Dol Net Fishery of India: Need for Resource Conservation

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Introduction

Dol net is a fixed tapering bag net which resembles a trawl net which are set in tidal streams and the net is held in place by attaching it to anchors. Dol netting is a very popular traditional, passive technique of fishing practiced along the north-west coast of India, in the states of Gujarat and Maharashtra. Dolnets were operated at a maximum depth of 20-24m which were close to the shore prior to mechanisation, but after mechanization of the crafts fishermen now set their nets at depths of 40m. Traditionally the Dolnet fabrication was using cotton twine, which were heavy and cumbersome which are now replaced by HDPE, which made the gears light, durable and also helped in easy deployment by the fishers. Dol nets are classified on the basis of the method and depth of their operation. The simplicity of its design, construction, operation and low investment has made this gear very popular among small-scale fishermen. Dol nets are operated by traditional, motorised as well as mechanised boats. Dol net can be efficiently operated at any depth in the water column and the gear is operated almost throughout the year.

Species of fish, which drift with the current or do not swim fast enough to counter the current form the major targeted catch in dolnets (Akerman, 1986). Dol nets are operated in three regions in Gujarat viz., Umbergaon to Kavi along the southern Gujarat, Siyalbet to Diu along the Saurashtra coast and Takkara to Modhwa in the Gulf of Kutch region (Nair *et al.* 2007). Among these, Saurashtra is the important region and the main fish landing centers are Jaffarabad, Rajpara, Navabunder and Goghla. Out of these the first three are the most important with more than 600 dol netters under operation (Manojkumar and Dineshbabu 1999). The Bombay duck, *Harpodon nehereus* (Ham.) is the main constituent of the catch so much that the 'dol' net fishery had become synonymous with Bombay duck fishery. The success of operation depends on favourable currents. Tapering of the net from mouth to the cod end is achieved by gradually reducing the size and number of meshes.

Dol net design, its operation and fishery:

Dolnet is a fixed tapering bag net, resembling a trawl net, set in tidal streams by attaching it to anchors for holding the net in place and floats are used to maintain the mouth opening of the gear. In the Maharashtra region the anchoring is done on the poles fixed to the sea bottom whereas in the Saurashtra coast heaps of stones are used as anchors. The success of operation depends on , currents and the period of operation is linked to the tidal pattern in the region where the gear is operated. In Navabandar, *dol* net was operated from the eleventh day of Gujarati month *Akadashi* to the fifth day of Gujarati month, *Panchmi*. During this period, water level and water current are favourable for *dol* net operation. After *panchmi*, fishermen wait for the next *Akadashi* for the tide and currents to be favourable.

The method of operation of Dolnets, differ significantly in Gujarat and Maharashtra mostly by the method of anchoring. Smaller bag nets are operated along other parts of the Indian coast, but mainly in estuaries and creeks. The dominant species caught in Dolnets along the north-west coast include Bombay duck, clupeids, elasmobranchs, catfishes, croakers, eels,

ribbonfishes, threadfins, pomfrets, flat fishes, penaeid shrimps, non-penaeid shrimps and lobsters (Sehara and Karbhari, 1987).

Dolnet is divided into seven parts at Versova area they are name as Mohor which is mouth opening portion followed by Chirat, Katra , Mazvala, Khola, Par and Ambadpar the last portion (Fig. 1, Table 1). The detail information on overall length of the boat, engine power of the boat, depth of operation, number of nets use at one time, number of crews required in one time fishing is provided in Table 2 (Raje and Deshmukh, 1989).

The main season of operation is divided into two; the first season from September to the middle of January and the second from February to May. Doln ets used along Navabander is divided into Bochi the mouth portion followed by Aor, Trijo, Bangu, Chothi, Jalo (the last portion of the The detail information on dol net in Navabander is given in Table 3 and Table 4

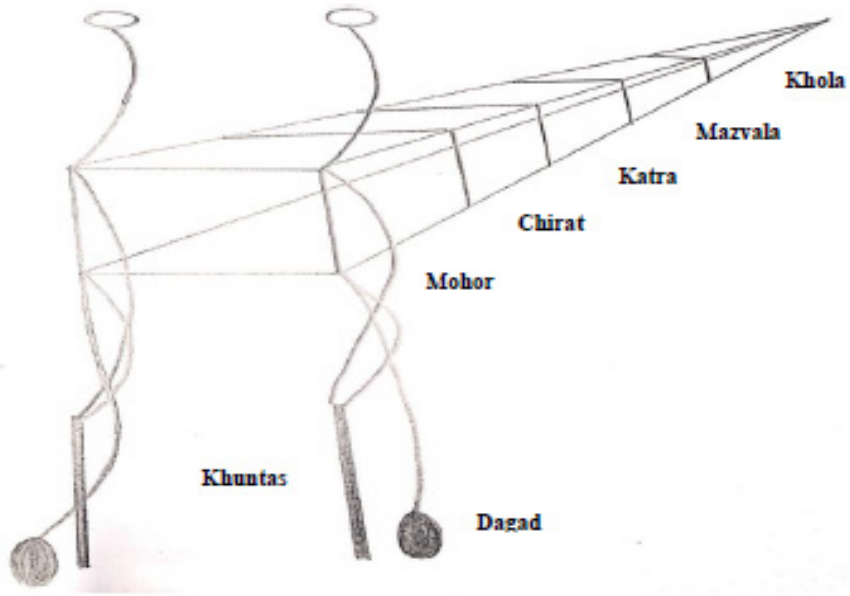

Fig. 1 Dol net in set position

Table 1. Details of various sections of Dol Net at Versova (Raje and Deshmukh, 1989)

Part of the net	Mohor	Chirat	Katra	Mazvala	Khola	Par	Ambadpar
Average length (m)	11	13	13	16.5	5.5	5.5	5.5
Mesh-size from beginning to the end of that part (mm)	350-280	260-130	130-140	40-12	12	30-40	25-30
No. of meshes	1065-890	890-870	870-850	850-400	400	200	250
No. of creases between meshes	-	2	3	8	-	-	-
Polythylene twine size (mm)	1.5	1.0	1.0	1.0	1.0	1.25	1.0

Table 2. Details of size of boat, depth of operation, number of nets and crew strength (Raje and Deshmukh, 1989)

Overall length of boat (m)	Engine power (HP)	Depth of net operation (m)	No. of nets used	No of crew required
6.5-8	5-25	10-20	2	3-4
10-13	30-35	10-32	2-3	5-6
13-17	50-100	30-40	3	7

Table 3. Gear specifications for *Dol nets* operated at Navabandar (Sikotaria *et.al* 2018)

Specification	Measurements	
Overall length (m)	60-90	
Height (m)	14-15	
Breadth (m)	28-36	
Types of material	HDPE, PP, PA	
Parts of net	**Length (m)**	**Mesh size (mm)**
Bochi	14.0-18.0	110-130
Patiya	12.0-14.0	100-110
Aor	16.7-22.0	70-90
Trijo	09.0-14.0	45-70
Bangu	03.0-05.6	30-45
Chothi	02.4-04.6	15-20
Jalo	03.0-05.5	10-15

Table 4. Vessel and engine specifications of crafts used by dol netters at Navabandar (Sikotaria *et. al* 2018)

Specification	**Measurement**
Overall length (m)	10-12.8
Breadth (m)	2.4-3.6
Height (m)	1-1.8
Tonnage (t)	15-20
Fish hold (Number and capacity in kg)	1 no. & 1200 kg- 2 nos.. & 2500 kg
Voyage time (days)	8
Crew member	8-10
Depth of operation (m)	40-60
Engine power (Hp)	87-105
Number of cylinders	6
Engine make	Ashok Leyland

Plate 1 Dol net catch at Maharashtra

Dol net fishing at Saurashtra coast (Gujarat)

Dol nets are operated almost throughout the year, but the main season can be divided into two such as the first season from September to the middle of January and the second from February to May. This division is based on the shifting of the fishing grounds at all the three landing centres viz., Navabunder, Jaffarabad and Goghla. During the first season the fishing ground is located in the southeast direction from all the three landing centres. Fishing is done from this ground till the middle of January and afterwards the ground shifts towards north of the existing ground. This shifting takes place in about 15 days and the next fishing starts in the beginning of February. Dolnet being the fixed bag net the success of operation depends on the favourable currents, so the shifting of the ground must be associated with a change in the current patterns of the area.

The fishing ground is identified and stones are laid as marker for different 'dol' nets. The fishing season starts with the laying of stones. The stones are purchased from nearby quarries and taken to the fishing ground. First a stone is laid with the rope followed by a number of stones through the attachment in the main rope. Two such stone heaps are made for each dol net. A dol net needs 50 to 60 stones. The dol net operation in Saurashtra is confined to depths ranging from 15 to 35 m. The anchor ropes are strongly based at the bottom with the help of these heaps. The other end of the rope is tied to the floats. Earlier floats were made of wooden barrels but now plastic cans and readymade floats are used for this purpose. The dol nets are attached to these ropes. The mouth of the net is placed against the tidal current and before the current changes the net is hauled and after emptying the catch it is again put in the opposite direction. The number of hauls depends upon the season and number of nets carried in a boat. The four net units generally do single hauls only whereas two and three netters do two hauls. The net is made up of HDPE with a codend mesh of 20 mm. The codend is double walled for extra protection. The length of the net varies from 40 to 80 m and costs around Rs.70,000 to 1,00,000. The ropes and net last for almost 10 years (check. The length of the craft used for the dolnet operation varies from 10 to 15 m with tonnage ranging from 5 to 20. Earlier the boats were with sails and were using wind power for propulsion. At present all the dol net units are motorised with engine power varying from 20 to 88 HP. They also carry sails along with them to utilise the favourable wind (Sikotaria *et.al* 2018).

Dol net fishing at Versova (Maharashtra)

Versova fishermen make use of iron poles which are dug deep in sea bed where it is anchored using ropes. Different codend with mesh size varying from 10 to 40mm mesh size called par, is used when large sized fish, including Bombay Duck are available. Codend with 10-12mm mesh called *Khola*, is used for small-sized non-penaeid prawns, *Acetes* spp. A par with 25-30 mm mesh called *ambad par*, is generally used from March to June when *Nematopalaemon tenuipes* is abundant. The selective use of *ambad par* enables filtering off of smaller *Acetes spp*. also abundant in the same period, which otherwise block the cod end causing eddies. Another reason why fishermen do not prefer a mixture of *Acetes* and *N. tenuipes* is that their mixture fetches lower price than *N. tenuipes* alone.

Thus for Bombay duck, penaeid prawns, ghol, *Coilia, N.tenuipes* etc. generally a *par* is attached to *mazvala* and the net is set at bottom; whereas for pomfrets, scerfish, chirocentrus and other pelagic clupeids the net is set at surface by adjusting the length of *so.* A cod end with 10 mm mesh *khola* is used only when no quality fish, including Bombay duck is available and to catch

Acetes sp.. This indicates that the fishermen use the different cod ends with varying mesh sizes to regulate their catch (Raje and Deshmukh, 1989).

Need for resource conservation in dolnet fishing

Dolnet fishing is operated in different depths of water. The dol net fishing though its success depends on water current large quantity of different varieties of fishes are caught in the net. Dolnets, though target Bombay duck, they also land different varieties of fishes including large quantity of juvenile of commercially important species. The very small mesh sizes used in the codend is one of the reason for the high juvenile capture rate, the govt. has stipulated 40 mm square mesh codend as legel, but the adherence to the provisions in the MFRA is minimal. The increase in the fishing power, as a resuls of the larger nets and bigger vessels adds to the problem of over exploitation. At present there is report of accidental catch of sea turtle and huge quantity of juvenile fishes. In the state of Maharashtra juvenile catch of Pomfret is becoming very common and its in alarming situation. Some of the places where huge number of juvenile catch are landed are Versova, Naigaon, Raongaon, Satpati, Dahanu (Plate 1).

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