



Note

Catch and size composition of *Eetroplus suratensis* (Bloch, 1790) from Kumarakom region of Vembanad Lake, India

L. BINDU^{1,2} AND K. G. PADMAKUMAR³

¹Regional Agricultural Research Station, Kerala Agricultural University, Kumarakom - 686 566, Kerala, India

²Post Graduate Department of Zoology, M. S. M. College, Kayamkulam, Alappuzha - 690 502, Kerala, India

³International Research and Training Centre for Below Sea Level Farming, Kuttanad, Thottappally Alappuzha - 688 561 Kerala, India

e-mail: bindukylm@gmail.com

ABSTRACT

The present study investigated catch and size composition of *Eetroplus suratensis* (Bloch, 1790), based on the data collected from two main fishing practices common in the Vembanad Lake, South India. Both the fishing practices viz., gillnetting and scare line fishing were in vogue round the year and the landings showed considerable variations. *E. suratensis* constituted 49% of the gillnet landings, while scare line fishing is exclusively for this species. In Kumarakom region of the lake, the estimated annual landings of *E. suratensis* by scare line and gillnet varied from 14,369 to 30,232 kg and 1,747 to 2,142 kg respectively during the study period. Size distribution studies showed that young ones constituted a significant proportion of gillnet landings, whereas subadults and adult fishes were more in scare line catch. Length-weight relationship showed isometric growth pattern with b values of 2.890 and 2.700 for gillnet and scare line fishing respectively.

Keywords: Catch composition, *Eetroplus suratensis*, Gillnet, Scare line, Vembanad Lake

Eetroplus suratensis (Bloch 1790), is one of the largest among the three indigenous cichlids found in Peninsular India. The backwaters of Kerala are the potential source of its seed. This commercially important species is a symbol of delicacy in the backwater tourism and treated as the 'state fish' of Kerala (Padmakumar *et al.*, 2012). The fish was reported to constitute almost 10% of the total landings from these backwaters during 1960's (George and Sebastian, 1970). On account of their unique colouration and remarkable patterns, they are also valued as an ornamental fish.

Previous research on this endemic species focused on its biology (Jayaprakas, 1980; Vijayaraghavan *et al.*, 1981; Jayaprakas *et al.*, 1990; Bindu and Padmakumar 2008, 2014), reproduction (Padmakumar *et al.*, 2009a, 2012), phylogenetic diversity (Sachithanandam *et al.* 2012) and culture (Padmakumar *et al.*, 2009b). Fishery of this species in Vembanad Lake was documented by Unnithan *et al.* (2001) and Padmakumar *et al.* (2002). There has been no available information on the size of *E. suratensis* from diverse fishing methods of Vembanad Lake. The fishery of *E. suratensis* is almost year round in the Vembanad Lake (9°30' - 10°12' N; 76°10' -6° 30' E) and supported predominantly by two fishing practices viz., scare line fishing during daylight hours and gillnetting in night hours (Bindu, 2006). Day and night catches exhibit considerable variations. The present paper provides catch

and size composition of *E. suratensis* from gillnet and scare line catches in the Vembanad Lake.

Diverse gears were used for fishing in the Vembanad Lake and the differences noticed in the fishing activity have a direct bearing on the dissimilarity observed in the resources. A salt water regulator at Thanneermukkom divides the estuarine system into a brackishwater lagoon on the north and a freshwater lake on the south. Gillnet contributed the major part of fish landings in the southern sector of the Vembanad Lake (Menon *et al.*, 2000). A survey on the *E. suratensis* fishery in the Kumarakom region was carried out during the period 2003-2005 based on the actual landings recorded by two main co-operative societies of the area; one was exclusively for scare line fishing and the other for gillnetting. Daily data on catch and effort of *E. suratensis* from gillnet (2003-2005) and scare line fishing (2003-2005) were collected. The day's catches were pooled and raised to corresponding months. Catch per unit effort (CPUE, kg per craft per day) was calculated by adjusting the catch data using the number of fishing days recorded. Seasonal variations in catches from the two fishing methods for three years (2003-2005) were also calculated. Seasons were divided into pre-monsoon (February-May), monsoon (June-September) and post-monsoon (October-January). Total length (L_T) and total weight (W_T) of the fishes from gillnetting (N=1715) and scare lining (N=1223) were measured on a monthly basis

from the fish landing centre itself. They were grouped into different size classes and assessed the percentage of occurrence in each class. The size composition of *E. suratensis* in scare line fishing was compared with that of gillnet landings. Results were expressed as Mean±Standard Deviation. Length–weight relationship (*LWR*) was derived for both gillnet and scare line collections separately using the equation $W = a L^b$ (Le Cren, 1951) and the data were analysed using regression analysis.

The annual landings of *E. suratensis* by scare line was 22182.23±7934.35 kg and that of gillnet was 1915.62±203.50 kg (Table 1). Higher catches were observed during pre-monsoon and post-monsoon months, while during monsoon, a decline in catch was perceptible (Fig. 1). Fishing days were also less during these periods. The average effort expended for scare line in a year was 226 and that for gillnet was 211 fishing days. Fishing activity was at its peak during the pre-monsoon months. The reduction in total catch during the monsoon period was due to bad weather and the prolific spreading of the aquatic weeds *Eichhornia crassipes* and *Salvinia molesta*, which hinder the fishing activity during this season. A detailed evaluation of the catch trend of *E. suratensis* in the Kumarakom region during the period 2003-2005, revealed a perceptible reduction by 40%, both in terms of production and catch per unit effort (CPUE). A marked decline in CPUE from 18.8 to 13.8 kg for scare line fishing and from 2.65 to 2.38 kg for gillnetting was also apparent (Fig. 2) in these places. In gillnet catches, *E. suratensis* constituted 49% of the total.

Size variations of *E. suratensis* in the monthly collections of gillnet and scare line fishing are provided in Table 2. Length-frequency distribution of fishes,

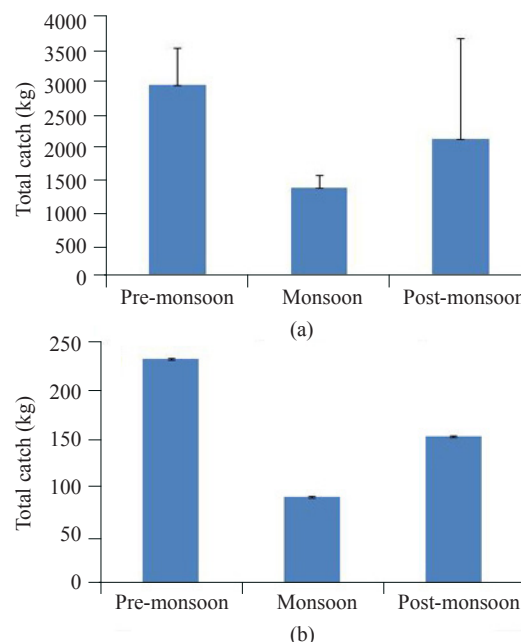


Fig. 1. Seasonal variation in total landings (Mean±SD) of *E. suratensis* from (a) scare line and (b) gillnetting during 2003-2005

revealed that only fishes between 10 and 25 cm were highly vulnerable to commercial gears (Fig. 3). Smaller fishes (<15 cm) dominated in gillnet collections (17.5%) as compared to scare line catches (3.6%). With the boom in backwater tourism, the demand for pearlspot is on the increase and is exploited to the maximum. This is evident from the decline in average size of this species in catches

LWR is an important parameter which provide estimate of the weight at a given length or *vice versa*. In *E. suratensis*, *b* value was more or less similar in both

Table 1. Total landings and total fishing days expended for *E. suratensis* (Mean±SD) in scare line and gillnet fishing (2003-05) from the Kumarakom region of the Vembanad Lake

Month	Monthly landings (kg)		Fishing days	
	Scare line	Gillnet	Scare line	Gillnet
Jan.	3611.5±819.97	442.43±152.52	26.00 ± 1.00	28.33±3.79
Feb.	2877.9±302.54	499.92±70.07	20.33±1.53	27.00±1.73
Mar.	3378.8±941.50	296.92±31.24	23.67±1.53	27.00±1.00
Apr.	2223.9±696.72	47.13± 41.04	22.33±0.58	14.00±12.12
May	2250.8±1120.51	95.98±84.27	19.67±2.08	17.33±15.04
Jun.	1365.0±1342.69	81.87±72.31	13.00±6.08	14.67±5.51
Jul.	680.1±474.33	71.42±75.51	10.67±6.11	14.33±8.50
Aug.	1253.2±540.55	92.57±94.33	15.67±4.04	18.67±7.23
Sep.	1054.9±569.17	115.45±122.80	14.67±7.09	14.67±8.50
Oct.	453.8±276.46	52.03±40.32	8.67±4.73	14.00±9.64
Nov.	819.6±618.44	10.58±13.96	13.67±7.02	4.00±4.00
Dec.	2212.6±863.76	109.32±29.19	25.00±3.46	17.33±6.03
Total	22182.2±793.4	1915.62±203.50	213.33±32.25	211.33±7.02

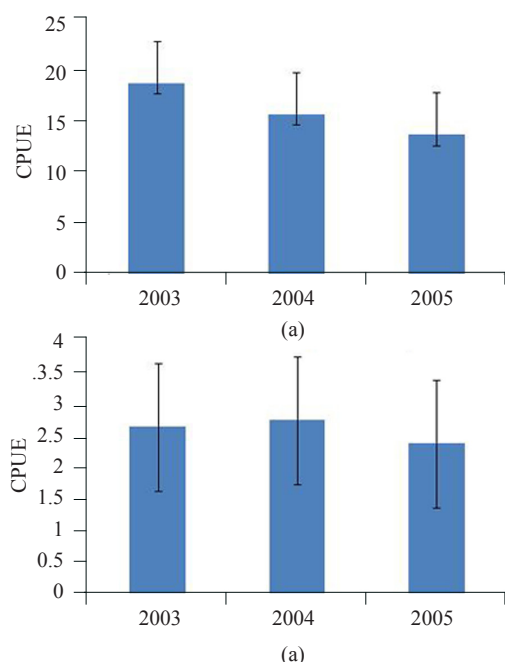


Fig. 2. CPUE (kg) of *E. suratensis* in (a) scare line and (b) gillnet fishing during 2003-2005

the sexes and was only marginally higher in case of male, whereas in case of juveniles, the value was much lower than the isometric value (Bindu, 2006). The value of *b*, less than 3, ranging between 2.89 and 2.70 in the present observation for scare line and gillnet respectively (Fig. 4), indicated that the *LWR* in *E. suratensis* exhibited only slight variations from isometric growth pattern, similar to that reported for this species in Veli Lake (Jayaprakas,1980). The maximum size observed during the period was 37 cm (1.2 kg), from the scare line collections of Vembanad Lake. Panicker (1924) reported a maximum size of over 30 cm (1.35 kg) from Ashtamudy waters.

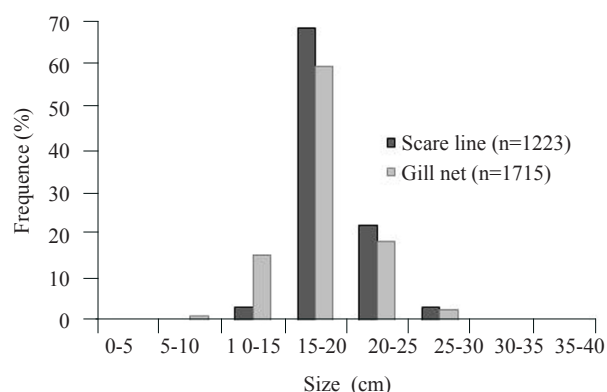


Fig. 3. Size frequency distribution of *E. suratensis* in gillnet and scare line catches

Total catch of *E. suratensis* from the backwaters of Kerala was reported to vary from 2,402 to 3,907 t per annum and the per hectare productivity in Vembanad is many times higher than that of Chilika and Kolleru lakes (Sultana *et al.*, 1995). A comparison of production of *E. suratensis* in different peninsular coastal systems also indicate that the species constitute almost 10.76 to 13.06% of the total inland catches of Kerala, as compared to mere 0.1% of the landings in lake Kolleru (Sultana *et al.*, 1995). Unnithan *et al.* (2001) reported a production of 46.9 and 52.77% respectively of the total catches during 1995-97 from Vembanad Lake, south of the Thanneermukkom Barrage. Padmakumar *et al.* (2002) reported only 154.6 t (50%) and 163.6 t (48%) respectively from a larger region extending upto Vaikom on the north which tells on the rapidly declining trend of pearlspot production in the lake. The present findings were in conformity with the earlier reports that *E. suratensis* continues to contribute up to 46% of the total fish production. The catches were highest in the Kumarakom zone, contributing almost

Table 2. Size variation of *E. suratensis* (Mean±SD) in scare line fishing and gillnet fishing during 2003-2005

Month	Scare line fishing (T _N -1223)		Gillnet fishing (T _N -1715)	
	L _T (cm)	W _T (g)	L _T (cm)	W _T (g)
Jan.	17.62 ± 2.05	142.03 ± 60.49	16.74 ± 3.25	124.19 ± 74.64
Feb.	19.33 ± 3.13	197.74 ± 107.69	18.48 ± 3.63	164.88 ± 129.53
Mar.	18.51 ± 2.80	187.75 ± 91.02	18.77 ± 3.00	161.64 ± 70.89
Apr.	18.43 ± 2.81	186.3 ± 94.80	18.65 ± 3.74	153.13 ± 109.13
May	18.2 ± 3.33	188.13 ± 101.95	16.43 ± 2.64	137.96 ± 69.34
Jun.	18.73 ± 2.32	183.16 ± 73.51	18.12 ± 2.94	167.86 ± 83.02
Jul.	19.11 ± 3.12	191.99 ± 93.80	17.29 ± 2.65	142.91 ± 63.42
Aug.	18.7 ± 2.89	185.95 ± 89.39	17.1 ± 2.49	127.58 ± 69.60
Sept.	19.12 ± 2.90	217.44 ± 112.23	16.78 ± 3.61	123.67 ± 112.63
Oct.	21.45 ± 2.92	194.76 ± 97.38	17.89 ± 4.75	157.39 ± 119.92
Nov.	17.58 ± 1.78	145.87 ± 49.12	18.1 ± 3.28	163.79 ± 88.05
Dec.	19.28 ± 3.46	196.67 ± 114.17	18.15 ± 3.20	162.75 ± 85.50

T_N: Total number

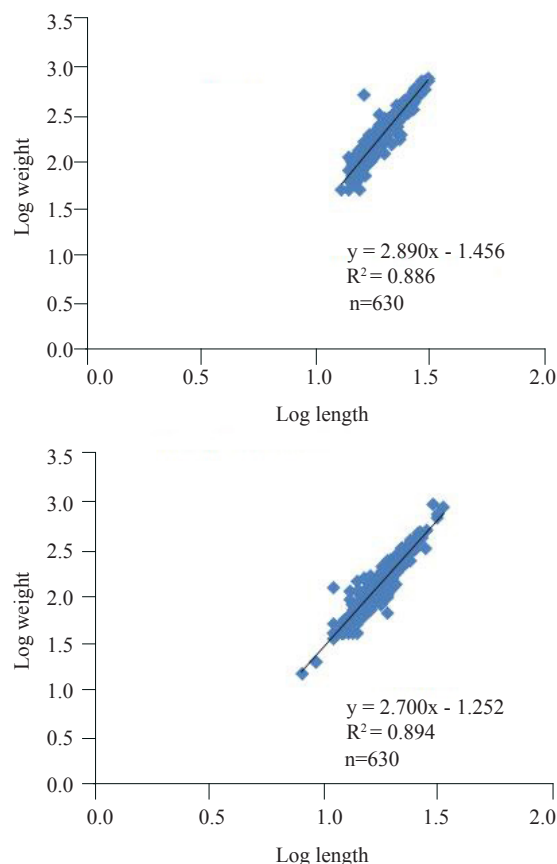


Fig. 4. Length-weight relationship of *E. suratensis* in (a) scare line and (b) gillnet catches

48% of the total landings of this species in the lake (Padmakumar *et al.*, 2002). The observed CPUE of 2.38 kg day⁻¹ in gillnetting, agrees with the values observed (2.05) during 1996-1997 (Unnithan *et al.*, 2001). But the drastic fall in CPUE during the study period indicated its overexploitation. Similar to the present observations, Unnithan *et al.* (2001) and Padmakumar *et al.* (2002) also observed peak fishing and maximum landings of *E. suratensis* from January to March.

A comparison of the diurnal variation in catches of *E. suratensis* indicates that the contribution of gillnet fishery was small as compared to scare line fishing. *E. suratensis* is a visual feeder and hence, naturally higher catches are obtained in daylight hours (De Silva *et al.*, 1984). This diurnal variation in catches also confirm the pattern of diurnal feeding.

In *padal fishing* (Thomas and Kurup, 2004), fishes of all size groups including young ones are aggregated by providing refuges and aggregating devices and harvested by employing encircling gears. Similarly, a more recent development promoted by certain non-governmental agencies to set up 'mini sanctuaries' and refuges in the

open lakes in near shore areas for fish enhancement is without any protective reefs and exposed to wanton fishing. In scare lining, only 36% are mating and brooding fishes and a vast majority of feeding fishes (Bindu, 2006), which indicate that this fishing practice, is not as serious and disastrous as compared to other methods. Large sized fishes are selectively harvested after driving and scaring by a team of expert scarers and divers where in a particular species alone is caught by following their unique 'self protection' response without use of any known nets or gears. This method of fishing has become a unique attraction to water tourism growing in the region.

Acknowledgements

We are indebted to the Indian Council of Agricultural Research (ICAR), New Delhi for financial assistance under the National Agricultural Technology Project (NATP) and to the Kerala Agricultural University, India for the facilities provided during the study. We are also grateful to the staff of the Regional Agricultural Research Station, Kumarakom for their help and cooperation in the field investigations.

References

- Bindu, L. 2006. *Captive breeding protocols of two potential cultivable fishes, Etroplus suratensis (Bloch) and Horabagrus brachysoma (Gunther) endemic to the Western Ghat region, Kerala*. Ph. D. thesis. Mahatma Gandhi University, Kerala, India, 217 pp.
- Bindu, L. and Padmakumar, K. G. 2008. Food and feeding of the pearlspot, *Etroplus suratensis* (Bloch) from the Vembanad Lake, Kerala. *J. Mar. Biol. Ass. India*, 50(2): 156-160.
- Bindu, L. and Padmakumar, K. G. 2014. Reproductive biology of *Etroplus suratensis* (Bloch) from the Vembanad wetland systems, Kerala. *Indian J. Geo Mar. Sci.*, 43(4): 646-656.
- De Silva, S. S., Maitipe, P. and Cumaratanunge, R. T. 1984. Aspects of biology of euryhaline Asian cichlid, *Etroplus suratensis*. *Environ. Biol. Fish.*, 10(1/2): 77-87.
- George, A. I. and Sebastian, M. J. 1970. Review of the backwater fisheries and brackishwater fish culture in Kerala state. In: *Symposium on Coastal Aquaculture. Report No. FI-IPFC/C70/SYM. 19*. 18-27 November, 1970. Indo-Pacific Fisheries Council, Bangkok, 12 pp.
- Jayaprakas, V. 1980. *Biology of Etroplus suratensis (Bloch)*. Ph. D. Thesis, Department of Aquatic Biology and Fisheries, University of Kerala, Thiruvananthapuram, India, 434 pp.
- Jayaprakas, V., Nair, N. B. and Padmanabhan, K. G. 1990. Sex ratio, fecundity and length weight relationship of the Indian pearlspot, *Etroplus suratensis* (Bloch). *J. Aquac. Tropics*, 5: 141-148.

- Le Cren, E. D. 1951. The length weight relationship and seasonal cycle in gonad weight and condition in the Perch (*Perca fluviatilis*). *J Anim. Ecol.*, 20(2): 201-219. DOI: 10.2307/1540.
- Menon, N. N., Balachand, A. N. and Menon, N. R. 2000. Hydrobiology of the Cochin backwater system - a review. *Hydrobiologia*, 430: 149-183.
- Padmakumar, K. G., Krishnan, A., Radhika, R., Manu, P. S. and Shiny, C. K. 2002. Openwater fishery interventions in Kuttanad, Kerala, with reference to fishery decline and ecosystem changes. In: Boopendranath, M. R., MeenaKumari, B., Joseph, J., Sankar, T. V., Pravin, P. and Edwin, L. (Ed.). *Riverine and reservoir fisheries, challenges and strategies*. Society of Fisheries Technologists (India), ICAR-Central Institute of Fisheries Technology, Kochi, India, p. 15-24.
- Padmakumar, K. G., Bindu, L. and Manu, P. S. 2009a. Captive breeding and seed production of *Etroplus suratensis* in controlled systems. *Asian Fish. Sci.*, 22: 51-60.
- Padmakumar, K. G., Manu, P. S. and Bindu, L. 2009b. Open water farming of pearlspot *Etroplus suratensis* (Bloch) in low volume cages. *Asian Fish. Sci.*, 22: 839-847.
- Padmakumar, K. G., Bindu, L. and Manu, P. S. 2012. *Etroplus suratensis* (Bloch), the state fish of Kerala. *J. Biosci.*, 37: 925-931. DOI 10.1007/s12038-012-9271-x.
- Panikkar, N. P. 1924. Further notes on the breeding habits of the pearlspot *Etroplus suratensis*. *J. Bombay Nat. Hist. Soc.*, 33: 1064.
- Sachithanandam, V., Mohan, P. M., Muruganandam, N., Chaaithanya, I. K., Kumar, P. A. and Sankar, R. S. 2012. DNA barcoding, phylogenetic diversity studies of *Etroplus suratensis* fish from Pooranankuppam brackishwater, Puducherry. *Int J. Curr. Res. Rev.*, 4: 33-42.
- Sultana, M., Krishnamurthy, K. N. and Pillai, S. M. 1995. Biology, fishery, culture and seed production of the pearlspot *Etroplus suratensis* (Bloch). *CIBA Bulletin No. 7*, ICAR-Central Institute of Brackishwater Aquaculture, Chennai, Tamil Nadu, India, 43 pp.
- Thomas, J. V. and Kurup, B. M. 2004. Pandal fishing - a unique fishing method in the Ashtamudi Estuary of Kerala, South India. *NAGA*, 27: 24-27.
- Unnithan, V. K., Nandan, S. B. and Vava, C. K. 2001. Ecology and fisheries investigation in Vembanad Lake. *CIFRI Bulletin No. 107*, ICAR-Central Inland Capture Fisheries Research Institute, Barrackpore, West Bengal, India, 38 pp.
- Vijayaraghavan, S., Krishnakumari, L., Gopinath, V. J. and Dhawan, R. M. 1981. Aquaculture of pearlspot *Etroplus suratensis* in an estuarine pond: Environmental characteristics, primary production, growth and cost benefit ratio. *Indian J. Geo Mar. Sci.*, 10: 82-89.