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TWENTY FIRST REGIONAL TECHNICAL MEETING ON FISHERIES
(Noumea, New Caledonia, 7-11 August 1989)

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Tuna Resources and Research in New Zealand - 1989 Status Report

Talbot Murray, David Burgess, Brian Jones,
Paul Taylor, and Kevin Bailey
Fisheries Research Centre
P.O. Box 297
Wellington, N.Z.

Summary

This paper summarizes tuna catch and effort data collected within the New Zealand waters for domestic fisheries (1974-1988) and foreign licensed longline fisheries (1980-1988). Tuna research conducted since the twentieth RTMF together with research proposed for the present year is summarized.

Recent fishery developments east of New Zealand in the area of the Subtropical Convergence Zone (STCZ) for albacore (*Thunnus alalunga*) and for Peruvian jack mackerel (*Trachurus murphyi*) are also reviewed.

Domestic New Zealand Tuna Fisheries

Domestic tuna fisheries have been slowly developing since the early 1970s and can still be regarded as largely under developed. Currently there are three commercial fisheries for tuna which contribute about 10% of all domestic fish landings by weight. Albacore and yellowfin are also important components of recreational big gamefish catches. The catches by domestic fisheries are summarized in Table 1, recreational catches are not presently available.

The two most important commercial tuna species, skipjack (*Katsuwonus pelamis*) and albacore (*Thunnus alalunga*), are fished in New Zealand waters during the summer migration of juvenile fish. The apparent fluctuations in landings evident in Table 1 are generally believed to be due to climatic variation. Landings of southern bluefin tuna (*T. maccoyii*), however, have steadily declined since 1982. The declines in apparent abundance and the changes in size composition appears to reflect stock declines evident globally.

Domestic tuna fisheries take place primarily within 60-70 n mi of shore and are seasonal in nature. Purse-seine fishing for skipjack takes place from November to March, albacore trolling from December to April, while fishing for southern bluefin tuna (trolling, hand lining, and longlining) usually takes place in July and August. Although many of the fishers active in the southern bluefin fishery also participate in the albacore fishery, most tuna fishers participate in inshore demersal fisheries when not tuna fishing.

Table 1. Domestic commercial tuna landings (tonnes) from 1974 to 1988.

Species	1974	1975	1976	1977	1978
albacore	898	646	25	621	1686
skipjack	659	1159	291	1657	2841
southern bluefin	4	0	0	5	10
yellowfin	1	1	1	1	1
Total Tuna	1562	1806	317	2284	4538

Species	1979	1980	1981	1982	1983
albacore	814	1468	2085	2434	744
skipjack	3129	2717	3221	3723	3911
southern bluefin	5	130	173	208	112
yellowfin	1	1	1	2	0
Total Tuna	3949	4316	5480	6367	4767

Species	1984	1985	1986	1987	1988
albacore	2773	3253	1911	1227	330
skipjack	3865	1075	5214	5174	n/a
southern bluefin	96	90	83	50	n/a
yellowfin	2	1	2	7	n/a
Total Tuna	6736	4419	7210	6458	n/a

Foreign Licensed Longline Tuna Catch and Effort

Tuna longline vessels from Japan, Republic of Korea, and Taiwan regularly fished outside New Zealand's territorial sea until the declaration of the EEZ in 1979. Since 1979, however, foreign tuna longlining has been limited to Japanese and Korean flag vessels. Detailed catch and effort statistics for tuna longlining within the waters of New

Zealand are available since 1980 and are provided as a condition of licensing.

Two tuna longline fisheries distinguished by target species, season, area of operation, and flag of registry fish within New Zealand waters. By far the most important is the Japanese longline fishery for southern bluefin tuna (Thunnus maccoyii) involving 38 vessels. This fishery operates primarily along the 1000 m depth contour of the east coast of the North and South Island between January and September. Fishing begins in southern waters and progresses northwards along the shelf edge presumably in response to cooling of sea temperatures and the migratory pattern of southern bluefin tuna. Approximately 38 vessels have participated in this fishery in recent years.

The second tuna longline fishery is composed of both Japanese and Korean vessels targeting albacore and yellowfin tuna (Thunnus albacares). This fishery is restricted to the northern waters of New Zealand to ensure southern bluefin tuna are not targeted. Vessel number has been increasing in recent years and has varied between 10 and 33 since it began in 1981.

All longline fishing in northern waters, except for the EEZ surrounding the Kermadec Islands, is currently prohibited from 1 October to 1 June. The purpose of the current moratorium is to avoid potential conflict with the New Zealand recreational big game fishery targeting striped marlin (<u>Tetrapturus audax</u>). The relationship between marlin by-catch by tuna longliners has not been clearly established. However, the period of increasing fishing effort in the northern longline fishery did coincide with a marked decline in recreational catches of marlin in New Zealand waters. The possibility that declines in the recreational marlin catch are related to climatic variation is currently being examined.

Catch, effort and average fish size is summarized in Table 2 for the four main tuna species caught in the foreign licensed longline fisheries within the New Zealand EEZ. By-catch species are not included in this report.

The total longline catch of albacore, bigeye, southern bluefin, and yellowfin tunas in 1988 was 2444 tonnes, of which the majority was albacore and southern bluefin (49.2% and 37.7% respectively). The 1988 longline catches, however, dropped 35.6% relative to 1987. This decline was accompanied by a 17.8% reduction in the number of hooks set (from 18.0 to 14.8 million hooks) and a reduction in the average length of longlines set. Until 1988 longline fishing effort, especially in the southern fishery, had exhibited steady but gradual increases each year. The past year is the first year in which a decline in effort has been seen.

Table 2. Summary of catch and effort of the major tuna species caught by foreign licensed tuna longliners in the New Zealand EEZ.

	1980	1981	1982	1983	1984
Southern Fishery - Japan					
no. vessels	87	85	72	55	34
no. hooks ($X10^6$)	25.9	26.2	23.5	15.6	12.7
CPUE (no./10^3 hooks)					
albacore	0.8	1.9	2.9	3.1	3.1
bigeye	0.2	0.3	0.6	0.8	1.2
so. bluefin	4.6	3.5	2.0	1.7	1.9
yellowfin	0.0	0.1	0.1	0.0	0.2
catch (tonnes)					
albacore	221	471	736	522	458
bigeye	238	387	607	423	500
so. bluefin	6618	5161	2754	1618	1510
yellowfin	11	74	75	21	44
average weight (kg)					
albacore	11.3	9.6	10.8	10.8	11.8
bigeye	40.8	45.3	46.3	35.0	33.8
so. bluefin	55.3	56.8	58.7	61.7	64.4
yellowfin	29.6	32.8	36.8	30.6	21.1
Northern Fishery - Japan					
no. vessels	0	0	1	1	2
no. hooks ($X10^6$)	0.0	0.0	0.1	0.1	0.2
CPUE (no./10^3 hooks)					
albacore	0.0	0.0	12.1	3.6	12.1
bigeye	0.0	0.0	1.2	0.4	0.7
so. bluefin	0.0	0.0	0.0	0.0	0.0
yellowfin	0.0	0.0	0.6	0.1	0.3
catch (tonnes)					
albacore	0	0	24	5	20
bigeye	0	0	9	3	6
so. bluefin	0	0	0	0	0
yellowfin	0	0	4	0	2
average weight (kg)					
albacore	0.0	0.0	13.7	13.5	10.8
bigeye	0.0	0.0	53.0	73.7	49.8
so. bluefin	0.0	0.0	0.0	0.0	0.0
yellowfin	0.0	0.0	44.7	45.2	34.1

	1980	1981	1982	1983	1984
Northern Fishery - Korea					
no. vessels	0	11	4	4	18
no. hooks (X10^6)	0.0	1.1	0.5	0.7	1.3
CPUE (no./10^3 hooks)					
albacore	0.0	24.5	22.7	43.5	30.3
bigeye	0.0	2.5	2.6	0.9	0.7
so. bluefin	0.0	0.0	0.0	0.0	0.0
yellowfin	0.0	1.2	1.2	0.7	0.5
catch (tonnes)					
albacore	0	297	129	374	440
bigeye	0	72	31	17	26
so. bluefin	0	0	0	0	0
yellowfin	0	29	12	9	14
average weight (kg)					
albacore	0.0	11.1	12.6	11.8	11.3
bigeye	0.0	26.0	25.8	27.4	27.5
so. bluefin	0.0	0.0	0.0	0.0	0.0
yellowfin	0.0	23.3	23.4	18.4	22.3

	1985	1986	1987	1988
Southern Fishery - Japan				
no. vessels	34	33	38	38
no. hooks (X10^6)	11.3	11.4	14.7	12.2
CPUE (no./10^3 hooks)				
albacore	2.7	2.8	2.7	3.1
bigeye	0.9	1.1	0.7	0.4
so. bluefin	2.3	1.7	1.5	1.0
yellowfin	0.1	0.2	0.2	0.0
catch (tonnes)				
albacore	334	337	430	440
bigeye	340	439	336	147
so. bluefin	1718	1337	1622	920
yellowfin	14	47	64	17
average weight (kg)				
albacore	10.8	10.4	11.0	11.6
bigeye	33.3	35.5	33.8	33.0
so. bluefin	66.6	70.7	74.3	77.3
yellowfin	21.1	26.3	22.2	28.6

	1985	1986	1987	1988
Northern Fishery - Japan				
no. vessels	3	10	16	20
no. hooks (X10^6)	0.5	1.6	2.1	0.8
CPUE (no./10^3 hooks)				
albacore	7.5	16.5	12.6	18.9
bigeye	4.9	2.5	2.5	1.9
so. bluefin	0.1	0.0	0.0	0.0
yellowfin	0.7	1.2	1.2	0.8
catch (tonnes)				
albacore	43	231	241	123
bigeye	139	210	228	69
so. bluefin	2	1	2	2
yellowfin	8	50	57	18
average weight (kg)				
albacore	11.2	8.7	9.1	8.2
bigeye	55.5	52.0	42.6	47.1
so. bluefin	77.1	71.1	74.9	102.1
yellowfin	20.2	25.9	22.4	26.3

	1985	1986	1987	1988
Northern Fishery - Korea				
no. vessels	13	6	8	13
no. hooks (X10^6)	2.2	0.7	1.2	1.8
CPUE (no./10^3 hooks)				
albacore	34.4	62.0	61.7	37.0
bigeye	1.0	0.5	0.5	0.5
so. bluefin	0.0	0.0	0.0	0.0
yellowfin	1.9	0.2	1.3	0.9
catch (tonnes)				
albacore	680	398	757	638
bigeye	60	12	20	25
so. bluefin	0	0	0	0
yellowfin	79	4	38	46
average weight (kg)				
albacore	8.8	8.7	9.8	9.7
bigeye	27.8	32.6	29.7	30.4
so. bluefin	0.0	0.0	0.0	0.0
yellowfin	18.4	20.4	23.1	29.4

Tuna Research Projects

Albacore Tagging

Since 1986 the Pelagic Research Group of MAFFish has carried out six albacore tagging cruises in conjunction with the SPC, ORSTOM (Centre Noumea), and the U.S. National Marine Fisheries Service. During this period New Zealand has tagged and released 1852 albacore (62.5% of those caught). This high release rate is due to the modification of techniques for capture and handling fish. The most important modifications were the use of single barbless hooks, short trolling lines, and reducing vessel speed while hauling.

Thus far only one of the fish tagged in New Zealand waters has been recaptured. Reasons for the low recovery rate of tagged albacore have been reviewed by Bailey (1989). Although no clear reason for the lack of returns can be given he speculates that the large number of drift gillnet vessels targeting albacore may be responsible.

Two tagging programmes are planned for the coming year and are currently awaiting budget approval. The first would continue the SPAR tagging and to coordinate any future tagging with the newly approved SPC albacore tagging programme. New Zealand will do its utmost to continue its cooperation and to coordinate tagging with SPC, NMFS, and other regional programmes under the SPAR group philosophy. In addition New Zealand is proposing to carry out albacore surveys in the Tasman Sea and use the frequency of recent gillnet damage and the position of capture relative to gillnet fleet position to estimate direction and speed of the albacore migration. This study is awaiting funding and if approved will be implemented in November/December 1989. Given the frequency of gillnet damage observed east of New Zealand in 1988/89 (12-19% of all troll caught fish) the use of gillnet marks should circumvent the continuing problem of low recovery rate in the SPAR tagging programme.

Catch Rates in Relation to Oceanographic Features

The third and last oceanographic survey of albacore catch rate in conjunction with the longline fishery was completed in June 1989. These surveys together with the three conducted in conjunction with the albacore troll fishery will be the subject of analysis over the next few years.

Thus far the generally higher catch rates in the vicinity of surface temperature fronts has been used to develope a satellite sea surface temperature forecast for albacore fishing. This service was field tested in the troll fishery for albacore and in the longline fishery for southern bluefin this year. The comments thus far received indicate the forecasts are very useful in locating albacore and southern bluefin grounds.

Studies of Albacore Parasites

Studies of albacore parasites in the South Pacific have been underway within New Zealand since 1984. As a result of discussions at the first SPAR workshop in 1986 these studies were focused to provide information on the origin and patterns of movement of albacore. The assistance and cooperation of numerous fisheries officials form Pacific Island countries has been critical to these studies.

Parasite have been collected from 384 albacore of various sizes form New Zealand waters, the Coral Sea, the Tasman Sea, the STCZ, and French Polynesian waters. The decrease in prevalence of didymozoid parasites with increasing size up to 85-90 cm fork length is followed by a rapid increase and subsequent decrease in prevalence. This pattern of change in prevalence is consistent with initial infection in the tropics, a juvenile dispersal phase in subtropical/temperate waters, followed by a return to the tropics to spawn.

In addition there is a geographical pattern of parasite prevalence that when considered with other fisheries data suggests that albacore move from the tropics to the New Zealand area and then eastwards along the STCZ.

<u>Age Determination of Albacore</u>

A preliminary analysis of caudal vertebrae from 417 South Pacific albacore caught by trolling and longline indicates that it may be possible to rapidly determine the age of fish up to 10 years old. The predominance of small troll caught fish (77.9%) appears to strongly bias estimates of asymptotic length, the Brody growth coefficient, and t_0. Additional samples from longline caught albacore larger than 85 cm have been collected and these will be used to review the preliminary results gathered thus far.

<u>Albacore Scientific Observer Programme</u>

The Pelagic Research Group has carried out an ad hoc scientific observer programme aboard Japanese tuna longliners targeting southern bluefin during the past three June/July periods. The trips have been of short duration and timed to coincide with periods of high albacore by-catch. The information gathered has included catch and by-catch composition to verify logbook reports, size frequency and allometry of tuna and billfish species, and information on fishing methods. In addition biological samples for age determination, parasite fauna, and biochemical analysis have been gathered. Details of fishing techniques were gathered and are described in two Internal Reports produced thus far.

This programme will be formalized from the next season under the aegis of the MAFFish Scientific Observer Programme and observer coverage of the entire season (March - August) adopted. The results of the observer trips on tuna longliners completed to date are expected to be available as MAFFish Marine Research Internal Reports by January 1990.

Developing Jack Mackerel Fishery in the STCZ Region?

Bailey (1989) collected and described juvenile Peruvian jack mackerel (*Trachurus murphyi*) from albacore stomachs and regurgitum during the albacore surveys by the NOAA ship *Townsend Cromwell*. The apparent abundance of Peruvian jack mackerel juveniles in the Subtropical Convergence Zone (STCZ) south of French Polynesia and the Cook Islands may suggest there is potential for regional fishery development by South Pacific island states.

Support for the development potential is provided by recent reports of significant by-catch of adults (unpublished MAFFish Scientific Observer Reports) within New Zealand waters and catches from the South Pacific (FAO area 81) by

Japan and the USSR adjusted for catches within the NZ EEZ. Table 3 summarizes the development of Japan's and the USSR's apparent phantom fleets since 1980. The increase from 1700 t in 1980 to over 113000 t in 1986 strongly suggests that the resource in the central South Pacific is very large. This resource may be an extension of the South American fishery.

Table 3. Jack mackerel catches (tonnes) reported from the South Pacific (FAO area 81) by Japan and the USSR adjusted for catches reported from within New Zealand waters.

Year	Japan	USSR	Total
1980	1700	0	1700
1981	4100	0	4100
1982	4200	4700	8900
1983	6100	10600	16700
1984	11800	11000	22800
1985	3900	20000	23900
1986	8200	105400	113400

The fishery for Peruvian jack mackerel in the eastern Pacific is one of the world's largest single species fisheries. In this area adults are fished on and along the continental shelf of South America and occurs around the Galapagos and Juan Fernandez Islands. Adults also occur around New Zealand on the Chatham Rise, Snares/Southland Shelf, and Taranaki Bight (Hurst and Bagley 1987) and in the central South Pacific from 40 - 48° S and from 125 - 145° W (Kawahara et al. 1988).

Adult Peruvian jack mackerel caught in New Zealand waters in December had ripe gonads. Juveniles are present in the STCZ south of French Polynesia and the Cook Islands between January and March.