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Aqua tourism: Evaluation of pearl spot as a candidate species for angling

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Abstract

Aqua tourism is one of the fastest growing tourism sectors in the world. Angling, the recreational catching of fish by hook and line (sport-fishing), is a principal component of aqua tourism activity. The species of fish pursued by anglers in different parts of the world vary very much. Some fishes are sought for their value as food, others are pursued for their fighting abilities or for the difficulty of pursuit. Angling for recreation in Kerala is more or less restricted to high ranges. The fishes used are principally trouts and mahseers. Though there is very good scope, Kerala has paid little attention for the development of recreational fisheries, in mid land and in the coastal regions. In the present study pearl spot, *Etroplus suratensis* (Bloch) is evaluated as a candidate species for use in angling in these regions. The potential of the species for use in recreational fisheries and its role in development of aqua tourism in the state are also discussed.

Keywords: *Etroplus*, pearl spot, aqua tourism, angling

1. Introduction

Aqua tourism is one of the fastest growing tourism sectors in the world. Angling, the recreational catching of fish by hook and line (sport-fishing), is a principal component of aqua tourism activity. The species of fish pursued by anglers in different parts of the world vary very much. Among the many species of fish that are caught for sport are swordfish, marlin, tuna, cod, bass, pike, perches, trout, salmon, catfish, carp etc. Some fishes are sought for their value as food, others are pursued for their fighting abilities or for the difficulty of pursuit^[1].

Angling for recreation in Kerala is more or less restricted to high ranges. The fishes used are principally trouts and mahseers. Though there is very good scope, Kerala has paid little attention in the past for the development of recreational fisheries especially, in the mid land and in the coastal regions.

For the development of the sector a thorough knowledge on the usefulness of various fishes in angling is a pre requisite. Sehgal^[2] has given a detailed account of principal game fishes of India, which includes fresh water, estuarine and sea fishes. However his list does not include many fishes like pearl spot *Etroplus suratensis* (Bloch) which is a high value food fish in Kerala and which may also be used as a game fish. Korakandy^[3] has given a detailed account of recreational fisheries development in India. He has discussed the economics and management of the sector with special reference to Kerala. He has also presented a strategy for the development of recreational fisheries in Kerala and has provided brief accounts of principal game fishes of the State. However studies for the evaluation of fishes for game purpose are totally lacking in Kerala.

The present study is an attempt in this direction. Here pearl spot is evaluated as a candidate species for use in angling. An attempt was also made to find out the right size of hook and the right kind of bait for catching the species.

2. Materials and Methods

For the present study, information from both primary and secondary sources was employed. Information on Biology relevant to angling was collected from published literature. Preliminary surveys were conducted at various fishing centers of Kannur district of Kerala to identify the common types of fishing hooks used and their operations for catching pearl spot. It was found that straight shank J-style hooks (round bent) are the most common type of

fishing hook used for catching pearl spot. Preliminary information on types of baits used was collected from local fishermen who catch the fish by hook and line method regularly from natural water bodies in Kannur district.

The fishing efficiency of the hook is an important factor deciding the performance of a hook and line fishing gear. In order to allow a preliminary comparison of the hooking efficiencies of the different hooks and the different baits hooking rates were employed. Hooking rate was expressed as the ratio of number of successful hooking divided by the number of fish bites [4].

$$\text{Hooking rate} = \frac{f}{F} \times 100$$

Where f and F stand for the number of fish caught and the number of bites respectively.

The experiments were carried out between 1st April 2015 and 30th April 2015 in a pond in a farmer's field in Kannur district. The pond had earthen bottom and concrete sides. The pond is rectangular in shape and is 20.00 m long and 12.50 m wide. The pond had a depth of 2.40 m and the effective water level was maintained at 2.10 m. The pond was filled with freshwater and stocked with grown up (10 month old) pearl spot having sizes ranging from 136 to 192 g (mean= 158g). The fishes were obtained from a nearby grow- out pond at the time of harvest. The pond was stocked with the fish at a stocking density of one fish per square metre. Additional fishes were stocked in another tank which served as a ready stock of fish for replacement of injured/ died ones. The fishes were acclimatized for three days initially and the experiment was begun on the fourth day. Hooked fish was pulled out of the water, but the uninjured ones were released back to the pond. The injured fishes were replaced with new ones from the stock maintained separately so that the total number of fishes remained the same throughout the experimental period. The experimental fishing was carried out with pole and line fishing gear configuration using the selected hooks as the terminal gear. The gear configuration used was identical with the pole and line configuration used by the local artisanal fishermen. Polyamide monofilament yarn of 0.8 mm diameter was used as the line. The hook was rigged at one end of a line of about 3.00 m length. The other end of the line was tied to the pole.

Two sets of experiments were conducted. The first set of experiment was for studying the right size of hook for use in angling the pearl spot. Since the preliminary field survey revealed that only small hooks are useful in angling pearl spot, hooks of number 16, 18, 20, 22 and 24 were tried. Care was taken to operate the different hooks in identical conditions, using the same type and size of bait to avoid interferences due to difference in bait types. The bait used was earthworm in all cases. Depth of operation remained the same in all experiments. The baited lines were cast concurrently in the same location. Each casting was recorded as one attempt. The number of bites and the number of successful hooking were recorded. A fish bite was considered to be a strike that resulted in the line being pulled out of the water, or when a bite was witnessed visually. Hooking rate was calculated as the number of fish caught per hundred hooks [5] which is used to compare the efficiency of the different types of hooks experimented. A total of 50 operations were carried out with each hook type. The experiment was replicated thrice and the average of the hooking rates was taken.

The second set of experiment was conducted for assessing usefulness of different baits for angling pearl spot. The baits

tried were earthworm, whole prawn (*Metapenaeus dobsoni*), peeled prawn (*M. dobsoni*), small fishes, maida dough (a finely milled refined and bleached wheat flour) with turmeric (*Curcuma longa*) powder, maida dough without turmeric powder, tapioca dough and boiled pieces of chicken. The number 20 hooks were selected as they were found to be more efficient in the first experiment and are commonly used by the fishermen in the study area. A total of 45 operations were carried out with each bait type. All other experimental conditions were as discussed in the case of the first experiment. The number of bites and the number of successful hooking were recorded and the hooking rates were calculated. The experiment was replicated thrice and the average of the hooking rates was taken.

3. Results and Discussion

3.1. Biology of Pearl Spot relevant to angling

Pearl spot is endemic to peninsular India and is distributed along the coastal tracts from south Canara to Malabar on the west coast to Chilka Lake on the east coast [6, 7]. It is a high value- food fish inhabiting both fresh and brackish waters. Owing principally to its wide salinity tolerance and omnivorous feeding habits, it is considered as an ideal candidate species for farming. The fish is compatible with many fin fishes and prawns of importance in aquaculture. The fish in nature predominantly subsist on macro vegetation, detritus, filamentous algae and occasionally on insects and molluscs [8, 9].

The body of the fish is laterally compressed. Mouth is small and terminal. Teeth are villiform and are present on both the jaws. Palate is edentulous, dorsal fin is inserted above the pectoral fin base, caudal fin is emarginated, scales are weakly ctenoid. The body of the fish is light green with eight transverse bands. Specimens from salt waters are deep purple in colour with bands almost black [10]. Most of the scales above the lateral line are with central pearly spot. Some irregular spots are present on abdomen. Pectoral fin is yellowish with black base. Young fish has a white edged black ocellus from fourth to tenth dorsal ray [11, 12]. The maximum size of the fish reported was 37 cm and 1200 g [10]. The fish has high adaptability and ability to breed even in confined waters. The fish breeds in shallow waters throughout the year and in Kerala backwaters twice a year during May-June and November- February with peak in January [13]. Adults engage in altruistic multiple parental care where several adults care for a single brood that presumably were spawned by only two of the adults [14]. Pearl spot is hetero sexual. No distinct sexual dimorphism is seen in this species, except during the breeding season. Females are generally smaller and have a muddy yellowish colour. Close to spawning, males have a greenish blue iridescence, pearly white spots. In males colour bands become dark and strongly marked and the fin rays become slightly reddish. Genital papilla in female is larger and broader, compared to males in which it is thin and pointed. In females the genital papilla becomes much enlarged as an ovipositor close to breeding [10].

The fish attains maturity at the end of the first year. The size at first maturity for this species in diverse environments has been reported differently by various authors. According to Padmakumar *et al.* [10] the males become mature at a size of 14.5 cm and the females at 16.9 cm in Vembanad Lake. The fish has been reported to attain maturity at 125 mm [15], 140 mm [16], 120 mm [17] and at 100 mm [18]

Padmakumar *et al.* [10] have presented a detailed account of

breeding of pearl spot. Breeding behavior in this species is unique. It involves a series of events such as pairing, nest making and parental care. Before pair formation breeding fishes form groups, the largest being comprised of 20 to 30 members. From among the members, some become 'attached' and courtship commences between such pairs. After pair formation the paired couples search for solid objects submerged in water for attachment of the adhesive eggs. Stones, tiles, bamboo poles, coconut shells, coconut petioles, coconut husk, wooden pieces or other hard objects will serve the purpose. Materials submerged at depths less than a metre and raised sufficiently above the ground level are preferred by the fish. The nesting surfaces are cleared off attached algae browsing over the substrate. In 3-5 days the courtship begins and female lies flat to the spawning site and gently move from side to side. The eggs are attached carefully one by one in a single layer with the help of the cup like ovipositor.

Eggs attached to submerged objects look like yellowish oblong patches and are generally having a size of 15 cm x 17.5 cm. On an average there are 2000 eggs in each patch, guarded by the parent fish [13]. After the eggs are laid the parent fish, mostly the females brood over the fertilized eggs fanning and oxygenating the eggs with the pectoral fins. The parents make a couple of depression on a firm ground, by scooping out mud with their mouth. The eggs hatch out in 75-80 hours. Hatchlings measure, on an average, 5.25 mm in length. The hatchlings are picked up by the mother in her mouth and transferred to pits. The parental care is continued till the young ones attain 4-5 cm.

On account of their unique coloration and remarkable patterns, pearl spot is also valued as ornamental fish. The coloration and markings are highly susceptible to change in relation to surrounding environment, emotional condition and life-phase of the fish.

3.2. Hooking Performance

Hooking rates of different hooks employed are presented in fig.1. It is evident from the figure that the highest rate was obtained in the case of hook No. 20 followed by hook No. 22, 18, 24, 26 and 16.

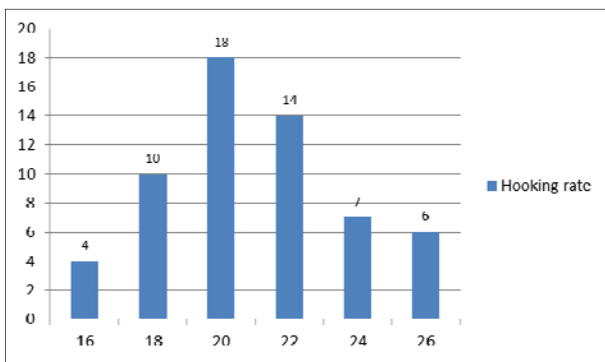


Fig 1: Hooking rates of hooks of different sizes (bait: earthworm)

Fishing hooks come in a variety of shapes and sizes designed to fit the type of bait one is using and the type of fish one is trying to catch. The sizing system for hooks is numerical, with higher numbers indicating smaller hooks. Hooks also have different shapes, with the most common shapes being "J" and "circle" hooks. J hooks are an all-purpose hook, suitable for catching most fish. Pearl spot has a relatively small mouth and hence they can swallow baits provided on smaller hooks.

Observations in the present experiment indicate that for pearl spot smaller hooks of size 20 are more suitable. When large hooks are used they nibble the bait and 'steal' the bait without being hooked.

Many imported branded hooks are popularly used all over India along with the Indian hooks, for catching fish. Popularity of recreational angling using hooks is also on the rise in India. Regardless of all these, there is scarcity of sufficient and dependable data as detailed studies on the fishing performance of different types of fishing hooks in the Indian context [19]. Further, hooking efficiency is also influenced by the size and species of the target fish [20]. In view of these, a direct comparison of the results of the present experiment with those of others is not possible.

The physical and mechanical properties of the hook and the biological aspects of the target fish affect catching efficiency of a hook [21]. The size, shape and design of the hook are the important factors affecting the performance of a hook set against a targeted species. According to Baranov [22] the success of the catch from a hook depends on the angle, the spear of the hook makes with the direction of the pull.

Hooking rates of hooks with different baits are presented in fig.2. It is evident from the figure that the highest rate was obtained in the case of maida dough (with turmeric powder) followed closely by maida dough (without turmeric powder) and earthworm. Maida dough (without turmeric powder) and earthworm showed similar performance followed by peeled prawn, tapioca dough and whole prawn.

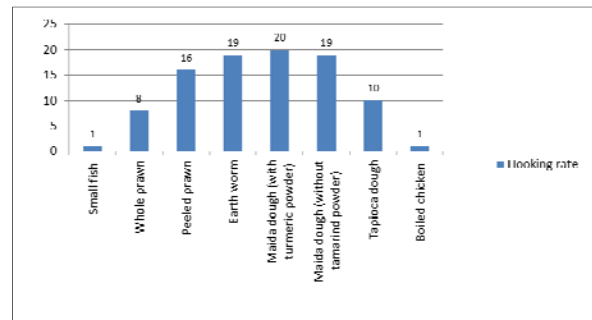


Fig 2: Hooking rates of hooks provided with different baits (hook size: 20).

The hooking rates obtained in the present study are relatively higher compared to some earlier studies. It is because of the fact that the present experiment was conducted in a constructed pond where density of fishes is relatively high compared to natural bodies of water like rivers, backwaters, seas etc. When the density of fish is higher the chances of encounter of the fish with hooks is also higher. As a result, there are higher chances of the fish being hooked.

Selection of the right type and size of hook is very critical for successful hook and line fishing operations. A good understanding of the different hook pattern and size of the hooks are important in selection of hook for a particular fish. Choice of hook depends on several factors such as the quality of the hook, the size of the targeted fish, its preferred bait, feeding habits, the fishing area (marine/inland) and the size of the line used.

The mechanical properties of the hook and the biological aspects of the target fish affect catching process [23]. A large hook is less readily broken or straightened and its wider gap may allow the hook point to engage more deeply in the mouth cavity. Larger hooks require a stronger force to allow the

hook to fully penetrate the inside of the mouth cavity [20]. Hence large hook may be effective in preventing escape of hooked fish especially larger fish. Generally, fishermen select smaller hooks for smaller fish and bigger hooks for bigger fish based on their experience and acquired knowledge. Here the physical and behavioral characteristics of the targeted fish play an important role. The line size, the type of fish and the type and size of hook are to be matched and should be selected as a package.

The mouth of the targeted fish, its size, shape, structure and fighting pattern also influence the choice of hook. In the case of baited hooks, the hook needs to be large enough to be able to hold the bait and hook the fish, yet it should be sufficiently small enough that it does not hide the bait. A hook with barbs on the hook shank is found to be good for live bait and an offset worm hook for artificial bait. The live bait hook should be large enough that it does get the attention of the targeted fish when it is in water along with the live baits and small enough that it does not kill the bait. The hook should be sharp as dull- hooks lead to escape of fish as well as unwanted mortality. The size of the hook and the gape should be proportional to the size of the bait.

3.3. Pearl Spot as a Candidate Species for Angling

Qualities required for a fish to be considered for angling include the value as food, ability to fight, difficulty of pursuit etc. A fish to be suitable for use in angling should also be a vigorous taker of baits. In the true sense a game fish should put up a fight when hooked [2]. Knowing what kind of experience anglers want at a given water body and the catchability of each fish, one can choose to stock fish that will create the desired fishery. Factors affecting catchability are varied, and may include the behaviour of the fish within a water body, how and where they move, and how they react to different fishing gears. The ease with which a fish can be hooked and reeled in affects the quality of the angling experience.

Pearl spot is a high value species fetching Rs. 400-650 per kilogram. It is considered as a delicacy in most parts of Kerala. The species contributes to about 10% of the total inland fish landings of the state [24]. The fish is a vigorous taker of baits, especially shrimp and worms. In the present study among the different baits studied the most effective baits were found to be *maida* dough, earthworm and small shrimps (peeled). Earthworms, small shrimps etc. are widely in use in Kerala by local fishermen for catching the fish. In some parts of Kerala (eg., Valapatnam river in Kannur district) fishermen use a dough made of *Maida* as bait. Powder of curry *turmeric* is sometimes added to the dough to impart a distinctive yellow colour which improves the catchability. Kneaded tapioca, ragi etc. are also found to be used as baits for pearl spot fishing, in Kerala.

4. Pearl spot in farm tourism

As has already been discussed pearl spot is an excellent fish for farming in fresh and brackish waters. Farms in areas where tourists visit in large numbers may be converted as a spot of farm tourism. For the purpose, the farm bunds must be suitably modified and maintained well. Turfing may be done on the bunds. The pond may have a minimum depth of 1.20 m. To provide shade, trees may be planted on the bunds at regular intervals. The branches of trees may be pruned and made attractive. Mush room huts or parasols may be provided on the bunds. Fishing platforms or piers may also be provided

on the bunds or on water. Fishing platforms are the grounds from which shore based anglers can cast their lines, take rest and manipulate their hooks. These may be provided as safe angling spots without disturbing the ecology of the water body. Fishing boats may be provided for anglers in large ponds. Row boats or pedal boats may be more convenient from the point of view of avoiding environmental pollution

Healthy seeds of pearl spot may be stocked at least 5-6 months prior to the beginning of tourism season. For the purpose the ponds may be drained and dried under sun for a few days. Lime may be applied to correct the acidity and fertilized with inorganic fertilizers. Organic fertilizers like cow dung, chicken manure etc. may be avoided as it may hamper the aesthetic beauty of the ponds. Once the pond is prepared healthy seeds of the fish may be stocked at a density of 5000-10000 numbers per hectare after proper acclimatization. To elicit fast growth of fishes stocked, good quality, nutritionally balanced, pelleted feed may be given, twice a day. To ensure quality of the rearing water, periodic water exchange may be resorted to. Once the fish grow to 100g size the anglers may be allowed to fish using pole and line. After the tourist season fishes may be harvested in full or in batches. Pearl spot may grow to a size of around 300- 400 g within a year.

5. Conclusion

The foregoing indicates the potential of use of pearl spot as a game fish in Kerala, in both fresh and brackish water areas. It also has importance in farm tourism. The fact that the species is a high value food fish offers added attraction to anglers. There is an imperative need to recognize the potential of the species for angling.

The observations in the present experiment showed that small hooks (No. 20) are more suitable than larger hooks in catching pearl spot. Among the various baits experimented, *maida* dough followed by small peeled prawns and earthworms were found to be the best baits for catching the fish.

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