The Recruitment of the Queen Snapper *Etelis oculatus* Val., into the St. Lucian Fishery: Recruitment of Fish and Recruitment of Fishermen

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ABSTRACT

Parameters of the von Bertalanffy growth equation, obtained using ELEFAN 1 (L_∞:103.2 and k:0.61), were used as the basis for determining the recruitment pattern of Queen snapper landed at Vieux Fort in St. Lucia. There appeared to be two recruitment peaks per year. On the basis of fish ages in the catch two annual pulses of spawning were identified, one around March and the other around August. Although seasonal variation in recruitment into the fishery may result from the seasonal variation in spawning, consideration is given to the possibility that the former could also be due to seasonality of effort by the fishermen.

INTRODUCTION

During the St. Lucian "low" fishing season, the Queen Snapper, *Etellis oculatus* Valencinnes, known in St. Lucia as the "Red Snapper," makes up some 97% of demersal fish landings at Vieux Fort in the south of the island. The "low" season occurs between August and November of each year and almost all of the landings of this species take place during this period.

Little work has been done on this species in the region. Thompson and Munro (1974) only briefly mentioned it in their study of snappers in the Jamaican fishery. Mahon *et al.* (1981) reported that it was among the most common species landed by the Barbados' deep sea fishery. Growth in this species is presently being studied by Murray (in prep.).

While the Queen snapper is landed mainly between August and November, it seems likely that significant landings could be made between January and June each year (A.V. Charles, Fisheries Management Unit, St. Lucia, pers. comm.). Low catches during the first part of the year may result from the fact that the migratory pelagics are accessible in St. Lucia waters at this time and are preferentially targeted.

METHODS

Length-frequency data collected over the 1987 season were analyzed using the Keil version (Brey and Pauly, 1986) of the ELEFAN computer program package (Figure 1) . Estimates of von Bertalanffy growth parameters, Loo and k,

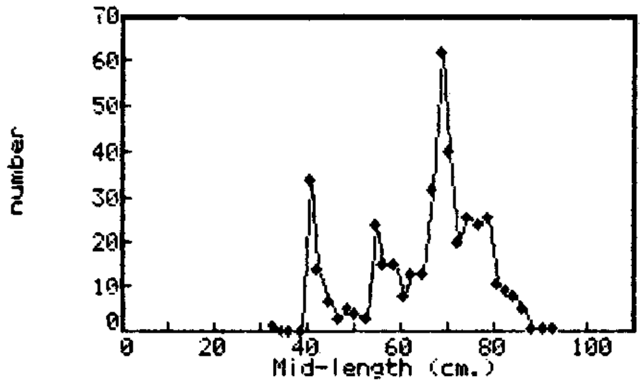

Figure 1. Frequency distribution of *E. oculatus* measured during the 1987 fishing season.

were obtained using the ELEFAN 1B sub-routine. To determine the age structure of the catch the von Bertalanffy growth equation, based on the parameter estimates obtained, was used to estimate age in months for each of the 96 fish measured in the first two week sampling period at the start of the fishing season. This was done on the basis of the predicted age at length (Table 1) given by the equation. The Bhattacharya method (Bhattacharya, 1967; Sparre, 1987) was used to separate out individual cohorts and to determine the mean age of each (Table 2); the possible months of spawning were obtained on the basis of the mean ages. The estimated parameters were also used in the ELEFAN 2A sub-routine to obtain a recruitment pattern or "graphic description of the recruitment process that generated the length-frequency data" (Pauly, 1987). This and the aging procedure are based on the assumption that all fish in the data set grown according to the equation defined by the growth parameters obtained, an assumption which Pauly (1987) claims should have relatively little impact on

Table 1. Von Bertalanffy growth curve based on growth parameters obtained by ELEFAN 1B. The lengths are given in cetimetres.

MONTH	LENGTH							
1	3.2	48.8	73.7	87.2	94.5	98.5	100.6	101.8
2	8.2	51.6	75.2	88.0	94.9	98.7	100.8	101.9
3	13.0	54.2	76.6	88.7	95.3	98.9	100.9	101.9
4	17.1	56.4	77.8	89.4	95.7	99.1	101.0	102.0
5	21.5	58.8	79.1	90.1	96.1	99.3	101.1	102.1
6	25.5	61.0	80.3	90.7	96.4	99.5	101.2	102.1
7	29.4	63.1	81.4	91.4	96.8	99.7	101.3	
8	33.0	65.1	82.5	91.9	97.1	99.9	101.4	
9	36.6	67.0	83.5	92.5	97.4	100.0	101.5	
10	39.9	68.8	84.5	93.0	97.7	100.2	101.6	
11	43.0	70.5	85.4	93.5	98.0	100.3	101.7	
12	46.1	72.1	86.3	94.0	98.2	100.5	101.7	

Table 2. Ages (in months) obtained for fish in first two week sample (mid-date: 87/08/17).

Age	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
# Fish	3	3	3	0	2	5	6	7	2	3	8	16	15	2	5	4	2	5	3	2
Mean age		12					17							24					29	

the results from ELEFAN 2A.

RESULTS AND DISCUSSION

The estimated von Bertalanffy growth parameters were: $L_\infty = 103.2$ and $k = 0.61$. This estimate of L_∞ exceeds the maximum size reported by Allen (1985) for this species of 62cm and 76% of the fish measured also exceeded this figure (Murray, in prep.).

The analysis of the age structure showed four mean ages of 12, 17, 24, and 29 months (Table 2), which suggests two annual spawning peaks around August and March. This is similar to the reported spawning behavior of *E. carbunculus* and *E. coruscans* in Vanuatu (Brouard and Grandperrin 1984 cited in Grimes, 1987), and agrees with the suggestion of Grimes (1987) that populations and species of snappers associated with small oceanic islands reproduce year round with main pulses of reproductive activity in the spring and autumn. Despite the fact that the rainfall pattern for 1986 invites the conclusion that rainfall is in some way causal, until all other potential cues are examined it is only possible to offer it as a possible proximal or pre-proximal cue inducing the spawning peaks in *E. oculatus* (Figure 2).

The recruitment pattern obtained is shown in Figure 3. It suggests that there are two major periods of recruitment into the fishery annually. It should be noted that the ordinate in Figure 3 is relative time and therefore although the months are in chronological sequence, month one is not necessarily January. Nevertheless, taking Figure 3 and the suggested spawning pattern into consideration, the recruitment pattern appears to follow from the second type of reproductive seasonality suggested by Grimes (1987) wherein there is "more or less continuous year-round spawning with peaks of reproductive activity in the spring and fall." Although Gulland (1983) has warned about extrapolating back to numbers of recruits, from commercial landing data, Dennis (1987) has suggested that the parameter estimates arrived at from this type of data are acceptable. Pauly (1987) considers the patterns obtained from ELEFAN 2A to contain useful information for making inferences on the dynamics of a stock. On the basis of the two latter views, we believe that the results presented (Figure 3) are worthy of discussion.

If both spawning and recruitment take place more than once during the year, the question remains as to why Queen snappers are almost exclusively landed over such a short season. Fishermen claim that the catching of snappers outside of this season is precluded by a tendency to lose lines to strong ocean currents. Thus, traditionally, fishing for snappers does not begin before August 15th.

A significant proportion of St. Lucian fishermen (circa 30%) are part-timers, *i.e.*, do not fish year round (Fisheries Management Unit, St. Lucia, unpubl. data), and when they are not fishing most of them work as laborers in the banana industry. The end of the migratory pelagic fishery coincides with a drop off in the U.K.'s demand for bananas (Gov't of St. Lucia, 1985-86) and the beginning of the banana planting season. It is at the end of this planting period that the fishermen return to the bank fishery from which the main species caught is the Queen snapper. This has led us to conceptualize what we call a "banana fishermen": the fisherman whose fishing activities are affected by the demands of another industry, in this case the banana industry, for labor.

In giving serious consideration to all preceding it must be remembered that any determination of growth parameters is dependent on the data collected. These data are limited by the availability of fish, which are only caught when there are fishermen to catch them. Then, as a result, the pattern of recruitment suggested in addition to being caused by the spawning pulses, could very well be a function of the seasonal concentration of the fisherman's effort on this species. This idea is of course not unique, Pitcher and Hart (1982) have defined recruitment as "an artificial discontinuity in the life of the fish caused by the way in which man operated his fishery," and Ricker (1975) has referred to a "type B" recruitment which is proportional to the rate of fishing effort, for that

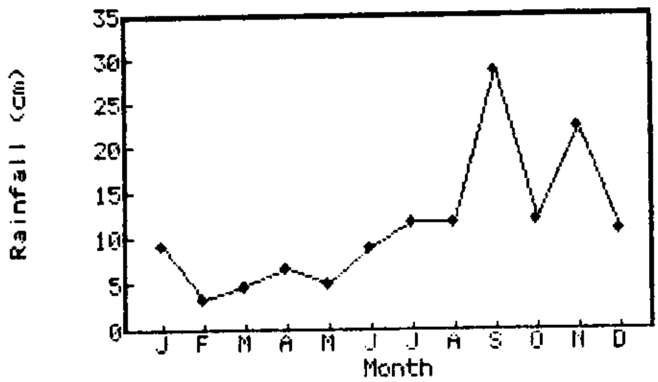

Figure 2. Monthly rainfall at Vieux Fort, St. Lucia during 1986

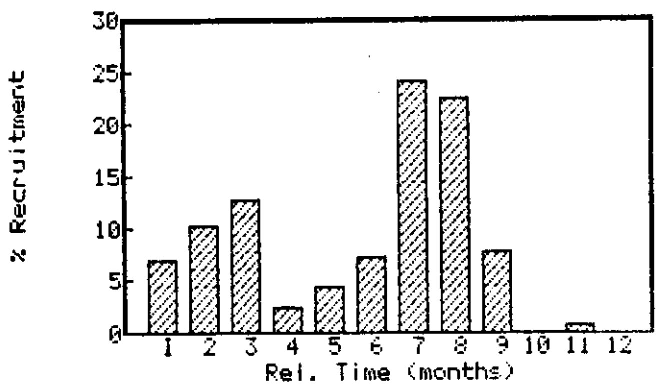

Figure 3. Recruitment pattern for *E. oculatus* based on von Bertalanffy growth parameters obtained from ELEFAN 1B. The monthly % recruitment figures are percentages of the annual total.

species, throughout the fishing season.

The conclusion from this preliminary examination of data on Queen snapper landings in St. Lucia is that although the pattern of recruitment into the fishery might be due to the reproductive biology of the species, this may not be the only explanation. The socioeconomic situation of the fishermen can play an important part in determining variations in fishing effort and thus could have a noticeable effect on the fishery. The causes or reasons for this variation should therefore be given greater consideration in any assessment of what is occurring in the industry. This is confirmed by the results of the 1979-81 study of the fisheries of San Miguel Bay in the Philippines (*c.f.* Pauly and Mines, 1982; Smith and Pauly, 1983). As a consequence, the socioeconomic aspects must not be ignored in the assessment of the future potential of this fishery.

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