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Note

Stock assessment of the brown mussel, *Perna indica* (Kuriakose and Nair) from the southwest coast of India

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ABSTRACT

Estimated the population parameters and the maximum sustainable yield (MSY) of the brown mussel *Perna indica* from the southwest coast of India. Analysis using the length based Thompson and Bell's method indicated MSY of 853 t, F_{msy} (X =) 1.4875 and mean biomass 961 t. Though the estimated annual average catch is less than the MSY, an increase in effort is not recommended since it will not lead to a considerable increase in the catch.

The brown mussel, *Perna indica*, occurring along the southwest and southeast coasts of India (Kuriakose and Nair, 1976), is exploited in many centres for edible purpose. Details of the brown mussel fishery during the earlier years were given by Jones (1950), Jones and Alagarswami (1973), Appukuttan and Nair (1980), Appukuttan *et al.* (1988) and Joel and Ebenezer (1989). However, information on the population characteristics of this species is meagre and hence an attempt to estimate the population parameters and maximum sustainable yield (MSY) of *P. indica* from selected areas along the southwest coast of India was carried out.

Data on the mussel catch were collected from the major mussel fishing centres of the southwest coast of India, namely Kovalam-Pulinkudi area in Trivandrum district of Kerala and Enayam, Colachel and Kadiapatanam in Kanyakumari district of Tamil Nadu during the period between 1989 and 1996. The average catch per unit on sampling days was used to estimate the total catch. Effort was calculated in man-days. Samples of mussels taken from the catch were used for further studies in the laboratory. The length of each mussel in the sample was measured to the nearest 0.1 cm using vernier calipers and the weight to the nearest 0.1 g using a balance. Modes of the length distribution of mussels were identified using Bhattacharya's method (the Compleat Elefan computer package), and the growth parameters L_∞ and K were estimated using Gulland and Holt's method (Sparre and Venema, 1992). The natural mortality M was calculated according to Taylor's method, used by Ehrhardt *et al.* (1983) for the giant squid, *Dosidicus gigas*. For length-weight relationship, Jones' length

based cohort analysis and length based Thompson and Bell's method were adopted using the LFSA computer package.

TABLE 1. *Monthly variation (average) in catch, effort and catch per effort in* Perna indica *from Kovalam-Kadiapatanam area*

Month	Catch (kg) (man-days)	Effort	C/E (kg)
April	8,912	1,263	7.1
May	7,142	788	9.1
June	214	9	23.8
July	3,776	193	19.6
August	23,720	1,208	19.6
September	71,529	3,611	19.8
October	1,07,248	5,456	19.7
November	1,35,204	7,739	17.5
December	2,30,568	10,390	22.2
January	1,32,091	6,808	19.4
February	74,837	5,491	13.6
March	28,038	2,886	9.7

The average monthly catch, effort and catch per effort are presented in Table 1. This shows that the landings are lesser during June-July, the peak spawning period (Appukkuttan *et al.*, 1989) and of the mussels the few months immediately preceding it, thus preventing depletion of the spawning stock which affect the subsequent recruitment. A comparatively higher exploitation during October-January reduces intraspecific competition among mussels in the sea in the subsequent reproductively active period (Appukuttan and Nair, 1980; Appukuttan *et al.*, 1989). The estimated inputs used for Jones' length based cohort analysis, apart from the length composition of the average annual catch, were:

L_∞ = 11.7 cm, K = 0.9, terminal F/Z = 0.5, M = 0.9 g in $W = gL^b$(g, cm) = 0.171973 and b = 2.547035

The results of the length based Thompson and Bell's analysis are given in Tables 2 and 3. From Table 3 it is

TABLE 2. *Results of length based cohort analysis and Thompson and Bell's analysis (F factor X - 1)*

Length group C	No. caught ('000) N	No. of survivors	F/Z	F	Z	Mean biomass (kg)	Yield (kg)(cm)
2.5-	1,544	87,085	0.2477	0.2963	1.1963	11,787	3,492
3.0-	24,50	80,851	0.3487	0.4820	1.3820	17,596	8,480
3.5-	3,088	73,826	0.4121	0.6308	1.5308	24,397	15,389
4.0-	4,338	66,332	0.5102	0.9376	1.8376	31,715	29,736
4.5-	2,059	57,830	0.3430	0.4700	1.3700	39,868	18,736
5.0-	208	51,827	0.0511	0.0485	0.9485	50,356	2,442
5.5-	319	47,760	0.0767	0.0748	0.9748	63,135	4,722
6.0-	2,561	43,602	0.4084	0.6213	1.5213	75,458	46,882
6.5-	2,426	37,331	0.4115	0.6292	1.5292	85,863	54,028
7.0-	592	31,435	0.1516	0.1609	1.0609	98,309	15,816
7.5-	2,046	27,532	0.3936	0.5842	1.4842	1,10,886	64,781
8.0-	907	22,334	0.2349	0.2763	1.1763	1,21,885	33,675
8.5-	2,267	18,472	0.4563	0.7552	1.6552	1,29,471	97,778
9.0-	2,720	13,503	0.5488	1.0949	1.9949	1,23,443	1,35,153
9.5-	1,813	8,548	0.5127	0.9468	1.8468	1,08,797	1,03,012
10.0-	1,495	5,011	0.5476	1.0895	1.9895	88,554	96,483
10.5-	907	2,281	0.5520	1.1087	2.0087	59,605	66,085
11.0-(+)	319	638	0.5000	0.9000	1.8000	28,995	26,096

TABLE 3. *Results of the length based Thompson and Bell's analysis*

F-Factor (X)	Yield (kg)	Mean biomass (kg)
0.0	0,00,000	31,07,146
0.2	3,73,938	24,48,107
0.4	5,86,346	20,04,928
0.6	7,10,033	16,88,836
0.8	7,82,093	14,52,839
1.0	8,22,785	12,70,120
1.2	8,43,780	11,24,448
1.4	8,52,097	10,05,510
1.6	8,52,107	9,06,484
1.8	8,46,618	8,22,697
2.0	8,37,477	7,50,845

MSY = 852897,For F - Factor X = 1.4875, Biom. msy = 961,301.

evident that the maximum sustainable yield of 853 t can be obtained only by a considerably higher fishing mortality (X = 1.4875) and the additional yield on account of this increase is only about 30 t. Therefore, it is suggested that the level of fishing mortality of *P. indica* from this area need not be increased further.

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