

Mesh selectivity and biological impact studies of west coast shrimp trawl fishery

P. A. A. T. Jayawardane

Marine Biological Resources Division, National Aquatic Resources Research and Development Agency

Recently concluded fisheries study in the Negombo lagoon and the associated coastal ecosystem indicated that most of the fishing gear targeting shrimps in the system exploit substantial amount of undersized individuals (<mean length at maturity) of commercially viable shrimps. Though it is an inevitable phenomenon that the fishing gear used in the estuarine environment exploit substantial quantities of juveniles, if the two types of trawls exploiting the parent populations of the same also take greater proportions of under size individuals, it is a crucial factor to be drawn immediate attention. Therefore, present investigation was conducted to estimate the selection ogives of the commercially viable shrimp/fish species for the existing trawl gears and also to determine the optimum mesh sizes to be used in the cod ends to ensure the existence of the shrimp resources in the western coastal waters of Sri Lanka. In addition, a relative yield per recruit analysis was also performed to evaluate the biological impact of trawling on the shrimp resources in the west coast.

Shrimp trawling is conducted by two types of crafts in the shallow seas off west coast, non-mechanized and mechanized trawlers operating on the grounds situated north and the south of the sea mouth of the Negombo lagoon respectively. The covered cod end method was used during the present study to investigate the selection properties of the two trawl gears. 45 fishing trials with non-mechanized trawlers (NMT) and 60 trials with mechanized trawlers (MT) were conducted in March/April and November/December periods of 2002 respectively. The cod end mesh sizes experimented with two craft types (non-mechanized and mechanized trawlers) were 16 (the existing cod end mesh size of the two trawl gears), 18, 20 and 26 mm and 16, 18, 20, 23 and 26 mm respectively. The operational depth varied from 5.4 – 9.9 and 6.3 – 12.6 m for non-mechanized and mechanized crafts respectively. The estimated mean true fishing time (duration of a haul) for non-mechanized trawlers was 27.16 minutes (SD = 10.98) while for mechanized trawlers the same was estimated at 29.56 minutes (SD = 7.35). The mean trawling speed was estimated at 3.43 km hr⁻¹ (SD = 0.57) for mechanized trawlers which was relatively

higher when compared to the similar estimation made for non-mechanized trawlers which was 1.7 km hr⁻¹ (SD = 0.18).

The estimated mean catch rates for the experimental fishing conducted using non-mechanized trawlers with 16, 18, 20 and 26 mm cod ends were 16.47, 5.13, 2.47 and 2.3 kg hr⁻¹ respectively. For same the mean catch rates for the cover were estimated at 0.02, 0.02, 0.1 and 0.53 kg hr⁻¹ respectively which were relatively low compared with the above. These values favorably compare with the estimated mean catch rates for the experimental fishing conducted using mechanized trawls with 16, 18, 20, 23 and 26 mm cod ends, which were 10.28, 6.76, 9.85, 2.73 and 11.85 kg hr⁻¹ respectively. However, for the same operations the estimated mean catch rates for cover were much higher indicating relatively improved releasing properties of the trawl gear used by mechanized trawlers.

The statistical analysis indicated that the estimated mean catch rates for fishing with both craft types on different days and also using different cod end mesh sizes were significantly different (P<0.05). In terms of non-mechanized trawlers the estimated mean catch rate for the experimental fishing with 16 mm cod end was significantly higher than the rest. On the other hand for mechanized trawlers the estimated mean catch rates for fishing with 16 and 26 mm stretched mesh cod ends were significantly higher than the same estimated for 23 mm (P<0.05).

The estimated 50% retention lengths and the selection ranges (cm) for the experimental fishing with different cod end mesh sizes

Species	Mesh size (mm)				
	16	18	20	23	26
NMT					
<i>M. dobsoni</i> (Male)			4.14 (1.5)		4.95 (2.14)
(Female)	4.59 (1.36)		4.05 (1.62)		3.64 (6.3)
<i>S. ruconius</i>	3.28 (0.35)				
<i>J. belangerii</i>			6.96 (3.43)		
MT					
<i>M. dobsoni</i> (Male)	2.43 (2.52)			4.77 (1.56)	5.36 (7.54)
(Female)	1.97 (2.93)			6.63 (2.45)	6.47 (4.22)
<i>P. coromandelica</i> (Male)	3.2 (2.74)	4.91 (3.06)		6.9 (1.88)	8.35 (9.13)
(Female)	2.76 (3.04)	4.99 (2.78)	6.97 (4.54)	6.95 (1.7)	4.71 (6.27)
<i>O tardoore</i>	4.03 (10.04)	5.58 (1.99)	6.83 (3.33)		10.63 (4.5)
<i>T. dussumieri</i>	4.03 (10.05)	5.86 (1.58)			10.34 (4.26)
<i>T. setirostris</i>		10.3 (5.42)		10.92 (4.59)	
<i>S. ruconius</i>	2.53 (1.57)	4.05 (1.53)	6.22 (4.16)		5.97 (1.36)
<i>S. insidiator</i>		5.28 (2.12)			4.46 (0.96)
<i>G. achlamys</i>	8.34 (1.77)				5.26 (9.47)

The outcome of the exercise clearly indicated that the estimated 50% retention lengths have been on an increasing trend with elevation of the mesh size though it appeared that the fishing with non-mechanized trawlers was not so productive compared to that with mechanized trawlers. It was also revealed that to increase the 50% retention length of *M. dobsoni* to 7 cm (>mean length at maturity) the existing mesh size of the cod end should be increased to 31 mm for males and 26 mm for females. In addition, for *P. coromandelica* the similar estimations were made on 23 and 20 mm respectively. The relative yield per recruit analysis performed using the estimated selection ogives of two shrimp species for mechanized trawlers also indicated that the estimated optimum exploitation level was highest for 23 mm cod end while lowest for 16 mm. Though it seems that further investigations are necessary for confirmation and also to gather more information on the selection properties of the trawl gear used by the non-mechanized trawlers, it is reasonable to conclude that it should be an advisable initiative to see the possibilities of increasing the existing mesh size of the cod ends of the trawl gears to ensure the existence of the shrimp resources in the seas off western coastal waters of Sri Lanka.