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Kahawai fishery assessment 1989

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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.

KAHAWAI FISHERY ASSESSMENT 1989

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1. INTRODUCTION

1.1 Overview

A record high reported catch of 9608 t of kahawai was taken by the commercial fishing sector in the 1987-88 fishing year, of which nearly half (4144 t) was taken from the Bay of Plenty. Non-commercial fishing groups are concerned about the increasing difficulty for Maori and recreational fishers to catch kahawai between North Cape and East Cape. The "mixed fish" catch of kahawai from purse seine vessels for 1979 to 1988 was assessed by a pro-rata procedure for each QMA. Based on this new information and the existing reported catch data, a national MCY of 5,180 t was calculated which was then separated into MCYs for QMA1 (1,825 t), QMA2 (825 t), QMA3 (2,040 t) and QMA9 (490 t). The MCY for QMA3 represents QMAs 3,4,5,6,7 and 8 combined. Management options are outlined for resolving the conflict between the commercial and non-commercial fishing sectors.

This FARD provides three new pieces of information: (i) the catch statistics are updated by including the data for the 1986-87 and 1987-88 fishing years, (ii) an assessment of the "mixed fish" catch of kahawai by purse seine vessels is made, and (iii) a national MCY is calculated which is then divided into separate MCYs for the different QMAs.

1.2 Description of the fishery

The information presented in Kilner (1988) remains applicable.

1.3 Literature review

Kilner (1988) provided a detailed summary of the existing information on the kahawai fishery.

2. REVIEW OF THE FISHERY

2.1 Landings

The catch (9608 t) for the 1987-88 fishing year is the highest reported kahawai catch from the commercial fishery to date (Table 1). This record catch was probably due to commercial fishers and fishing companies firstly ensuring that their kahawai catch was fully reported, and secondly increased targeting in certain areas for kahawai in anticipation that kahawai will become an ITQ species. Therefore, the reported catch for the 1986-87 and 1987-88 fishing years is considered to be accurate.

Nearly half (4144 t) of the kahawai catch for the 1987-88 fishing year was caught in the Bay of Plenty. In previous years, the Bay of Plenty catch accounted for 20-30% of the reported New Zealand catch (Figure 1). Around 75% of the total New Zealand catch each year was taken by domestic purse seine vessels (Table 2); this proportion increased to 86% for 1987-88. There are currently seven vessels (which target kahawai) involved in the New Zealand domestic purse seine fishery based at Tauranga, Gisborne and Nelson. The foreign chartered purse seiners that have fished around Northland and the Bay of Plenty over the summer since the late 1970s fish for skipjack tuna and catch only negligible amounts of kahawai.

Since the introduction of the QMS, there has been a general decline in trawling in the Auckland FMA, which has meant that there is now less trawl-caught kahawai (Table 2). This trend is especially pronounced for pair trawling. On the west Auckland coast prior to the QMS there was a large snapper trawl fishery, with an average of 209 t of kahawai caught as a by-catch from 1983-84 to 1985-86. For 1987-88, there was only 67 t of kahawai caught by pair trawlers on the west Auckland coast.

CPUE values were not calculated for the kahawai fishery since for the main target fishing method (purse seining) it was not possible to ascertain from the fishing return forms what the target species was for a particular set. Also, for the set-net and pair trawl methods it was not possible to differentiate between the target and non-target kahawai catch.

2.2 Other information

The reported kahawai catch from fishing returns under-estimated the actual catch until the introduction of the QMS in 1986. Three main sources of non-reported kahawai catch have been identified: (i) "mixed fish" from the purse seine fishery, (ii) bait for the line and rock lobster fisheries, and (iii) kahawai dumped at sea. There was also the problem of assigning the catch to a particular QMA if the fishing area had not been declared on fishing returns. It was possible to partially resolve this problem using the aerial sightings data-base and local knowledge about fishing patterns. The non-reported catch and unknown fishing area problems are discussed in greater detail below.

2.2.1 Non-reported catch

i) "Mixed fish"

Large amounts of kahawai caught by purse seiners were recorded on fishing returns by a variety of terms such as "mixed", "meal", "felix" and "rejects". This practice usually occurred for fish that had been caught in mixed schools which were not readily identifiable by individual species because of the large quantity of fish caught. This fish was a mixture of many species, but in particular jack mackerel and kahawai. The problem was especially pronounced prior to 1983, since fish recorded as "mixed", "meal", "felix" or "rejects" on fishing returns was generally entered into the fisheries statistics data-base as "mixed fish".

The "mixed fish" catch for each purse seiner was pro-rated for each year since 1979 by QMA to estimate the kahawai component as illustrated in the following generalised example. The annual catch of a particular purse seine vessel may have been: 500 t kahawai, 800 t skipjack tuna, 300 t blue mackerel, 500 t jack mackerel, 200 t trevally, 700 t "mixed fish"; total catch 3,000 t. The "mixed fish" catch was subtracted from the total catch. The skipjack tuna catch was also subtracted from the total catch, because when the purse seiners are targeting skipjack, inshore species such as jack mackerel and kahawai are very seldom caught. This equals a sub-total of 1500 t. Kahawai accounts for 33.3% (500 t) of the 1500 t sub-total for the remaining species. Therefore, it was assumed that kahawai accounted for 33.3% or 233 t of the 700 t of "mixed fish". The results of pro-rating the "mixed fish" catch are presented by QMA in Table 3.

An additional problem prior to 1983 was that the area where the fish were caught was not recorded on fishing returns. This problem was overcome by using two different methods for the purse seiners depending on their base port. For the Nelson-based purse seiners, a detailed non-computerised data-base had been maintained by MAF which stated the fishing areas by vessel for each fishing trip for 1979-82. This was particularly useful because Nelson-based boats frequently fished in three QMAs 3,7 and 8. For these vessels

catches were pro-rated for each QMA by fishing trip. For the Tauranga-based and Gisborne-based purse seiners the aerial sightings data-base was used to determine the fishing areas. Purse seine vessels are normally directed on to schools of fish by spotter plane. It was assumed that there was a close relationship between the area where the purse seiner was fishing and the area where the spotter plane was flying. Using the aerial sightings data-base, the catch by QMA for each of the Tauranga-based and Gisborne-based purse seiners was determined. Catches were pro-rated for these vessels for each QMA by month.

The "mixed fish" problem was not as pronounced after 1983 (as shown in Table 3), due mainly to the new fishing return system which required that two forms be filled out for purse seining. Skippers were required to fill out a form which provided information on each purse seine set including position and the estimated proportion of each species in a set. The fishing company then filled out the landed catch form for each occasion the vessel was unloaded, recording the weight of the unloaded catch by species. Low grade and unidentifiable fish, however, were still recorded as "mixed fish". However, under the new system, it was possible for the FSU staff to allocate the "mixed fish" recorded on the landed catch form to a species, depending on the proportion of each species recorded on the skipper's form (K. Fisher, pers. comm.). Because of the nature of purse seining, it is possible for a skipper to become very accurate in estimating species composition in a mixed school, although most sets are on single species schools. This almost completely resolved the "mixed fish" problem after 1983, although there were a few occasions when the FSU staff could not confidently allocate the "mixed fish" recorded on the landed catch form. Therefore, for the remaining small amounts of "mixed fish", catches were pro-rated by calendar year and by vessel to estimate the amount of kahawai caught.

ii) Bait

Quantities of kahawai that have not been reported on fishing returns have frequently been used for bait by commercial fishers, especially in the line and rock lobster fisheries. However, there has been only one quantitative bait study. The amount of finfish used as bait was assessed in the South-East FMA rock lobster fishery during the 1986-87 season (Table 4). The only area where kahawai was used as rock lobster bait in significant quantity (301 t) was in the Kaikoura area. It is likely that about 50% of this kahawai was not recorded on fishing returns (G. McGregor, pers. comm.). There has been concern that the non-reporting of kahawai as bait in the Kaikoura area may have also occurred in other rock lobster fisheries and also the line fisheries.

An informal telephone survey was carried out to determine the extent of kahawai used as bait by commercial fishers over the last 10 years. Fishers from around the country who had been in the fishery since 1979 were asked to comment on the usage of kahawai as bait by fishers in their areas. Each fisher was asked to consider only kahawai caught and used as bait by the fishers themselves and not reported on fishing returns. The survey showed that of the line fishing methods, only long-line fishers caught kahawai to use for bait. However in general, long-line fishers try to set their gear in order to avoid catching kahawai, since a large number of kahawai hooked on a long-line can cause considerable structural damage to the long-line.

It was believed by the fishers surveyed that the usage of kahawai as long-line bait has changed through time and tended to be more common prior to 1983. This was especially true amongst the "part-time" fishers who had relatively small boats with low fish holding capacity. The review and removal of part-timers from the fishery commenced in October 1983 and this may have had a considerable impact on the decreased usage of kahawai as long-line bait. It is highly probable that kahawai was not recorded by the part-timers on fishing returns. The fishers surveyed believed that most of the "full-time" fishers started to record most of their kahawai catch beginning in 1983, due mainly to the introduction of the more detailed fishing returns. However, about 10-20% of fishers may

still be using around 200 kg of kahawai for bait each year that is not reported on fishing returns.

For the rock lobster fishery, small fish, damaged fish and fish frames of many species supplied from the processing companies are commonly used as bait. Most rock lobster fishers did not attempt to catch their own bait. Kaikoura was the only area where kahawai was caught in large amounts by the fishers themselves in gill-nets and used as rock lobster bait.

iii) Dumping

In the past, because kahawai was a low value species, kahawai were dumped at sea and not recorded on fishing returns. To determine the extent of dumping, the telephone survey was broadened to include most fishing methods. The fishers were asked to comment on the amount of kahawai that was dumped in their area. The survey showed that the main methods for which dumping occurred were long-lining and trawling. These methods primarily targeted snapper which was a high value species, and dumping occurred when a large amount of kahawai was caught. Dumping was rare for most other fishing methods, for example drag netting and gill-netting, because although kahawai was usually a by-catch species, its value was still high enough to warrant landing compared to the regular target species such as grey mullet or flatfish.

Virtually all of the long-line fishers commented that dumping was reasonably rare after 1983, but that dumping had occurred prior to 1983, mainly by the part-time fishers. Dumping was a major problem for the pair trawl fishery on the west Auckland coast in the 1960s and early 1970s when, except for snapper, virtually all species (including trevally and red gurnard) were dumped. However, dumping declined from the late 1970s, mainly because as snapper became more difficult to catch, so many vessels and companies had a "policy" of landing rather than dumping species. In addition, the trawlers became larger with greater fish holding capacity and the companies developed markets for the lower value species such as kahawai. For the Bay of Plenty, large amounts of kahawai were probably dumped from pair trawlers through until 1983, at which time the fishers introduced a voluntary ban on pair trawling followed in 1984 by the formal prohibition on pair trawling in the Bay of Plenty.

2.2.2 Unknown fishing areas

i) Landings data before 1983

Before 1983, the area where fish were caught was not recorded on fishing returns, and instead, the port where the fish was landed was recorded (King 1985). To overcome this problem, the kahawai catch by QMA was reconstructed in the following way. Because purse seiners are comparatively mobile and frequently fish large distances from their base ports, their reported kahawai catch was subtracted from the reported kahawai landings for their respective ports (Tauranga, Gisborne and Nelson). The purse seine reported and "mixed fish" catch of kahawai was used to estimate the kahawai catch by QMA as described earlier (Table 3). For the remaining methods, it was assumed that the kahawai landings for a particular port had been caught in the QMA in which the port was situated. This is a reasonable assumption, because for large areas such as the QMAs, it is likely that even relatively mobile boats conducted most of their fishing within the QMA in which the landing port was located.

ii) Unknown areas after 1983

After 1983, there were a few occasions when the area where the fish were caught was not recorded on fishing returns. In these situations, it was again assumed that the fish were caught in the QMA in which the landing port was located. The only exception to using this procedure was in 1985 when two purse seiners failed to record the fishing area for some months. This problem was resolved by using the aerial sightings data-base for the spotter planes that were associated with the purse seiners as described earlier.

2.3 Recreational, traditional and Maori fisheries

Kahawai is a very significant Maori and recreational fishery. However, recreational fishing groups and Maori have stated that over the last two years it has become increasingly difficult for recreational fishers to catch kahawai between North Cape and East Cape.

MAFFish's Freshwater Fisheries Research Centre at Rotorua conducted a detailed study of the kahawai fishery at the Motu River mouth in the early 1980's (Penlington 1988). Penlington concluded that "... any loss of kahawai from the river mouth could have serious implications for the [Maori] people of Maraenui and the surrounding district."

The National Marine Recreational Fishing Survey identified kahawai as the second most frequently caught species by non-commercial fishers over the period of the survey (May 1986 to May 1987). The estimated number of people catching kahawai annually was 311,345. Snapper was the most important non-commercial species with an estimated 356,832 people catching snapper each year. Other species were not as frequently caught as kahawai and snapper. Blue cod was the third most important species with 90,375 people catching this species annually.

If all of the people who reportedly caught kahawai each caught one kahawai weighing 1.25 kg (the best available estimate of the average size of kahawai caught by recreational fishers nationally (B. Wood, pers. comm.)), then the annual non-commercial catch would be 389 t. For an average of 50 fish each, the annual catch would be 19,460 t. A more reasonable estimate of the non-commercial catch is 5-10 kahawai per person per year. The annual catch would then be 1,945-3,890 t.

More information on the non-commercial fishery for kahawai is presented in Kilner (1988).

3. RESEARCH

3.1 Stock structure

From October 1981 to February 1984, 13,911 kahawai were tagged at 23 locations around New Zealand (B. Wood, pers. comm.). Up to October 1986, 1,122 tagged kahawai were recovered and the recapture information provided to MAF (Tables 5A and 5B).

A preliminary analysis has been done on the tagging information to examine the extent of movement between QMAs (Table 5B). The data indicate that kahawai do not make extensive movements nor mix freely between certain QMAs. In particular, there was little movement from QMA1 (80% of fish tagged in QMA1 were recaptured from QMA1), QMA2 (86%) and QMA9 (84%).

3.2 Resource surveys

No new information is available.

3.3 Biomass estimates

No new information is available.

3.4 Yield estimates

3.4.1 Estimation of MCY

A national MCY was estimated for the commercial fishery using the equation MCY = cY_{av} (Method 6 of McKoy 1988). Y_{av} is the average annual catch from 1983-86 and equals the reported catch plus the estimate of the non-reported "mixed fish" catch from the purse seiners (Table 6). The period 1983-86 was selected as this is believed to have been a period of reasonably constant effort in the kahawai fishery, and because prior to 1983 it is likely that there were significant non-reporting problems. It is considered that after 1986 commercial fishers and fishing companies increased targetting and fishing effort for kahawai in certain areas in anticipation that kahawai would become an ITQ species. In addition, although fishing effort cannot be measured on a fine scale for purse seining (the method which takes most (70-80%) of the catch), effort in general terms increased after 1986 when the purse seine fleet increased from five to seven vessels. Because it is believed that the kahawai fishery was not fully developed during 1983-86, c was set equal to 1.0.

The national MCY estimate was divided into separate MCYs based on the proportion of the catch for 1983-86 for QMAs 1,2,3 and 9 (Table 6); QMA3 includes QMAs 3,4,5,6,7 and 8 combined. There are two reasons for dividing the national MCY into separate MCYs. First, although the 1981-84 kahawai tagging programme indicated that there were not clearly defined separate stocks, it was apparent that kahawai do not freely mix and do not make extensive movements around New Zealand (Table 5B). Second, the separate QMAs are necessary to prevent local depletion in areas that are important non-commercial fisheries and to spread the catch amongst fishing areas in which purse seine vessels operate. The local depletion reason is especially relevant given the importance of kahawai to the Maori and recreational sectors.

The MCY estimates are given in Figure 2 and Table 6.

3.4.2 Estimation of CAY

CAY cannot be determined because there are no estimates of total biomass nor fishing mortality.

4. MANAGEMENT IMPLICATIONS

Recreational fishing groups are concerned about the increasing difficulty recreational fishers are having catching kahawai between North Cape and East Cape. The commercial fishing sector caught a record high reported catch (4144 t) from the Bay of Plenty during 1987-88. Non-commercial fishers perceive a conflict over access to the kahawai resource between the commercial and non-commercial fishing sectors in the area from North Cape to East Cape.

There are two general types of management options available to resolve the perceived conflict between the sector groups. Option 1 is to place catch restrictions such as ITQs, IQs or regional TACs on the overall commercial kahawai catch. Option 2 is to introduce small scale localised area restrictions on the commercial fishery.

A combination of options 1 and 2 may be the most effective management option because problems may arise if only one of the options was employed. Because kahawai are relatively mobile, if only small scale localised area controls were implemented to improve non-commercial fishing, then it is likely that the kahawai would be caught by the commercial fishery when the fish move outside the restricted area. Alternatively, if only overall catch controls were introduced, then localised depletion caused by the commercial sector could occur in the areas close to shore (within 3-4 nautical miles) where most non-commercial fishers tend to fish for kahawai.

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Table 1: Reported landings of kahawai (t) by the commercial fishery from 1970 to 1987-88. Calendar year used for 1970 to 1983; fishing year (1 October to 30 September) used for 1983-84 to 1987-88.

	FSU DATA			
Year	Domestic	Chartered	Licensed	LFRR data
1970	294	-	-	-
1971	572	-	-	-
1972	394	-	-	-
1973	586	-	-	-
1974	812	-	-	-
1975	345	-	-	-
1976	729	-	-	-
1977	1461	-	-	-
1978	2228	-	-	-
1979	3072	-	-	-
1980	3265	-	-	-
1981	3085	-	-	-
1982	3236	-	-	-
1983	4965	-	-	-
1983/84	4365	5	2	-
1984/85	4667	1	1	-
1985/86	4606	2	0	-
1986/87	7667	-	-	7431
1987/88	9608	-	-	9075

Table 2: Reported landings of kahawai (t) by fishing method (all areas combined) from 1983-84 to 1987-88. Data from the FSU; fishing years from 1 October to 30 September used.

METHOD	1983-84	1984-85	1985-86	1986-87	1987-88
Trawl/Danish seine	580	321	460	298	261
Purse seine	3076	3561	3467	6341	8281
Set-nets	587	594	483	754	651
Long-lines	64	73	96	38	62
Others	58	118	100	236	80
Total	4365	4667	4606	7667	9608

Table 3: Kahawai catch (t) for each QMA from 1979-88. The total catch has been derived from five sources: (i) the reported catch by each purse seiner for 1979-82, (ii) kahawai that has been pro-rated for each purse seiner from the non-reported "mixed fish" catch, (iii) reported landings for 1979-82 (from King 1985) include all methods except for purse seining, (iv) reported catch from the FSU for all methods for 1983-88, and (v) the reported catch from the FSU for unknown areas for 1983-88. See the text for detailed explanation of how the catch for each source was derived.

Quota Management Area	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988[1]
QMA1										
Purse seine reported catch	1,234	674	432	435	-	-	-	-	-	-
Purse seine "mixed fish"	53	57	93	364	4	2	28	36	24	32
Reported landings[2]	305	369	229	611	-	-	-	-	-	-
Reported catch (all methods)	-	-	-	-	991	2,264	1,339	2,050	3,224	3,461
Unknown area	-	-	-	-	11	10	534	15	10	11
TOTAL	1,592	1,100	754	1,410	1,006	2,276	1,901	2,122	3,258	3,504
QMA2										
Purse seine reported catch	303	523	388	462	-	-	-	-	-	-
Purse seine "mixed fish"	498	982	181	281	0	0	0	0	0	1
Reported landings[2]	42	53	70	27	-	-	-	-	-	-
Reported catch (all methods)	-	-	-	-	640	665	596	954	870	1,944
Unknown area	-	-	-	-	3	1	421	13	19	6
TOTAL	843	1,558	639	770	643	666	1,017	967	889	1,951
QMA3[3]										
Purse seine reported catch	191	735	659	870	-	-	-	-	-	-
Purse seine "mixed fish"	2	6	11	144	0	0	0	2	0	0
Reported landings[2]	0	0	14	77	-	-	-	-	-	-
Reported catch (all methods)	-	-	-	-	488	776	622	830	1,573	1,906
Unknown area	-	-	-	-	2	2	2	6	26	2
TOTAL	193	741	684	1,091	490	778	624	838	1,599	1,908

Quota Management Area	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988[1]
QMA7										
Purse seine reported catch	597	765	825	663	–	–	–	–	–	–
Purse seine "mixed fish"	132	244	212	397	1	0	1	3	0	0
Reported landings[2]	58	52	73	61	–	–	–	–	–	–
Reported catch (all methods)	–	–	–	–	1,719	400	808	1,582	1,572	890
Unknown area	–	–	–	–	2	7	9	1	3	7
TOTAL	787	1,061	1,110	1,121	1,722	407	818	1,586	1,575	897
QMA8										
Purse seine reported catch	52	192	117	260	–	–	–	–	–	–
Purse seine "mixed fish"	51	120	22	276	0	0	0	0	0	0
Reported landings[2]	35	20	27	50	–	–	–	–	–	–
Reported catch (all methods)	–	–	–	–	470	171	101	140	141	64
Unknown area	–	–	–	–	2	8	3	2	2	2
TOTAL	138	332	166	586	472	179	104	142	142	66
QMA9										
Reported landings[2]	229	309	441	420	–	–	–	–	–	–
Reported catch (all methods)	–	–	–	–	634	567	317	395	182	175
Unknown area	–	–	–	–	14	20	7	9	4	6
TOTAL	229	309	441	420	648	587	324	404	186	181

Notes:

1. 1988 data are provisional.

2. Reported landings for 1979–82 (from King 1985) include all methods except for purse seining.

3. The catch from QMAs 4,5 and 6 is included in QMA3.

Table 4: Estimated catch (t) of finfish used as lobster bait in the South-East FMA during the 1986-87 rock lobster season; data from the draft South-East FMA FMP.

Species	Kaikoura	Akaroa	Otago	Chathams	Total
Barracouta	34	-	-	10	44
Blue cod	1	-	32	116	149
Butterfish	-	-	-	17	17
Conger eel	3	-	-	5	8
Flatfish	-	-	39	-	39
Gurnard	-	-	2	-	2
Hoki[1]	15	-	-	-	15
Kahawai	301	-	-	21	322
Mackerel[1]	31	-	-	-	31
Moki	3	-	1	46	49
Processed	404	31	150	190	775
Rat tails[1]	75	-	-	-	75
Red cod[1]	16	3	105	-	124
Sea perch	30	1	20	2	53
Stargazer	3	-	-	-	3
Tarakihi	1	-	3	2	6
Witch	-	1	7	-	8
Wrasse	-	-	3	1	4
Total	917	36	362	410	1724

Note

1. Small or damaged fish which had passed through a processing company in greenweight form are included as processed bait.

Table 5A: Total numbers of kahawai released for each QMA and numbers and percentage of recaptured fish by QMA. (Unpublished data from B. Wood). Fish were tagged between October 1981 and February 1984. Only fish that were recaptured up to October 1986 have been included. Any returns with an unknown recapture area have been excluded.

	QMA1	QMA2	QMA3	QMA7	QMA8	QMA9	TOTAL
Number of fish released	2096	2102	5084	2512	1437	680	13911
Number of fish recaptured	199	268	321	131	121	82	1122
Percentage of fish recaptured	9.5%	12.7%	6.3%	5.2%	8.4%	12.1%	8.1%

Table 5B: Numbers of recaptured kahawai and percentage of total recaptured fish for each tagging release area by QMA up to October 1986. (Unpublished data from B. Wood).

	Recapture Area						
Release Area	QMA1	QMA2	QMA3	QMA7	QMA8	QMA9	TOTAL
QMA1	160 80%	27 14%	4 2%	3 2%	4 2%	1 -	199
QMA2	5 2%	230 86%	3 1%	3 1%	27 10%	0 0	268
QMA3	3 1%	2 -	217 68%	81 25%	9 3%	9 3%	321
QMA7	3 2%	1 1%	25 19%	89 68%	13 10%	0 0	131
QMA8	1 1%	20 17%	8 7%	21 17%	50 41%	21 17%	121
QMA9	3 4%	1 1%	1 1%	0 0	8 10%	69 84%	82

Table 6: Estimated kahawai catch (t) derived from Table 3 by QMA for 1979-88 and estimated MCY (t). MCY estimate based on 1983-86 catch only. The 1988 catch data are provisional.

YEAR	QMA1	QMA2	QMA3[1]	QMA9	TOTAL
1979	1,592	843	1,118	229	3,782
1980	1,100	1,558	2,134	309	5,101
1981	754	639	1,960	441	3,794
1982	1,410	770	2,798	420	5,398
1983	1,006	643	2,684	648	4,981
1984	2,276	666	1,364	587	4,893
1985	1,901	1,017	1,546	324	4,788
1986	2,122	967	2,566	404	6,059
1987	3,258	889	3,316	186	7,649
1988	3,504	1,951	2,871	181	8,507
MCY	1,825	825	2,040	490	5,180

Note:

1 The catch data and MCY estimate for QMA3 includes QMAs 3,4,5,6,7 and 8 combined.

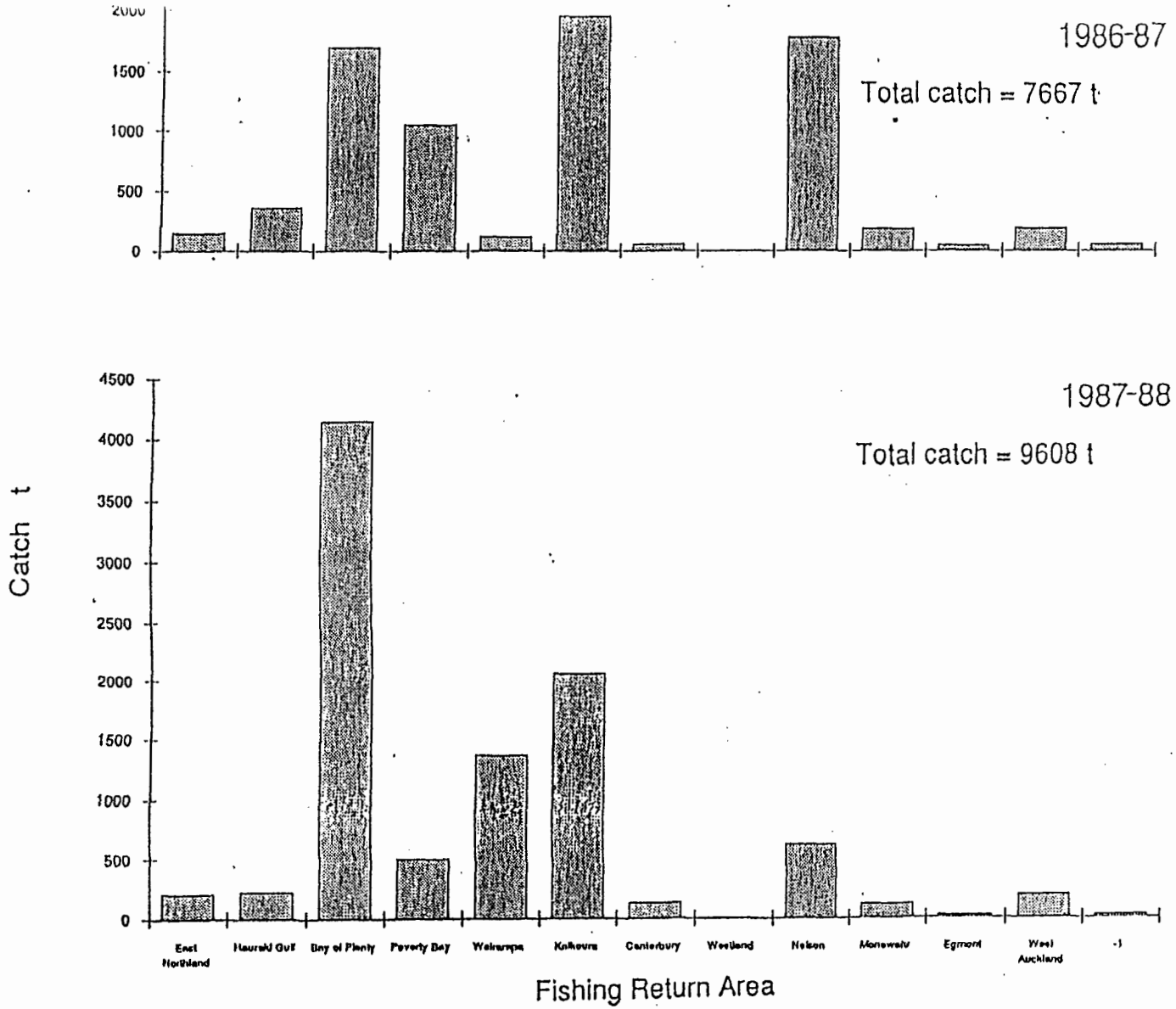
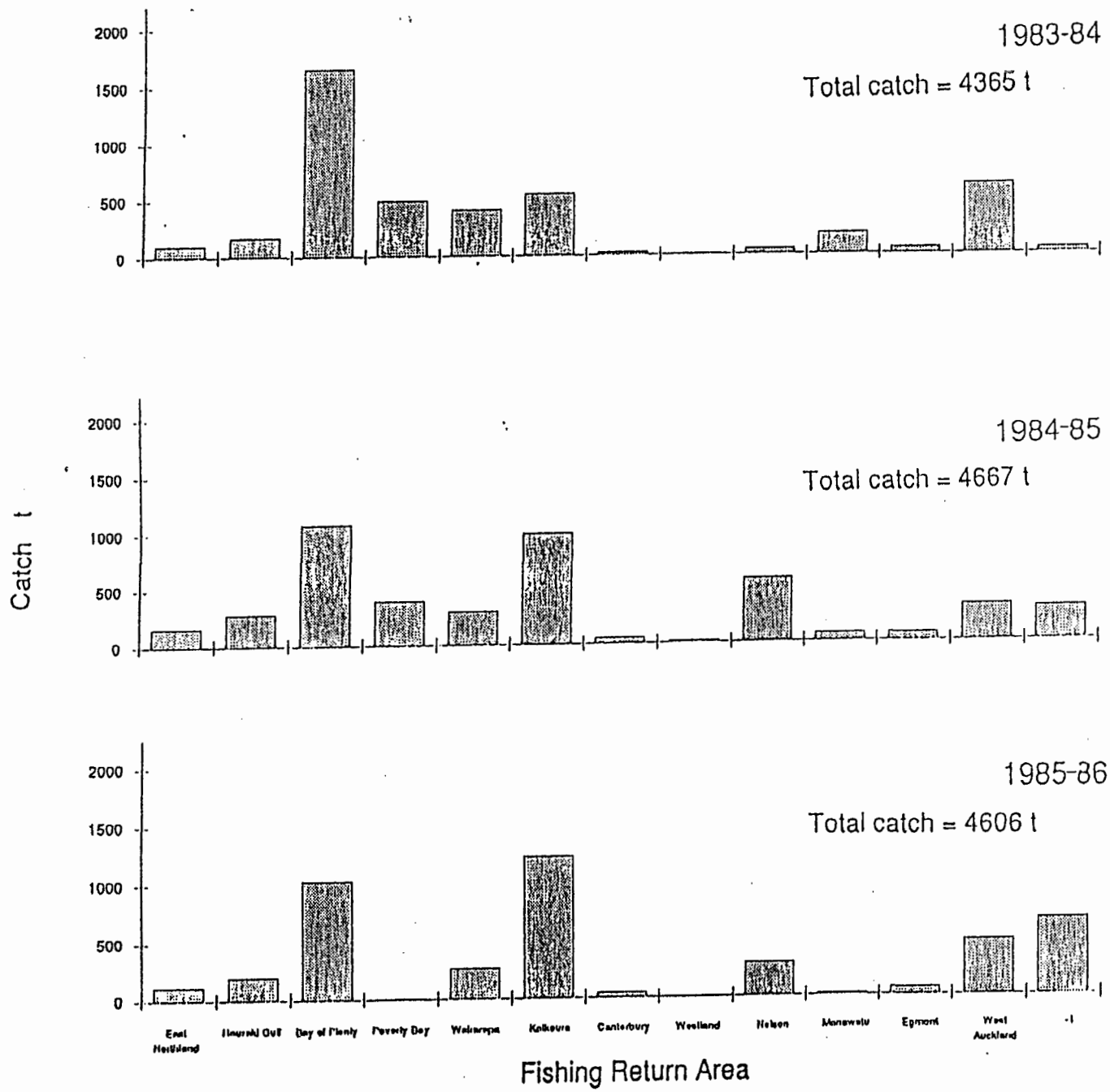


Figure 1: Landings of kahawai (t) caught by the commercial fishery from 1983-84 to 1987-88: data from the FSU. East Northland (domestic fishing return areas 1-4), Hauraki Gulf (5-7), Bay of Plenty (8-10), Poverty Bay (11-13), Wairarapa (14-15), Kaikoura (17-18), Canterbury (19-29), Westland (30-35), Nelson (36,38), Manawatu (16,37,39). Egmont (40,41). West Auckland (42-48), area unknown (-1).


1983-84
Total catch = 4365 t
1984-85
Total catch = 4667 t
1985-86
Total catch = 4606 t
Catch t
2000
1500
1000
500
0
Bay of Plenty
Poverty Bay
Wairarapa
Kaikoura
Canterbury
Westland
Nelson
Egmont
West Auckland
Fishing Return Area

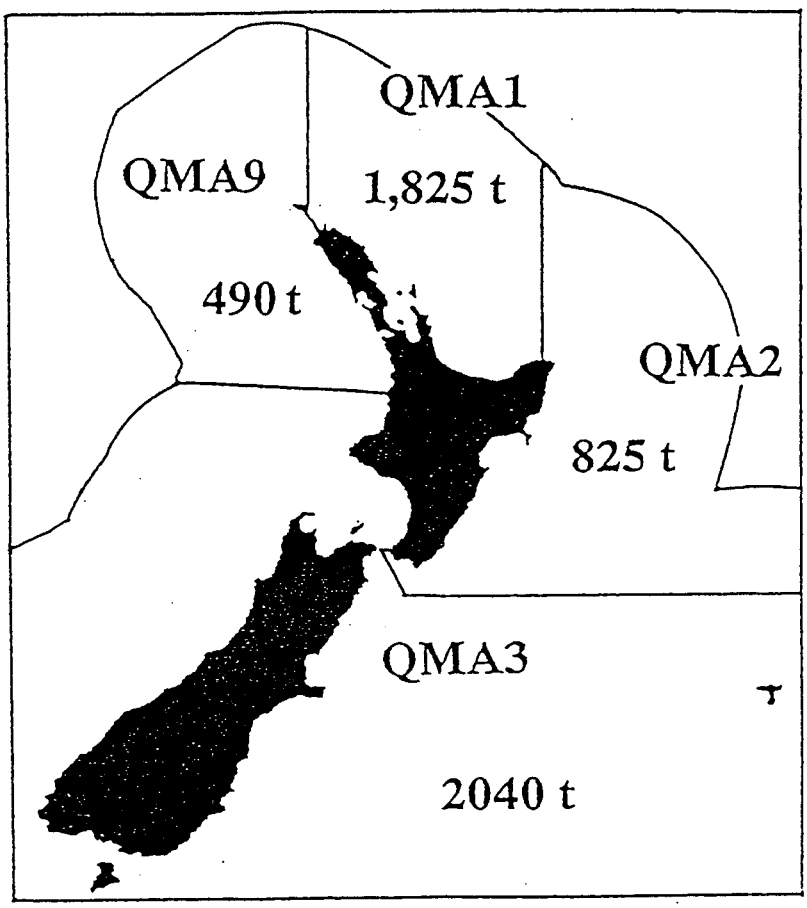


Figure 2: MCY estimates for QMA1, QMA2, QMA3 and QMA9. The MCY for QMA3 includes QMAs 3,4,5,6,7, and 8 combined.