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1032 Drift-gillnet fishery along Mangalore-Malpe coast

Of the several gears employed in the harvest of marine fishes in Mangalore-Malpe area, drift-gillnet is the only major gear used to catch larger pelagics like seerfish, tuna and billfish, shark, catfish etc since more than two decades. Though the catch by drift-gillnet forms only 1% of the total marine fish catch of the region the value of the quality fishes it lands exceeds the catch value of major gear like purseseine. Besides, this gear has become more popular because of easy maintenance and low operational costs. The major landing centres for drift-gillnet units in Mangalore-Malpe area are Mangalore Fisheries Harbour and Malpe Fisheries Harbour. This gear plays a pivotal role in the economy of indigenous gear fisheries sector with greater potential for further expansion. Investigation on their economics and future potential will be of paramount help to small-scale fishermen and for judicious exploitation of the component resource groups. During 1970s and 1980s the area of operation was 25-45 m depth zone. With the advent of motorization of canoes and improvement in crafts design during 1990s and 2000 the area of operation was extended up to 60 m depth. At present the distance between shore and fishing ground is about 50-60 km. The operational area extends 30-45 km away from the base towards either south or north direction.

Drift-gillnet fishing was carried out from ordinary wooden dug-out canoe of 5-6 m OAL fitted with or without out-board engine or mechanised boat of 9.7 m OAL. Of late, the craft is of 10 m OAL and made up of plywood coated with fibreglass and propelled by out-board engine like Yamaha or Suzuki of 10-15 hp.

The mesh size of the net made from synthetic fibre varied from 45 to 90 mm during 1981-1990 and gradually increased to 65-140 mm in 1991-2000. Cement stones are used as sinks. The length of one piece of net varies from 60 to 70 m and depth from 13 to 15 m. Usually 15 such pieces are used in a single unit. The overall length of the net ranged from 800 to 1000m.

Operational details

Generally fishermen depart from their base at 16 00 h on a fishing day and reach the fishing ground by around 19 00 h. At dusk they start setting the net. The time taken for one haul varies from 3 to 4 h depending on the fish catch and usually 2-3 hauls are made per trip. The manpower generally was 3-4 per unit earlier days and now is reduced to 2-3 per unit. Migrant fishermen from Kerala and Tamil Nadu practise the drift-gillnet fishing in the area. During 1980s and 1990s these fishermen along with their boats camped in the area and carried out fishing. Of late, boats belonging to other states are forbidden to operate in Karnatka waters. As a result, fishermen from other states engage local fishermen's boat and conduct fishing operations. For this, they get a share of 50% of net profit. More than 70% of the fishermen engaged in drift-gillnet fishing belong to neighbouring states.

During the two decadal periods of 1981-1990 and 1991-2000 the annual drift-gillnet effort at Mangalore Fisheries Harbour fluctuated from 2,429 units (1989) to 7,598 units (1999). At Malpe, the annual effort during 1987-2000 varied from 1,386 units (1995) to 8,457 units (1987). During 1998-2000 the effort expended showed an increasing trend at both the centres. The average annual catch and catch rate at Mangalore Fisheries Harbour during the first decadal period (1981-1990) was 369 t and 89 kg/unit, which increased to 485 t and 101 kg/unit respectively in 1991-2000. At Malpe Fisheries Harbour, the average annual catch of 419 t in 1987-1990 decreased to 314 t in 1991-2000. However, the catch rate of 87 kg/unit in the first period had increased to 92 kg/unit in the latter period.

The drift-gillnet fishery is supported by seerfishes followed by tunas, billfishes and sharks. Minor groups include catfish, carangids, mackerel, pomfrets, ribbonfish, barracudas, full-beaks and wolf-herring. Bull's-eye, perches, batfish, cobias are encountered in small quantities. The contribution of seerfish and

elasmobranches (sharks and rays) to the drift-gillnet catch has stood almost at the same level (46% and 15% respectively) in both the decadal periods. The share of tuna and billfish rose from 17% during 1981-1990 to 30% in the subsequent decadal period. The landings of pomfret and catfish constituted 6 and 8% of the total drift-gillnet landings respectively during 1981-1990 and reduced to a mere 1% each during 1991-2000. Seerfish, formed 40-50% of the total drift-gillnet landings in the Mangalore-Malpe area. The most productive period was September-January with peak in October-November. The kingseer, *Scomberomorus commerson* dominated the catch followed by the spotted seer, *S. guttatus*. The wahoo, *Acanthocybium solandri* was aught in few numbers. The cost of *S.commerson* varied between Rs. 30 and 60/kg during 1981-1990 and between Rs. 40 and 100/kg in 1991-2000 period, depending on the size of the fish. The rate of spotted seer varied from Rs. 15 to 40/kg and Rs. 20 to 80/kg during 1981-1990 and 1991-2000 respectively.

Due to low local demand the entire catch of tunas and billfishes were iced and packed to Kerala and Tamil Nadu. This group formed 17-18% of the total drift gillnet landings during 1981-1990, which increased to 25-30% (1991-2000). Bulk of the landings was observed during September-December. Among tunas, the little tunny *Euthynnus affinis*, long-tail tuna *Thunnus tonggol*, frigate tuna *Auxis thazard* were the major species. Yellowfin tuna *T. albacares*, the bullet tuna *A. rochei* and the oriental bonito S.*orienalis* contributed to the fishery in minor quantities. The drift-gillnet is the only major gear used to exploit billfishes along this coast. They are represented by sailfish, *Istiophorus platypterus* and the marlin, *Makaira indica*. The auction rate of tunas in the landing centre varied from Rs. 5 to 12/kg during 1981-1990 and Rs. 8 to 25/kg during the next decadal period. The value of billfishs was Rs. 5/kg in 1981-90 and Rs. 10/kg in the latter period.

Elasmobranchs constituted 16% of the total landings of drift-gillnet in both the decadal periods. This group was represented by sharks like spadenose shark, *Scoliodon laticaudus*; blacktip reef shark, *Carcharinus melanopterus*, hammerhead shark, *Sphyrna* spp. and rays like lesser devil ray, *Mobula diabolus*. Elasmobranchs were encoutered in the fishery during all months and the most productive periods were September and October. The price structure of sharks ranged from Rs. 15 to 30/kg during 1981-1990 and Rs. 25 to 60/kg during 1991-2000.

Catfish, which formed 8-9% of the total drift-gillnet landings during 1981-1990 declined to 1-2% in the consecutive decadal period. The species in the fishery were *Tachysurus dussumieri, T. thalassinus, T. serratus* and *T. tenuispinis*. The best fishing season for this group was

Table 1. Monthwise variations of important resources (t) along the Mangalore - Malpe coast during 1981-1990

Month/ Species	Seerfish	Tuna & billfish	Catfish	Elasmo-branchs	Pomfret	Carangids	Mackerel	Others	Total
January	182.9	2.8	57.9	82.1	15.5	1.1	8.6	20.2	371.1
February	62.5	3.7	19.4	77.0	5.1	0.2	2.8	10.0	180.7
March	61.9	32.5	12.3	57.6	4.3	0.4	5.1	7.0	181.1
April	29.5	26.1	2.3	54.4	1.0	0.7	5.4	4.7	124.1
May	7.4	3.9	0.4	9.3	0.1	0.1	0.2	0.6	22.0
June	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0	0	0
September	153	120.6	57.1	69.1	47.0	11.6	5.8	18.9	483.1
October	682.7	491.4	168.4	269.3	156.0	36.1	23.5	96.6	1924.0
November	850.7	204.4	44.2	185.5	95.7	22.2	5.4	63.2	1471.3
December	412.6	47.3	47.1	60.2	16.1	4.6	3.3	18.5	609.7
Total	**2443.2**	**932.7**	**409.1**	**864.5**	**340.8**	**77.0**	**60.1**	**239.7**	**5367.1**

Table 2. Monthwise variations of important resrouces (t) along the Mangalore-Malpe coast during 1991-2000

Month/ Species	Seerfish	Tuna & billfish	Catfish	Elasmo-branchs	Pomfret	Carangids	Mackerel	Others	Total
January	225.9	89.5	8.2	34.6	2.3	6.0	4.5	37.2	408.2
February	107.4	49.5	2.6	37.9	1.5	2.9	3.0	18.2	223.0
March	132.8	114.5	1.8	18.8	1.1	3.7	4.6	18.7	296.0
April	82.3	110.6	1.3	30.8	0.5	3.9	5.4	8.4	243.2
May	171.4	167.6	1.9	47.3	0.7	10.3	8.8	18.8	426.8
June	11.7	19.0	0	9.0	0	0.5	0.9	1.4	42.5
August	1.9	8.3	0.1	46.7	0.2	0.4	1.0	2.0	60.6
September	667.5	668.2	36.5	283.7	38.4	56.3	61.3	170.2	1982.1
October	910.2	721.0	35.3	107.1	44.2	69.2	69.4	179.6	2136.0
November	800.6	362.0	16.6	74.5	18.4	25.6	13.1	157.2	1468.0
December	449.7	76.5	13.3	65.1	9.2	11.0	9.5	61.8	696.1
Total	**3561.4**	**2386.7**	**117.6**	**755.5**	**116.5**	**189.8**	**181.5**	**673.5**	**7982.5**

September-December. The price/kg of catfish ranged from Rs. 10 to 20 during 1981-1990, which increased to Rs. 30 to 50 in the next decadal period. In recent years, the catfish catch drastically declined and are caught only in few numbers.

Pomfrets account for 6% of the total drfit-gillnet landings during 1981-1990, which declined to 1-2% in the next decadal period. The fishery was supported by two species, black pomfret, *Formio niger* and white pomfret, *Pampus argenteus*. The former formed the bulk of the catch. The peak fishing season for this group extended from October to November. The auction rate of pomfret varied from Rs. 20 to 30 and Rs. 30 to 50 per kg during 1981-1990 and 1991-2000 respectively.

Carangids such as horse mackerel, *Megalaspis cordyla*; queenfish, *Scomberoids* spp. constituted 1-3% of the total drift-gillnet landings in both periods. The value of fish ranged from Rs. 3 to 6 during 1981-1990 and Rs. 5 to 10 per kg in the next period.

Mackerel, barracuda, full-beaks, wolf-herring, cobias, batfish and perches were the common fishes frequently encountered in the fishery. Ribbonfish, oilsardine, eel, sciaenids, crabs, milkfish *etc.* occur occasionally in stray quantities. Marine mammals like dolphin and porpoise and turtle that were caught accidentally were brought to the landing centre.

The drift gill-net fishing commences soon after the south-west monsoon. The month wise variation of major group of fishes landed by the gear during 1981-1990 and 1991-2000 are presented in Tables 1 and 2.

At Mangalore fish catches are auctioned in the wholesale market, situated adjoining the Mangalore Fisheries Harbour and at Malpe they are auctioned in the Fisheries Harbour itself. There are many agents in the trade and each one is in charge of auction of fish catch of certain drfit-gillnet units. In turn, the agent gets some percentage of the total auction value as his share. Owners of most of the drift-gillnet boats employ fishermen from Kerala or Tamil Nadu for fishing. After deducting the fuel charge and other miscellaneous charges from profit, the owner gets 30% of the net profit as his share and the other 70% will be shared equally among the fishermen. The quality fishes such as seerfish, pomfret and mackerel, which have high demand locally, are sold fresh in the local markets. The big sized seerfish, ribbonfish, tunas and sharks are ice-preserved and transported to neighbouring states. Sharks and wolf-herrings are generally salted and dried and sold in the dry fish market.

Economics of fishing operation

The economics of fishing operation of a drift-gill unit during 2000 are presented in Table 3. The average initial

Table 3. Average annual cost and earnings of a drift-gillnet unit operating along the Mangalore-Malpe coast during 2000.

	Value (Rs)
A. Initial investment	
Craft	150000
Net	80000
Engine	70000
Other accessories	12000
Total	**312000**
B. Average catch (tonnes)	**17**
C. Revenue	**1013980**
D. Operating cost	
Fuel	167200
Wages	586586
Miscellaneous cost	8800
Total operating cost	**762586**
E. Fixed cost	
Interest @	12.50%
	39000
Depreciation	
a. Craft	30000
b. Gear	48600
Total depreciation (a+b)	78600
Insurance	6000
Total fixed cost	**123600**
F. Total cost (D+E)	**886186**
G. Gross profit (C-D)	**251394**
H. Net profit (G-E)	**127794**
I. Rate of return (%)	**53**

investment i.e., cost of a plywood craft coated with fibreglass, out board engine, net and other accessories was estimated at about Rs. 3.12 lakhs. The total fixed cost that was estimated by adding interest, insurance and the depreciation of the above items was about Rs. 1.24 lakhs. The annual average operating cost per unit including fuel, wages and miscellaneous expenditure was worked out as Rs. 7.63 lakhs, of which wages formed the major component (Rs. 5.87 lakhs). Therefore, the annual total cost of one drift-gillnet unit was about Rs. 8.86 lakhs (i.e., total fixed cost + operating cost). The average annual catch of 17 tonnes was calculated by the average annual catch per unit multiplied by the number of actual fishing days for the year. The revenue earned for the catches was about Rs. 10.14 lakhs. The gross profit was calculated as Rs. 2.51 lakhs and the actual net profit was found to be Rs. 1.28 lakhs. The rate of returns for one drift-gillnet unit was calculated by using the formula, Rate of returns to capital = Net profit + interest / Average capital investment and the same for the above was about 53%. The income gathered from different groups of fishes during 2000 and their percentage contribution to the total income is given in Table 4.

Table 4. Specieswise value of drift-gillnetters of Mangalore-Malpe area during 2000

Species	Total (kg)	Rs/kg	Value (Rs)
Sharks and rays	86019	55	4731045
Catfish	6112	50	305600
Oil sardine	337	10	3370
Ribbonfish	3470	15	52050
Carangids	31411	12	376932
Pomfrets	4076	45	183420
Mackerel	12716	12	152592
Seerfishes	458782	90	41290380
Tunas and billfishes	235404	25	5885100
Crabs	283	12	3396
Squid	679	50	33950
Barracudas	32192	25	804800
Bull's eye	308	20	6160
Fullbeaks	15161	20	303220
Wolf-herrings	3256	15	48840
Other fishes	41279	30	1238370
Total (kg)	**931485**		**55419225**

The drift-gillnet fishery in the Mangalore-Malpe area plays a significant role in the economy of small-scale fisheries sector. In view of the present increasing trend of fish catch and appreciable financial returns, the drift-gillnet fishery is found very encouraging. Unlike the dimnishing catch rate in the purseseine and single-day trawl fishery sectors, in drift-gillnet fishing, the catch

rate showed increasing trend over the past two decades, from 88 kg/unit in 1981 to 90-97kg/unit in 1991-2000. At present on an average, an annual effort of 8,600 drift-gillnet units land 92 kg/unit of economically important larger pelagics. As this gear targets the high value seerfish and sharks, the economics of its operation show good profit to the operators owing to the growing consumer demand. There is further scope to increase the yield, especially of seerfish from the distant waters i.e., by further shifting the fishing operations into deeper waters from where the multi-day trawlers net seerfish in appreciable quantities. For this, it is suggested that similar to multi-day trawl fishing, multi-day drift-gillnet fishing could be attempted. By adopting multi-day drift gillnet fishing for 2-3 days, expenditure on fuel can be reduced to certain extent. This step has already been initiated at Malpe Fisheries Harbour. The peak period of abundance of the target species, (seerfishes) in the region is September-December which happens to be the lean season for single-day trawl units, hence, these units can profitably operate drift gillnet operations during this period. Also, these units can operate trawling during day time and shift to drift gill fishing during night to enhance the fish yield and economic returns.

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