New Zealand Fisheries Assessment Research Document 88/11

Blue warehou

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Blue warehou

(Seriollela brama)

I. Introduction

(a) Overview

This paper is a compilation of data presented to the 1985,1986 and 1987 stock assessment meetings with catch data updated to December 1986 for the domestic fishery, and to the end of the 1985/86 fishing year for the deepwater fishery.

CPUE data from domestic gill-nets from 1983-1986 is included and continues to show a decline.

Because the target trawl fishery for blue warehou, both domestic and deepwater, is relatively small the CPUE data is of doubtful value but is included for area F only (from 1978/79 to 1983/84 fishing years). No trends are discernable.

Also included are notes on the biological information available.

The evidence presented by Jones & Hurst (1988) in the blue warehou paper at the 1987 TAC meetings, recommending a reduction in quota from 3000 to 1000 t in QMA 3 is still valid.

(b) Description of the fishery

Blue (or common) warehou are a moderately fast growing schooling species, averaging 40 - 60cm in length and reaching a maximum of about 75cm. The fish is common around the South Island and lower North Island, but occurs patchily along the coast of the North Island to about 37 S. The species also occurs in south Australia (McDowall 1981).

Wellington landings made up the bulk of the national catch until the 1960s, and Wellington also has the longest continuous series of blue warehou landings with records beginning in 1936. This fishery was almost entirely a net fishery until the 1960's when, with the advent of the high opening bottom trawl, trawling began to take a major part of the catch (table 1). Landings in Wellington have fluctuated with peaks in 1937, 1959 and 1978. Whether the fluctuations reflect a reduction in availability of the fish, an aberration caused by the relatively small quantities

involved, or a change in the fishing patterns is unknown. Although Shuntov et al. (1981) stated that blue warehou catches were related to water temperature, it is more likely that the drop in Wellington landings in the 1960's was due to the Chatham Islands crayfish boom from 1965-1975. No correlations have been found between blue warehou catches and climate (Jones 1986).

The peak catch for Wellington was in 1978, and for the domestic fishery in 1981 (table 1, figure 1).

Catches of Centrolophidae (warehous) by foreign licenced (FLV) and foreign chartered vessels (FCV) were not reported by species prior to 1978/79 and it is impossible to determine how much blue warehou was caught. The only area with a sizable warehou fishery is area F, particularly the Solander Corridor in spring. Catches within the EEZ peaked in 1983/84 as an overflow effect of the introduction of a deepwater policy, with more effort being put into catching unrestricted species (Hurst 1985) and have since declined (tables 2,3). The Solander Corridor was closed to FLV's and FCV's from 1st October 1985.

Current TAC and management boundaries:

Area	QMA*	Gazetted TAC (t)	1986/87 catch (QMR#)
Kermadec	10	10	0
Auckland	1	30	7
Central -East	2	480	190
Central -West	8	210	40
Challenger	7	910	780
Southland + South-east + Sub-Antarctic	3	3210	1330

* = Quota management area for WAR.
# = Quota management reports (these are provisional only).

(c) Review of the literature

The taxonomy of the centrolophids found in the New Zealand region is dealt with by McDowall (1981).

Data on historical domestic landings have been published in the preliminary draft background papers for the fisheries management plans for the Auckland, Central, Southern, and Challenger FMA's (Reference copies are lodged in the MAFfish library).

Data on the history of the fishery, biomass estimates, and possible stocks were given by Hurst (1985) and updated by Jones & Hurst (1988). Ages based on scale readings are provided by Tsarev (1971) and preliminary data on age from otoliths is provided by Jones(1986). Robertson (1975,1980) described the eggs and gives spawning information; Gavrilov & Markina (1979) provide information on feeding, and Fenaughty & Bagley (1981) provide information on length frequencies, feeding and spawning. The effects of water temperature on abundance are discussed by Shuntov et al. (1981) and Jones (1986).

II. Review of the fishery

(a) Catch/effort data

For the domestic fishery there is no way of separating out vessels which, while not specifically fishing for warehou, nevertheless caught some and therefore have a relatively low catch for the effort involved.

In Jones (1986), a comparison of catches by gill net, from all areas combined, from vessels landing over one tonne of warehou per annum showed a decline in catch from 1983 to 1985. These data have been updated in figure 2 and, given the seasonal nature of the fishery and the effects of the ITQ scheme on numbers of fishermen (as indicated by a reduction in net length of over 50% between 1984 and 1986), it is probable that the change in CPUE reflects changes in the fishery rather than in the availability of the fish.

The only area of the EEZ which supported a sizable blue warehou target trawl fishery was area F. The quantity of warehou targeted for exceeded 500 t only in 1982/83 and 1983/84 (556 t and 863 t respectively) and the data do not therefore provide a good series for CPUE analysis.

Some CPUE data for vessels working in area F up to 1983/84 (table 4) was provided by Jones (1986), who concluded that target catch rates appeared to be low,compared to other species in the area but did not appear to be declining.

(b) Other information

Catches by Fisheries Management Area for 1984-86 are shown in figure 3. In 1986 warehou were caught around Northland, the Hauraki Gulf and the Chatham Islands suggesting that in that year blue warehou had a more northern distribution than in the period 1983-1985.

Seasonal catch information shows that there is a winter/spring fishery for warehou in area 40 and 14 (New Plymouth and north Wairarapa); a summer fishery with a small autumn peak

in area 16 (Wellington),and a summer/autumn fishery in areas 18 and 22 (Kaikoura , east coast South Island) .
Area 33 (west coast South Island) has a fishery in august/september which picks up again in summer. The fishery in Tasman Bay (area 38) is also a summer one (figures 4,5).

There is probably a migrational movement of blue warehou to explain these patterns.

Seasonal catch data for the licenced and chartered vessels shows that the fishery is a summer one with the majority of the catch being taken by the charter vessels. The 1985/86 season was later than in 1983/84 or 1984/85 and included significant quantities from area G (for which area catches have not exceeded 100 t since the EEZ was declared), but not area E(a) which in the past has provided reasonable catches (figures 6,7).

(c) Maori and recreational fishing patterns

The recreational fisheries survey shows that blue warehou are not commonly caught by recreational fishermen.

III. Research

(a) Review studies of stock structure

No stock boundaries are known, however, Hurst (1985) after considering known spawning grounds and seasonal fishing patterns, suggested that there were probably two stocks: a central and a southern stock.

A low priority tagging programme in 1984 was carried out in conjunction with barracouta surveys, and also with the cooperation of local gill net fishermen. Just over 100 fish were tagged in an effort to detect movements of fish, but there have been no returns.

(b) Review of resource surveys

There have been no resource surveys targeted primarily at blue warehou but surveys targeting other species do provide some biomass estimates from which yield figures can be derived (see later discussion).

Struik & Bray (1979) noted a significant ($p < 0.001$) decline in amateur gill net catches of warehous in the Marlborough Sounds over the period 1971-1978.

Data from the domestic statistics suggest a decline in

overall catch between 1981 and 1985 which could be related to increasing catches by deepwater vessels in the southern area, but could also be due to a redirection of effort (e.g. orange roughy) or a decline in abundance. There was a slight improvement in the 1986 catch over the 1985 level but this was only due to increased catches in Tasman Bay, off Gisborne, and in the north of the North Island. Only three domestic areas recorded increases of over one tonne in 1986.

(c) Other studies

Ageing/growth:

"Length at age" results from counts of check rings of about 300 otoliths are given in Jones (1986) and are compared with lengths back calculated by Tsarev (1971) from the check rings present on scales of over 3700 fish. These data suggest that fish of 40cm are between 4 and 5 years of age, reaching 7-8 years of age at a length of 50cm.

feeding:

Gavrilov & Markina (1979) reported that S. brama is a macroplankton eater, living primarily on the tunicate Pyrosoma, the salp Iasis and the euphausid Nyctiphanes. Graham (1956) recorded that blue warehou also eat small fishes, shellfish, crabs and ostracods. The predominant food found by New Zealand Fisheries staff has been salps, tunicates and Munida (Fenaughty & Bagley 1981, Jones 1986)

length frequency data:

Length frequencies by area and time obtained from the W.J.Scott trawl survey on the West Coast South Island have been published (Fenaughty & Bagley 1981). There is also a moderate amount of length frequency data accumulated from a variety of sources at FRC which have not been analyzed.

Net selection:

Unpublished data held at FRC show that there is no size selection of blue warehou between 20cm and 60cm fork length by nets of 90mm, 115mm ,135mm mesh.

Reproductive biology, spawning areas:

Known spawning areas include the west coast of the South Island (in August-September), Kaikoura (in March, April, May), Southland (in November), and Hawke Bay (in September). Eggs are described by Robertson (1975), and spawning (Robertson 1980; Fenaughty & Bagley 1981).

(d) estimates of biomass

Relevant biomass survey data are summarised in table 5.

Coefficients of variation are often very high due to the patchy distribution of the fish, and diurnal variability in availability to the trawl (Hurst 1985). Expansion of the yield estimates to include unsurveyed areas is inappropriate because of the known patchiness of distribution and probable migrations between areas.

In 1986 a further two trawl surveys on the Stewart-Snares shelf, which included the area inside the territorial sea, made it possible to re-evaluate biomass estimates in that area. This was calculated in two ways: by using the mean biomass from all six surveys of warehou in this area (resulting biomass estimated at 7555 tonnes); and by using the estimate with the lowest coefficient of variation (26% in November 1986)(biomass estimated at 4300 tonnes)(Jones & Hurst 1988).

(e) estimates of short and long term yield

The TACs recommended in 1985 were set at the level of the 1983 landings (Hurst 1985). The high foreign and chartered vessel catch in area F in 1983 was not repeated in 1984 or 1984/85, and the analysis of the research data available after the 1986 surveys (assuming a 15% productivity) did not support a 3000 tonne TAC for the Southland Sub-antarctic area. For the 1987/88 fishing year it was recommended that the TAC for the Southland + South-East + Sub-antarctic be reduced to 1000 t which was the mean yield derived from the six surveys carried out in the Southland/Sub-Antarctic area.

Maximum constant yield:

This is difficult to estimate since both catches and effort have been fluctuating.

Recruited biomass for the South Island has been estimated in two ways using existing trawl data (table 3). In calculating yields a value of M of 0.3 has been used based on estimates of age from otoliths.

1. There are three recruited biomass estimates from trawl surveys in area G which provide an average biomass of 2700 tonnes; an estimate from northern area G/southern area H (Oct/Nov. 1981) of 1550 tonnes; and an average from area E/F of 6450 tonnes. The relationship between these areas, given the probable existence of warehou migrations around the coast, is uncertain so that the fish in area G in August, for example, may have moved further north into area H in November. However, in the absence of better information the yields from these areas (which accounted for 19% of the 1985/86 catch) would be 1000 t in E/F; 410 t in G and 230 t in G/H; a total of 1540 t; split up as 1000 t in fishstock 3, (410+230) = 640 t in fishstock 7.

2. By using data from trawl surveys held at similar times in an effort to overcome double counting an estimate of yield can also be derived. Feb - Apr 1983 surveys in areas E/F and C+D give 2980 t (one survey with a high c.v) and Sep - Nov 1983 surveys in G, E/F and C+D give a yield estimate of 740 t. Averaging the two 1983 seasonal estimates gives a yield figure of 1800 tonnes. Two further surveys in Jun - Jul 1986 in areas E/F and C+D give an average yield of about 1200 t, the combined average over the two years (1983 and 1986) is 1500 t.

It is possible that the decline in catch in the South Island domestic fishery since 1983 was exacerbated by the high catches in the Solander Corridor. Should the QMA area 3 quota not be reduced, vessels fishing in that area could potentially take over half the estimated biomass in that area (based on the 1986 data).

There are no biomass estimates available for the Auckland or Central (East) areas. However, average landings into Wellington over the period 1977 to 1983 were relatively stable at 300 t.

East Coast landings have shown large fluctuations, at Gisborne from 2 t in 1978 to 140 t in 1979 before declining to 2 t again in 1983. In Napier landings have also fluctuated from 1 tonne in 1960 to 87 t in 1972, decreasing to less than 20 t in 1975 before peaking at 123 t in 1978 and then declining to 30-40 t. The MCY for the Central (East) area (Fishstock 2) is therefore calculated as 300-350 tonnes x a c factor of 0.7 (to account for fluctuations) = 210-250 t.

The average domestic landings in the Central (Egmont) zone in 1977 to 1983 are 70 t, the average (declining) catch over 1983/84 to 1985/86 is 79 t. An MCY of 80 tonnes is suggested for this area. New Plymouth has a peak seasonal catch in July, the season extending from June to September. However, the trawl surveys in G/H in October-February, which included part of the Central (Egmont) zone outside 12 miles, coincided with the December fishery in Tasman Bay and northern West Coast South Island. Therefore the biomass results for those surveys have been included with the Challenger area, and the yield for the Central (Egmont) zone has been calculated separately.

The best estimate of maximum constant yeild is thus between 1500 and 1900 tonnes.

Current annual yield:

It is not possible to calculate this in the absence of current biomass estimates.

(f) Models

None attempted.

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Figure captions

figure 1. Domestic and total landings of blue warehou 1936-1986 (tonnes).

figure 2. Catch per metre of gill- net set, 1983- 1986 (excluding vessels catching less than 1 tonne).

figure 3. Catches by Fisheries Management Area 1984-1986. Catches from unrecorded areas totalled in 1984:2192 t;1985: 325 t; 1986: 624 t.

figure 4, 5. Catches by month for selected domestic areas, 1984;1985;1986.

figure 6. Foreign licensed and foreign chartered vessel catches of blue warehou by month, all areas combined, 1983/84; 1984/85; 1985/86 fishing years.

figure 7. Catches by month in selected EEZ areas, 1983/84, 1984/85, and 1985/86 fishing years.

TABLE 1: Annual domestic landings of blue warehou 1931-1986 and annual landings into Wellington, 1931-1983.

year	total (t)	Wellington (t)	year	total (t)	Wellington (t)
1936	80	80	1961	70	70
1937	150	120	1962	110	100
1938	90	90	1963	110	100
1939	30	10	1964	140	120
1940	50	40	1965	80	60
1941	80	50	1966	40	20
1942	70	60	1967	330	40
1943	70	60	1968	370	30
1944	50	30	1969	170	30
1945	10	10	1970	370	30
1946	20	20	1971	440	30
1947	30	30	1972	430	40
1948	20	20	1973	725	50
1949	20	20	1974	840	100
1950	50	50	1975	530	150
1951	30	30	1976	990	160
1952	20	20	1977	1090	250
1953	40	40	1978	1680	400
1954	70	70	1979	1820	260
1955	40	40	1980	1870	370
1956	60	60	1981	2900	250
1957	125	125	1982	2300	270
1958	110	110	1983	2340	350
1959	140	140	1984	1590	
1960	70	70	1985	1400	
			1986	1580	

TABLE 2: Blue warehou catches (t) by all vessels for the fishing years 1983/84-1985/86

EEZ areas	1983/84 DOM	1983/84 FCV	1983/84 FLV	1983/84 total	1984/85 DOM	1984/85 FCV	1984/85 FLV	1984/85 total	1985/86 DOM	1985/86 FCV	1985/86 FLV	1985/86 total
A	154	0	0	154	72	0	0	72	49	0	0	49
C	367	95	0	462	393	3	0	396	252	1	0	253
D	0	8	1	9	0	1	-	1	0	-	11	11
E	0	10	293	303	0	2	637	639	0	4	34	38
F	108	2438	378	2924	11	552	84	648	3	1358	175	1536
G	600	42	0	642	343	27	0	370	284	382	0	666
H	372	1	2	373	376	3	1	380	362	7	3	372
Unknown	116	0	-	118	43	35	0	83	72	0	0	72
Total	1716	2594	673	4983	1243	622	722	2587	1022	1753	223	2997

= New Zealand domestic vessels
= New Zealand chartered vessels
= Foreign licenced vessels
= less than 0.5 t.

TABLE 3.

Blue warehou catches (tonnes) from the EEZ 1981/82 to 1986/87.

Year	Foreign licensed vessels			chartered	domestic	total
	Japan	USSR	Korea	vessels	vessels	
1981/82	67	0	0	1478	2900 #	4446
1982/83	284	11	465	982	2300 #	4042
1983/84	293	6	347	2594	1716	4983
1984/85	13	23	686	622	1279	2623
1985/86	151	0	72	1751	1260	3234
1986/87						2340*

* = Quota monitoring reports (provisional only).
# = Calender years for domestic catch 1982 and 1983.

TABLE 4a: CPUE of deepwater vessels working in Area F, targetting on common warehou

Year	Tonnage Class											
	0-550			550-1500			1500-2500			2500-4000		
	t	hr	t/hr	t	hr	t/hr	t	hr	t/hr	t	hr	t/hr
1978/79	-	-	-	43	85	0.5	10	45	0.2	-	-	-
1979/80	12	113	0.1	53	271	0.2	304	468	0.7	44	30	1.4
1980/81	Data not available											
1981/82	117	183	0.6	8	113	0.1	14	44	0.3	107	95	1.1
1982/83	44	93	0.5	239	392	0.6	252	301	0.8	21	14	1.5
1983/84	243	182	1.3	134	189	0.7	379	414	0.9	108	134	0.8

TABLE 4b: CPUE of deepwater vessels working in the Solander corridor common warehou fishery over the weeks 42 to 53

	Tonnage class											
	0-550			550-1500			1500-2500			2500-4000		
	t	hr	t/hr	t	hr	t/hr	t	hr	t/hr	t	hr	t/hr
1978/79	-	-	-	-	-	-	-	-	-	-	-	-
1979/80	-	-	-	18	94	0.2	239	195	1.2	44	30	1.4
1980/81	Data not available											
1981/82	83	124	0.7	4	11	0.3	-	-	-	91	66	1.4
1982/83	-	-	-	175	256	0.7	186	208	0.9	-	-	-
1983/84	233	162	1.4	104	100	1.0	243	240	1.0	62	41	1.5

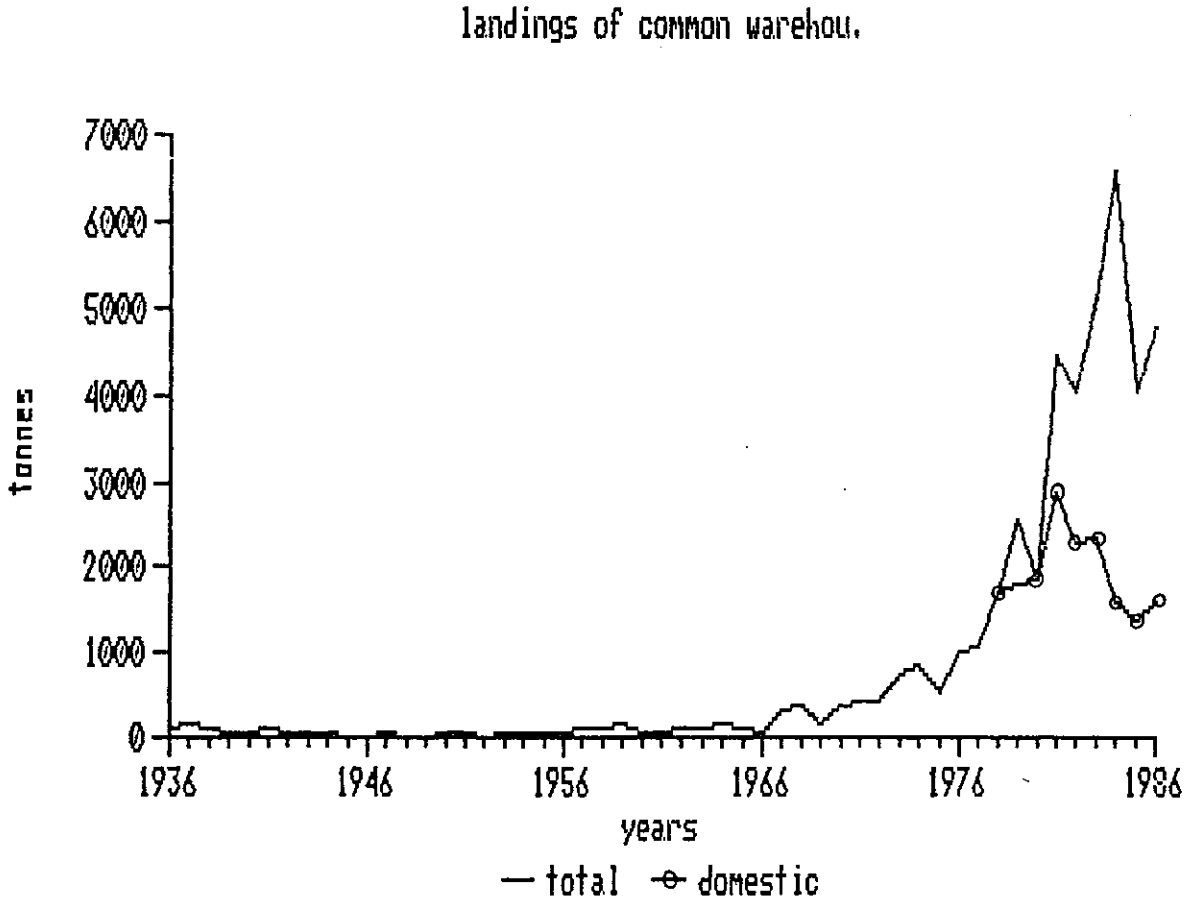
TABLE 5 :Biomass estimates1 (tonnes) of blue warehou from trawl surveys.

area	vessel	date	biomass	c.v.2	yield3
G	W.J. Scott	May-Aug 81	4900	29	730
		Sep-Feb 82	1720	44	260
		Mar-Jul 82	1840	46	280
		Jul-Oct 82	3280	28	490
		Oct-Feb 83	610	35	90
		Feb-Apr 83	280	35	42
	James Cook	Sep/Oct 83	1320	48	200
		Aug/Sep 84	2070	29	310
G + H	Shinkai maru	Oct/Nov 81	1550	48	230
	Tomi maru	Dec-Feb 81	0	-	0
C + D	Shinkai maru	Mar 83	240	29	40
		Nov/Dec 83	0	-	0
		Jul 86	200	100	30
E/F	Shinkai maru	Feb 1981	5800	44	870
		Mar 1982	2350	62	350
		Apr 1983	19620	72	2940
		Oct-Nov 1983	3560	58	540
		Jun 1986	7300	59	1100
	Akebono maru	Nov 1986	4300	26	650

1 The biomass was calculated by using the average of the doorspread and wingspread estimate. All surveys were random trawl surveys except those of W.J. Scott and James Cook which were systematic.

2 Percentage coefficient of variation.

3 Using yield = biomass X 0.5 X mortality (=0.3).


landings of common warehou.
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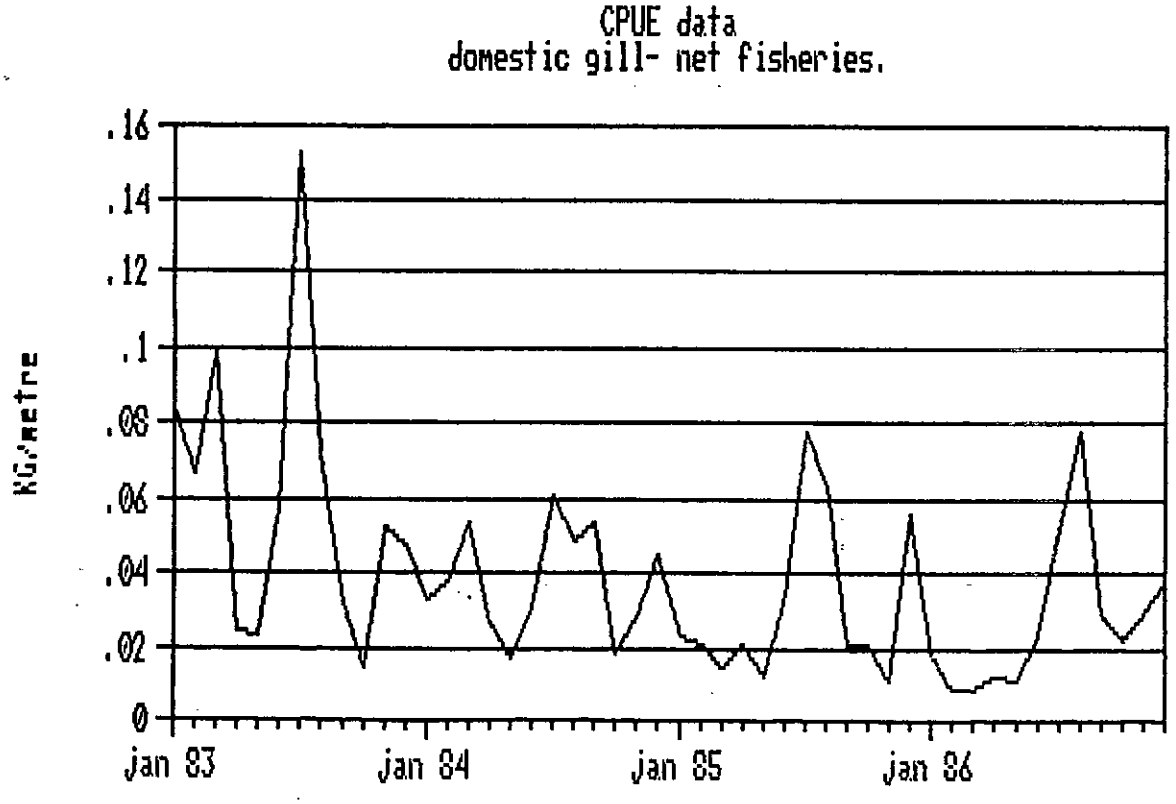
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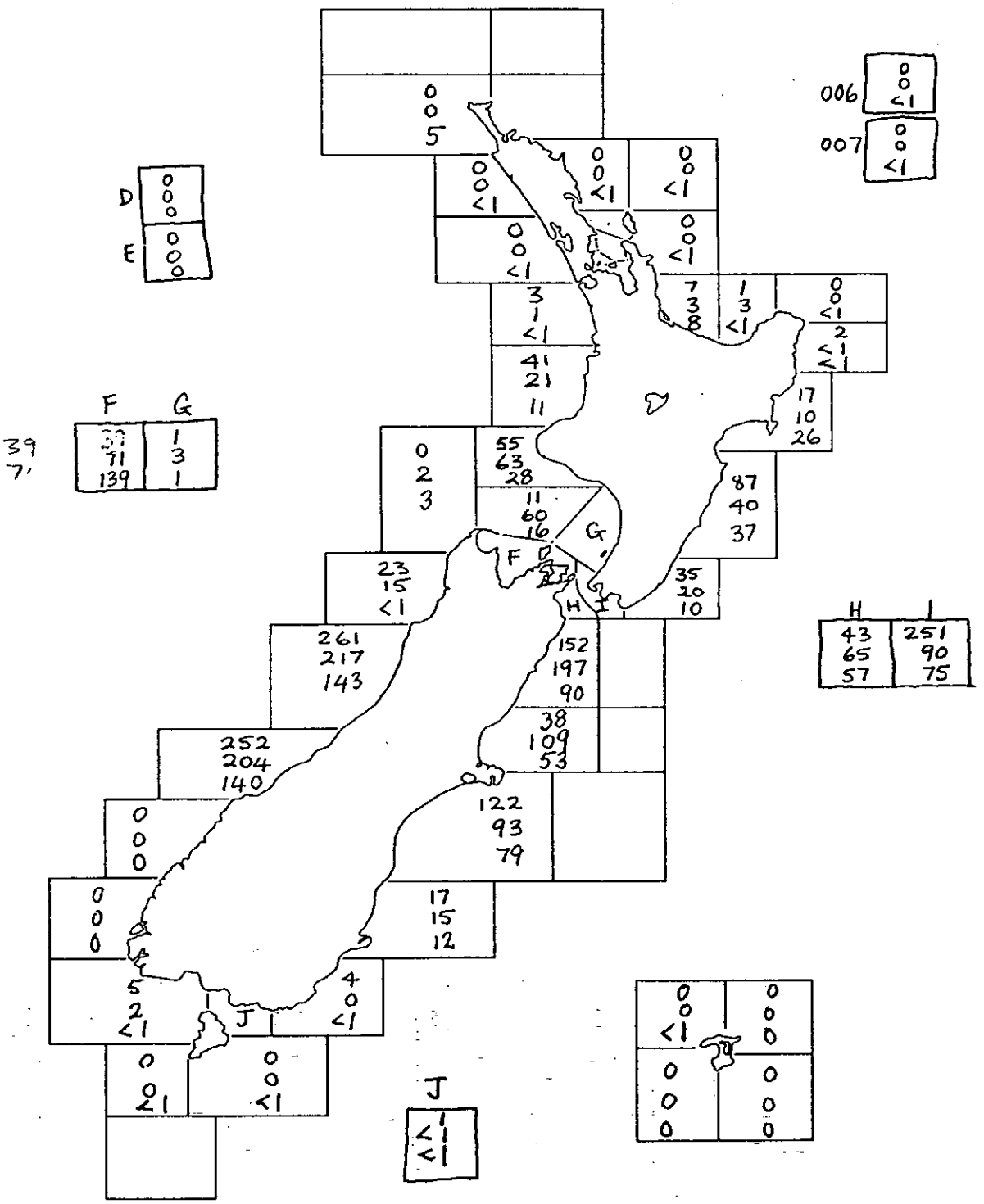
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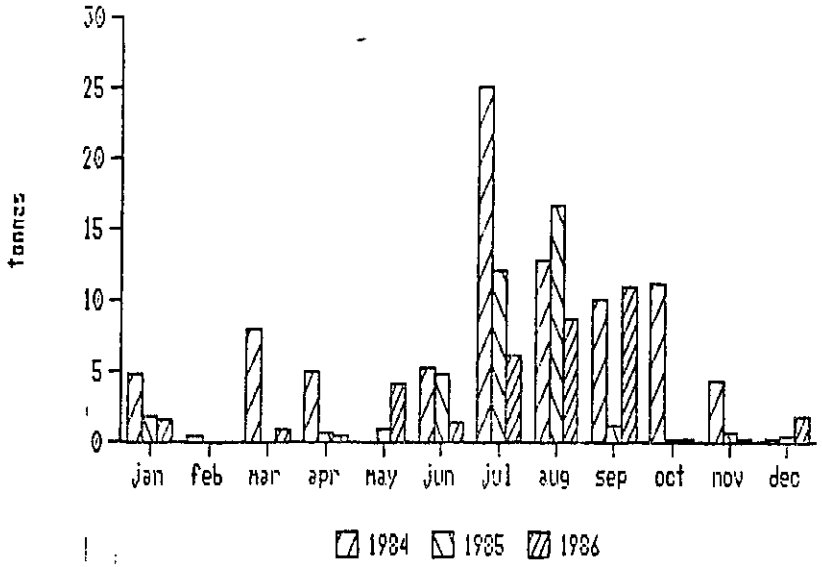

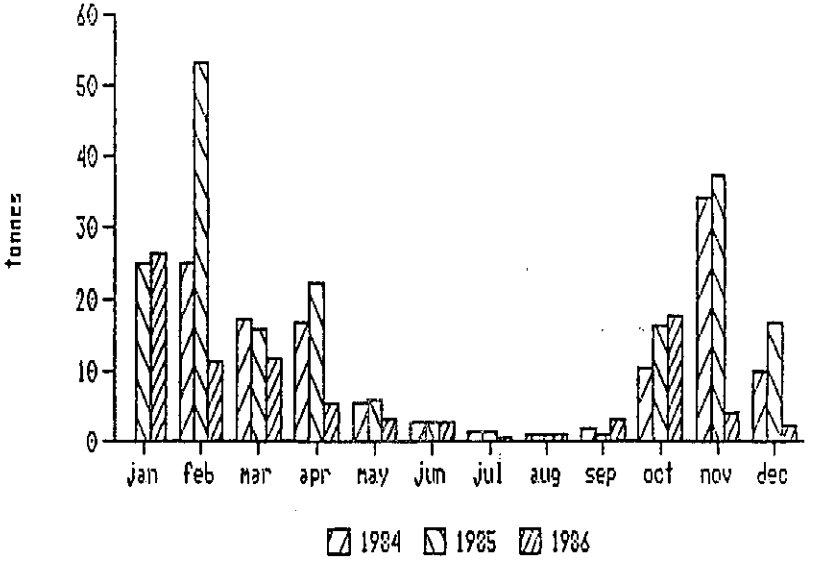

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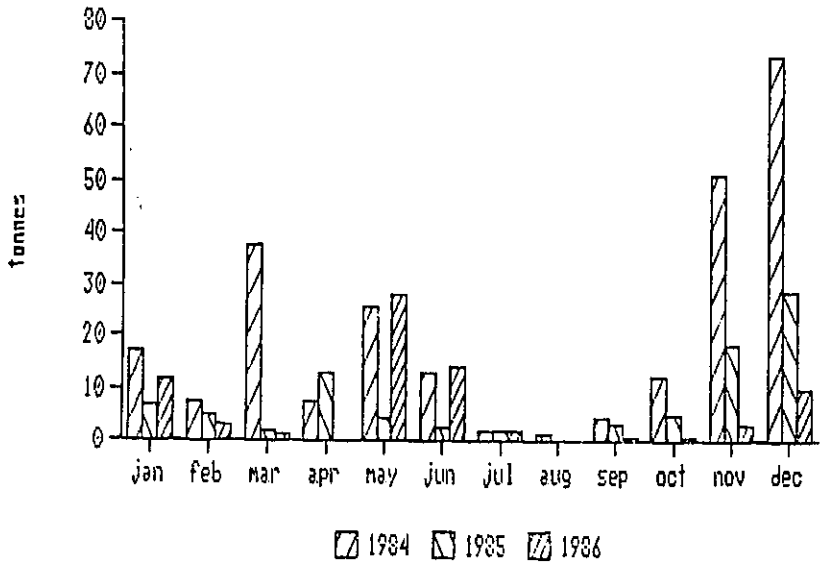

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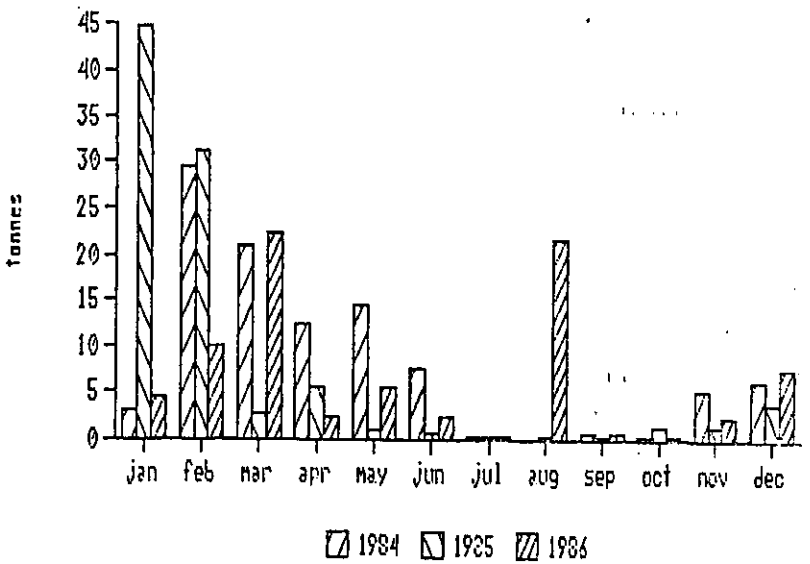
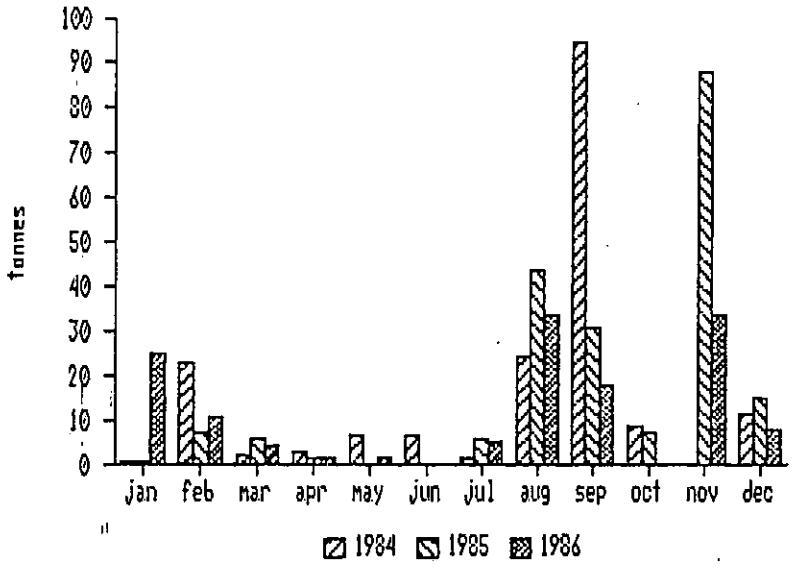
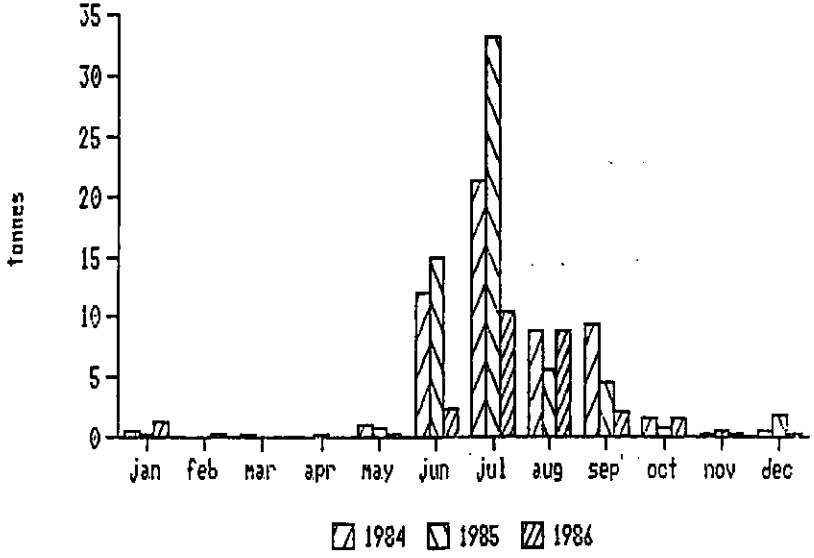


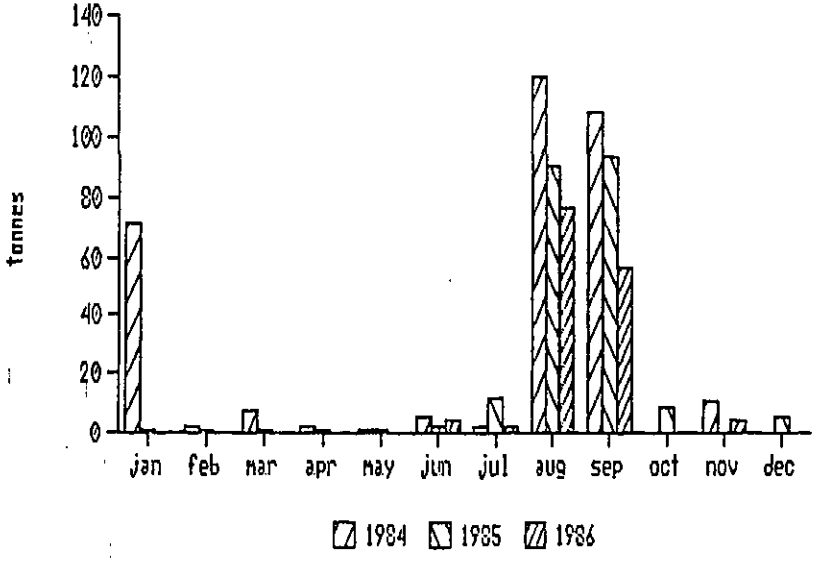
area 33 HAR landings



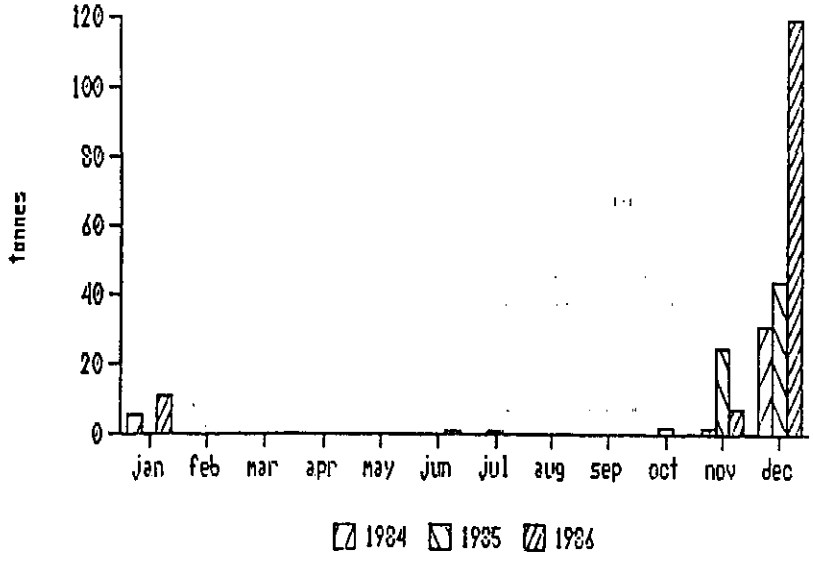
area 49 HAR landings

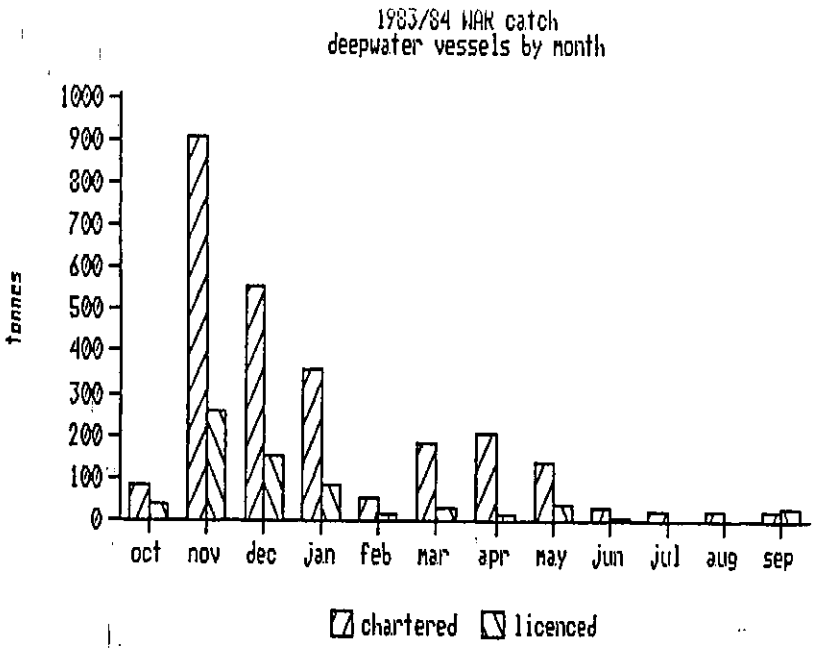


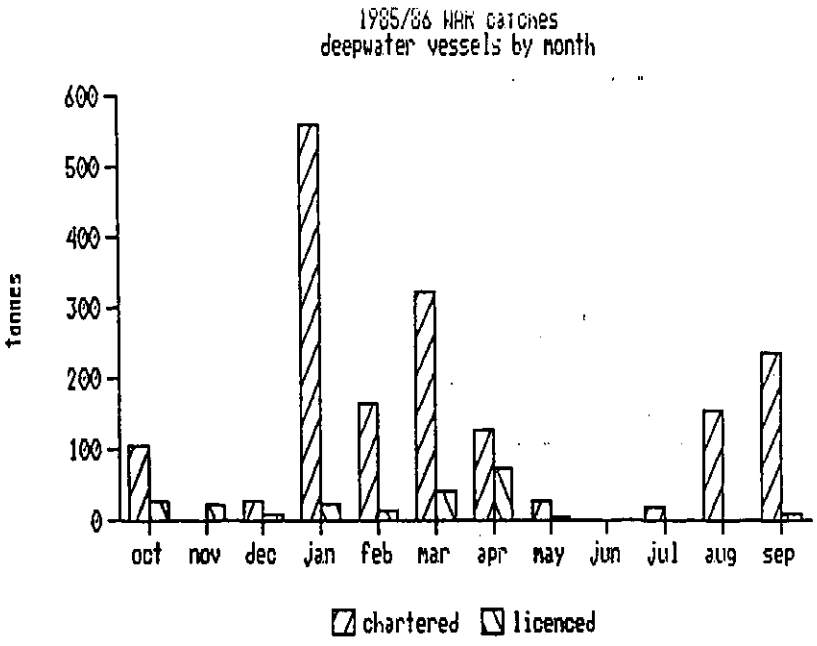
area 34 HAR landings

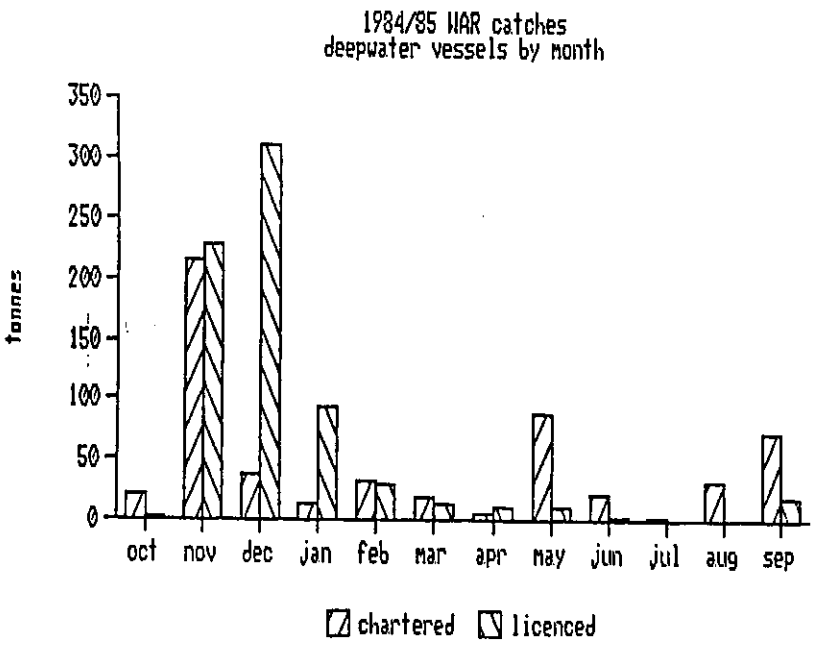


area 38 HAR landings

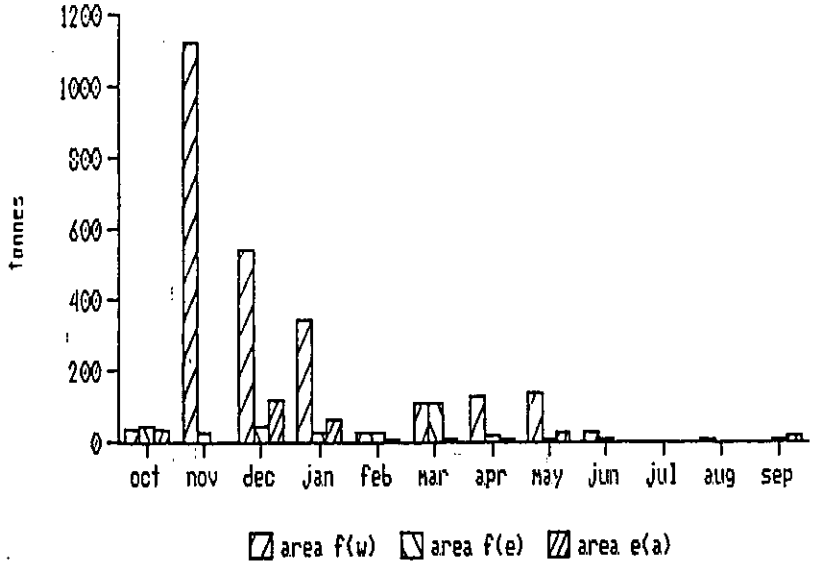



1983/84 WAR catch
deepwater vessels by month
tonnes
1000
900
800
700
600
500
400
300
200
100
0
oct nov dec jan feb mar apr may jun jul aug sep
chartered
licenced

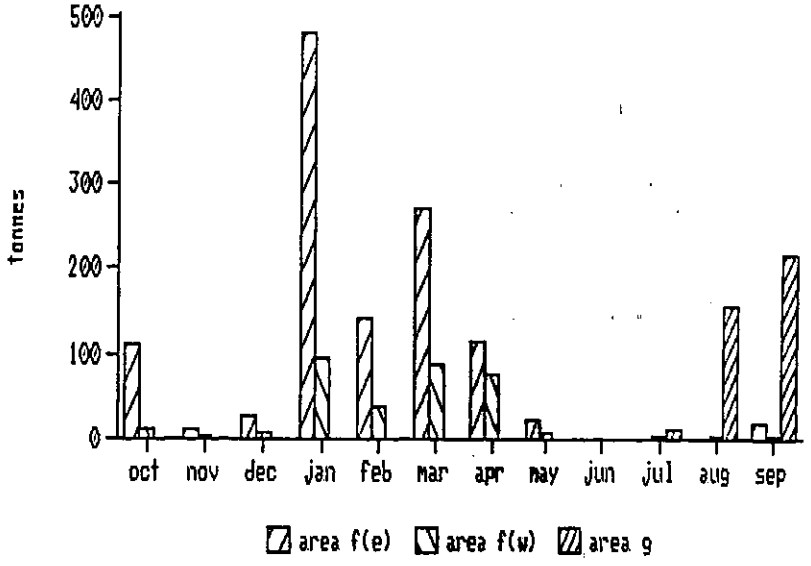

1985/86 WAR catches
deepwater vessels by month
tonnes
600
500
400
300
200
100
0
oct nov dec jan feb mar apr may jun jul aug sep
chartered
licenced


1984/85 WAR catches
deepwater vessels by month
tonnes
350
300
250
200
150
100
50
0
oct nov dec jan feb mar apr may jun jul aug sep
chartered
licenced

1983/84 WAR catch
by month and EEZ area



1985/86 WAR catches
deepwater by area & month



1984/85 WAR catch
deepwater by area & month