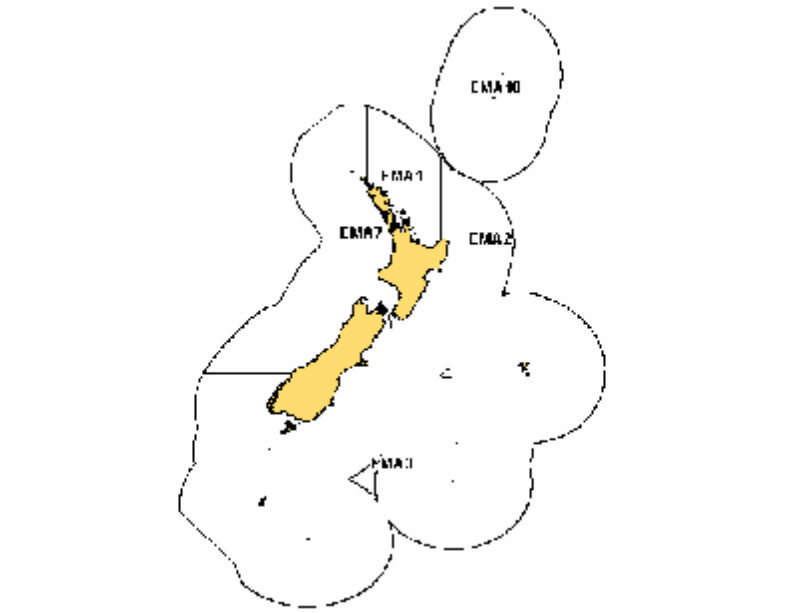
BLUE MACKEREL (EMA)

(*Scomber australasicus*)



1. FISHERY SUMMARY

Blue mackerel were introduced into the QMS on 1 October 2002, with allowances, TACCs and TACs as follows.

Fishstock	Recreational Allowance	Maori customary Allowance	TACC	TAC
EMA 1	40	20	7 630	7 690
EMA 2	5	2	180	187
EMA 3	1	1	390	392
EMA 7	1	1	3 350	3 352
EMA 10	0	0	0	0

(a) Commercial fisheries

Blue mackerel are taken by a variety of methods, including bottom longline, bottom pair trawl, beach-seine, bottom trawl, drift net, dip net, Danish seine, handline, lampara, midwater trawl, purse-seine, lobster pot, ring net, surface longline, set-net, and troll. However, for many of these methods the catch is very low. Most catch is taken north of latitude 43° S (Kaikoura). The largest and most consistent catches have been from the target purse-seine fishery in EMA 1, 2 and 7, and as non-target catch in the jack mackerel midwater trawl fishery in EMA 7. Since 1983–84 the catch of blue mackerel in New Zealand waters has grown substantially (Table 1), primarily in the purse seine fishery in EMA 1. Purse seine fishing effort on blue mackerel has been strongly influenced by the availability and market value of other pelagic species, and fishing effort has increased as limits were placed on the catch of kahawai by purse seine. Catches peaked in 1991–92 at more than 15000 t, of which 60–70% was taken by purse seine. More recently, commercial landings of over 12500 t were taken in 1998–99, 2000–01 and 2004-05, with the highest landings recorded in EMA 1 and EMA 7. In 2004-05 the pattern of landings changed with the EMA 1 landings exceeding the TACC for the first time since EMA was introduced to the QMS. The 2004-05 EMA 7 landings also exceeded the TACC. However, landings in EMA 2 and EMA 3 were well below the TACC and at levels near the lowest recorded since 1983-84. The blue mackerel catch from EMA 7 was principally non-target catch from the jack mackerel midwater trawl fishery. Most of the purse seine catch comes from the Bay of Plenty and East Northland, where it is primarily taken between July and December.

Table 1: Reported landings (t) of blue mackerel by QMA and where area was unspecified (Unsp.), from 1983–84 to 2004–05.

QMA	1	2	3	7	10#	Unsp	Total
1983–84*	480	259	44	245	0	1	1 028
1984–85*	565	222	18	865	0	73	1 743
1985–86*	618	30	190	408	0	51	1 296
1986–87†	1 431	7	424	489	0	49	2 399
1987–88†	2 641	168	864	1 896	0	58	5 625
1988–89†	1 580	<1	1 141	1 021	0	469	4 211
1989–90†	2 158	76	518	1 492	0	<1	4 245
1990–91†	5 783	94	478	3 004	0	0	9 358
1991–92†	10 926	530	65	3 607	0	0	15 128
1992–93†	10 684	309	133	1 880	0	0	13 006
1993–94†	4 178	218	223	1 402	5	0	6 025
1994–95†	6 734	94	154	1 804	10	149	8 944
1995–96†	4 170	119	173	1 218	0	1	5 680
1996–97†	6 754	78	340	2 537	0	<1	9 708
1997–98†	4 595	122	78	2 310	0	<1	7 104
1998–99†	4 505	186	62	8 756	0	4	13 519
1999–00†	3 602	73	3	3 169	0	0	6 847
2000–01†	9 738	113	6	3 278	0	<1	13 134
2001–02‡	6 368	177	49	5 101	0	0	11 694
2002-03‡	7 609	115	88	3 563	0	0	11 375
2003-04‡	6 523	149	1	2 701	0	0	9 373
2004-05‡	7 920	8	<1	4 817	0	0	12 746

* FSU data.
† CELR data.
\# Landings reported from QMA 10 are probably attributable to Statistical Area 010 in the Bay of Plenty (i.e., QMA 1).
‡ MHR data.

(b) Recreational fisheries

Blue mackerel does not rate highly as a recreational target species although it is popular as bait.

There is some uncertainty with all recreational harvest estimates for blue mackerel and there is some confusion between blue and jack mackerels in the recreational data. The harvest estimates from the diary surveys should be used only with the following qualifications: a) they may be very inaccurate; b) the 1996 and earlier surveys contain a methodological error; and, c) the 2000 and 2001 estimates are implausibly high for many important fisheries.

Recreational catch in the northern region (EMA 1) was estimated at 114000 fish by a diary survey in 1993–94 (Bradford 1996), 47000 fish in a national recreational survey in 1996 (Bradford 1998), 84000 fish (c.v. 42%) in the 2000 survey (Boyd & Reilly 2002) and 58000 fish (c.v. 27%) in the 2001 survey (Boyd et al. 2004). The surveys suggest a harvest of 35-90 tonnes per year for EMA 1, insignificant in the context of the commercial catch. Estimates from other areas are very low (between 500 and 3000 fish) and are likely to be insignificant in the context of the commercial catch.

(c) Maori customary fisheries

Quantitative information on the current level of customary take is not available.

(d) Illegal catch

There is no known illegal catch of blue mackerel.

(e) Other sources of mortality

There is no information on other sources of mortality.

2. BIOLOGY

The geographical distribution of blue mackerel, and its habitat, varies with life history stage. Juvenile and immature blue mackerel are northerly in their distribution, having been recorded from commercial and research catches around the North Island and into Golden-Tasman Bay at the top of the South Island.

By contrast, adults have been recorded around both the North and South Islands to Stewart Island and across the Chatham Rise to almost the Chatham Islands. Sporadic catches of small numbers of yearling blue mackerel have been made by otter trawl in shallow waters.

The distribution of blue mackerel at the surface is seasonal and differs from its known geographical range. During summer, surface schools are found in Northland, Bay of Plenty, South Taranaki Bight, and Kaikoura, but they disappear during winter, when only occasional individuals are found in Northland and the Bay of Plenty.

Summaries from aerial sightings data show that blue mackerel can be found in mixed schools with jack mackerel (*Trachurus* spp.), kahawai (*Arripis trutta*), skipjack tuna (*Katsuwonus pelamis*) and trevally (*Pseudocaranx dentex*) and that its appearance in mixed schools varies seasonally.

Blue mackerel are serial spawners, releasing eggs in batches over several months. Based on gonad condition, sexual maturity for both sexes of blue mackerel taken in the Great Australian Bight between January 1979 and December 1980 was estimated to be about 28 cm FL, which relates to an age of about 2 years. Eggs are pelagic and development rate is dependent on temperature. In plankton surveys, blue mackerel eggs have been found from North Cape to East Cape, with highest concentrations from Northland, the Hauraki Gulf, and the Western Bay of Plenty. Eggs have been described throughout the Hauraki Gulf from November to the end of January, at surface temperatures in the range 15–23° C. Individuals in spent or spawning condition have been taken in a few tows off Tasman Bay and Taranaki, in EMA 7 and in the Bay of Plenty in EMA 1.

Age and growth studies suggest a difference in the age structures of catches taken in the Bay of Plenty (New Zealand; EMA 1) and New South Wales (Australia). For fish from the New South Wales study, a peak was found at 1 yr that accounts for more than 55% of the fish sampled, with a maximum age of 7 yr. The Bay of Plenty results show a much broader distribution, with a maximum age of 24 yr, and a mode in the data around 8 to 10 yr. Growth parameters estimated in the Bay of Plenty study are given in Table 2. Following a quantitative test of competing growth models in the Bay of Plenty study, no evidence was found of statistically significant differences in growth between the sexes in Bay of Plenty blue mackerel.

Table 2: Von Bertalanffy growth parameters for Bay of Plenty (EMA 1) blue mackerel (Manning et al. 2004).

	Males	Females	All fish
L_∞	52.49	53.10	52.79
K	0.15	0.15	0.15
t_0	-3.29	-3.18	-3.19
Age range	1.8-21.9	1.8-21.9	1.8-21.9
N	240	269	509

Catch sampling of the blue mackerel purse seine fishery in EMA 1 shows that in that area, blue mackerel recruit to the fishery at around 3 years of age and that the catch is dominated by fish in the 4–12 yr age class. Few fish older than 15 years were sampled.

Australian studies may underestimate the ages of larger, older blue mackerel in their catch. The Australian method for estimating blue mackerel ages is based on reading otoliths whole in (lavender) oil, whereas the New Zealand method is based on otolith thin-sections. Results from the New South Wales study referred to above, suggest that blue mackerel 25–40 cm in fork length may be 3–7 yr old. Using the New Zealand method, fish in this length range could be as old as 16 yr. Australian scientists,

reading whole otoliths, may be missing opaque zones near the margin, which are visible in sectioned otoliths.
Although Australian scientists have validated the timing of the first opaque zone in blue mackerel otoliths, their results do not cover the complete life history defined using either the Australian or New Zealand method. A standard, validated, age estimation method for blue mackerel in an important topic of future research for this species in New Zealand.

In New Zealand, the diet of blue mackerel has been described as zooplankton, which consists mainly of copepods, but also includes larval crustaceans and molluscs, fish eggs and fish larvae. Feeding involves both filtering of the water and active pursuit of prey, with blue mackerel able to take much smaller animals than kahawai can.

3. STOCKS AND AREAS

Sampling of eggs, larvae, and spawning blue mackerel indicate at least three spawning centres for this species – Northland-Hauraki Gulf, Western Bay of Plenty, and South Taranaki Bight. Nothing is known of migratory patterns or the fidelity of fish to a particular spawning area. Examination of mitochondrial DNA shows no geographical structuring between New Zealand and Australian fish. Meristic characters show significant regional differentiation within New Zealand fisheries waters and combined with parasite marker information blue mackerel are sub divided into at least three stocks in New Zealand fisheries waters: EMA 1, EMA 2, and EMA 7.

4. STOCK ASSESSMENT

(a) Estimates of fishery parameters and abundance

Analysis of the aerial sightings database for east Northland from 1985/86 to 2002/03 found no apparent trends in abundance, apart from a peak off east Northland in 1991/92 for both the number of schools and the estimated tonnage, and a further strong signal for the number of schools and the estimated tonnage from 2000/01 through 2002/03.

(b) Biomass estimates

No biomass estimates are available.

(c) Estimation of Maximum Constant Yield (MCY)

It is not feasible to estimate MCY. There are no estimates of biomass or reference fishing mortalities and recent fishing effort has been interdependent on several small pelagic species. A large proportion of catch is by purse seine, and catch restrictions for kahawai (which traditionally received greater effort) first set in the early 1990s, shifted fishing effort towards blue mackerel. A significant component of the catch is also taken as non-target catch when targeting other small pelagic species.

(d) Estimation of Current Annual Yield (CAY)

Estimates of current biomass are not available and CAY cannot be determined.

(e) Other factors

Recent catch sampling indicates that catch at length and catch at age is relatively stable between years in EMA 1. Although total mortality in EMA 1 is poorly understood, the relatively stable age-length composition between years and the number of year-classes that compose the catch-at-age within fishing

years, suggest that blue mackerel may be capable of sustaining current commercial fishing mortality in EMA 1.

5. STATUS OF THE STOCKS

Little is known about the status of blue mackerel stocks. Reported catches increased from 1983–84 to peak at more than 15000 t in 1991–92 but were reduced to about 6000 t in 1995–96. A second peak of almost 13500 t was reported in 1998–99 and although catches dropped to 6847 t in 1999–00, an increase to 13134 t was observed again in 2000–01, with a decrease to 11694 t in 2001–02, 11375 t in 2002-03 and 9373 t in the 2003-04 fishing year. Purse-seine fishing effort on blue mackerel has been strongly influenced by the supply of other small pelagic species and the market value of blue mackerel relative to those species.

No estimates of current and reference biomass, or yield, are available for blue mackerel. It is not known if recent catch levels are sustainable or at levels that will allow the stock to move towards a size that will support the MSY.

6. FOR FURTHER INFORMATION

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