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Silver warehou

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This series documents the scientific basis for stock assessments and fisheries management advice in New Zealand. It addresses the issues of the day in the current legislative context and in the time frames required. The documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

Silver warehou  
(*Seriolella punctata*)

INTRODUCTION

The gazetted TAC for silver warehou in the fishing year 1987/88 is 8010 t, allocated as follows:

- A (Fishstock 1) = 1800 t (Challenger, Central, Auckland)
- B (Fishstock 3) = 2600 t (South East (Coast))
- C (Fishstock 4) = 3600 t (South East (Chatham Rise), Southland,  
Sub-Antarctic)
- D (Fishstock 10) = 10 t (Kermadec)

Of the TAC, 5863 t is held by New Zealand companies, 806 t by Japan, 168 t by Korea, 56 t by USSR and 1117 t by MAF.

There have been no FRC research programmes since 1983 directed specifically at silver warehou. Hence recent information on the biology of this fish is largely derived from published Soviet research, and on stock structure from both Soviet research and observations on bycatch or from FRC research surveys directed at other species. Estimates of stock size of SWA in several areas of the EEZ are available from a range of FRC trawl surveys. However, because the surveys were aimed at other species, the estimates have a high level of imprecision, have been obtained from a range of vessels and do not represent any consistent time series.

The commercial fishery has undergone considerable changes with restricted fishing zones and shifts in fishing effort and it does not provide a time series of data that can reliably show trends in catch rates or fishing patterns.

There has been concern in the past of overfishing silver warehou, particularly off the eastern Stewart-Snares Shelf. However the data available have been inadequate to justify a reduction in TAC, although a case to do so based on conservatism and caution was made by Livingston (1986). In 1986 the ITQ system was introduced and silver warehou are now managed as four fishstocks with an EEZ TAC of 8010 t. In the TAC background paper for the NZ fishing year 1986/87, Livingston (1987) argued a case for shifting fishstock boundaries, in keeping with stock structure observations, but not altering overall TAC allocations. These changes did not, however, occur for 1987/88.

In the present paper, the new approach in provision of management advice by estimation of MCY and CAY, has been used. Catch histories are updated and research and commercial data are reanalysed.

## REVIEW OF THE FISHERY

Prior to declaration of the EEZ in 1978, the reported warehou catch included silver warehou, common warehou and white warehou. The annual warehou catches were close to 19 000 t (Table 1). Silver warehou has an overlapping depth distribution with white warehou (200-600 m) but is usually distinct from that of common warehou (< 200 m). In addition, reported landings since 1978 and results from trawl surveys have suggested that in the deep water, white warehou contributes a negligible biomass compared to silver warehou. To estimate the proportion of silver warehou contributing to the total warehou catch prior to 1978, data presented by Japan at early bi-lateral discussions have been used. Japan presented a breakdown of warehou catch by management areas. Because of the depths covered in each, it is possible to identify which areas would have been predominantly silver warehou, i.e. areas D, E, F (Table 2). Thus, silver warehou would have made up about 70% of the total warehou catch by Japan in fishing years 1975/76 to 1977/78 (Table 2). Since Japan caught the bulk of the warehou prior to 1978, 70% of total warehou catch has been used to estimate total silver warehou landings during those years (Table 1).

Table 3 lists catches by foreign licensed and N.Z. chartered vessels since 1978. Table 4 lists catches by domestic vessels since 1981 which is only a fraction of the deepwater fleet. Preliminary CPUE data (i.e. catch (t) per hour target fished) is usually less than 3 t h<sup>-1</sup> although catch rates up to 29 t h<sup>-1</sup> were taken April-June in 1979 at the Bounty Islands (Livingston 1986).

Recreational and Maori silver warehou catches are unlikely to occur as this is an offshore species.

Since declaration of the EEZ in 1978, the bulk of the deepwater fleet catch of silver warehou has come from EEZ management areas C, D, EA and F (Table 3). This differs from the domestic fleet, which focuses on the West Coast of the South Island (Area G) and on Mernoo Bank (CM) (Table 4).

Scientific recommendations for management of the fishery has been driven by concerns of overfishing, although data to confirm or refute these concerns are not available. In October 1977-January 1978 a closed area on the eastern Stewart-Snares Shelf was introduced to protect silver warehou.

When the EEZ was declared in 1978, safe biological yields of 4000 t (Area F), 1000 t (Area C) and 500 t (Area D) were recommended. However, a total EEZ TAC of 18 000 was then gazetted for silver warehou with a maximum of 5000 t in each of Areas C, D, F. In 1980/81, the TAC was halved to 9000 t, and the previous Stewart-Snares closed area was controlled from January-March 1981 with a limit of 4000 t only to be taken. These controls continued until 1984/85 when the TACs for Areas C, D, F were amalgamated.

Other changes include a boundary alteration between Areas E and F in 1983 which shifted the catch from the southern tip of the Snares Shelf from Area E(A) to Area F.

Since 1979, catches have been lower than the TAC, and a lot less than estimated catches prior to the establishment of the EEZ (Table 1). It is not certain whether this is a function of overfishing, or a shift in effort to other deepwater species such as orange roughy, oreos or squid. As a

precaution against possible overfishing, a TAC reduction to 5000 t was recommended for 1986/87 (Livingston 1986). However, this was not implemented.

(a) Stock Structure

Silver warehou spawn on the west coast of the South Island in winter, Mernoo Bank in spring and winter and at the Chatham Islands in spring and summer (Livingston 1987). Spawning may also occur on the Stewart/Snares Shelf in early spring (Hurst and Bagley 1986).

There are therefore at least four potential spawning stocks of silver warehou. Commercial catches do not have a marked seasonality, i.e. good catches have been taken in each of the main fishing grounds in all seasons (Figs. 1, 2). These observations lead to a different interpretation of stock structure than the unit stock theory given by Gavrilov (1979). It is thought that several separate stocks may exist and that the TAC should continue to be divided among management areas. Ideally, to match likely biological stock distributions, Area 3 should include the Chatham Rise, and the southern area which would become Area 5 should only include Southland and Subantarctic (i.e. not Chatham Rise).

The current TAC stands at 8010 t and is divided among 4 fishstocks (Fig. 3). It is unclear why the East Coast South Island (Fishstock 3) has been isolated from the Chatham Rise, Stewart/Snares Shelf and the Subantarctic, as this does not correlate with biological observations on spawning stocks (see below).

*No evidence given below*

(b) Resource Surveys

Trawl surveys from which biomass estimates have been calculated for silver warehou are listed in Table 5. These data suggest a larger, less variable stock exists on the Chatham Rise compared with the Stewart/Snares Shelf or the Subantarctic.

(c) Maximum Constant Yield (MCY)

i. Fishstocks 3, 4

MCY for Fishstocks 3 and 4 combined were calculated based on average biomass estimates from surveys in Areas C, D, F, and E. The surveys selected for MCY estimation were those conducted in the same season of the same year (see Table 5). Three independent biomass estimates of fishstocks 3 and 4 were averaged to calculate MCY, as follows:

$$MCY = \frac{1}{2} \bar{M} \bar{B}$$

where  $\bar{M} = 0.3$  (based on work by Gavrilov 1979) and  $\bar{B}$ , average biomass (assumed to be less than virgin biomass)

$$\bar{B} = 39,830 \text{ t (mean of values in Table 6)}$$

thus  $MCY_{(\text{fishstocks } 3 + 4)} = 5974 \text{ t}$ .

The division of this MCY into separate MCYs for each of fishstocks 3 and 4 is not possible on the basis of proportional biomass from the



Fishstock	Current TAC (t)	MCY (t)
1	1 800	795
3	2 600	1 792
4	3 600	4 182
10	<u>10</u>	-
	8 010	

In the absence of CAY estimates, the MCY values should theoretically be used as a guide to the TAC. It is recognised, however, that for SWA the MCY approach is probably conservative and the data used to estimate it far from ideal. It is also recommended that as further information on stock distribution is collected, fishstock boundaries be reviewed.

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- Paul, L. 1980: Warehouse - facts and figures. Catch '80 7(7): 5-6.

Table 1: Reported landings (t) of "warehouse" 1974-1978  
(Data source: Paul 1980)

Year	NZ	Japan	USSR	Total	Estimated Silver warehou landings*
1974	845	2 343	7 400	10 588	7 412
1975	529	9 088	200	9 814	5 869
1976	994	15 380	2 200	18 794	13 142
1977	1 088	11 135	6 300	18 523	12 966
1978	2 337	15 635	-	17 974	12 581

\* 70% of total - see text and Table 2.

Table 2: Warehou catch (t) by Japanese fleet in fishery management areas  
1975/76-1977/78 fishing years. (Data source: unpublished  
report held at FRC.)

Area	1975/76	1976/77	1977/78
B	-	3	1
C	2 087	4 175	3 079
D	34	54	12 913
E	4 482	1 394	541
F	9 027	4 529	2 183
G	767	1 414	3 101
H	104	76	122
Total	16 985	11 645	21 940
% catch from D, E, F	82%	51%	71%

Mean percent of deepwater warehou catch (i.e. mostly silver warehou) = 68%  
of total warehou catch.

Table 3: Silver warehou catches (t) by the deepwater fleet (New Zealand Chartered and Foreign Licensed Vessels) per EEZ management area (source: FSU, Wellington)

Fishing year	CM	C-	D	EA*	EB	EC	EP	FE	FW	G	H	B	NG <sup>1</sup>	Total	TAC
1978-79 (Apr-Mar)	111	318	571	1 168	-	13	2	2 202	277	110	19	29	-	4 820	(not specified)
1979-80 (Apr-Mar)	244	314	2 866	1 829	640	3	11	2 016	52	54	13	10	22	8 082	18 000
1980-81 <sup>2</sup> (Apr-Mar)														9 000	
1981-82 (Apr-Mar)	401	53	590	589	-	-	-	1 343	476	432	32	-	-	3 917	9 000
1982-83 (Apr-Mar)	2 104	52	778	1 217	-	12	-	581	94	97	44	-	-	4 976	9 000
1983 <sup>2</sup> (Apr-Sep)														2 166	
1983-84 (Oct-Sep)	577	148	560	114	3	-	-	908	244	70	471	-	-	3 495	9 000
1984-85 (Oct-Sep)	3 635	-	271	[ 967 ]				[ 791 ]		521	62	0.6	-	6 248	9 000
1985-86 (Oct-Sep)	729	1 471	360	180	-	<1	78	2 717	582	645	16	-	-	6 778	9 000
1986-87 <sup>3</sup> (Oct-Sep)	[ 1 930 ]	[ 2 779 ]	[ 397 ]											6 106	8 010

\* The boundary between areas F and EA changed from 48° 30' S to 49° S in October 1983.  
 1 Area not given.  
 2 Data for 1980-81 are not available; the total only is available for 1983.  
 3 Includes foreign licensed, chartered and domestic vessels.

Table 4: Silver warehou catches (t) by the domestic fleet.  
(Data source: FSU)

Year	C-	CM	FE	FW	G	H	B	W	Total
1981* )									115
1982 )	Area catch not determined								136
1983 )									269
1983/84**	92	27	<1	<1	81	78	13	12	303
1984/85	82	33	<1	<1	57	22	6	3	203
1985/86	47	36	31	<1	91	18	36	17	276

\* Calendar year.

\*\* NZ fishing year

Table 5: Trawl survey biomass estimates of silver warehou

EEZ Area	Vessel	Date	Biomass (t)	c.v. (%)
EA, F	Shinkai Maru	Feb 1981	7 160	27
E, F	Shinkai Maru	Mar/Apr 1982	800	42
EA, F	Shinkai Maru	Apr 1983	500	25
E, F	Shinkai Maru	Oct/Nov 1983	540	58
F	Shinkai Maru	Jun 1986	9 050	32
F	Akebono 3	Nov 1986	2 400	25
G	W.J. Scott	Winter 1981	2 450	37
	W.J. Scott	Winter 1982	2 000	33
C, D	Shinkai Maru	Mar 1983	22 700	32
D	Shinkai Maru	Nov/Dec 1983	44 400	40
C, D	Shinkai Maru	Jul 1986	42 300	33

Biomass = mean of wingspread and doorspread estimates.

c.v. = coefficient of variation

Table 6: Silver warehou biomass estimates (average of wings and doors) from 6 Shinkai Maru trawl surveys used to calculate MCY for Fishstocks 3 and 4 combined

Date	EEZ Area	EEZ Area Biomass (t)	Fishstock 3 + 4 Biomass (t)
April 1983	E(A), F	500	23 200
March 1983	C, D	22 700	
Oct/Nov 1983	E, F	540	44 940
Nov/Dec 1983	D	44 400	
June 1986	F	9 050	51 350
July 1986	C, D	42 300	

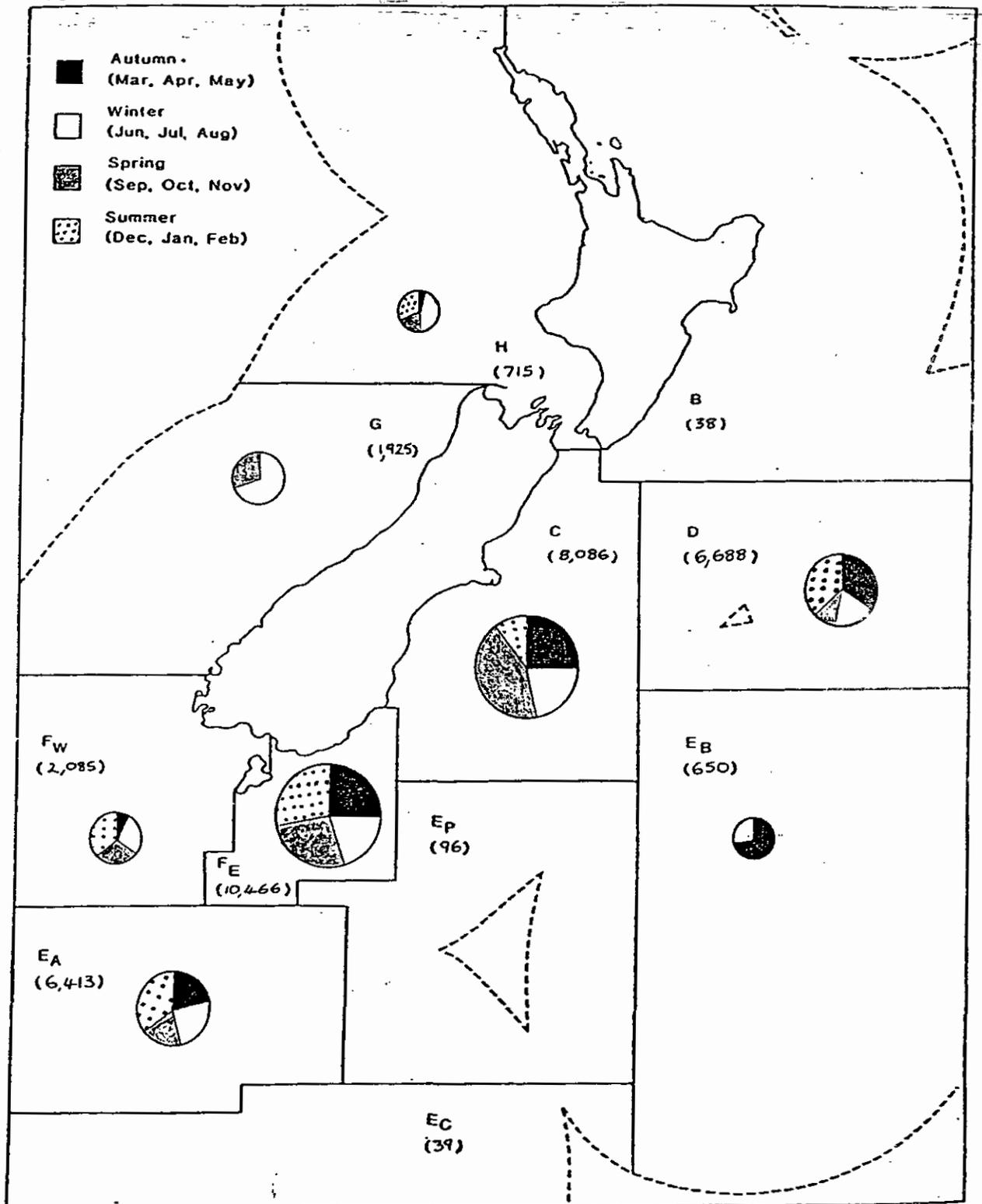


Figure 1:  
 Seasonal catch (t) of silver warehou by New Zealand chartered and foreign licensed vessels 1978-86. The boundary between areas F and EA changed from 48°30'S to 49°S in October 1983. (The catches from each season from each year have been summed and expressed as a percentage of total catch for that area.)

Figure 2: Monthly silver warehouse catch (t) by EEZ area.  
 (New Zealand charter and foreign licence statistics only)

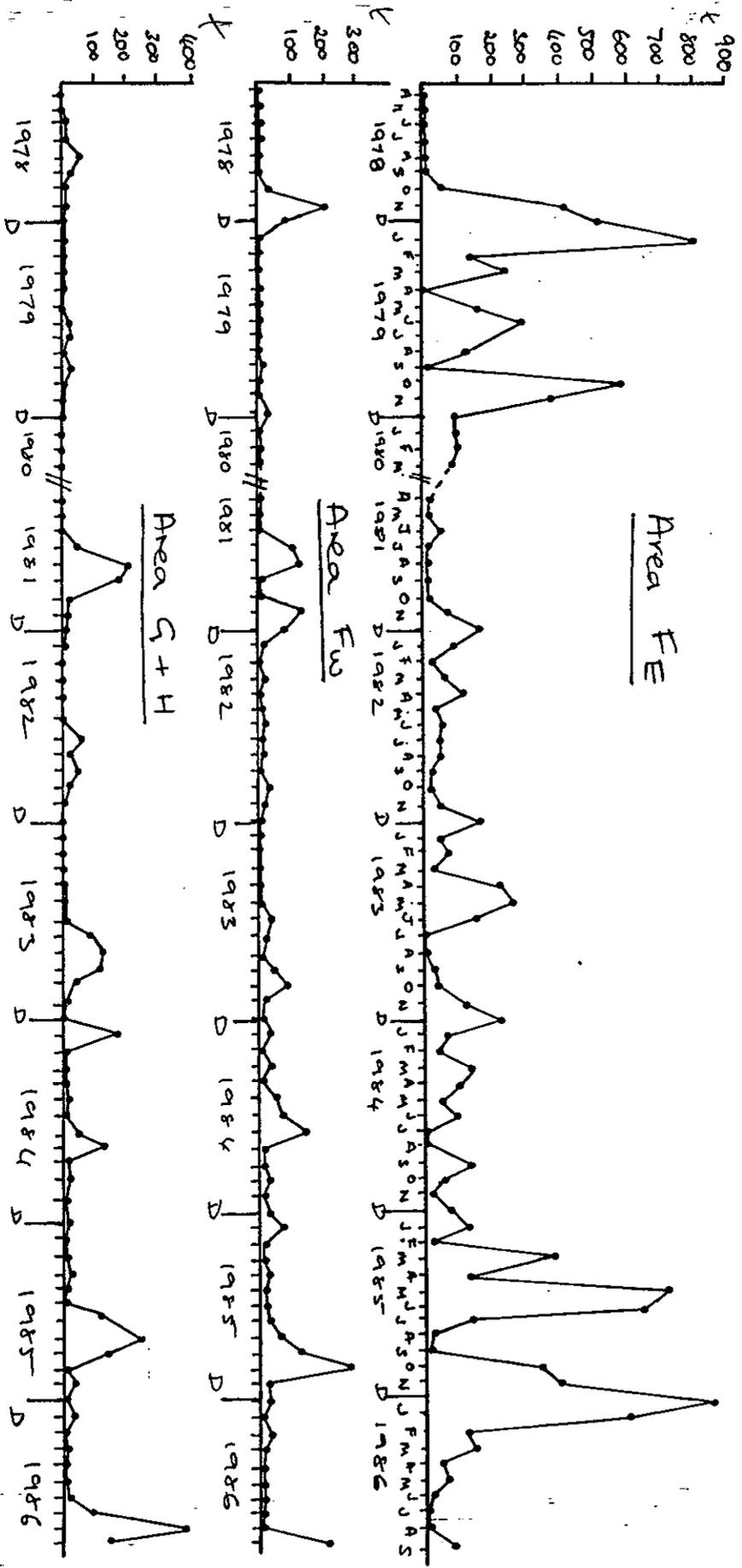


Figure 2: continued

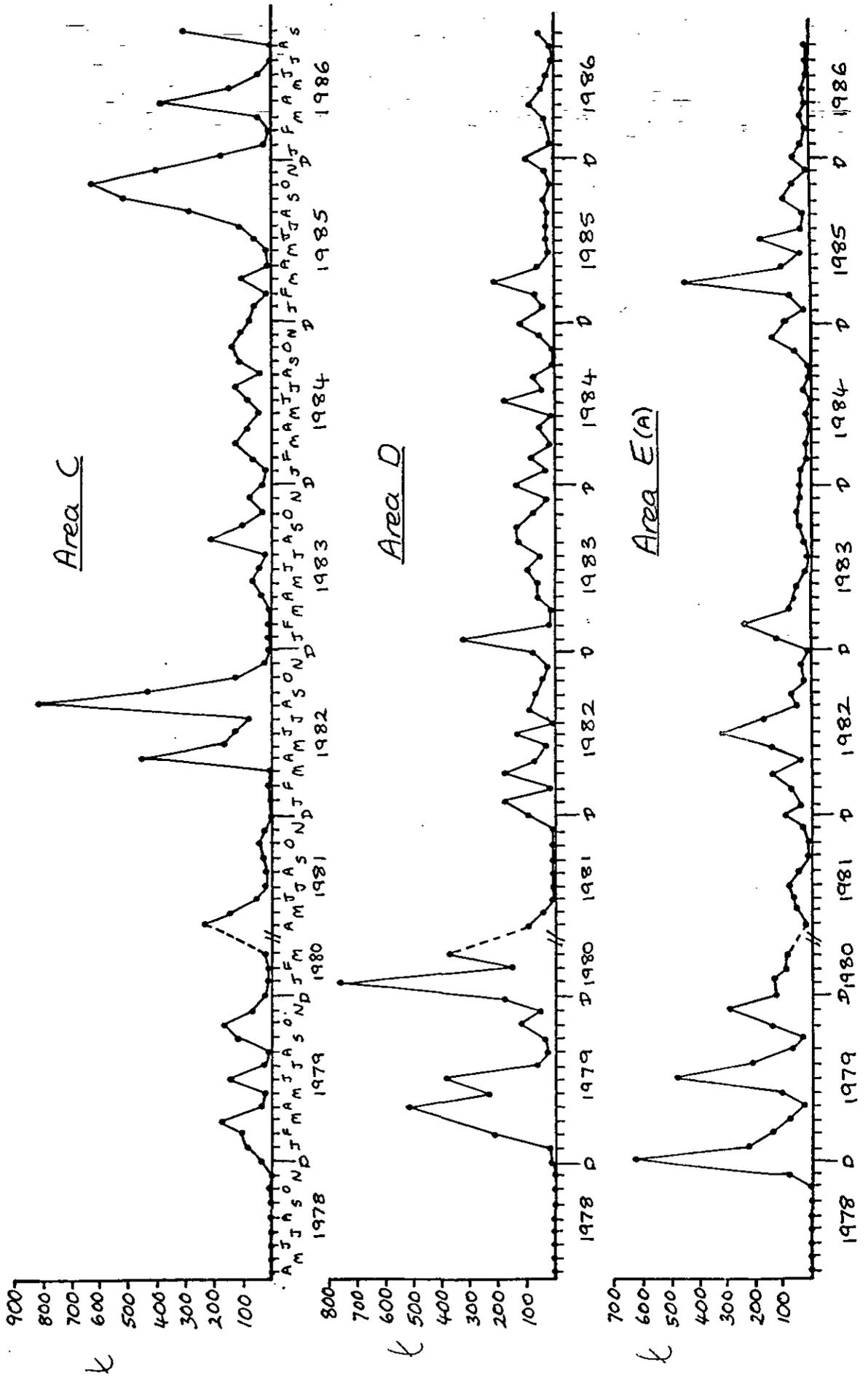
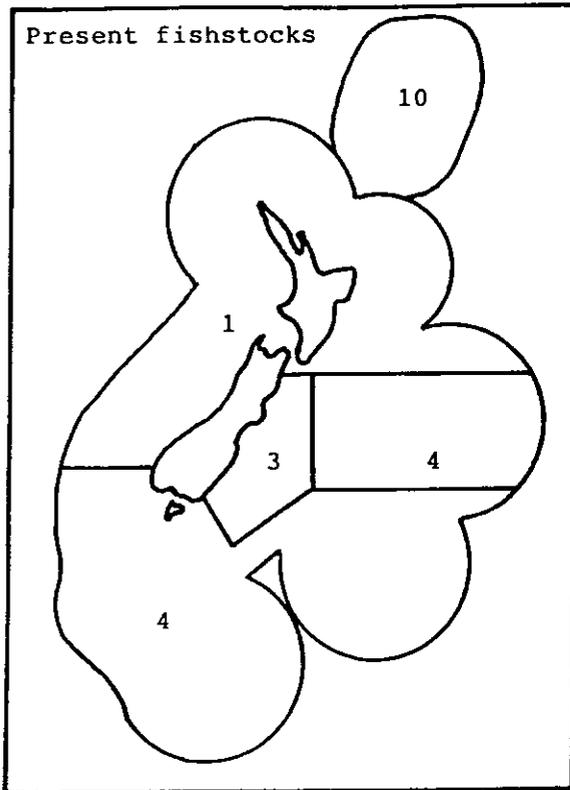
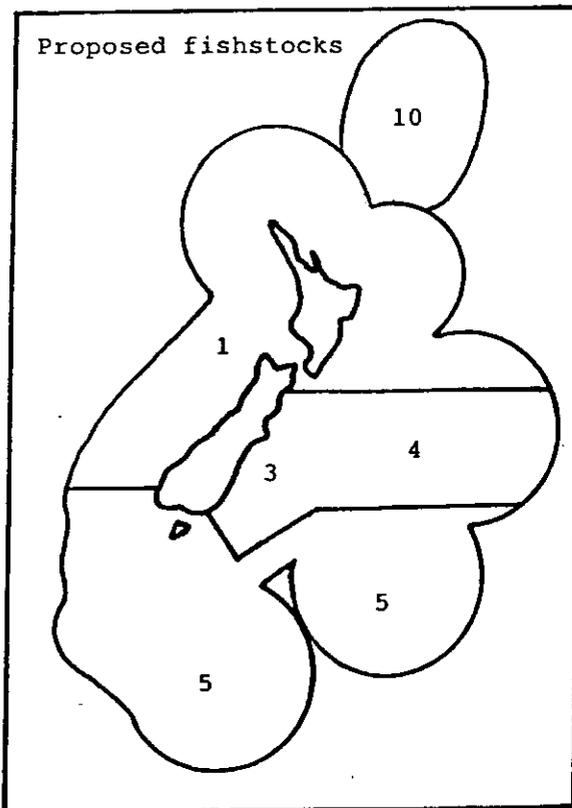


Figure 3: Current and proposed silver warehou Fishstock Management Areas



	Current TAC allocation	MCY
1	1800	795
3	2600	1792
4	3600	4182
10	10	



TAC (t) recommended by Livingston (1988) if fishstock boundaries altered to reflect biological information

	Proposed TAC allocation
1	1800
3	3700
5	2500
10	10