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Gillnet Selectivity of Small Cyprinids in Three Sri Lankan Reservoirs

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Abstract

As it has been reported that there is a harvestable potential of presently unexploited small cyprinid species in Sri Lankan reservoirs, attempts were made to investigate the gillnet selectivity for small cyprinids in three reservoirs with a view to defining regulatory measures for the subsidiary gillnet fishery. As exotic cichlids support profitable fisheries in reservoirs of Sri Lanka, any strategy to exploit small cyprinids should not adversely affect the cichlid stocks. Possibly due to the depth preference, exotic cichlids are not caught in small mesh (12.5 to 37 mm) gillnets which are set in the areas with water depths of over 2 m. The effective mesh sizes (stretched) of gillnet which were set in these areas were 16 and 20 mm for *Amblypharyngodon melettinus* and 33 and 37 mm for *Puntius chola* and *P. filamentosus*. Although *P. dorsalis* is caught in significant numbers in 50 and 60 mm mesh gillnets, this species is unlikely to be exploited without harming exotic cichlids because sub-adults of exotic cichlids are also caught in these mesh sizes. The importance of gillnet selectivity studies of small indigenous cyprinids in Sri Lankan reservoirs is discussed.

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Introduction

It has been estimated that by 2025, an additional 62 million tonnes of aquatic products will be required to maintain the present per capita consumption and that much of it will have to come from inland waters including reservoirs and small water bodies (Petr 1994). As small-sized fish species are known to occur in abundance in most tropical reservoirs (Ahmed et al. 2001; Jutagate et al. 2003; Roos et al. 2007), future demand for fish can be partly met by exploiting these untapped fish resources. Attempts that have been made to evaluate the harvestable potential of presently unexploited small cyprinid species, such as *Amblypharyngodon melettinus* (Val.) in Sri Lankan reservoirs (Amarasinghe 1985, 1990; De Silva and Sirisena 1987, 1989; Sirisena and De Silva 1988; Pet et al. 1996; Amarasinghe et al. 2002) undoubtedly contribute to fulfill this global need. These studies indicated that a small mesh (< 52 mm stretched mesh) gillnet fishery could be introduced to harvest presently unexploited small cyprinids which would co-exist with the large mesh (>8.5 cm stretched mesh) gillnet fishery of exotic cichlids (i.e. *Oreochromis mossambicus* and *O. niloticus*) which make the mainstay of the reservoir fishery of Sri Lanka. As juvenile stages of cichlids are known to prefer shallow, littoral areas in the lacustrine water bodies (Caulton and Hill 1973; 1975; Ribbink and Hill 1979), juveniles of exotic cichlids in Sri Lankan reservoirs are spatially segregated from the minor cyprinids (Pet et al. 1999; Ajith Kumara et al. 2008). Hence introduction of an additional gillnet fishery for minor cyprinids without harming juvenile cichlids is feasible (Amarasinghe 1985; De Silva and Sirisena 1987).

It is a fact that a well-managed fishery is expected to use gear types that catch most of the available species at sizes that do not undermine the sustainability. For introduction of a new fishery for minor cyprinids, reservoir fishers will essentially be involved so that scientific investigations are imperative to define exploitation methods which can be managed through fisheries regulations. Although De Silva and Sirisena (1987) and Pet et al. (1999) have made comparison of gillnet selectivity of small cyprinids and cichlids to investigate the feasibility of differential exploitation of small cyprinids without harming the cichlid fishery, no attempts have been made to investigate gillnet selectivity of small cyprinids with a view to defining regulatory measures. In the present study, attempts were made to investigate the gillnet selectivity for small cyprinids.

Materials and Methods

Studies were conducted in three Sri Lankan reservoirs (Minneriya, Udawalawe and Victoria). The locations of the three reservoirs are given in Ajith Kumara et al. (2009). For gillnet selectivity studies, fishes were sampled approximately bi-monthly from August 1998 to January 2001. On each sampling date, fishes were sampled using multi-mesh, mono-filament drifting gillnets (12.5, 16, 20, 25, 33, 37, 50, 60, 76 and 90 mm stretched mesh size). Dimensions and hanging ratios (Hamley 1975) of experimental gillnet used are given in table 1. Experimental gillnet fishing was carried out in about 2 m deep, inshore areas and in offshore areas exceeding 2 m water depth separately to investigate the spatial segregation of cichlids and minor cyprinids. Gillnets of mesh sizes 12.5 to 37 mm were exposed for about 1.5 hours during different time intervals of day time. Gillnets of other mesh sizes (50 to 90 mm) were exposed overnight (approximately 10 to 11 hrs) in each fishing operation. On each sampling visit, several gillnet fishing trials were carried out in order to obtain sufficient samples of dominant fish species.

Table 1. Hanging ratio, length, depth and area of net panel of gillnets of various mesh sizes used. Total numbers of hours of exposure for individual mesh gillnets are also given here.

Stretched mesh size (mm)	Hanging ratio	Length of net panel (m)	Depth of net panel (m)	Area of net panel (m^2)	Number of fishing trials	Total number of hours of exposure
12.5	0.5	10.7	2.1	22.5	183	233.11
16	0.5	10.7	2.1	22.5	289	373.83
20	0.5	15.0	1.5	22.5	207	245.55
25	0.5	15.0	1.5	22.5	199	241.95
33	0.5	15.0	2.0	30.0	239	376.12
37	0.5	18.7	2.0	37.5	152	197.13
50	0.5	28.0	2.0	56.0	197	1991.22
60	0.5	25.0	2.0	50.0	193	1940.0
76	0.5	21.0	2.0	42.0	136	1474.83
90	0.5	25.0	2.0	50.0	67	754.75

Mesh-wise catches in the fishing trials in inshore and offshore areas separately were sorted into species, counted and weighed to the nearest g *in situ* using a field balance. Catch per unit effort (CPUE) values, expressed as numbers per 100 m^2 of net per hour ($CPUE_{(N)}$) were estimated for each species. $CPUE_{(N)}$ were also estimated for cyprinids, cichlids and other species caught in gillnets in inshore and offshore areas separately. CPUE values, expressed as weight per 100 m^2 of net per hour ($CPUE_{(W)}$), were also estimated for each species caught in gillnets. The gillnet mesh sizes which had higher $CPUE_{(N)}$ of each of the species were considered as the effective mesh sizes for each dominant species.

Fish caught in each mesh were measured to the nearest mm for each species separately using a measuring board. Mesh-wise length frequency data of each species were adjusted for $CPUE_{(W)}$ as follows:

$$f_{adj} = f_{obs} * \frac{W}{CPUE_{(W)}} \quad (1)$$

where f_{adj} is the adjusted frequency; f_{obs} is the observed frequency; and W is the total weight of fish caught in the gillnet.

Gillnet selectivity patterns of the dominant fish species caught in small-mesh gillnets were determined from the Baranov-Holt method (Baranov 1914; Holt 1963; Hamley 1975). The logarithms of ratios of f_{adj} in overlapping ranges of two adjacent mesh sizes were related to mid-point of length class (L), which were of the following form (Hamley 1975).

$$\mathrm{Ln}\frac{C_2}{C_1} = a + bL \quad (2)$$

where C_1 and C_2 are f_{adj} in a length class in mesh sizes M_1 and M_2 respectively, and a and b are constants. The intercept (a) and the slope (b) of the equation 2 were used to determine optimal length for mesh size M_1 ($L_{opt(1)}$) and M_2 ($L_{opt(2)}$) as follows:

$$L_{opt(1)} = -\frac{2a(M_1)}{b(M_1 + M_2)} \quad (3a)$$

$$L_{opt(2)} = -\frac{2a(M_2)}{b(M_1 + M_2)} \quad (3b)$$

The standard deviation (SD) of both selection curves were estimated by;

$$SD = \sqrt{\frac{2a(M_1 - M_2)}{b^2(M_1 + M_2)}} \quad (4)$$

When there were two estimates each of L_{opt} and SD for a particular species in a given mesh size, mean values were taken. Using $L_{opt(1)}$, $L_{opt(2)}$

and SD values, probabilities of capture of length L, in each mesh size (P_1 and P_2) were estimated by the following equations.

For mesh size M_1: $$P_1 = -\frac{(L - L_{opt(1)})^2}{2SD^2} \quad (5a)$$

For mesh size M_2: $$P_1 = -\frac{(L - L_{opt(2)})^2}{2SD^2} \quad (5b)$$

Selection factor (SF) for each species for each mesh size was estimated as,

$$SF = \frac{L_{opt}}{\text{Mesh size}} \quad (6)$$ (Hamley 1975)

Results

Hanging ratios, dimensions, areas of net panels and periods of exposure for gillnets of individual mesh sizes are given in table 1. $CPUE_{(N)}$ values of minor cyprinids, cichlids and other species caught in different mesh gillnets in the inshore and offshore areas of Minneriya, Udawalawe and Victoria reservoirs, together with pooled data for all three reservoirs are given in table 2. They indicate that in gillnets of stretched mesh sizes smaller than 37 mm, cichlids are caught in insignificant numbers indicating the possibility of differential exploitation of small cyprinids using gillnets without harming the cichlid stocks in reservoirs.

Based on the percentage index of relative importance (%IRI) of fish species as estimated by the method of Kolding and Skaalevik (2007), *Amblypharyngodon melettinus*, *Puntius chola* and *P. filamentosus* were recognized as common species in all three reservoirs (Ajith Kumara et al. 2009). *P. dorsalis* was also caught in sufficient numbers in gillnets of 50 and 60 mm mesh sizes in Udawalawe reservoir. $CPUE_{(N)}$ of each of these species in gillnets of each mesh size (Fig. 1) indicated that the mesh sizes 12.5 to 25 mm were the most effective gillnet mesh sizes for *A. melettinus* while *R. daniconius* was effectively caught in 12.5 and 16 mm mesh gillnets. For *P. chola* and *P. filamentosus*, 33 and 37 mm mesh gillnets were most effective. In Victoria reservoir, *D. malabaricus* was effectively caught in 20, 25 and 33 mm mesh gillnets.

Table 2. Catch per unit effort (CPUE) ± SE values of minor cyprinids, exotic cichlids and other species caught in different mesh gillnets in inshore and offshore area of the three reservoirs. Pooled data for all three reservoirs are also given here.

Mesh size (mm)	Fish group	CPUE ± SE (Nos•100m^{-2}•hr^{-1})						
		Minneriya		Udawalawe		Victoria		All three reservoirs
		Inshore	Offshore	Inshore	Offshore	Inshore	Offshore	
12.5	Minor cyprinids	226.92±110.49	287.30±114.04	72.68±32.34	47.85±17.95	93.90±29.15	238.39±116.15	165.91±34.86
	Exotic cichlids	1.21±0.94	0.06±0.06	0	0	0	0	0.27±0.20
	Others	16.32±6.14	14.95±6.35	11.97±4.25	1.94±0.78	0.80±0.55	1.77±0.74	8.83±1.88
16	Minor cyprinids	335.86±103.04	296.91±92.51	216.56±89.41	218.10±58.73	240.06±73.68	101.69±18.14	209.69±25.92
	Exotic cichlids	1.02±0.57	1.49±0.31	3.10±2.34	0	0	0	0.49±0.24
	Others	9.32±1.09	2.64±0.98	2.10±0.86	0.18±0.13	1.07±0.87	0.64±0.26	2.28±0.67
20	Minor cyprinids	156.24±85.01	188.59±56.31	75.93±33.61	99.04±35.72	82.23±21.57	105.73±25.37	116.47±19.04
	Exotic cichlids	0.32±0.13	0.36±0.20	0.12±0.12	0.10±0.10	0	0	0.14±0.04
	Others	10.59±7.42	4.20±3.07	1.05±0.60	0.20±0.11	0.50±0.44	1.61±0.78	2.93±1.28
25	Minor cyprinids	136.70±59.82	148.01±57.32	51.57±21.26	52.55±19.54	100.82±33.58	128.55±32.45	101.65±15.91
	Exotic cichlids	0.93±0.51	0.54±0.39	0.33±0.29	0.05±0.05	0	0	0.29±1.03
	Others	3.74±2.68	3.06±1.25	0.06±0.06	0	2.62±1.67	2.16±1.36	1.84±1.18
33	Minor cyprinids	77.42±21.01	113.86±38.53	24.30±7.11	0.11±0.09	59.56±28.36	64.57±9.80	64.85±7.37
	Exotic cichlids	2.20±1.04	1.62±0.62	0.21±0.15	37.05±5.65	1.37±0.82	0	2.32±0.61
	Others	12.08±10.34	1.47±0.75	0.33±0.33	0.04±0.04	0	0.09±0.05	1.67±1.18
37	Minor cyprinids	43.54±15.98	34.08±9.55	22.57±7.16	24.78±5.86	28.28±11.72	45.53±9.27	35.45±4.45
	Exotic cichlids	2.69±1.35	2.80±1.53	0.06±0.06	0.04±0.04	0	0	1.00±0.36
	Others	1.73±0.94	0.88±0.39	0.09±0.06	0.26±0.19	0	0	0.54±0.19
50	Minor cyprinids	0.63±0.11	0.33±0.11	0.75±0.25	1.69±0.34	0.93±0.22	1.04±0.36	0.95±0.11
	Exotic cichlids	3.46±1.02	2.02±0.68	0.19±0.08	0.31±0.09	1.05±0.17	1.34±0.35	1.56±0.29
	Others	0.46±0.09	0.30±0.12	0.06±0.04	0.18±0.07	0.03±0.01	0.05±0.03	0.21±0.03
60	Minor cyprinids	0.41±0.08	0.68±0.36	0.41±0.13	1.04±0.23	0.64±0.23	0.83±0.36	0.68±0.09
	Exotic cichlids	3.23±1.08	1.44±0.39	0.18±0.05	0.40±0.14	2.85±1.72	1.51±0.37	1.84±0.44
	Others	0.20±0.04	0.26±0.09	0.08±0.06	0.23±0.06	0.27±0.26	0.04±0.03	0.21±0.05
76	Minor cyprinids	0.01±0.01	0.04±0.02	0.06±0.04	0.49±0.19	0.13±0.07	0	0.12±0.04
	Exotic cichlids	36.7616.48	1.52±0.67	0.06±0.03	0.22±0.06	0.33±0.06	0.71±0.21	11.64±5.20
	Others	0.04±0.01	0.21±0.14	0.01±0.01	0.01±0.01	0	0.04±0.03	0.04±0.02
90	Minor cyprinids	0.003±0.02	0	0.29±0.03	0.48±0.21	0	0.10±0.06	0.09±0.04
	Exotic cichlids	0.06±0.34	0.38±0.19	0	0.07±0.04	0.16±0.12	0.30±0.24	0.14±0.04
	Others	0.01±0.04	0.10±0.10	0	0	0	0	0.01±0.00

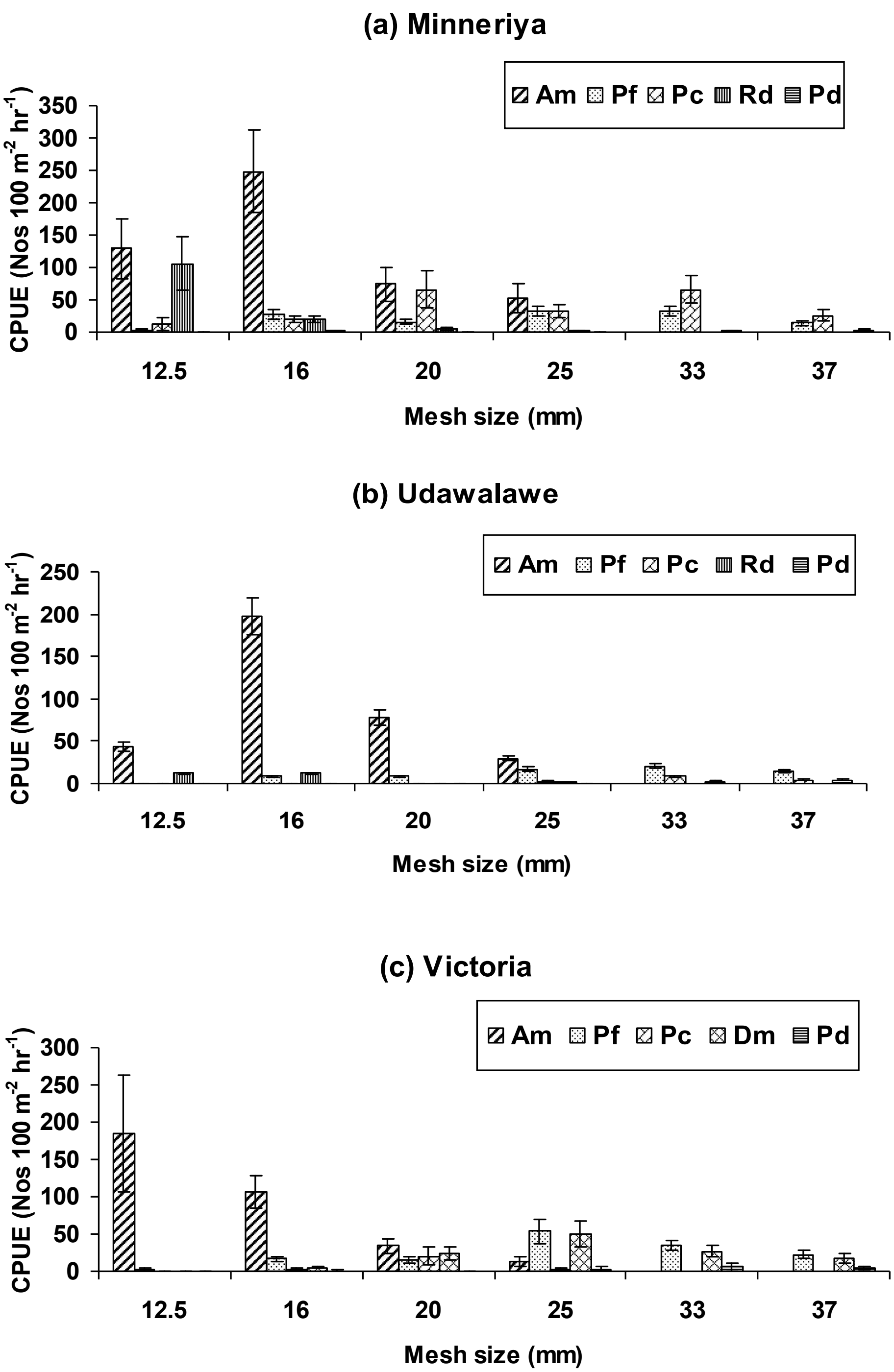

Figure 1. Catch per unit effort (CPUE) values of different species in gillnets of different mesh sizes in the three reservoirs. Am – *A. melettinus*; Pc – *P. chola*; Pf – *P. filamentosus*; Pd – *P. dorsalis*; Rd – *R. daniconius*; Dm – *D. malabaricus*.

For gillnet selectivity studies using Baranov-Holt method, *A. melettinus*, *P. chola* and *P. filamentosus* were caught in sufficient numbers in all three reservoirs. In addition, *P. dorsalis* was also caught in 33, 37, 50 and 60 mm mesh gillnets in Udawalawe reservoir. Gillnet catches of these four species were treated for selectivity studies.

The relationships of Ln catch ratios of f_{adj} of fish species in the overlapping ranges of gillnets of adjacent mesh sizes (Ln C_2/C_1) to mid-points of length classes are shown in figure 2. The regression relationships of Ln C_2/C_1 against mid-length and size ranges of fish used are given in table 3. As all regression relationships are significant at least at 0.05 probability level, the normal spread model is appropriate for the gillnet selection for all mesh sizes. The estimated optimal lengths, selection factors, standard deviations of selection curves and corresponding selection ranges of the cyprinid species for each mesh size of gillnets in three reservoirs are given in table 4. The gillnet selection curves for cyprinid species in the three reservoirs are shown in figure 3. The relationships between the optimal length and the gillnet mesh size for *A. melettinus*, *P. chola*, *P. filamentosus* for the data pooled in all three reservoirs and *P. dorsalis* in Udawalawe reservoir are given in table 5 and graphically shown in figure 4.

Discussion

In view of reducing non-target catches in many world's fisheries, gillnets are disreputed due to the reason that being a static gear, gillnets take a wide variety of species. However, catch efficiencies in gillnets are known to be influenced by several biotic factors, including fish morphology, behaviour and distribution of fish. From the present study, it is evident that small mesh (< 37 mm stretched mesh size) gillnets can be used in Sri Lankan reservoirs to differentially exploit small cyprinids without harming juveniles of cichlid stocks. Furthermore, even among the small cyprinids, possibly due to the differences in body morphology and activity patterns, differential exploitation of cyprinids is possible using gillnets of different mesh sizes as shown by the present analysis. For example, *A. melettinus* can be effectively caught in the gillnets of mesh sizes 16 and 20 mm whereas *P. chola* and *P. filamentosus* can be exploited using 33 and 37 mm mesh gillnets. *A. melettinus* is known to be active during non feeding period (Hofer et al. 2003) and their diel feeding pattern (Weliange et al. 2006) also indicates that their feeding time and peak activity period of getting caught in gillnets do not overlap. For these reasons, local fisheries in inland reservoirs of Sri Lanka pave way to introduce new

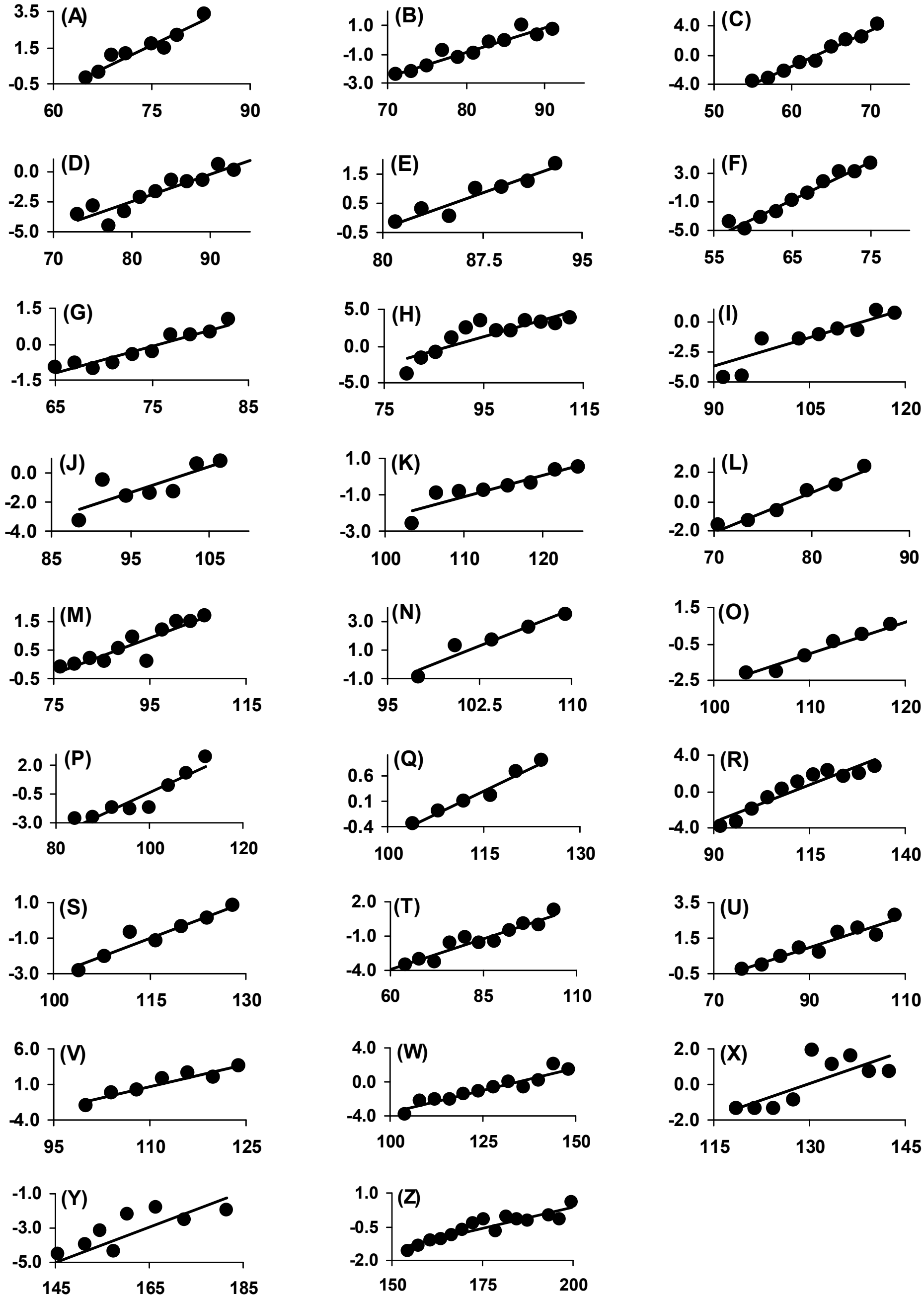

Figure 2. The relationships of Ln catch ratios of fish species in the overlapping ranges of gillnets of adjacent mesh sizes (vertical axes) to mid-points of length classes (horizontal axes in mm). The regression equations and significance levels are given in table 3.

Table 3. The regression relationships of Ln C_2/C_1 (Y) against mid-length (L in mm) and size ranges of fish used. r = correlation coefficient; p = probability level. The relevant figure numbers are also indicated here.

Species/ Reservoir	Net combi-nation (mm)	Length range consid-ered (mm)	Regression relationship	r	p	Fig-ure No.
A. melettinus						
Minneriya	16/12.5	65-83	Y = 0.1735L-11.956	0.960	<0.001	2A
	20/16	71-91	Y = 0.1681L-14.304	0.952	<0.001	2B
Udawalawe	16/12.5	55-71	Y = 0.4860L-30.763	0.990	<0.001	2C
	20/16	73-95	Y = 0.2249L-20.500	0.920	<0.001	2D
	25/20	81-93	Y = 0.1603L-13.182	0.955	<0.001	2E
Victoria	16/12.5	57-75	Y = 0.5315L-35.292	0.981	<0.001	2F
	20/16	65-83	Y = 0.1139L-8.634	0.951	<0.001	2G
P. chola						
Minneriya	33/25	79-113	Y = 0.1899L-16.711	0.856	<0.001	2H
	37/25	88-119	Y = 0.1589L-18.055	0.875	<0.001	2I
Udawalawe	33/25	88-107	Y = 0.1762L-18.101	0.813	<0.05	2J
	37/33	103-125	Y = 0.1199L-14.297	0.909	<0.002	2K
Victoria	20/16	70-86	Y = 0.2748L-21.337	0.984	<0.001	2L
	25/20	76-107	Y = 0.0629L-5.054	0.920	<0.001	2M
	33/25	97-110	Y = 0.3367L-33.203	0.963	<0.01	2N
	37/33	103-122	Y = 0.1741L-20.231	0.976	<0.001	2O
P. filamentosus						
Minneriya	33/25	84-112	Y = 0.1878L-19.169	0.932	<0.001	2P
	37/25	104-124	Y = 0.0607L-6.6819	0.984	<0.001	2Q
Udawalawe	33/25	92-132	Y = 0.1658L-18.377	0.940	<0.001	2R
	37/33	104-128	Y = 0.1386L-16.959	0.960	<0.001	2S
Victoria	20/16	64-104	Y = 0.1079L-10.427	0.957	<0.001	2T
	25/20	76-108	Y = 0.0884L-7.008	0.962	<0.001	2U
	33/25	100-124	Y = 0.2098L-22.365	0.949	<0.002	3V
	37/33	104-148	Y = 0.1084L-14.543	0.951	<0.001	2W
P. dorsalis						
Udawalawe	37/33	118-137	Y = 0.1243L-16.105	0.751	<0.02	2X
	50/37	136-182	Y = 0.1041L-20.089	0.870	<0.005	2Y
	60/50	154-200	Y = 0.0375L-7.127	0.920	<0.001	2Z

fisheries to exploit non-exploited fish resources, using gillnet. The present study substantiates the previous findings that small cyprinids in Sri Lankan reservoirs can be differentially exploited using gillnets without posing a threat to cichlid stocks which are presently supporting profitable fisheries (Amarasinghe 1985; De Silva and Sirisena 1987; Pet and Piet 1993). *P. dorsalis* is however, caught in significant numbers in gillnets of mesh sizes 50

Table 4. The estimated optimal lengths, selection factors (SF), standard deviations of selection curves (SD) and corresponding selection ranges of the cyprinid species for each mesh size of gillnets in three reservoirs.

Reservoirs/Species	Mesh size (mm)	Optimal length (mm)	SF	SD	Selection range (mm)
Minneriya					
A. melettinus	12.5	57.4	4.59	9.6	48-67
	16	74.6	4.66	10.1	64-85
	20	94.6	4.73	10.6	84-105
P. chola	25	75.9	3.03	11.3	65-87
	33	103.6	3.14	10.2	93-114
	37	120.1	3.25	9.0	111-129
P. filamentosus	25	88.0	3.52	12.3	76-100
	33	110.0	3.33	13.3	97-124
	37	116.4	3.15	14.4	102-131
Udawalawe					
A. melettinus	12.5	55.5	4.44	5.7	50-61
	16	76.1	4.75	7.6	68-84
	20	87.2	4.36	8.2	79-95
	25	91.4	3.66	10.7	81-102
P. chola	25	88.6	3.54	12.7	76-101
	33	114.7	3.48	11.7	103-126
	37	126.1	3.41	10.7	115-137
P. filamentosus	25	101.2	4.05	16.6	85-118
	33	120.8	3.66	11.8	109-133
	37	129.4	3.50	10.1	119-139
P. dorsalis	33	120.4	3.65	8.4	112-129
	37	144.2	3.90	18.0	126-162
	50	202.7	4.05	29.0	174-232
	60	207.3	3.46	30.4	177-238
Victoria					
A. melettinus	12.5	58.3	4.66	5.5	53-64
	16	71.0	4.44	8.9	62-80
	20	106.2	5.31	11.7	95-118
P. chola	25	87.1	3.49	12.9	74-100
	33	110.9	3.36	8.9	102-120
	37	122.8	3.32	8.7	114-132
P. filamentosus	16	86.0	5.37	14.1	72-100
	20	89.5	4.28	14.1	75-104
	25	106.9	3.60	13.0	94-120
	33	132.9	4.03	11.9	121-145
	37	141.8	3.83	11.9	130-154

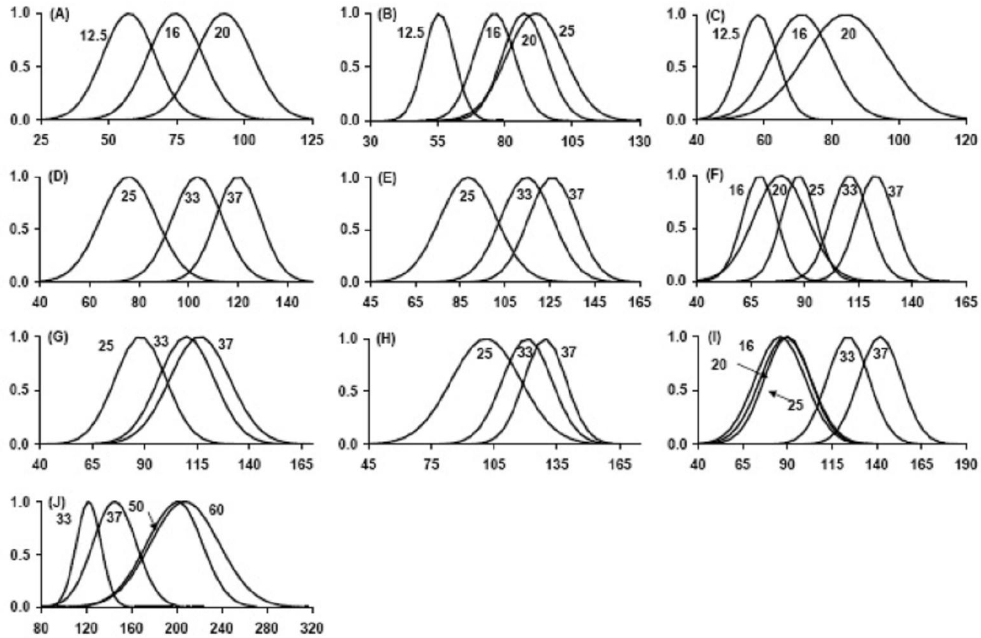

Figure 3. Gillnet selection curves of fish species in the three reservoirs studied. (A) *A. melettinus* in Minneriya; (B) *A. melettinus* in Udawalawe; (C) *A. melettinus* in Victoria; (D) *P. chola* in Minneriya; (E) *P. chola* in Udawalawe; (F) *P. chola* in Victoria; (G) *P. filamentosus* in Minneriya; (H) *P. filamentosus* in Udawalawe; (I) *P. filamentosus* in Victoria; (J) *P. dorsalis* in Udawalawe. Vertical axes – Probabilities of capture; Horizontal axes – Total length in mm. Mesh sizes (in mm) corresponding to individual selection curves are also indicated here.

Table 5. The regression relationships of optimal length (mm) against mesh size (mm) of gillnet. r = correlation coefficient; p = probability level. Here, data for *A. melettinus*, *P. chola* and *P. filamentosus* are pooled for all three reservoirs. Data for *P. dorsalis* are for Udawalawe reservoir. The relevant figure numbers are also indicated here.

Species/ Reservoir	Regression relationship (Y = Optimal length; X = mesh size)	r	p	Figure No.
A. melettinus	Y = 3.6483X + 15.0260	0.871	<0.002	4A
P. chola	Y = 3.2571X + 2.3905	0.965	<0.001	4B
P. filamentosus	Y = 2.2792X + 44.6630	0.878	<0.001	4C
P. dorsalis	Y = 3.3288X + 18.8530	0.954	<0.05	4D

and 60 mm, which are also effective for sub-adults of exotic cichlids. As such, *P. dorsalis* cannot be differentially exploited using gillnets in Sri Lankan reservoirs. Pet et al. (1999) have also shown that differential exploitation is more feasible using gillnets of 15 and 20 mm mesh sizes for *A. melettinus*.

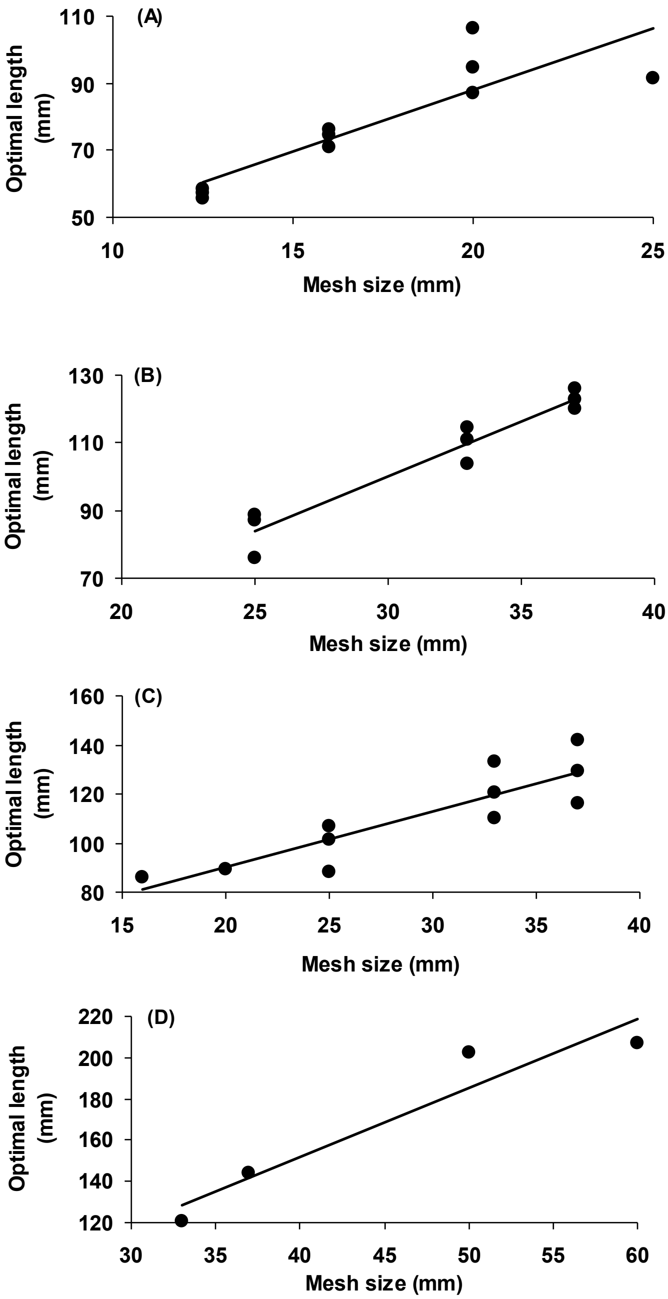

Figure 4. The relationships between optimal lengths in mm (vertical axes) to the gillnet mesh sizes in mm (horizontal axes) of fish species caught in the three reservoirs. The regression equations and significance levels are given in table 5. Note: Data for *A. melettinus*, *P. chola* and *P. filamentosus* are pooled for all three reservoirs. Data for *P. dorsalis* are for Udawalawe reservoir.

It is known that gillnets are standard gear that can be used for general use in sampling fish in inland waters (Hamley 1980). Furthermore, gillnetting is a convenient method of fishing requiring less effort in operation than many forms of other gear (Craig et al. 1985). The disadvantages are however, that gillnets are passive so that the catches depend on the various biological factors which influence behaviour of the fish such as food availability, temperature, maturation state, etc. (Craig et al. 1985; Gray et al. 2005). This disadvantage of gillnets for depending on behaviour of fish for its catch efficiencies in small cyprinids in Sri Lankan reservoirs can nevertheless be treated as an advantage. This is because small cyprinids can be caught in gillnets in offshore areas of reservoirs based on the fact that juvenile cichlids occupy shallow (<1.5 m water depth) areas due to their depth preference with size (Caulton and Hill 1973; Ribbink and Hill 1979).

Gillnet selectivity patterns of small cyprinids in Sri Lankan reservoirs, as determined by the present study, are necessary for two main reasons. First, optimal length of fish species in different mesh gillnets is important for establishing regulations for minimum capture sizes from the new fishery that will be established to exploit small cyprinids. Secondly, the probabilities of capture in gillnets are needed to make adjustments to the length frequency data before treating in length based stock assessment methodologies. Although there were no sufficient observations to relate optimal lengths of fish to mesh sizes, except *A. melettinus* in Udawalawe and Victoria, statistically significant relationships were evident between two variables. Therefore gillnet mesh sizes can be deduced corresponding to optimal sizes of first capture which can be determined independently using length-based stock assessment methodologies (Gayanilo et al. 2006). Hence, the present analysis has a potential use for defining management strategies for the subsidiary fishery that has to be introduced to exploit the untapped fishery resources in Sri Lankan reservoirs.

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