

Population Parameters of *Pennahia anea* and *Nibea maculata* in the Palk Bay/ Gulf of Mannar Area, India

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Abstract

The population parameters of the two most abundant sciaenids comprising the trawl catch in the Palk Bay/ Gulf of Mannar area are presented. The following parameters were estimated: 233 mm (L_∞), 1.26 yr⁻¹ (K), -0.08 yr (t₀), 4.24 yr⁻¹ (Z) and 2.24 yr⁻¹ (M) for *Pennahia anea*, 284 mm (L_∞), 1.08 yr⁻¹ (K), -0.05 yr (t₀), 4.41 yr⁻¹ (Z) and 1.92 yr⁻¹ (M) for *Nibea maculata*. Length at first capture was 97 mm for *P. anea* and 124 mm for *N. maculata*. These lengths were noted to be less than the corresponding length at first maturity for both species. The exploitation rates (E) derived indicate that the two species are heavily fished, which may account for the decline in sciaenid catches from 1988 to 1992.

Introduction

The trawling grounds off Rameswaram Island lie in the Palk Bay and Gulf of Mannar between India and Sri Lanka (Fig. 1). About 80% of the trawlers operating there are boats 9.8 m in length fitted with 63-88 hp engines. In the Palk Bay area, until recently trawlers were primarily fishing at night with very few boats engaged in dayfishing during the months from January to August. Trawl fishing is limited to three days per week to minimize conflict with traditional fishers although trawlers may operate for one day and one night before returning to port. In the Gulf of Mannar, trawlers engage in dayfishing during May to September; while during October to April, the trawlers operate continuously for two nights and one day before returning to port.

From 1988 to 1992, mechanized trawlers landed an average of 425 t/yr of sciaenids from the trawling grounds off Rameswaram Island. This represents 2.4% of the annual trawl catch during the period. Five genera and nine species of the family Sciaenidae are commonly found in the commercial catches off the island and

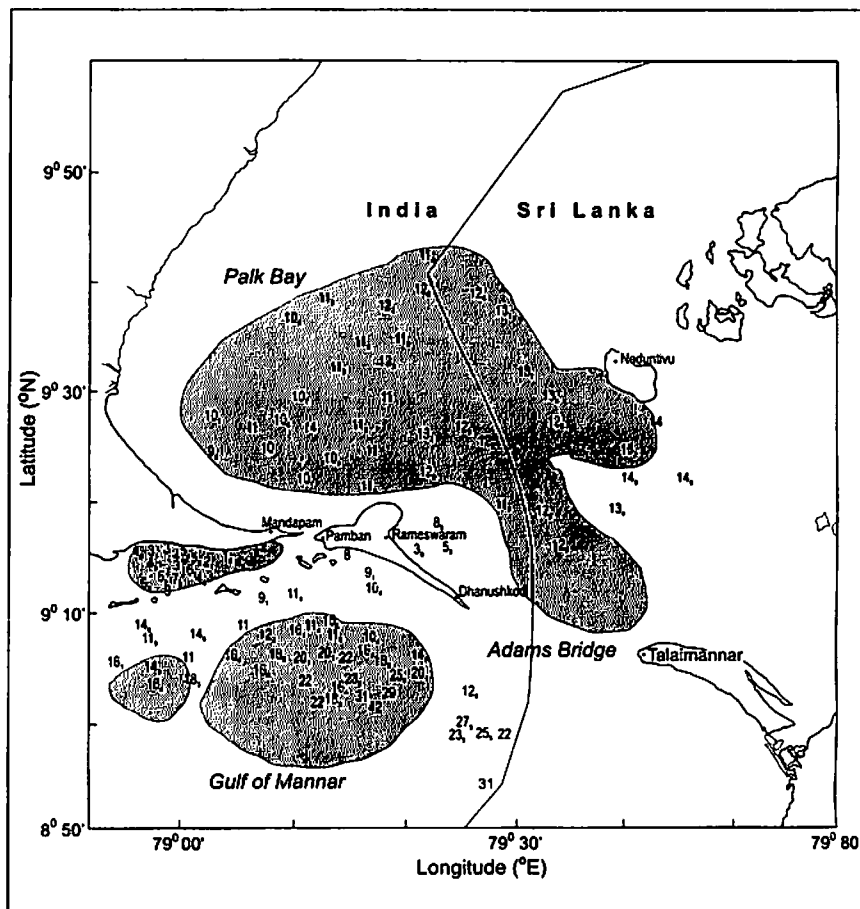


Fig. 1. Trawling grounds (shaded area) in the Palk Bay and Gulf of Mannar off Rameswaram Island, India.

Pennahia anea (synonym: *P. macrophthalmus*) in the Palk Bay and *Nibea maculata* in the Gulf of Mannar area are the dominant species.

Materials and Methods

Data on catch and effort were collected from 10 to 20 days a month from January 1988 to December 1992. Length measurements were taken at weekly intervals. The catch and length data were then raised to monthly records using the Sekharan (1967) method.

Population parameters were estimated based on length measurements of 4 903 specimens of *Pennahia anea* (total length ranging from 40 to 223 mm) and 4 277 specimens of *Nibea maculata* (60-249 mm) taken during January 1990-December 1992. The asymptotic length (L_{∞}), growth coefficient (K) and the age at zero length (t_0) of the von Bertalanffy equation were estimated using the Ford-Walford method. Total mortality (Z) was estimated by the length-converted catch curve method of Pauly (1983, 1984). Natural mortality (M) was estimated using the empirical relationship derived by Pauly (1980) with the mean environmental temperature taken as 28.4°C. The exploitation ratio (E) was estimated by dividing fishing (F) by total mortality (Z).

Length at first capture (l_c) was estimated by the method of Pauly (1984)

in which the ascending limb of the linearized catch curve is considered to estimate the selection ogive.

Results and Discussion

Table 1 summarizes total trawl landings and the sciaenid component from the Palk Bay and Gulf of Mannar area during the total catch monitoring from 1988 to 1992. It can be seen that sciaenid catches have declined during the period from 340 t (1988) to 223 t (1992) in the Palk Bay area and from 230 t (1989) to 67 t (1992) in the Gulf of Mannar area. There was a 40% increase in standard trawling effort from 1988 to 1992. Monthly data during the five-year period indicate peak sciaenid catches from October to January, with minimum catches from March to May.

The composition of the sciaenid catches of trawlers during the 1988-1992 period is shown in Fig. 2. *P. anea* made up almost 75% of the total sciaenid catch in the Palk Bay area, followed by *Protonibea diacanthus*, *Otolithes ruber*, *N. maculata* and *Dendrophysa russelli*. On the other hand, in the Gulf of Mannar, the sciaenid catch was dominated by *N. maculata* (comprising over 40% of the total), followed by *O. ruber*, *Johnius dussumieri*, *J. carutta* and *J. macropterus* during the period of 1988-1992. The mean annual catch of *P. anea* was 237 t, while that of *N. maculata* was 41 t.

The estimates of L_{∞} , K and t_0 are given in Table 2. These estimates are consistent with the values given by Ingles and Pauly (1984) for similar species. The catch curves obtained for both species are illustrated in Fig. 3 and provide a summary of the mortality and exploitation rates obtained. The M/K ratio of 1.78 obtained for both species is in conformity with the normal range observed in fishes (Beverton and Holt 1959). Their E values indicate that both species are heavily fished which may explain the continuing decline in sciaenid catches.

The estimates of l_c obtained were 97 mm and 124 mm for *P. anea* and *N. maculata*, respectively. However, the length at first maturity for these two species are substantially higher than these l_c values (see Gandhi 1982; Jayasankar 1989). In order for the fish to be able to spawn before being caught, the possibility of increasing the present 20 mm codend mesh size of trawlers should be considered.

The results of this study indicate the state of sciaenid resources in the area. Although sciaenids form only a small proportion of the many species exploited by trawling, these results indicate that utmost caution must be taken in future fisheries management and that a full assessment of the multispecies resource base should be made.

Table 1. Trawl and sciaenid catches from Palk Bay and Gulf of Mannar off Rameswaram Island, India, from 1988 to 1992. See text and Fig. 1.

Year	Palk Bay		Gulf of Mannar	
	Trawl catch (t)	Sciaenid catch (t) (%) ^a	Trawl catch (t)	Sciaenid catch (t) (%) ^a
1988	12 191	340 2.8	3 799	115 3.0
1989	12 422	340 2.7	3 486	230 6.6
1990	15 977	320 2.0	6 225	98 1.6
1991	12 927	306 2.4	4 112	82 2.0
1992	13 412	223 1.7	3 536	67 1.9
Mean	13 386	306 2.3	4 232	118 3.0

^aSciaenid catch as percentage of trawl catch.

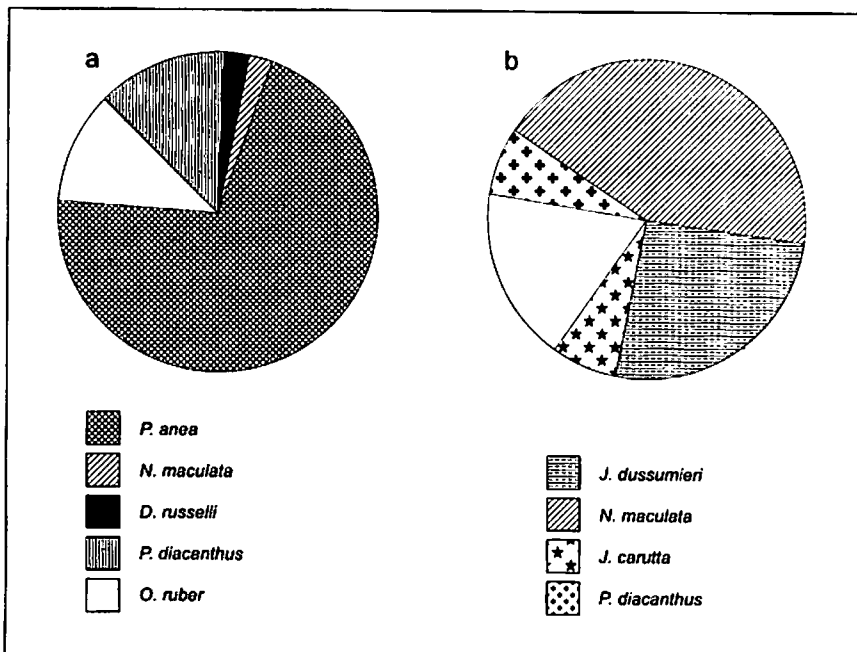


Fig. 2. Species composition of the sciaenid component of trawl catches in (a) Palk Bay and (b) Gulf of Mannar. *P. anea* dominate sciaenid catches in Palk Bay, while *N. maculata* predominate in the Gulf of Mannar.

Table 2. Estimates of von Bertalanffy growth parameters for *P. anea* and *N. maculata*.

Species	L_{∞} (TL,mm)	K (yr ⁻¹)	t_0 (yr) ⁻²
<i>P. anea</i>	233	1.26	-0.08=0.84
<i>N. maculata</i>	284	1.08	-0.05=0.85

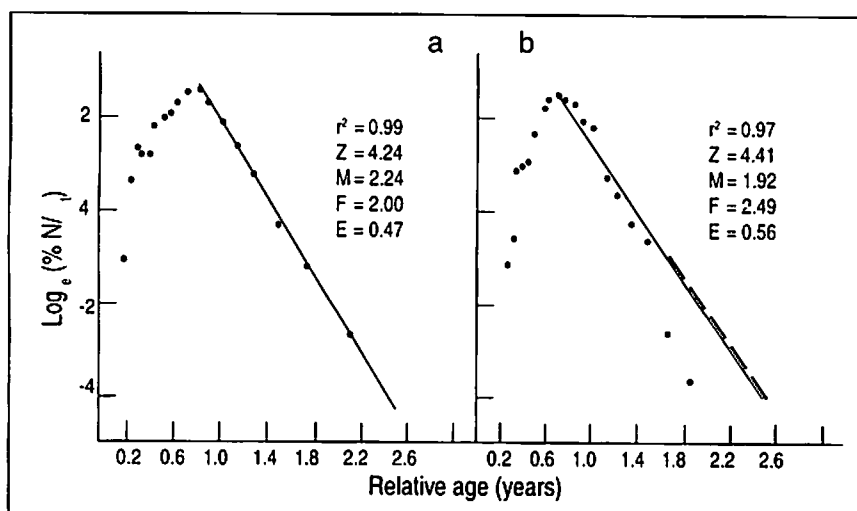


Fig. 3. Length-converted catch curve for (a) *P. anea* and (b) *N. maculata*.

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