Design and Operational Performance of Needlefish Gillnets along the Coast of Ramanathapuram District, Southeast Coast of Tamil Nadu

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ABSTRACT

A study undertaken to analyse the design and operational aspects of Needlefish gillnets of four different fishing villages of Ramanathapuram district of Tamilnadu, revealed the existence of notable difference with respect to catch rate despite having many common design features. Relatively shallow and broader continental shelf boarded with coral reef was found to serve as an ideal habitat for Needlefishes along the coastal villages of this district. Six species viz.,Ablenneshians, Tylosurus crocodiles, T. choram, T. agus,Strongylura strongylura and S. leiura were found to constitute the fishery of Needlefish in gill nets with the dominant species being either A. hians orT. crocodiles.A. hians was dominant in the gillnet catches Gulf of Mannar while T. crocodiles showed its dominance in the gillnet catches from the fishing villages of Palk bay. Trawling was found to be a common disturbing activity for Needlefish gillnetting in all the four fishing villages studied. Among four villages, Mundal was found to be notable for Needlefish gillnetting as relatively longer gill nets involving more number of fishing crafts were found to be operated from this village. The catch composition of gillnets revealed that the mean Catch Per Unit Effort (CPUE) of Needlefishes ranged from 23 to 25 nos/boat/day while the CPUE of commercially important fishes such as seer fish, barracudas, mackerels, flying fish, queen fish and sail fishes altogether ranged from 15 to 19 nos/boat/day. The study suggests evolving a selective pelagic longline gear for capturing Needlefishes considering the rich resource of Needlefish along the coast of Ramanathapuram district of Tamil Nadu

Key Words: Gillnet, Needlefish, *Vallam*, CPUE

INTRODUCTION

Needlefish popularly called as 'Mural' in Tamil has a wide distribution in the tropical and sub-tropical regions of the world. Needlefish belong to the family Belonidae is represented by 32 species under 10 genera. However, only eight species belonging to different four genera such as *Ablennes hians, Platybelone argalus, Strongylura incise, S. leiura, S. strongylura, Tylosurus acus, T. crocodiles* and *T. choram* have been reported in the gillnet catches of Indian seas (FAO, 1995; Anon, 2011).

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Ramanathapuram is a notable maritime district of Tamil Nadu and occupies the first position in marine capture fish production of the state. This district has a coast line of 237 km and offers livelihood for nearly about 22% of the total fisher population and accounts for about 20% of the fish landings of the state (Johnson *et al.,* 2013).

Needlefishes form a sporadic bycatch in the gillnets operated all along the coast of Tamilnadu. However, Ramanathapuram coast is known for its Needlefish fishery through pelagic drift gillnets. The Needlefish fishery of this coast is constituted by seven species such as *A. hians, S. leiura, S.strongylura, P. argalus, T. acus, T. crocodiles, and T. choram*. The present study was undertaken with an objective analysing the present status of design and operational details of Needlefish gillnets of Ramanathapuram district.

MATERIALS AND METHODS

The study was carried out for four months from March 2016 to June 2016 covering four important coastal fishing villages of Ramanathapuram district *viz.,* Mundal (Lat.09°06'7"N; Long.78°35'6"E), Velayuthapuram (Lat.09°28'5"N; Long.78°89'6"E), Pamban (Lat.09°27'8"N; Long.79°22'9"E) and Mandapam (Lat.09°27'7"N; Long.79°12'5"E). Both design and operational details of Needlefish gillnets were collected. The survey included collection of information on the main specifications of fishing crafts engaged and the design details of Needle fish gillnets covering 17 parameters, drawn as per the FAO guidelines formulated Nedelec (1975). The operational details of the nets and catch- effort particulars were also collected from the selected fishing villages.

RESULTS AND DISCUSSION

Design description of Needlefish gillnets

A design detail of different types of Needlefish gillnets operated from four different fishing villages of Ramanathapuram coast are given in Table - 1. The nets showed notable differences with respect to hung depth despite having common design features. Regarding the material of construction, the webbing made up of both multi-filament nylon twine with the specification of 23tex x2x3 and mono-filament nylon twine with the thickness of 1.0mm dia. were found to be used in Velayuthapuram. However, in all other fishing villages, nets with the webbings fabricated using multi-filament nylon twine of the specification 23tex x2x3 were alone found to be used. The gill nets were either green or yellow in colour, however, green was found to be the predominant by used colour of the net. The Head Rope Length (HRL) of Needlefish gillnets ranged from 40.5 to 104.0 m and the hung depth was notably small ranging from 1.5 to 2m owing to the pelagic nature of the fish.

In present investigation the mesh size of the Needlefish gillnets was found to range from 30 to 52 mm. Gill nets used in Mundal were relatively longer with 4,000 meshes along length in contract to (2,700 meshes in the gillnets of Velayuthapuram. Regarding hung depth also, it was as high as 3.4m in the gillnets of Mundal and was 1.7m in the gillnets at Velayuthapuram. Fishermen were found to use 8 to 14 gill nets per trip. During the study period, floats made up of plastic

and cork were used in Velayuthapuram, whereas plastic floats were alone used in other three fishing villages. The plastic floats each weighing 20 g with the extra buoyancy of 30 g in seawater were found used in the gillnets invariably in all the four villages. The inter distance between two floats was 0.45 m in the gillnets of Velayuthapuram whereas, it was 1.3 m for the gillnets of the other three fishing villages studied (Table - 2 and Figure 1 and 2).

Table - 1. Specifications of Needlefish gillnets operated in the selected fishing villages of Ramanathapuram district

Sl.No	Parameters	Fishing villages				
		Mundal	Velayuthapuram		Mandapam	Pamban
1	Material of construction	Multi- filament Nylon twine	Multi- filament Nylon twine	Mono-filament Nylon twine	Multi filament Nylon twine	Multi-filament Nylon twine
2	Twine specification (Tex numbering / Ø in mm)	23 tex x 2 x 3	23 tex x 2 x 3	1.0	23 tex x 2 x 3	23 tex x 2 x 3
3	Colour	Green	Green & Yellow	Green & Yellow	Green	Green
4	Head rope length (m)	104.0	40.5	40.5	97.5	97.5
5	Hung depth (m)	3.4	1.7	1.7	2.7	2.8
6	Mesh size (mm)	51	32	32	52	51
7	No. of meshes in length	4,000	2,700	2,700	3,750	3,750
8	No. of meshes in depth	66	52	52	55	55
9	Hanging coefficient (Horizantal)	0.50	0.47	0.47	0.50	0.51
10	Hanging coefficient (Vertical)	0.86	0.88	0.88	0.86	0.86
11	Head rope material	Nylon	Polypropylene	Polypropylene	Nylon	Nylon
12	Head rope thickness(mm)	2.0	2.5	2.5	2.0	2.0
13	Float material	Plastic	Plastic & cork	Plastic & cork	Plastic	Plastic
14	Float weight (g)	20	20	20	20	20
15	Buoyancy of the float(g)	30	30	30	30	30
16	Float Interval (m)	1.3	0.45	0.45	1.3	1.3
17	No of units operated/ boat	8-14	8-12	8-12	10-14	10-12

Both FRP boats and '*Vallam*' were found used for operating Needlefish gillnets in the villages surveyed. In general, smaller fishing crafts with an Over All Length (OAL) ranging from 4 to 8 meters were found engaged for Needlefish gillnetting owing to the distribution of Needlefishes in the near shore fishing grounds located just 12 to 25 nm from the shore. The exclusive use of '*Vallam*' by the fishermen of Pamban in contrast to the other fishing villages may be attributed due to rough sea conditions prevailing in this region which prevented the operation of lighter FRP boats (Table - 2).

Table - 2. Specifications of crafts involved in Needlefish gillnets in the selected fishing villages of Ramanathapuram district

Sl.No	Parameters	Fishing villages						
		Mundal		Velayuthapuram		Mandapam		Pamban
1	Craft type	Vallam	FRP boat	Vallam	FRP boat	Vallam	FRP boat	Vallam
2	Length (m)	7.0 – 8.0	4.0	7.0-8.0	4.0-5.0	6.0-7.0	4.0	7.0-8.0
3	Beam (m)	2.0	1.5	2.0	1.5	2.0	1.5-2.0	1.5
4	Depth (m)	1.8 – 2.0	1.0–1.5	2.0	1.5	1.5-2.0	1.5	2.0-2.5
5	Total number of crafts	35	20	20	10	15	9	17
6	Total number of fishermen involved in Needlefish gill netting	180-200		100- 120		100-110		70-80

During the study period, six species of Needlefishes such as *A.hians, T. crocodiles, T. choram, T. agus,S. strongylura,* and *S. leiura* were found to constitute the catches of gill nets. *A. hians* was found to be the most dominant among the Needle fishes caught in the gill nets operated from Mundal and Velayuthapuram with the percentage contribution of 49% and 50% in the total Needlefish catch respectively. However, *Tylosurus crocodilus* was the most dominant species in the gillnet catches of Mandapam and Pamban with the percentage composition of 60% and 70% of Needlefish catch respectively (Table 4). Similar observations have been made by Kasim *et al.* (1996) who reported *Ahiansas* the most dominant species followed by *T. crocodilus* of Needle fishes in the drift gill net catches of Thoothukudi coast.

Table - 4. Catch composition Needlefish gillnets of selected fishing villages of Ramanathapuram district

Sl. No	Name of the fishing village			
	Mundal	Velayuthapuram	Mandapam	Pamban
1	*Ablenneshians(45%)*	*Ablenneshians (50%)*	*Tylosuruscrocodilus (60%)*	*Tylosuruscrocodilus (70%)*
2	*Tylosuruscrocodilus (27%)*	*Tylosuruscrocodilus (22%)*	*Tylosurusacusmelanot(20%)*	*Tylosurusacus (15%)*
3	*Tylosurusacus (14%)*	*Tylosurusacus (17%)*	*Ablenneshians (12%)*	*Ablenneshians (8%)*
4	*Strongyluraleiura (7%)*	*Strongyluraleiura (5%)*	*Strongylurastrongylura(3%)*	*Strongylurastrongylura((4%)*
5	*Strongylurastrongylura(5%)*	*Strongylurastrongylura (4%)*	*Strongyluraleiura(3%)*	*Strongyluraleiura(2%)*
6	*Platybeloneargalus (2%)*	*Platybeloneargalus (3%)*	*Platybeloneargalus (2%)*	*Platybeloneargalu(1%)*
7	Seerfishes, Barracudas, Mackerals & Sailfish	Flyingfish, Barracudas, Mackerals and half beaks	Seerfish, Barracudas, Mackerals and Queenfishes	Seerfish, Barracudas, Mullets, and Mackerals.

Among the four villages studied, Mundal was found to be a notable fishing village for Needlefish gill netting as evidenced through highest catch rate of 1, 00,870 numbers of Needlefishes and 67,223 number of other commercially important fishes for a total fishing effort of 4,434 fishing days during the study period (Table - 3). In terms of total fish catch, Mundal was followed by Velayuthapuram, Mandapam and Pamban (Table - 5, 6,7 and 8) and (Figure 3) .

Table - 3. Operational details of Needlefish gillnets in selected fishing villages of Ramanathapuram district

Sl. No	Parameters	Name of the fishing village			
		Mundal	Velayuthapuram	Mandapam	Pampban
1	No of fishing trips per month	25	25	16-20	20-25
2	Depth of operation (m)	8 – 9	12 – 13	8 - 9	6 – 7
3	Nature of operation	Pelagic; drift	Pelagic; drift	Pelagic; drift	Pelagic; drift
4	Distance to fishing ground (Nm)	25	14	12	25
5	Fishing season	Throughout the year	Throughout the year	Throughout the year	Throughout the year
6	Peak fishing season	Oct-Jan	Oct-Jan	April-July	April-July

Table - 5.Catch and effort particulars of Needlefish gillnets of Munda

Sl. No	Month	Average number of boats operated per day (a)	Number of Fishing days (b)	Monthly fishing effort (boat days) (c)	Mean number of Fishes landed / boat / day (d)		Monthly mean Catch / boat (b) x (d)		Total catch estimated (c) x (d)	
					Needle fishes	Other Fishes	Needle fishes	Other Fishes	Needle Fishes	Other Fishes
1	March	46.50	24	1,116	19.5	13.00	468	312	21,762	14,508
2	April	47.25	24	1,134	23.5	14.75	564	354	26,649	16,727
3	May	46.50	24	1,116	22.0	15.50	528	372	24,552	17,298
4	June	44.50	24	1,068	26.1	17.50	624	420	27,907	18,690
Total effort group wise catch (Nos.)				4,434					1,00,870 CPUE= 22.75	67,223 CPUE= 15.16
Total effort /catch (Nos.)				4,434					1,68,093 CPUE = 37.91	

Table - 6. Catch and effort particulars of Needlefish gillnets of Velayuthapuram

Sl. No	Month	Average number of boats operated per day(a)	Number of Fishing days (b)	Monthly fishing effort (boat days) (c)	Mean number of Fishes landed / boat / day (d)		Monthly mean Catch / boat (b) x (d)		Total catch estimated (c) x (d)	
					Needle fishes	Other fishes	Needle fishes	Other Fishes	Needle Fishes	Other Fishes
1	March	26.5	26	687	20	18	520	468	13,780	12,402
2	April	27.5	26	715	24	16	624	416	17,160	11,440
3	May	27.0	26	702	22	20	572	520	15,444	14,014
4	June	27.5	26	689	26	22	676	572	17,914	15,158
Total effort group wise catch (Nos.)				2,795					64,298 CPUE= 23.00	53,040 CPUE= 18.97
Total effort /catch (Nos.)				2,795					1,17,338 CPUE= 41.98	

Table - 7. Catch and effort particulars of Needlefish gillnets of Mandapam

Sl. No	Month	Average number of boats operated per day(a)	Number of Fishing days (b)	Monthly fishing effort (boat days) (c)	Mean number of Fishes landed / boat / day (d)		Monthly mean Catch / boat (b) x (d)		Total catch estimated (c) x (d)	
					Needle fishes	Other fishes	Needle fishes	Other Fishes	Needle Fishes	Other Fishes
1	March	20.0	21	420	26	18	546	378	10,920	7,560
2	April	21.0	21	441	24	15	504	315	10,584	6,615
3	May	20.0	21	430.5	22	14	462	294	9,471	6,027
4	June	21.0	21	441	27	17	567	357	11,907	7,497
Total effort group wise catch (Nos.)				1,732.5					42,882 CPUE =24.75	27,699 CPUE = 15.99
Total effort /catch (Nos.)				1,732.5					70,581 CPUE = 40.73	

Table - 8. Catch and effort particulars of Needlefish gillnets of Pamban

Sl. No	Month	Average number of boats operated per day (a)	Number of Fishing days (b)	Monthly fishing effort (boat days) (c)	Mean number of Fishes landed / boat / day (d)		Monthly mean Catch / boat (b) x (d)		Total catch estimated (c) x (d)	
					Needle fishes	Other fishes	Needle fishes	Other Fishes	Needle Fishes	Other Fishes
1	March	16	22	352	23	15	506	330	8,096	5,280
2	April	15	22	330	25	17	550	374	8,250	5,610
3	May	17	22	374	20	14	440	308	7,480	5,236
4	June	15	22	330	22.5	15	495	330	7,425	4,950
Total effort group wise catch (Nos.)				1,386					31,251 CPUE = 22.54	21,076 CPUE = 15.20
Total effort /catch (Nos.)				1,386					52,327 CPUE = 37.75	

Operational details of Needlefish gillnets

Fishermen belonging to the four fishing villages surveyed were found to operate the gill nets for 16 to 25 days per month (Table - 3). Further, fishermen of the Mandapam were found to restrict their number of fishing days not exceeding 20 per month owing excessive disturbances caused by the operation of trawlers. The reason for higher abundance of Needlefishes along the coastal fishing villages of Ramanathapuram district may be attributed to the availability of wide and shallow continental shelf bordered with coral reef which is found to be an ideal natural living habitat for Needlefishes. Though the Needlefish gillnetting was observed throughout the year, the peak fishing season was from October to January in Mundal and Velayuthapuram and April to July in Mandapam and Pamban may be attributed to spatial difference. As the fishing villages such as Mundal and Velayuthapuram are

located in Gulf of Mannar while Mandapam and Pamban are located in Palk bay. Owing to the difference in the oceanographic features such as current, wind etc., notable difference in the Needlefish fishing season could be observed between the villages although all the four fishing villages are located closer to each other.

Figure - 1. Needlefish gillnet ofVelayuthapuram

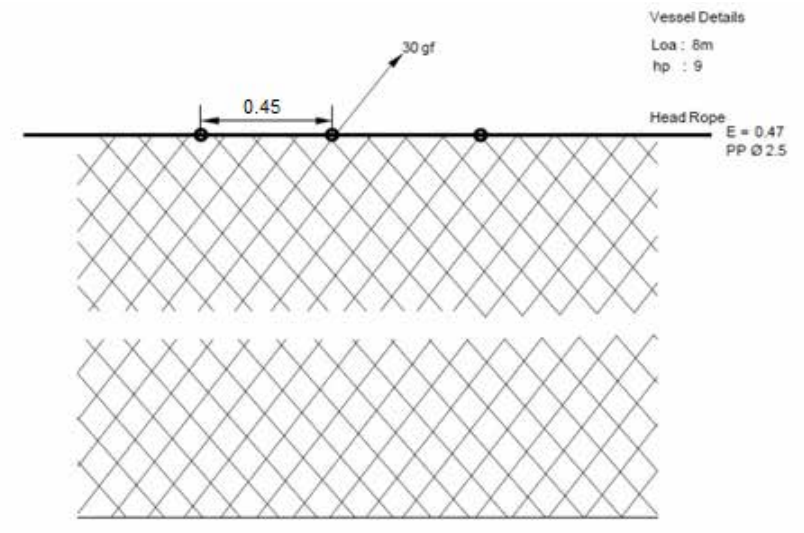


Figure - 2. Needlefish gillnet of Mundal, Mandapam and Pamban

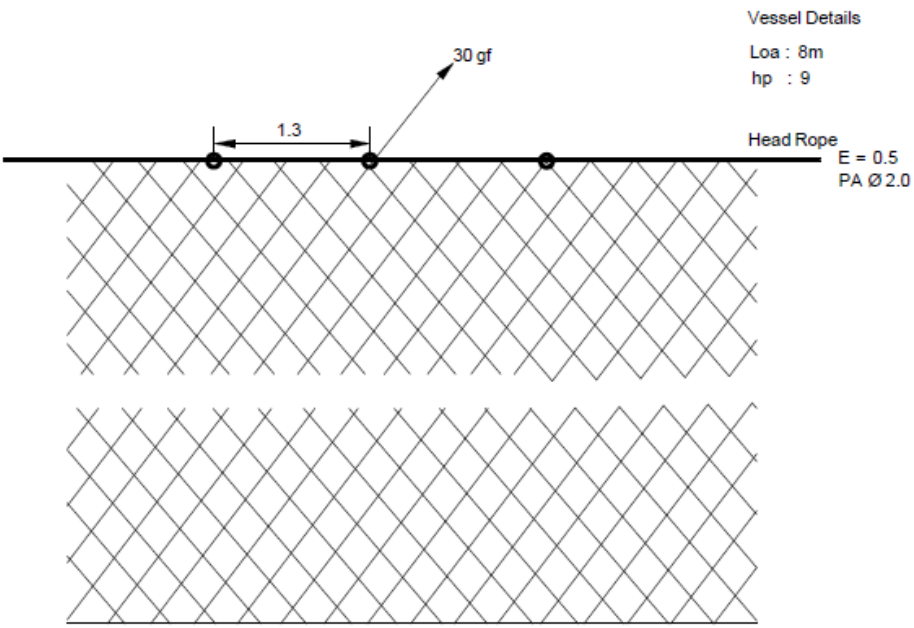
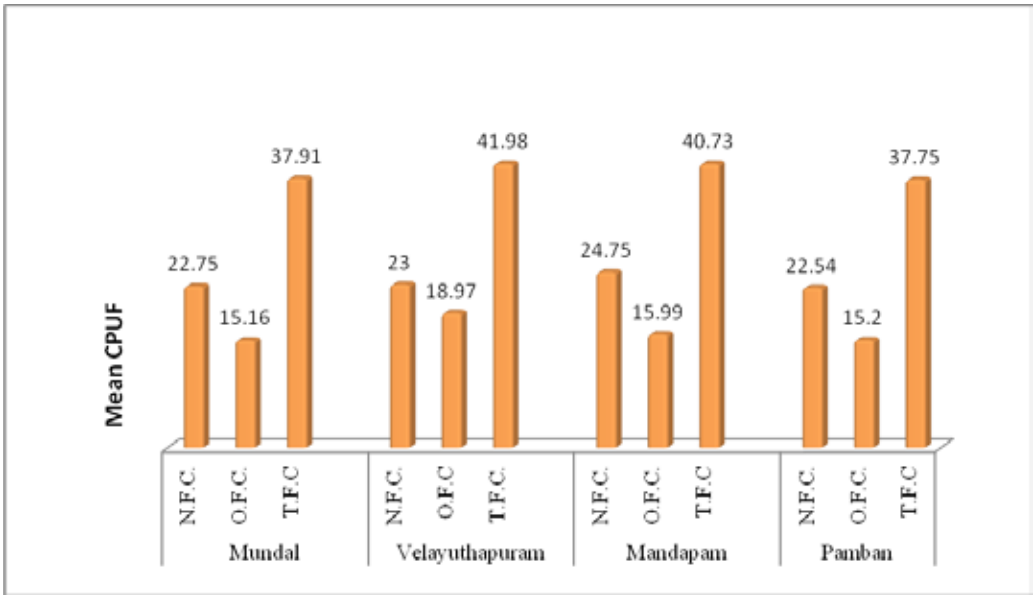


Figure - 3. Catch and effort particulars of Needlefish gillnets of different fishingvillages



Note: N.F.C – Needle fishes ; O.F.C – Other fishes ; T.F.C – Total fish catch

Mean CPUE = Average no. of fish caught / boat / day

Catch per unit effort

The catch composition of gillnets revealed that the mean CPUE of Needlefish ranged from 23 to 25 nos/boat/day while CPUE of all other commercially important fishes such as seer fish, barracudas, mackerels, flying fish, queen fish and sail fishes altogether ranged from 15 to 19 nos/boat/day. Further, the mean total fish catch ranged from 38 to 42 nos/boat/day. Hence, the pelagic drift gill nets are termed as Needle fish gill nets owing to the domination by Needlefishes

CONCLUSION

Higher abundance of Needlefishes along the coastal fishing villages of Ramanathapuram district was found to be due to wider continental shelf area bordered with coral reefs which serves as an ideal habitat for Needlefishes. Drift gillnetting was found to be an ideal fishing method for the capture of Needlefishes. However, the study suggests that developing pelagic longlines for the selective capture of Needlefishes is essential considering the rich resource of Needlefishes along the coast of Ramanathapuram district.

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