

Growth and Mortality of Spangled Emperor *Lethrinus nebulosus* in Fiji*

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Abstract

The parameters L_{∞} and K of the von Bertalanffy growth equation were estimated from length-frequency data of the spangled emperor *Lethrinus nebulosus* (Fam. Lethrinidae) caught in the Central and Western Divisions, Fiji. These parameters are compared with values from Papua New Guinea and New Caledonia and also used to derive estimates of total, natural and fishing mortality.

Introduction

The spangled emperor *Lethrinus nebulosus* (Family Lethrinidae) is the most important fish in the artisanal catches in Fiji waters. This fish, caught by gillnets and by hook and line contributes about 6% of the total coastal finfish sold in municipal markets and outlets around Fiji, fetching approximately \$F1 million a year. As population increases, the demand for fish also increases and the Fisheries Division in Fiji is very much concerned about the fisheries resources and attempts to apply measures to manage the stock.

This paper presents an analysis, in terms of growth and mortality, of length-frequency data from the Central and Western Divisions of Fiji (Fig. 1); the data sampled in the Northern Division were not sufficient for detailed analysis.

Materials and Methods

Table 1 (A & B) presents the (fork) length-frequency data collected by Fisheries Department staff at twelve municipal fish markets around Fiji. These data were computerized using the

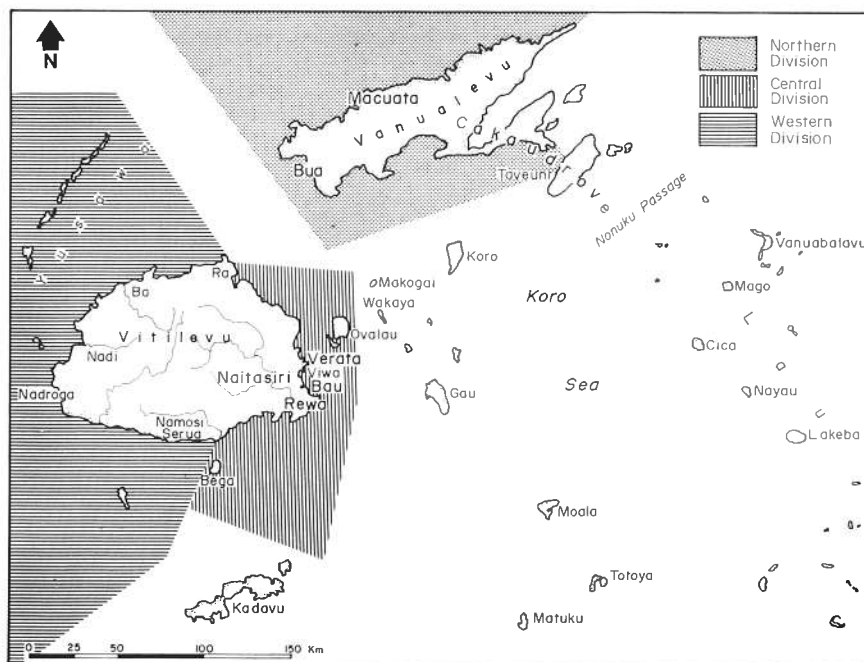


Fig. 1. Map of Fiji, showing the three divisions mentioned in the text.

*Preliminary results based on a paper written during a workshop on Length-based Methods in Fish Analysis, 5-17 December 1988, Honiara, Solomon Islands (see Fishbyte 7(1): 11-12).

Table 1A. Length-frequency data on *Lethrinus nebulosus* sampled in the Central Division, Fiji, in 1984 (n = 1,955).

LF (cm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
11	1											
13	0		1	2								
15	0	1	6	12	1	6			1		2	
17	5	11	9	28	2	13			0		0	
19	15	17	19	30	15	35	1	6	1	1	0	
21	17	16	8	25	8	29	0	12	4	4	5	
23	8	5	5	34	4	1	19	0	13	10	18	11
25	22	17	4	23	5	1	6	3	14	3	14	5
27	17	11	6	18	6	2	3	9	4	12	8	10
29	9	14	8	20	3	3	9	13	4	25	2	27
31	7	17	6	25	0	14	20	17	4	17	16	41
33	9	17	12	32	0	19	6	26	17	22	0	23
35	7	13	4	16	2	13	1	27	29	38	4	16
37	3	16	4	8	4	24	0	17	15	36	7	14
39	4	8	3	12	6	5	0	18	1	3	3	6
41	3	11	2	12	0	2	1	12	19	5	0	2
43	8	16	0	7	0	0	1	11	3	0	3	4
45	8	4	1	5	0	14	0	7	2	4	0	0
47	9	4	1	12	1	1	0	7		4	3	11
49	2	3	1	7	1		0	10		7	2	11
51	3	3		7			0	8		28	1	3
53	3	0		1			0	7		6		11
55	0	0					0	2				
57	3	1					0					
59							2					
Sum	163	205	100	336	58	99	151	195	134	226	86	202

Table 1B. Length-frequency data on *Lethrinus nebulosus* sampled in the Western Division, Fiji, in 1984 (n = 2,008).

LF (cm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
16			3									
18			32				1	4			2	
20	3	1	49				3	3	1	2	7	
22	12	0	18				4	12	9	4	5	
24	19	0	23				10	5	7	8	7	
26	9	2	26	1			9	17	15	9	8	1
28	9	5	25	5	5	2	5	21	6	5	18	2
30	24	18	39	5	7	7	10	23	6	9	22	4
32	29	15	19	40	14	20	14	29	9	9	15	2
34	12	3	26	7	17	2	13	24	6	10	11	3
36	7	14	19	6	2	8	16	32	19	11	22	4
38	8	6	5	10	5	14	15	31	15	12	13	3
40	2	10	7	6	7	6	18	30	15	9	23	1
42	4	6	6	13	18	5	14	24	14	11	18	2
44	2	1	4	5	2	6	16	21	13	6	21	3
46	3	4	7	11	5	5	19	24	12	4	20	3
48	6	4	1	5	6	7	14	21	15	4	14	1
50	3	3	4	1	2	2	6	26	14	6	9	2
52	1		2	0	3	3	7	14	4	5	0	1
54				3	1	3	4	6	5	4	1	
Sum	153	92	315	118	94	90	198	367	185	128	236	32

appropriate routine of the Compleat ELEFAN package of Gayanilo et al. (1989), and regrouped in 2 cm intervals.

The ELEFAN I program was then used to obtain a preliminary set of estimates of L_{∞} and K . These were subsequently re-estimated, based on (partial) corrections of the data in Table 1 for the effect of gear selection and of incomplete recruitment, as outlined in Pauly (1986). Then, total mortality (Z) was estimated from a length-converted catch curve, natural mortality (M) was estimated from the empirical equation of Pauly (1980), and fishing mortality was estimated from $F = Z - M$.

Results and Discussion

Table 2 presents the growth parameters obtained here, along with parameters estimated for other stocks of *L. nebulosus*, in Papua New Guinea and New Caledonia. As might be seen, the values of L_{∞} and K obtained here lead to a growth performance index ϕ' that is higher than observed elsewhere. However, the difference, particularly with the

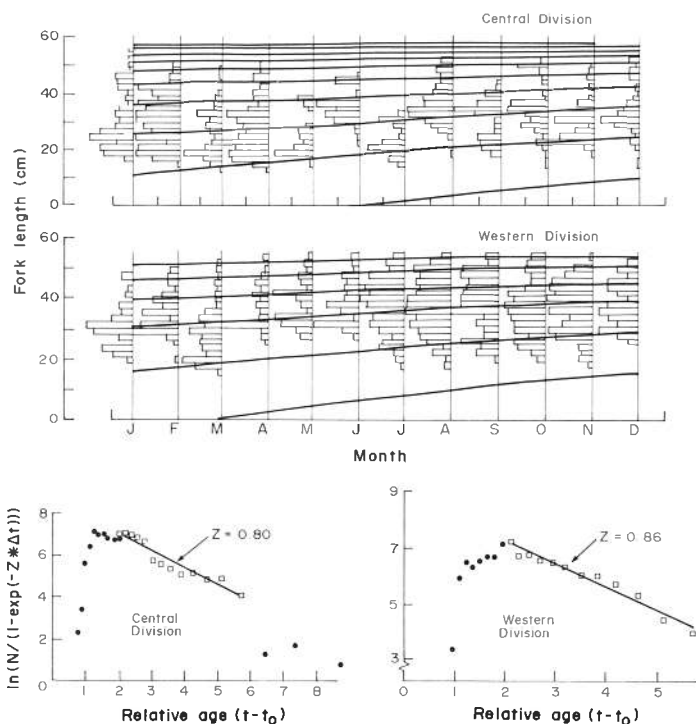


Fig. 1. Results of analyses of length-frequency data on *Lethrinus nebulosus*, by division; above: original data, with superimposed growth curves; below: length-converted catch curves.

Table 2. Growth and mortality estimates in various stocks of *Lethrinus nebulosus* in South Pacific waters.*

Location	L_{∞} (cm)	K (year ⁻¹)	ϕ' ^e	M (year ⁻¹) ^f
Kavieng, PNG ^a	54.7	0.41	3.09	0.74
Kavieng, PNG ^b	55.8	0.31	2.98	0.56
New Caledonia ^c	50.9	0.22	2.76	0.54
New Caledonia ^c	54.3	0.21	2.79	0.51
Fiji, Central Div ^d	61.4	0.34	3.11	0.71
Fiji, Western Div ^d	61.5	0.36	3.13	0.73

^aPetersen method (unpublished data).

^bBased on the ELEFAN I program (unpublished data).

^cBased on otolith ages (unpublished data).

^dThis study.

^e $\phi' = \log_{10}K + 2 \log_{10} L_{\infty}$; see Pauly and Munro (1984).

^fBased on the empirical equation of Pauly (1980).

*Editor's note: the New Caledonia data refer to males and females, but it is unclear which is which.

values from PNG, is small, suggesting that our estimates may be acceptable.

The estimate of Z obtained from length-converted catch curves were 0.80 year⁻¹ for the Central Division, and 0.86 year⁻¹ for the Western Division. Combined with the appropriate M values in Table 2 leads to $F = 0.09$ year⁻¹ and 0.13 year⁻¹ for the Central and Western Divisions, respectively.

Given the nature of the data at hand, and of the analyses conducted so far, these estimates should be taken as tentative. The study presented here should be complemented with detailed studies of catch and effort data, and with biological studies.

References

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