fishes (and probably the rest of the fauna as well). Consequently, it is banned by the Government, and offenders are liable to fines and imprisonment.

(e) Permanent Diversion of Part of a River (Shar chop - Baychaatpa; Nepali - Duwali)

This technique involves building a permanent fish trap come culture pond, through which is diverted part of the nearby river. The pond is typically 10-15 metres in breadth and length, and 8-9 metres in depth at the intake. A simple hole may be dug in the ground to make the pond, or concrete may be used to make a more sophisticated structure. A channel at least one metre deep and two metres wide is dug from the river to the pond. The outlet is positioned 1-2 metres below the inlet to allow excess water to pass out of the pond, while an iron grid covers the outlet to prevent fish escaping.

This system is particularly effective in trapping migrating fish, taking them in both spring and autumn. When the pond is used simply as a trap, fish may be removed as required. However, when the pond is used to culture the fish, pig faeces and edible green leaves are placed in the water to serve as food for the fish. This extension of the river diversion procedure in fact results in an indigenous fish culture system.

While used throughout the country, permanent river diversion is most common in the south in the terai, and also in the Central region, notably around Punakha. A simple version of the system involves merely collecting the fish which commonly accumulate in the rice paddies.

(f) Temporary Diversion of the Course of a River

In the south where the foothills meet the plains the rivers typically have several adjacent channels, all of which are full during the rains. However, before and well after the rains the rivers usually occupy only one channel, which is when diversion is practiced. A part of the river with good pools, together with an adjacent dry channel with deep holes, is selected for the diversion. Nets fitted with floats and weights are fixed a mile or so below the holes in the empty channel. The channel with the water is dammed, and a waterway is opened to the dry bed. Fish carried to the new channel either occupy the new pools, or are carried beyond by the rushing waters to be trapped in the nets below. Fish remaining in the pools of the original watered river bed are also caught. After a few days the process is repeated further down the river. After a month or so, when the fish have become accustomed to the new bed, the fishermen return to the site of the first diversion and repeat the process by re-diverting the river to the original channel. Diversion is labour-intensive, and may be used by gangs of poachers, at least outside Bhutan.

F. Methods of Preserving Fish

Fish are usually dried, with salt added to preserve them. Large fish are split along the ventral midline (large-scaled fish are scaled beforehand), and the spread inner surfaces exposed to the sun. Alternatively, a stick somewhat longer than the fish is inserted in the mouth and out the vent. The fish may then be dried in the sun or over a fire. For drying over a fire a thin rope is tightly stretched about a metre above the fire, and each fish is hung on the rope by its gill operculum.

DISCUSSION

The present study did not produce the number and variety of methods for Bhutan that Shrestha (1981) described from Nepal. For example, six kinds of net are reported from Nepal, including Mahajal (gill net), Jaal (cast net), Ghorlang (dip net), Tramel net, Chhanki, and Thakauli. Only the cast net ("Sor" in Sharchop) is reported from Bhutan. Similarly, six kinds of basket traps are described from Nepal, only one of which, Khunga ("Sor" in Sharchop), is reported from Bhutan. Other techniques apparently not practiced in Bhutan include the bow and arrow (Tir Kanda or Dhanush Ban), spearing (including at night by torch), stick bundle, temporary underwater reef (Newa or Nya), and Sup (or Bhad), which is a large mat used in conjunction with a dam. Of these, the most surprising omission for Bhutan is the bow and arrow, in view of the prevalence of archery in Bhutan.

Some general techniques are shared but differ in details. The two countries appear to have a variety of noosing and looping techniques which, however, seem to show some significant differences. For example, the small horse hair and worm loop used in Bhutan seems unknown in Nepal, as is the noose on the end of a long bamboo rod. On the other hand, a series of horse hair nooses hung on a line spanning a river is used in Nepal, but apparently not in Bhutan. Similarly, while poisoning is common in both countries, the poisons are obtained from different plants in the two countries. In Nepal fishermen generally throw crushed leaves of *Sapium insigne* (Khirara) and *Avicennia americana* (Ketukee) in the water. Other plant sources of poisons in Nepal include *Enlethia spicata* and *Dalbergia stiplacea* (bark and roots), *Adhatoda vasica* and *Randia dumetorium* (crushed leaves and fruit), and *Pithecolobium bigeminum*, *Edgeworthia gardneria* (Aryli), *Polygonum flaccidum*, *P. hydropiper* (Gerdy), *Ficus pumila* (Iru) and *Acacia pennata* (Laljya) (Shrestha 1981). Most of these plants also occur in Bhutan, but are not known by the authors to be used as fish poisons in this country.

Despite the relatively small number of techniques reported for Bhutan, several do not appear to be practiced in Nepal, according to the information given by Shrestha (1981). In addition to the worm-baited horse hair loop, and the bamboo pole noose, techniques apparently unique to Bhutan include the rolled stick bundle, the rubber-powered harpoon, and the river diversion trap/fish culture pond. Neither does Shrestha mention the temporary river diversion technique from Nepal but, because Atkinson (1974) cites the Superintendent of Dehra Dun as saying that this procedure is common in the foothills, it is very likely the Nepali also practice it.

The ethnic origin of most of these techniques is not clear. However, some have probably been introduced from the south, probably by Nepali immigrants. Some equipment, such as cast nets, have undoubtedly been developed in low-lying areas in India where the rivers are slow flowing and soft bottomed. On the other hand, basket traps used in association with rapids and small waterfalls suggest a highland origin. Similarly, looping and noose techniques may have been developed in the higher Himalaya where the

rivers are relatively small, rocky and clear. Possibly some of these techniques originated in Tibet, and were brought by the ancient immigrants to Bhutan who found in the headwaters of Bhutan's rivers familiar High Asian fishes originally trapped in Tibet.

Acknowledgements

Special thanks are due to Mrs. D. S. Fanthome whose gracious donation of four teaching periods made the field trip possible and practical. Mr. Sadruddin also willingly sacrificed a teaching period. Likewise, Dr. Khorana, inadvertently but in good humour, contributed his first teaching period at Sherubtse. Mr. Bhattarai accompanied the field party and we thank him for his help in the field. Mr. Aye Kyaw and Mr. Sherub Dorji provided essential computer hardware and software support, often at times most inconvenient to them. Without their help this paper would have taken much longer to complete than it did. Mr. Tashi Wangdi critiqued the manuscript. Dr. W. Vishwanath Singh of the Department of Life Sciences, Manipur University, advised on currently accepted taxonomic usage, and provided access to his personal library. Mr. W. Little, Paxus Services Ltd., Christchurch, New Zealand, also provided computing services at a critical time. Last, but not least, thanks go to Mr. B. Rai, zoology laboratory assistant at Sherubtse College, for his enthusiastic technical support in both field and laboratory.

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