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Fish Traps in Inland Waters of North Kerala

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Result of the study on traditional traps in the inland waters of three northern districts *viz.* Kasargod, Kannur and Kozhikode in Kerala state during 2003-2004 is presented. Mainly six types of traps are found in operation. *Chempally koode* is a rectangular bamboo trap with "D" shape in cross section operated without bait in some rivers of Kannur and Kasargod. Bamboo screen barriers are almost completely replaced with durable HDPE net screen to make handling easy. *Thottil vala* is a unique aerial trap operated from the dam in Pazhassi reservoir during monsoon to catch big fishes jumping against flowing water. *Therakkal* using filter trap is a primitive fishing method seen in the backwaters of Kuppam river. Due to the scarcity of resources and proliferation of other gears operation of fish traps has declined. The design, fabrication, mode of operation and economics of important traps used in the region are discussed along with conservation aspects.

Key words: fish trap, screen barrier, aerial trap

Traps are impounding devices into which an organism is lured and from which escape is made difficult because of the non-return device fixed at the entrance. According to Job & Pantulu (1953) traps being fixed engines do not require continuity of attention and vigilance on the part of the operator but can be left to function themselves and secure a catch while the owner is engaged in other occupation. They are highly fuel efficient both in terms of returns and biomass per unit of fuel consumed and they require modest investment and due to their simplicity, efficiency and the quality of catch obtained, this method is widely used in all water bodies (Willimovski & Alverson, 1971; Nair, 1993 and Mohan Rajan, 1993). The artisanal fishermen in inland waters operate primitive types of traps whereas the sea fishermen operate the most modern traps from mechanized boats. Traps are used to catch fishes, crustaceans and molluscs. Baits are not always required to lure the fish as some fishes voluntarily enter into the trap.There are several reports listing indigenous fish traps in the country but only a few are worth mentioning. A compilation of different fish traps in India is given by Job & Pantulu (1953). The *thatta-khonda*, a screen trap of the Chilka lake is given by Mohapatra (1955). Saxena (1964) listed fish traps operated in the middle stretch of Ganga river. Fish traps of the east and west coast of India is reported by Ramamurthy & Muthu (1969). George (1971) has given an account of fish traps operated in the inland waters of India. Traps operated for the capture of prawns in India is reported by Kurian & Sebastian (1986). Fish trapping devices and methods of Southern India is described by Mohan Rajan (1993). Kurup & Samuel (1985) and Kurup *et al.*, (1993) listed the indigenous fish traps of Vembanad lake. A brief description of various traps operated in Malabar coast is given by Hornell (1938).

The present communication describes the design, technical and operational aspects and modifications in various traps operated in the inland waters of north Kerala.

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Materials and Methods

The study on fish traps in the inland waters of north Kerala had been undertaken during the period March 2003 to June 2004. Three districts viz. Kozhikode, Kannur and Kasargod were selected for the study based on the density of inland water bodies and fishing activity. Details of fabrication, operation and catch of traps were collected from all known fishing centers as per the guidelines suggested by Miyamoto (1962). Details were collected from all places by checking representative samples. Data collected using the questionnaires were supplemented by interviewing fishermen who fabricate and operate the traps. Data on catch details were collected periodically and economics were worked out using standard procedure (FAO, 1974).

Results and Discussion

Traps are mainly operated in rivers and backwaters with more focus in the middle and upper stretches where the operation of other fishing gears like gill nets and seines are difficult. Traps are used for extra income or as hobby. Aerial trap is the only trap under operation in reservoirs, which is seen in Pazhassi reservoir. Classification of fish traps operated in north Kerala is given below.

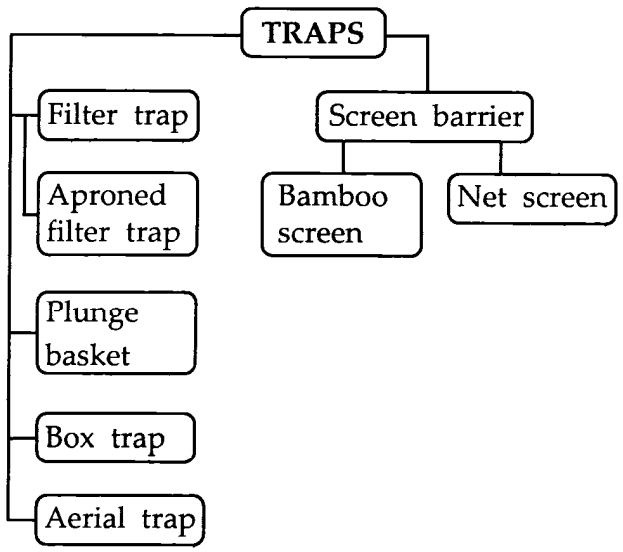
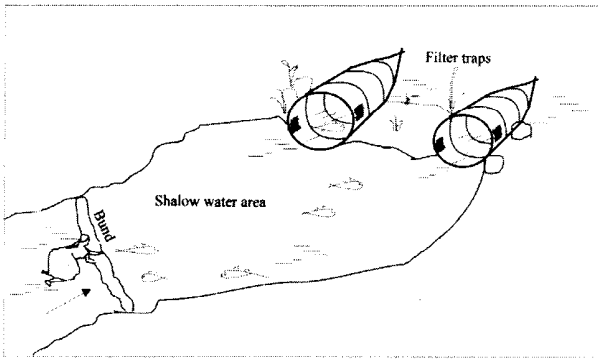


Fig. 1. Classification of fish traps from the study area

Filter traps:

Filter trap, locally known as *padal* in Kannur, is a cylindrical device made of midrib slivers (*irkal*) of the coconut palm leaves or bamboo splinters. Hornell (1938) reported the operation of filter traps in the backwaters of Kerala. It is about 0.6 m in length with a circular mouth of about 0.4 m dia. at one end and other end of the slivers are bunched and tied so as to close it. Few bamboo or creeper stem hoops are fixed inside the trap to give a cylindrical shape. To prevent the slivers from opening 6-7 encircling lacings using coir are also given. Filter traps are set against the receding current in shallow rivulets and *pokkali* fields. Job & Pantulu (1953) and (Mohan Rajan, 1993) reported that these traps are set where the current is rapid as in openings made in bunds or at inlet and outlet passages in inundated paddy fields. Sen (1972) reported that *pata*, a kind of filter trap in West Bengal, is set at a place where the flowing water falls to a lower depth in such a way that the water can pass through a filer and all the fish get strained and slide along the slope of the filter to the pouch.

Therakkal is a fishing method practiced by single or two fisherwomen in shallow brackish water areas and *pokkali* field of Kannur district, using one or two filter traps (Fig. 2). Initially they fix the *padals* using mud at one side of the water area. A bund like structure is created at both sides of the trap to divert the water flow through the traps. A bund is made across the water body using mud and aquatic grass collected from the place. The bund is slowly pushed towards the trap along the bottom and during this process the bund turn over several times and hence the name *therakkal* (Nayak *et al.*, 2000). On reaching the traps the muddy water is drained into the traps along with small prawns and fishes. Trap



Therakkal using filter traps

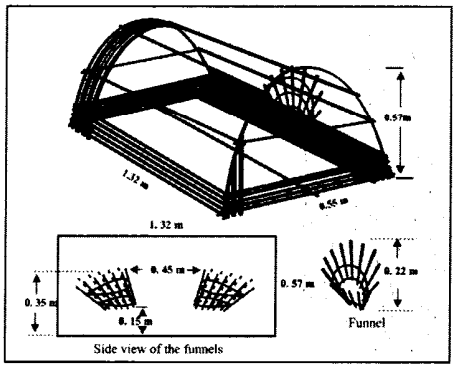


Fig. 2. Filter trap (above) and box trap

is taken out to collect the catch and the process is repeated in another suitable place.

Aproned filter traps

This is an improved filter trap popularly known as *tharapadal* in north Kerala. Job & Pantulu (1953) described this trap as modification of the simple cone cage for similar purposes. It is effected by the addition of a detachable fan shaped apron, one end of which is inserted into the open mouth of the cone. The mouth of the apron exactly meets the inner edge of the trap mouth and the converging funnel has an opening in the middle. Hornell (1924) reported that the out going water flows on to the apron and any small fish and prawns that come with the water are led by the converging sides of the apron into the cylinder behind, where they are trapped. The tail end of the cylinder is tied temporarily and can be loosened to remove the catch. The *kumni* of Hoshangabad described by George (1971) is an aproned cone cage made of bamboo splinters.

Plunge basket

Cover pots or plunge baskets, popularly known as *ottal or kuthu koodu,* is a conical trap open at both ends. Common size of plunge basket operated in Kerala varies from 50-70 cm height, 40-50 cm width at the lower end and about 15 cm at the top. It is constructed with closely set ribs made of sticks or bamboo splinters of about 10 mm width. To keep the ribs in position the trap is hooped at 3-4 places with split cane or other similar materials. Free ends of the splinters at the wide mouth are usually sharpened, so that the device could be pushed down and fixed temporarily in mud (Job & Pantulu, 1953). The sides of the narrow opening at the top is covered with old cotton cloth and stitched with cotton or other soft material to prevent the hand being hurt while handling and operation.

The *ottal* is operated in Kannur and Kasargod district to catch fish from knee-deep waters like inundated paddy fields, backwaters and other small water bodies where the bottom is soft. Fishermen plunge the basket almost every one meter intervals and press it to fix and catch the trapped fish. Plunge baskets are also operated with scare lines in Kozhikode district to capture pearl spot, silver biddies and other estuarine fishes. Job & Pantulu (1953) reported that in certain parts of South Kanara district the cover basket is often used in conjunction with the scare line.

Box trap

Box traps having "D" shape in cross section is known as *Chempally koode,* because major share of the catch is constituted by

Lutjanus argentimaculatus, locally known as *chempally*. Box traps are very common in the upper reaches of Kuppam, Valapatanam and Peruvamba river in Kannur and Kariangode, Chandragiri and Mogral rivers in Kasargod district where as these types of traps are not seen in Kozhikode district. *Konkra-kharia* is a box trap made of bamboo splinters seen in Chilka lake for catching *Scylla serrata* (Jones & Sujansingani, 1952). It is made of split bamboo and splinters of areca nut tree with an approximate dimension of 1.4 x 0.6 x 0.6 m. The bottom piece is rectangular in shape and is fabricated using 10-15 strips having 1.4 m length and 30-35 pieces of 0.6 m length kept perpendicular to the first set (Fig. 2). The strips are joined together using 3-4 mm dia coir twines. The curved roof portion of the trap is constructed using about 30-35 strips having 1.4 m length held together using coir.

There are two funnels fitted on either end of the trap. The non-returnable valves are constructed using 15-18 number of arecanut tree splinters each having 0.35-0.4 m length. One end of these splinters is cylindrical in shape having 2-2.5 cm in dia. and the thickness gradually reduce to a sharp point in the other end. According to Hickling (1961) the sharpened splinters at the hole may project into the trap in such a way that a fish in the trap will tend to jab itself against these sharp inwardly projecting points. Jones & Sujansingani (1952) stated that the opening of the box trap for crab is secured by means of a *Chevaux de fries* of bamboo splinters, which project inside the trap and form a V-shaped wedge. The entrance funnel is about 30- 35 cm long having 25-30 cm dia. in the upper side. The lower side of the funnel is oval in shape and is about 20 – 22 cm long and about 15 cm wide in the middle, just enough for a big fish to enter inside. The lower part of the funnel opens at about 45° angle and the distance between the lower opening and the base of the trap is kept minimum to reduce the chance of a trapped fish escaping through the funnel by swimming back. Fixing the entrance funnel is the most crucial thing in any type of trap since any defect in the alignment will reduce fish catch. There is a lid at one side, towards the base of the trap to take out the trapped fish. Details of cost of fabrication of a box trap from Kuppam river is given in Table. 1.

Table 1. Approximate cost of a box trap

No.	Material	Rate (Rs.)	Quantity	Cost (Rs)
1	Bamboo	100/piece	2 nos. (about 24')	200.00
2	Coir twine	15/coil	7 coils	105.00
3	PP rope	1.7/m	35 m	60.00
4	Areca nut tree	-	4 m	50.00
5	Labour	200/day	4 days	800.00
	Total			1215.00

These traps are usually operated in rivers through out the season except during June- July, when the current is strong. However in some places its operation is restricted between August to December, when almost fresh water condition exists in the upper regions of the rivers. During summer season when the salinity of the water increases the degradation of the coir used for securing the bamboo splinters is very fast. More over the settlement of organisms are also on the higher side during summer. Two fishermen operate the trap, using a canoe, during night to keep the location of the trap secret. Bait is not required for this trap and the fishes seeking shelter under submerged objects becomes the prey. Two stones weighing about 2-4 kg each are attached on either side of the trap to prevent it from drifting.

One end of a rope having 5-6 m length is tied to the trap and to the other end a

Table 2. Cost particulars of a screen barrier unit in Tellicherry river.

No.	Material	Rate (Rs.)	No. of units	Cost (Rs.)
1	Bamboo	110/peice	18 nos.	1980.00
2	Coir twine	10/coil	85 coils	850.00
3	Labour for 6 pieces of screen	250	7 days	1750.00
4	Transportation of bamboo	-	-	1000.00
5	PE netting	280/kg	30 kg	8400.00
6	Labour for net making	180/day	14 days	2520.00
7	PP rope	110/kg	15kg	1650.00
8	Lead sinker	80/kg	15	1200.00
9	Areca nut tree trunk	150/tree	4 tree (384 poles)	600.00
10	Labour for poles	180/day	6	1080.00
	Total			21,030.00

small stone is attached. Traps are set in 5 - 10 m depth and while putting the trap the attached line stretched to its full length to facilitate retrieving. Hauling is carried out at every alternate night. Grappling hook (an iron piece having 3 hooks) locally known as *chempally koka* or *Kollai* attached to one end of a 10-15 m PP rope is used to retrieve the trap. On reaching the area of the trap fishermen release the line in the water to hook the rope connected to the trap. As the canoe moves up and down the hook is also being dragged along the bottom. Once the line is hooked it is hauled back and the trap is taken onboard. Catch is taken out through the window provided in the lower corner. *Etroplus suratensis, Scylla serrata* and *Epinephelus* sp. are the other components of the catch. The average catch per haul from a box trap from Kuppam river worked out during 2004-2005 is 0.94 kg.Traps are sold @ Rs.1000-1500/piece. The average cost and earnings of a fishing unit operating two box traps is given in Table 3.

Table 3. Average annual cost and earnings of a box trap unit in Kuppam river

Items	Traditional
I. Capital investment (Rs)	
i) Cost of fishing craft	15000
ii) Cost of Gear (Traditional-2, Collapsible-10 units)	2430
Total	**17430**
2. Fixed cost (Rs)	
2.1.Depreciation on capital investment on craft (Life of vessel- 8y, scrap value-nil, Bank interest rate @ 12.5%)	1875
2.2. Depreciation on capital investment on gear (Life-1y-traditional, 3-y for collapsible)	2430
2.3. Interest on capital @ 6% per annum	1045
Total	**5350**
3. Variable cost (Rs)	
3.1 Maintenance of craft	1300
3.2 Maintenance of gear	500
3.3 Labour cost	10,000
Total	11800
4. Total cost for one year (Rs)	17150
5. Earnings (Rs) (Rs.100/kg of fish, Catch- @ 0.94kg/day for traditional & @ 0.54kg for collapsible)	37600
6. Net Profit (Rs)	21495
7. Profitability ratio (%)	
7.1 Return on capital	117.32
7.2 Return on total cost	119.24
7.3 Return on variable cost	173.30
7.4 Pay back period on capital investment (yr)	0.85

Screen barriers

Long leaders of converging screens erected in shallow waters to lead the fishes into the chambers fixed at the end is known as fish fences or screen barriers. This type of trap is fixed during high tide and removed during the next low tide and the fish actively swim up into the barrier.

Hornell (1924); Krishnamurthy and Rao, (1970); Kurian & Sebastian (1986) and Mohan Rajan (1993) reported that screen barriers are extensively used in the backwaters of Malabar.

Impoundments erected with the help of split bamboo in shallow waters of Chilka lake is known as *Janos* (Jhingran & Natarajan, 1969). These types of dams are constructed across the streams with the help of stones, leaves and reeds from one bank to other so that water would flow only through crevices. One or two places towards the middle are kept open where large basket traps kept with their open ends facing the lower side of the streams so that all the fish that ascend the streams and rivers are trapped (Jones, 1946; Hickling, 1961; Brandt, 1972 and Remesan *et al.*, 2002). Based on the materials used for the construction two types of barriers are seen in the region.

Bamboo screen barrier

These are large enclosures with trapping chambers put up in shallow waters where an extensive tract of flooded land is in the process of draining. *Banas* (Yadava & Choudhury, 1986) and fish *kraals* (Anon, 1995) are similar structures seen in the beels and estuaries in other places. Such structures are popularly known as *vesa* in Kozhikode and *Cheve* or *thadave* in Kannur district (Fig. 2). Screen barriers are common in rivulets and backwaters of Kuppam, Pervamba, Tellicherry, Chaliyar, Korapuzha and Kuttiadi rivers but they are not seen in Kasargod district. Length of a screen barrier varies from 100-500 m depending on the area of operation and availability of the screen. Individual screens measuring 1.5-2.5 m length and 0.9-1.8 m height are made using bamboo splinters which are held together with coir or 2 mm dia or Polypropylene twine at four to six transverse rows. They are made in convenient lengths so that they can be joined end to end to make a barrier long enough for the requirement. Several such screens (*chern*) are arranged as vertical walls along the shoreline to enclose an area. Since fabrication, maintenance and handling is difficult bamboo screen barriers are almost totally replaced by net barriers. Shorter service life is another drawback of bamboo screens.

Net barrier

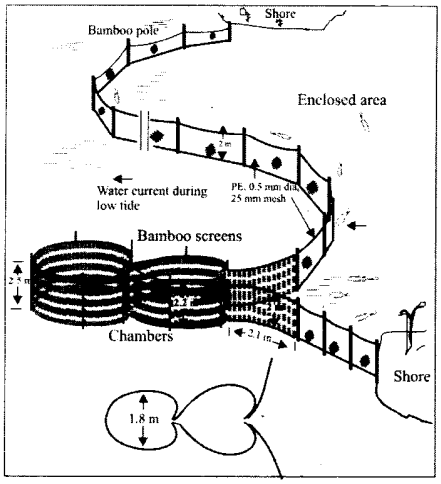
Traditionally the screen barriers are made of bamboo splinters but as cheaper and pliable materials like synthetic nettings became popular screens were introduced with netting. Mohapatra (1955) stated that *Khonda,* popularly known as *disco* net is a recently introduced modified net made of nylon twine which has replaced the traditional *thatta khonda* made of split bamboo and cotton twine. In Kuppam, Tellicherry, Kuttiadi, Chaliyar and Kadalundi rivers and backwaters screens made of HDPE netting are common. HDPE netting having a twine size of 0.5 mm dia. and 25-30 mm mesh size is commonly used in all these places. A piece of netting of varying length with 1.5–2 m height is cut and is mounted using 4-6 mm dia. PP rope of approximately equal length. Lead sinkers are used in the foot rope, but not often, to keep the lower edge close to the bottom.

The heart shaped fish collecting chambers of these traps are made using bamboo screen. One or two such chambers are set towards both ends of the leader line, depending on the length of the screen and topography of the area. Each chamber is having two compartments and is constructed using four screens each having about 2 m length. First two screens are pressed into the bottom in the shape of heart leaving about

10 cm gap in the front just enough for a big fish to enter and 4-5 cm exit space in the back. These screens are tied together using ropes and two wooden poles are erected adjacent to the screen for support. The second circular chamber is also built in the same fashion but without any opening at the back, accommodating the exit hole of the first chamber. Mohapatra (1955) and Job & Pantulu (1953) reported that the free end of the valve screens points towards the trap chamber, leaving small vertical opening for the one-sided passage of fish. Another two screens are set in the front of first chamber in such a manner that the converging ends exactly meet at the entrance of the front chamber and the other end is connected to the leader screen. The details are given in Fig. 2.

Peak season for trap operation is during December to May. Two canoes, with 2-5 fishermen are required for the operation. The chambers are set during low tide near the shore where the depth is less than the height of trap during high tide. Screens are arranged either to block the entrance of a blind creek having tidal influence or in a semicircular manner having shore at one side (Remesan *et al.*, 2002). The top of the chamber is covered properly using PE netting to prevent the entry of birds, poaching and also jumping of fishes from the chamber. Then the remaining poles are also erected in the front part of the chamber along the course of river at about 2.5 m intervals. During high tide the area between trap and shore get inundated. Just before the commencement of the next low tide the leader screen walls are set by fixing the foot rope into the bottom and tying the head rope to the poles already erected. Wishard (1976) reported that the *roak*, barrier net, is first fixed across the river, from one bank to other, with the help of two rows of bamboo poles.

In all these structures the mouth of the trap is always set in the direction of current during low tide so that the fishes moving against the current will be led into the chamber by the leader walls. Das (1993) while describing the operation of *Bitti* or *Atol* (bamboo cage traps) stated that as the ingress water enters the bheri, *Penaeus monodon* and other species of shellfishes move against the current and get entrapped in these traps. Towards the end of low tide a fisherman enter into these chambers and collects the fishes using a small scoop net.



Screen barrier in Kadalundi river

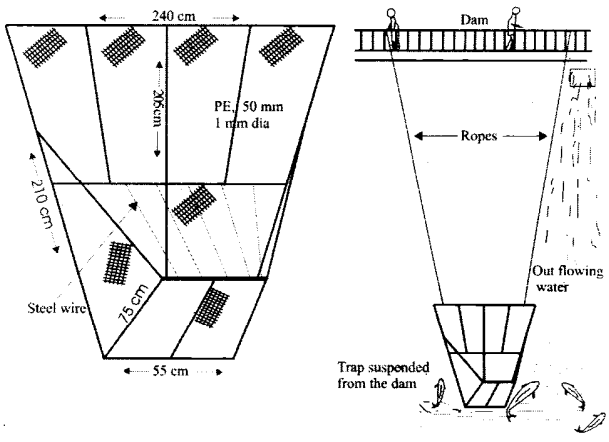


Fig. 3. Screen barrier (above) and Aerial trap

Mullets, catfish, prawns and other medium and small sized fishes are captured. Juveniles of many fishes constitute the major share of the catch. Single operation is possible in a day, since the capture process entirely depends on tide. Cost particulars of a screen barrier unit in Telicherry river is given as Table 2. Total income varies from Rs. 200 - Rs. 3000/day. Two shares of the total income is given to the owner of craft and gear. Balance amount is equally divided among the number of fishermen. According to the fishermen catch is declining and the operation is becoming uneconomical. Wilson & Davis (1973) reported that high cost of labour and materials plus scarcity of young men in the fishery are the chief reasons for declining pound net effort in Virginia.

Aerial trap

Thottil vala (cradle net) is an aerial trap operated in Pazhassi reservoir during monsoon to catch mainly carps. Usually bigger sized carps and sea bass are seen in shoals near the out let of the dam and they jump against the water flow especially when the shutters are open to release the excess water in the reservoir. It consists of a trapezoidal frame made of 6-8 mm dia. MS rod with a top open box at the base (Fig.2). PE netting made of 1 mm dia twine with 50 mm mesh size is used to cover the frame and the conical box at the base. A few steel strings or PA monofilaments are attached to the top of the box to prevent the escapement of fishes jumped into the box.

Two PP ropes of 8-10 mm dia., each having about 50 m length are attached to the top frame on either side and is lowered to the side of the out flowing water. Other ends of the ropes are tied to any rigid structure on the dam. One or two such traps are kept on either side of the flow and the trap is always kept above the water level in such a way that when a fish jumps it falls into the trap.

In general capture fisheries is showing declining trend worldwide due to various problems. The problem is severe in inland sector, especially the fishermen operating passive gears like fish traps. At present very few fishermen are engaged in trap operation in this area because of poor economic returns. More over compared to other gears like gill nets, trap fabrication, maintenance and operations are time consuming process. To increase the catch rate of box traps meat waste can be used as bait to attract other species of fishes into the trap. Synthetic materials, like tapes, can be tried for securing bamboo strips for trap fabrication to prolong its service life.

Barriers are non-selective gears destroying considerable amount of juveniles and young ones. Escape windows can be provided in large traps like screen barriers to exclude juveniles from the trap chambers or juveniles can be left out during the final capture from the chambers. Catching of brooders using aerial traps may affect the recruitment. Preventing habitat degradation, ranching coupled with responsible fishing practices can improve the productivity of the water bodies, which ultimately make this type of fishing methods more economically viable.

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