DEVELOPMENT OF THE SOUTH CANTERBURY/OTAGO SOUTHERN BLUEFIN TUNA FISHERY

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and

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December 1983

Research Report No. 144
Agricultural Economics Research Unit
Lincoln College
Canterbury
New Zealand

ISSN 0069 3790

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PREFACE

Much of the work behind this report was carried out while the senior author, Ms O'Donnell, was employed during 1982 as a Lecturer in the Department of Agricultural Economics and Marketing at the College. Ms O'Donnell was joined in writing the paper by Dr R. Sandrey, Lecturer in the Department of Agricultural Economics and Marketing.

What is highlighted in the report is the potential for substantial gains to the nation and the Otago/South Canterbury regions if a development of an East Coast bluefin tuna fishery is pursued. On the other hand, the potential loss to the nation if the development failed would be very small. The report is timely and highly relevant to the problems facing the present New Zealand Fishing Industry.

P.D. Chudleigh
Director

ACKNOWLEDGEMENTS

Many people were helpful in this study, both in its formative stages and in providing guidance as it proceeded. In particular Dr A.T.G. McArthur and Mrs L.A. Toovey of the Lincoln College Department of Agricultural Economics and Marketing deserve special thanks for their valuable comments on survey design and economic analysis. D.J.M. Gibson of the Fisheries Research Division of the Ministry of Agriculture and Fisheries was extremely helpful with his extensive data files and keeping us in touch with developments in the industry. I. Hultenberg, a commercial fisherman, generously gave a week of his time to assist with the surveying. Thanks are due to Dr K.L. Leathers and Ms D. Needham of the Agricultural Economics Research Unit who helped in shaping the project.

The willingness showed by fishermen in the South Canterbury and Otago regions in responding to the questionnaire strengthens our admiration for fishermen New Zealand-wide.

CHAPTER 1

INTRODUCTION

There is concern that many of New Zealand's inshore fish species are being overfished to the extent that fishing effort will have to be reduced to ensure the continued existence of some species as commercial stocks. A dual solution of both reducing the total level of fishing effort and transferring fishing effort to alternative fisheries to alleviate the problem is possible. Effort reduction proposals by the National Fisheries Management Advisory Committee (NAFMAC) include stricter fishing permits to exclude part-timers, increases in permit fees, vessel buyback, quota restrictions, effort restrictions and controlled fisheries. These schemes may be used concurrently and may include compensation to fishermen in the form of vessel or licence buyback (NAFMAC, 1983).

The development of alternative fisheries with possible potential to New Zealand include southern bluefin tuna, paddle crabs, East Coast albacore, beche de mer, sea horses, jack mackerel, squid, octopus, horse mussels, and the marketing of less preferred species. There exist elements of uncertainty in many of these alternative opportunities, with respect to both marketing and harvesting. Additionally, more emphasis on quality in some species and less on quantity by converting from trawling to lining and by providing sashimi grade mackerel, kahawai, and skipjack could reduce fishing pressure.

This report examines the economics of transferring fishing effort to southern bluefin tuna capture off the South Canterbury/Otago coast, and is therefore an example of the problems and potential in transferring fishing effort. The groundwork for the technology and marketing of bluefin has been laid on the West Coast, and this report studies the potential for using this groundwork to develop the East Coast fishery.

The study pays particular attention to the extension needs in developing fisheries using the results of a census of skippers in the region. Two chapters have been included to give the reader some background to the southern bluefin tuna fishery and the South Canterbury/Otago fishery. From this information the potential benefits of development, the direct cost of catching bluefin and the opportunity cost of foregoing catching traditional species have been estimated.

A census of all skippers on vessels exceeding 12 metres based in the ports of Timaru , Oamaru, Port Chalmers and Taieri Mouth was undertaken. A list of these fishermen was provided by the local Fishermen's Associations who were first contacted by mail outlining the purpose of the survey.

The skippers were surveyed by personal interview in early September of 1982. An extra five fishermen who had recently moved to the survey ports but who were not yet members of the Fishermen's Associations were included in the survey population. Some of the fishermen surveyed were members of the Timaru, Oamaru or Port Chalmers Fishermen's Associations but permanently fished out of Bluff, Milford Sound or Picton. In total 46 skippers were surveyed out of the survey population of 49.

The indirect costs of providing the necessary infrastructure for development were estimated from the survey. The survey also provided information on the readiness of fishermen and their vessels to undertake southern bluefin tuna fishing.

Individual fishermen face different investment criteria than a region or a nation. An individual will simply compare the net benefit of one fishery with another (Chapter 5), whereas a national and regional point of view would consider the effect on all fishermen, the fishing resource, the costs of providing an infrastructure and the flow on benefits and costs to the wider community. Regional multipliers have been used to estimate the secondary effects for the South Canterbury/Otago region, however, the effect on all fishermen and the resource is more difficult to estimate. The successful development of alternative fisheries could expand the fishing industry sufficiently to accommodate profitably all fishermen, thus alleviating the social and economic hardship from reducing fishing effort. There may not be enough time for effort transfer to solve all of the immediate problems facing the inshore fishery but the approach can certainly make a major contribution.

This paper does not consider the effect on the traditional fish stocks of transferring catching effort to alternative fisheries. However, consideration is given to the economics of transferring catching effort to alternative fisheries regardless of the reasons for having an effort reduction scheme.

The cost benefit analysis has seven scenarios based on the extent to which developing the bluefin fishing is able to alleviate the present inshore fisheries management problems.

CHAPTER 2

THE SOUTH CANTERBURY/OTAGO FISHERY

2.1 Depth Contours

The edge of the continental shelf at Timaru is about 40 nautical miles offshore. The term continental shelf refers to the sea bottom gradually sloping down from the sea mass before it drops abruptly away to great depths. The edge of the shelf usually varies between 100 metres and 300 metres in depth. Traditionally most of New Zealand's domestic fleet have fished on the continental shelf but southern bluefin tuna migrate past New Zealand in waters outside the shelf.

South of Timaru the shelf is closer to the coastline reaching less than ten nautical miles in places along the Otago Peninsula. Further south the continental shelf swings outward so that off the Taieri Mouth it lies about 30 nautical miles offshore.

2.2 Currents

Currents greatly influence fish species by controlling the temperature, distributing the laval stages of fish and bringing food into the area. There are no strong tidal streams in the inshore waters of the South Canterbury/ Otago region. Offshore, the main current stream runs in a northerly direction and then outwards to the Chatham Islands. Southern bluefin tuna feed on the squid following the offshore tidal stream. Both are concentrated on the south side of the areas where the sea bottom rises abruptly forcing up the cold water and resulting in a lower sea surface water temperature. In 1983 tidal patterns and water temperature have been affected by the strong southern oscillation, and early reports suggest that this may be reducing bluefin tuna catches (Brough, 1983, pers. comm.).

2.3 Fishermen and Vessels

Port Chalmers is the largest port in the region supplying fish to the domestic market. In recent years the Timaru port has grown substantially from supplying only the domestic fresh fish markets to processing and exporting fish on a substantial scale. A summary of total vessels registered in the survey area and an approximate breakdown between full-time and part-time fishermen are given in Table 1.

TABLE 1

Number of Fishermen and Fishing Vessels in the South Canterbury/ Otago Region for the Year Ended 31 December 1980

Port	No. of Registered Vessels	No. of Vessels with Gross Earnings Greater than $30,000	No. of Fishermen Employed on Vessels which earn more than $10,000
Timaru	72	21	88
Oamaru	24	2	14
Moeraki	37	2	35
Karitane	29	4	19
Port Chalmers	110	23	119
Taieri Mouth	28	1	16
Total	300	53	291
New Zealand	5346	589	2777
% of New Zealand	5.6	9.0	10.5

Source: New Zealand Fishing Industry Board Unpublished Data.

2.4 Traditional Catch

Table 2 summarises the catch statistics for 1980. The principal species landed in Timaru by weight are barracouta, red cod, rig, and elephant fish, while Port Chalmers landed barracouta, sole, warehou, red cod, and rig.

TABLE 2

Total Monthly Landings of Wetfish by Weight and Value for the South Canterbury/Otago Region in 1980

Month	Weight (Tonnes)	Value ($000)	Monthly Catch as % of Year Weight (%)	Monthly Catch as % of Year Value (%)
January	975	352	9.2	9.0
February	1,055	325	9.9	8.3
March	853	268	8.0	6.8
April	1,317	399	12.4	10.2
May	1,483	426	13.9	10.9
June	805	207	7.6	5.3
July	805	280	7.6	7.2
August	393	172	3.7	4.4
September	653	252	6.1	6.4
October	711	343	6.7	8.8
November	800	412	7.5	10.5
December	785	479	7.4	12.2
Total	10,636[a]	3,913[a]	100.0	100.0

Source: New Zealand Ministry of Agriculture and Fisheries Unpublished Data.

[a] Columns do not sum because of rounding.

Table 2 shows an increase in the traditional inshore catch over the period from February to May which coincides with the migration of bluefin up the South Canterbury/Otago coast. The value of fish caught does not vary as much as the volume probably because prices are inversely related to the size of the catch. This relationship may be changing; partly because the price freeze has fixed prices and partly because supplies of deep water fish are now being sold on the domestic market throughout the year.

CHAPTER 3

SOUTHERN BLUEFIN TUNA FISHERY

3.1 Resource and Management

The world catch of southern bluefin tuna in 1982 was estimated to be about 40,000 tonnes of which New Zealand vessels supplied a mere 250 tonnes. The Australian fleet landed about 18,000 tonnes, and the Japanese 22,000 tonnes. The 1982 Japanese catch included 2,800 tonnes from the New Zealand Exclusive Economic Zone (Allen, 1983). The Japanese distant longline fleet has usually landed around 60 per cent off the coast of South Africa, 20 per cent off the New Zealand coast, and the remaining 20 per cent off Southern India and Australia (Payne, 1981). The Australian fleet has developed an industry poling and lining for three to four year old juvenile bluefin.

The Japanese caught fish are of higher quality and sell on the high priced sashimi market whereas most of the Australian fish are used for canning receiving a price of only $A0.70/kg. In 1980 the Australians declared their 200 mile Exclusive Economic Zone and the government offered low interest loans to build vessels exceeding 70 feet. This resulted in substantial investment in large, modern pole and line vessels and dramatic increases in the Australian southern bluefin tuna catch rising to 14,000 tonnes in 1981 and an estimated 24,000 tonnes in 1983. The Australian catch increase is a cause for serious concern, as the juvenile catch will have a large impact on future adult stocks (Allen, 1983).

Much of the bluefin caught in the New Zealand zone have migrated down the Australian coastline from their breeding grounds in Java. The sustainable annual world yield is estimated by Gisbon to be 55,000 tonnes if only seven year olds are caught. However, if all age groups are taken then the world annual southern bluefin tuna catch would reduce to 29,000 tonnes (a 35 per cent reduction).

This reduction in yield, coupled with a lower price for the Australian juveniles, suggests a very significant user cost to all fishing nations concerned is associated with the Australians fishing for younger tuna. User cost is the foregone income from harvesting a fish now instead of leaving that fish to mature to a heavier weight and a greater per kilogram price in the future, as well as the foregone breeding potential. This situation is recognised and currently being discussed by the nations concerned.[1]

Evidence of overfishing is the decline in landings despite increases in effort; in 1982 there was a dramatic drop in the New Zealand zone by the Japanese to less than half the usual tonnage. The 1983 season has been very poor although fishermen believe it is the result of a change in the water temperature brought about by the southern oscillation.

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[1] An interim management plan for southern bluefin tuna for the 1983/4 season is outlined in Media Release PI 83/223, Minister for Primary Industry, Canberra, 23rd September 1983.

Japanese began fishing for bluefin in New Zealand waters in 1958. They have successfully fished for this species off the East Coast of both islands, but have never succeeded in finding bluefin off the West Coast. In 1978 it became apparent that many bluefin do migrate up the West Coast, but are older fish and migrate later in the year. In 1979 a Greymouth fisherman succeeded in exporting a single fish for $16/kg followed by other fishermen who began catching the bluefin that were attracted to the surface by offal from foreign trawlers. Further interest was generated with the leasing of a mother ship by Solander Fisheries in 1981 to transport frozen bluefin to Japan. This Taiwanese refrigerated vessel, the Ho Chun No. 1, shipped 173 tonnes to Japan receiving an average price of $8.15/kg. In 1982 Solander Fisheries invested in a 350 tonne vessel which can refrigerate down to −55°C and is capable of carrying 280 tonnes of bluefin. This vessel, the Daniel Solander, shipped 270 tonnes receiving an average price of $10.50/kg on the Japanese auction floor.

3.2 Catching

The Japanese use a longline method which entails running 2,200 hooks on up to 120 km of line. It takes five hours to set and 12 hours to haul. The longliners working in New Zealand waters all exceed 200 tonnes employing about 23 crew. Squid is often used to bait the hooks but it is expensive costing nearly 50¢/hook.

The vessels follow the migration path of the bluefin beginning off the Southland coast at the end of January. Fishing off Otago takes place between February and late April. During May and June the fleet moves north fishing the southern edge of the Chatham Rise, and cold water upwellings off the Kaikoura and Wairarapa coasts. From the end of June to August most of the fishing effort is directed off East Cape. Vessels then either leave for Japan or fish off the North Cape for bigeye and yellowfin.

In 1980 vessels average 11.8 fish/day which fell to 8.7 fish/day in 1981 and 5.6 fish/day in 1982. Rising labour and fuel costs have added to the economic pressures on longliners but this has largely been compensated for by dramatic increases in southern bluefin tuna prices.

New Zealanders have developed their own method of catching bluefin off the West Coast. Vessels troll seeking signs of bluefin on their echosounders. When they have a strike or see promising signs on the sounders they stop and chum (drop bait) to bring bluefin to the surface. Once the bluefin get into a feeding frenzy baited handlines are thrown over and played out as the fish are hooked. In 1982 fishermen caught an average 6.5 fish/day. If the New Zealand West Coast technology works on the East Coast then New Zealand fishermen should be able to catch bluefin at a much lower cost than the Japanese.

Four attempts have been made to establish a domestic East Coast fishery. The first was by four Wellington vessels in 1981 but the attempt was abandoned after four days when it was found that the Japanese vessels had followed the bluefin to Gisborne despite assurances from the Fisheries Control Centre that the vessels were still working off the Wairarapa Coast. A second attempt off Gisborne was plagued with breakdown problems. In 1982 there was a third attempt by a Port Chalmers vessel which caught two bluefin but only the jaws were landed because shock absorbers were not included in the line. In 1983 Fletcher Fishing organised a training programme and feasibility study during the period mid March to mid April. The trial was not a success, partly because of the southern oscillation affecting sea surface temperatures and delaying the appearance of the fish. Japanese

longliners also experienced a later season and reduced catch during the same period.[2] Fletchers hope to resume the trial in 1984.

Interest has been expressed in vertical longlining, a method where three hooks are suspended on snoods connected to a vertical line once the fish are located by trolling and the Nelson Gear Technology unit are experimenting with alternative longline methods.

3.3 Processing and Handling

The sashimi (raw fish) market demands exceedingly high quality. A manual on handling bluefin has been produced along with a training course by the Southern Bluefin Tuna Development Group to ensure premium quality. Bluefin have the additional complication that they are prone to burning because when stressed the fish will breath anaerobically. Unless quickly handled and well chilled the fish will generate acid and heat resulting in the fish slowly cooking itself.

Measures can be taken by New Zealand vessels to minimise the dangers of burning. Rapid handling is essential as is the placing of the fish into ice water slurries to hasten the chilling process. When stowed the fish are packed inside and out with ice then repacked as the ice begins to bridge. Research is continuing on the effectiveness of brain ablation on quality. The catch is transferred to a mother ship where it is frozen, glazed and stored at −55°C. The Japanese longliners stow their fish directly at −55°C, but their handling is similar to that used by New Zealanders.

Care is taken in handling to prevent bruising. Double prolonged gaffs are used to lift the fish out of the water cleanly. The sides of the boat are carpeted and spongy plastic is laid on the decks.

Gloves are worn to prevent heat from the fishermen's hands producing marks on the skin. Bluefin are bled with surgical precision, then gutted and the cavity thoroughly scrubbed. The handling of bluefin is well advanced but problems of too many fish burning still have to be resolved, especially by the domestic fleet.

3.4 Marketing

The mother ship sails for Japan at the end of the fishing season and tuna is sold on the Tsukiji market. Some 16,000 tonnes of sashimi grade bluefin are sold through the Tsukiji fish market in Tokyo with the remaining 10,000 tonnes being sold in other markets in Japan.

The New Zealand fish averaged $10.50/kg in 1982 compared with a market average exceeding $16/kg for sashimi grade bluefin over 40kg. There is considerable variation in the price with many fish receiving over $30/kg. Fresh fish vary more in price than frozen fish because the market can be more readily oversupplied with the former.

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[2] J.F. Brough, Project Officer, Southern Bluefin Tuna, pers. comm., April 1983.

Each bluefin is inspected by buyers who are concerned about the origins of the fish because the quality is affected by the method of capture, care in handling, size of fish, and the time of the year and place the fish is caught. Three factors are judged by buyers:

* freshness

* flesh colour

* fat content

Southern bluefin tuna is considered to be the most valuable speces on the market. It is favoured because it has a high oil content, firm texture and strong variation in colour from deep red in the centre to white near the surface.

3.5 Southern Bluefin Tuna Potential

Table 3 and Figure 1 show the value of southern bluefin tuna within the range of domestic vessels compared with the value of fish estimated to be caught by the domestic trawl and line vessels from both Timaru/Oamaru and Port Chalmers.

Southern bluefin tuna values were estimated from the Japanese one degree square catch returns furnished to the Ministry of Agriculture and Fisheries. New Zealand fishermen are assumed to be able to fish to 30 nautical miles offshore and 80 nautical miles north and south of each port. This is a conservative estimate as the survey of skippers showed that they were prepared to fish considerably further offshore.

The southern bluefin tuna price was set at the monthly average price at the Yaizu fish market in 1980 and converted to New Zealand dollars at the exchange rate 200 yen = $NZ1. This price may underestimate the value of the South Canterbury/Otago fish as the quality is very high at the beginning of the season in the south then declines as the bluefin migrate northwards. The average weight of the New Zealand East Coast bluefin once gutted was 55kg in 1980.

The domestic catch for trawl and line boats was estimated by taking the total value of landings of fin fish for each port in 1980 less a number of finfish usually only caught by small inshore boats working on rocky bottoms.

Southern bluefin tuna is shown to have considerable potential in all East Coast ports particularly Gisborne, Timaru and Port Chalmers, despite the limiting assumption that the fishermen were only prepared to fish up to 30 nautical miles offshore.

TABLE 3

Estimated Value Potential Southern Bluefin Tuna

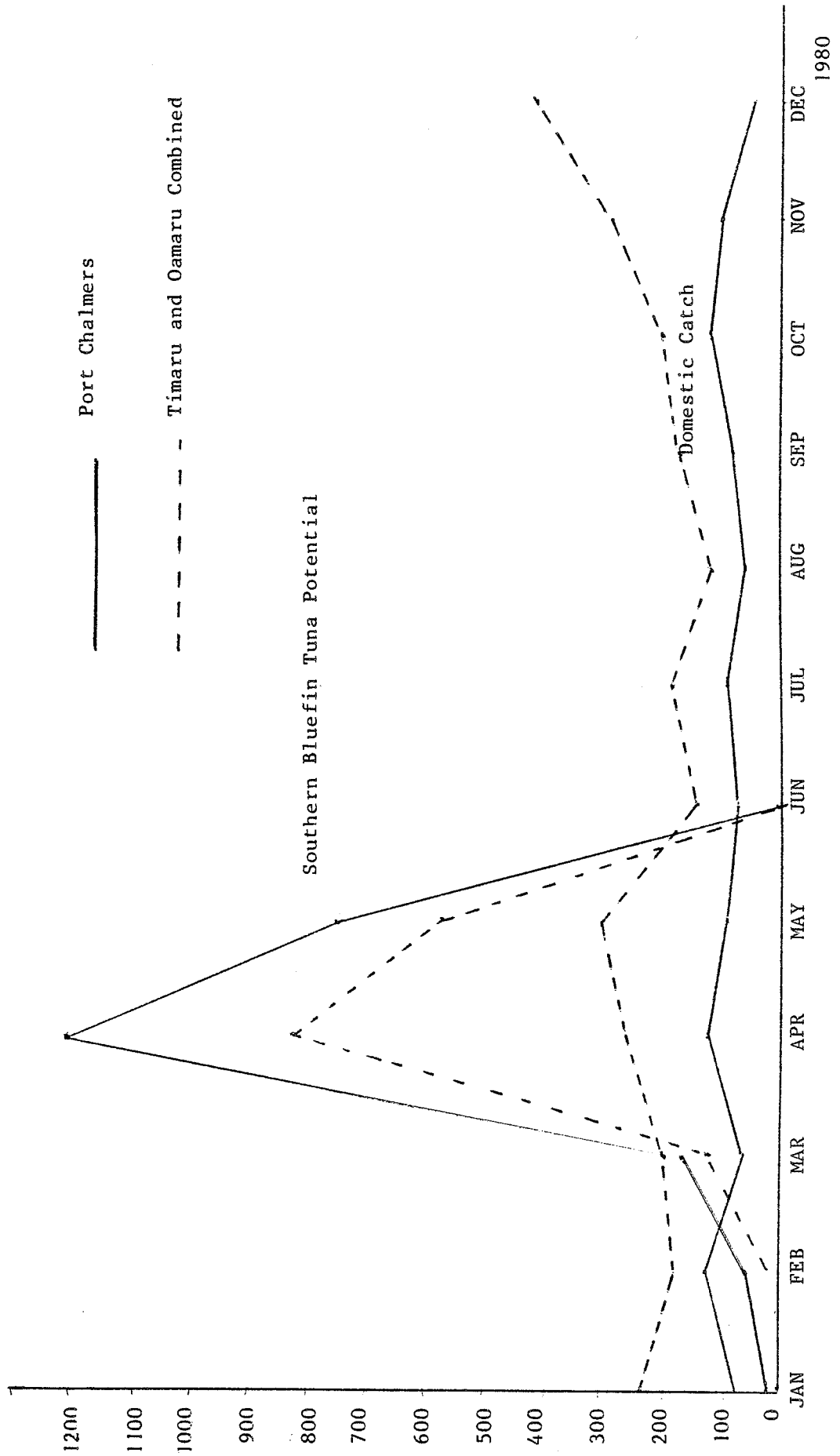
Catch for 1980 by Port

		Port					
		Gisborne	Napier	Wellington	Lyttelton & Akaroa	Timaru & Oamaru	Port Chalmers
January	No. Caught						27
	$NZ						15,849
February	No. Caught				2	37	96
	$NZ				1,140	21,088	54,715
March	No. Caught				2	209	300
	$NZ				1,104	115,384	165,623
April	No. Caught				333	1,570	2,273
	$NZ				177,797	838,262	1,213,612
May	No. Caught	360	380	809	516	1,125	1,455
	$NZ	185,184	195,472	416,150	265,430	578,700	748,457
June	No. Caught	410	454	383	2		
	$NZ	207,634	229,917	193,961	1,013		
July	No. Caught	3,950	189				
	$NZ	1,968,878	94,207				
August	No. Caught	60					
	$NZ	29,181					

Source: Japanese catch data supplied to New Zealand Ministry of Agriculture and Fisheries

Assumes:
1. Yaizu average monthly market price is a fair estimate of the price New Zealand fish would achieve on the Japanese auction floor.
2. 55 kg/fish processed weight.
3. New Zealand vessels will fish to 30 nautical miles off the coast and 80 nautical miles north and south of each port.
4. Exchange rate in 1980 of Y200 = $NZ1.
5. The New Zealand Fleet is able to achieve the same catch rate as the Japanese Fleet.

FIGURE 1. PORT CHALMERS AND TIMARU/OAMARU SOUTHERN BLUEFIN TUNA POTENTIAL - TOTAL REVENUE BY MONTH



CHAPTER 4

THE SURVEY OF DOMESTIC FLEET DEVELOPMENT POTENTIAL

4.1 Introduction

Potential is more than just the size of the fish stock. It includes the availability of vessels, equipment on those vessels, fishermen's knowledge, their level of risk averseness and their willingness to attempt southern bluefin tuna fishing. This information can only be obtained by direct survey. In the same way it was necessary to survey fishermen to identify barriers to development. With the low cost technology proven on the West Coast and the superior resource available on the East Coast one wonders why development has not already occurred. This survey attempts to answer these questions by identifying deficiencies in information and information flow, infrastructure, finance, equipment, distribution channels, motivation and management. The survey also attempts to find ways of overcoming these problems.

The results of the survey are applicable to other regions and other fisheries with development potential.

4.2 Vessels and Fishermen

As mentioned in Chapter 1, a census of skippers of all vessels (46) exceeding 12 metres based in the ports of Timaru, Oamaru, Port Chalmers and Taieri Mouth was undertaken. This survey was conducted in September 1982.

Seventeen of the skippers surveyed were based in Otago, 24 were based in Timaru, 1 in Oamaru and the remaining 4 fishermen were from other regions.

Most of the vessels (40) were in the 12 to 21 metre range, with five vessels being greater than 21 metres, and only one less than 12 metres.

The Ministry of Agriculture and Fisheries (MAF) proposed a southern bluefin tuna trial for 1983. They were seeking vessels equipped with radar, echosounder, satellite navigator, sonar, sea surface temperature recorder and deep sea fishing vessel survey. No vessel in the census had all of these items. Less than half of the vessels had a radar which exceeded 50 nautical miles, with only three vessels having a radar with greater than a 75 nautical mile range. One vessel had no radar, and four others had radar with less than 25 nautical miles capability.

All of the vessels had an echosounder but few had any other electronic equipment. Four vessels had a satellite navigator, three had sonar, four had a sea surface temperature recorder, and three had other specialist electronic equipment.

The MAF trial proposed fishing for southern bluefin tuna out to 130 nautical miles which would require vessels with a deep sea fishing vessel survey certificate and fishermen with a deep sea skipper qualification. However, no vessels surveyed, not even those exceeding 24 metres, were to fish beyond 75 nautical miles (Table 4), thus the proposed MAF trial was not feasible. Most skippers held a second class diesel trawler engineer qualification (Table 4).

The skippers were generally young (70 per cent under 40 years of age), 87 per cent were married and 74 per cent had capital invested in the vessel.

4.3 Development Input Required

Southern bluefin tuna migrate past the Otago/South Canterbury coast during the months of February, March and April. These months were perceived by fishermen in Timaru as profitable months for traditional fishing and in Port Chalmers as very profitable months although there is thought to be some falling off in the traditional catch in April (Table 5). This result is expected but is not fully supported by the catch statistics for 1980, the year used for subsequent analysis.

TABLE 4

Vessel Surveys and Skipper Qualifications

Survey Certificate	No. of Vessels
Inshore Fishing Vessel	2
Coastal Fishing Vessel	39
Deep Sea Fishing Vessel	5
	46

Skipper Qualifications	No. of Vessels
Inshore Fishing Skipper	5
Coastal Skipper and 2nd Class Diesel Trawler Engineer	37
Deep Sea Mate	1
Deep Sea Mate and 2nd Class Diesel Trawler Engineer	3
Deep Sea Skipper	0
	46

TABLE 5

Perceived Profitability of Traditional Fishing in February, March and April

	February	March	April
Very Profitable	12	11	9
Profitable	29	28	29
Not Very Profitable	5	7	8
Poor Month	0	0	0
	46	46	46

Of the fishermen, eleven fished from other ports, principally the West Coast, during the months of February, March and April.

Not only does the southern bluefin tuna migration clash with the perceived peak traditional fishing months but both fisheries improve over the full moon. Japanese southern bluefin tuna records indicate a sixfold increase while the traditional fisheries are less spectacular. One fisherman claimed his catch declined over the full moon, while 23 claimed that their catch increased and 22 said there was no change.

Thus, seasonal overlap between the traditional and potential fisheries means there are sizable opportunity costs for individual fishermen who transfer their catching effort into southern bluefin tuna fishing.

Despite the financial riskiness and considerable opportunity cost there was considerable interest in pioneering the East Coast southern bluefin tuna fishery. Eighty per cent of the skippers were interested in participating in the proposed MAF trial, a trial from which the MAF subsequently withdrew.

The fishermen were also willing to take their vessels considerable distances from shore (Table 6). Many fishermen cited 75 nautical miles as their limit because their qualifications did not permit them to go further. Ten fishermen cited distances further afield even though their qualifications did not allow them beyond 75 nautical miles.

Despite the skippers' willingness to try fishing for bluefin, very few of them knew how far from the coast the bluefin were likely to be found (Table 7).

TABLE 6

Distance Prepared to Take Vessel From Coast

Nautical Miles	No. of Fishermen
Less than 40	3
40 — 59	8
60 — 79	25
More than 80	10
	46

TABLE 7

Estimated Distance of Nearest School of Bluefin Tuna from the Coast

Nautical Miles	No. of Fishermen
Less than 20	7
20–40	8
41–60	2
61–80	3
81–100	1
More than 100	1
Don't know	24
	46

Some fishermen have had experience with the West Coast southern bluefin tuna fishery. Thirteen fishermen had attended a processing course and 25 or the 46 fishermen were sufficiently familiar with the West Coast bluefin tuna catching operation to be confident of using such operations on their vessel.

The surveyed fishermen were asked how necessary a number of factors were in encouraging them to fish for southern bluefin tuna (SBT). Results are shown in Table 8.

TABLE 8

Factors Necessary to Encourage Southern Bluefin Tuna Fishing

	Very Necessary	Quite Necessary	Not Necessary
More information on Location of SBT	29	7	6
More information on Catching Methods	24	12	6
More information on Handling of SBT	32	1	9
More information on Marketing of SBT	13	9	20
An Organised SBT Catching and Marketing Operation	21	9	12
An Experienced SBT Fisherman on Board	9	11	22
Gear Subsidy	6	5	31
Repayment of any Loss Incurred	16	8	18
Charter Agreement	5	4	33
Previous Success with SBT by Other Vessels in the Port	8	9	25

Valid Cases 42

Information on location, catching methods and handling was the most necessary ingredient for encouraging bluefin fishing. Less interest was expressed in needing information on marketing of the fish because many saw this as an exporter's responsibility.

An organised catching and marketing operation was seen as very necessary by half of the skippers. Many commented that it was no good catching the fish unless there was an organised outlet.

Very few fishermen felt it was necessary to have an experienced bluefin fisherman on board. In general the fishermen are highly confident of their ability to devise methods of catching fish, an observation borne out by the fishermen's earlier assertion that they were sufficiently confident in the West Coast bluefin catching operation to be confident of using it on their vessel. Yet many of these fishermen have no experience with the methods. Clearly the fishermen felt they could cope if they had the necessary information on catching and handling. However, many of them were not fully aware of the critical handling requirements for bluefin.

Three types of development subsidies were suggested; a gear subsidy, repayment of any loss incurred and a charter agreement. In general subsidies were not seen as necessary. The greatest interest was shown in the type of subsidy which guaranteed their fuel costs in the event of a loss being made. Fuel costs were also mentioned by many fishermen when they were asked for additional comments.

A gear subsidy was described by many as unnecessary because the cost of southern bluefin tuna gear is low.

A charter agreement was not favoured. Many fishermen said it was desirable but not necessary while others preferred to take the possibility of windfall gains over the guarantee of a fixed income from chartering.

Finally, previous success by other fishermen in the port was not seen to be necessary. This suggests the fishermen are innovators or early adopters of new technology which is probably a reflection of the common property resource characteristics of the fishing industry. Economic survival is often secured through being the first vessel to pioneer a virgin fish stock. Alternatively the result may reflect the riskiness, uncertainty and unsettled nature of the fishing lifestyle. A comparison with farmers' willingness to adopt new technology in surveys by Pryde (1982) suggest farmers are less likely to be early adopters than fishermen and very few farmers were willing to try a new crop or technology before others had shown it to be successful.

4.4 Information and Finance Channels

Respondents were asked where they would seek information on a new fishing idea (Table 9).

Other fishermen were the main source of information. Of the six respondents who did not record other fishermen as a source of information, five of them said they did not think other fishermen would have information on a new fishing idea. Only one fishermen was unwilling to share fishing knowledge. His responses to most of the other questions were also contrary to the trend.

TABLE 9

Sources of Information for a New Fishing Idea

	No. of Fishermen
Other Fishermen	40
MAF Fisheries Officers	16
MAF Scientists	10
Nelson Gear Technology Unit	15
Fishing Industry Board	18
Fishing Industry Training Council	5
Federation of Commercial Fishermen	12
Magazines	21
Other	4
Valid Cases 46	

Magazines, particularly the 'Fishing Board's Bulletin' and the 'Australian Fishing' magazine, were the second most common source of information, followed by the Fishing Industry Board's staff.

A number of Timaru fishermen said they would seek information from their local MAF fisheries officer but only one fishermen from the other ports mentioned this source. The chief fisheries officer in Timaru was a long standing Timaru fisherman.

A number of respondents said they were unaware of, or did not know how to contact, the Nelson Gear Technology Unit and most respondents said they had never heard of the Fishing Industry Training Council.

The MAF scientists were described as inaccessible and the Federation of Commercial Fishermen was viewed as a political organisation rather than an information source.

In general the fishing magazines were widely read (Table 10) but regarded as interesting rather than useful (Table 11).

TABLE 10

Frequency Magazines are Read

	Catch	Fishing Industry Board Bulletin	Commercial Fishing
Often	23	18	15
Sometimes	11	10	9
Seldom	7	7	9
Never	5	11	13
	46	46	46

The Fishing Industry Board's Bulletin was found by many to be more useful than Catch magazine because of its technical content. However, more fishermen were on the Catch mailing list than on the mailing list for the Bulletin.

TABLE 11

Usefulness of Magazines to Fishing Operation

	Catch	Fishing Industry Board Bulletin	Commercial Fishing
Very Useful	6	5	3
Useful	9	13	10
Not Very Useful	19	13	14
Useless	3	1	1
Do Not Receive the Magazine	9	14	18
	46	46	46

Many respondents mentioned the Australian Fisheries magazine as an interesting and useful source of information.

Those who attended the Fishing Industry Training Council seminars found them valuable, especially the recent seminar on fuel. A number of respondents did not realise that the seminars were produced by the Training Council but had attributed them to the Fishing Industry Board. This is not surprising as the two organisations are closely linked and are housed in the same building.

Few respondents had attended a Fishex Trade Fair mainly because the fairs are held in the North Island. Those who had attended one generally found them worthwhile (Table 12).

TABLE 12

Value of Training Council Seminars and Fishex Trade Fairs

	Seminars	Trade Fairs
Very Worthwhile	14	10
Worthwhile	5	1
Not Very Worthwhile	2	2
Worthless	0	0
Never Attended	25	33
	46	46

Fishdex are a series of technical reports produced by MAF for use by fishermen. Only seven respondents were aware of their existence and no respondents had ever seen a Fishdex publication.

There was considerable support for a daily radio programme for fishermen, with 36 fishermen claiming they would often tune in to a fisheries radio programme if it became available. All of the other 10 fishermen surveyed said they would tune in: 9 sometimes, and one occasionally.

There was also considerable support for an advisory service comparable to the service provided by MAF for the farming industry. Forty-two of the 46 fishermen said they would make use of such a service if it became available.

The Rural Banking and Finance Corporation was the main financier which fishermen would turn to when seeking finance to develop a bluefin tuna fishery (Table 13).

TABLE 13

Where Fishermen Would Seek Finance

	No. of Fishermen
Fishing Industry Development Grant Fund	7
Rural Banking and Finance Corporation	31
Development Finance Corporation	2
Banks	13
Insurance Companies	4
Wholesalers	23
Relatives or Friends	5
Others	1
Valid Responses 46	

Wholesalers were another major source of potential funds in some cases because the wholesaler owned the vessel. Very few respondents were aware of the Fishing Industry Development Grant Fund which was established for providing funds for developing fisheries. The fund was discontinued in the 1982 Budget and reinstated in 1983.

CHAPTER 5

COMMERCIAL PROFITABILITY

5.1 Introduction

Chapter 5 is concerned with the profitability of developing a bluefin tuna fisheries from the fisherman's point of view. The profitability of fishing for southern bluefin tuna is compared with the traditional, inshore, trawling operation. The difference between the national and the fisherman's assessment is that externalities are not considered by the fishermen. For instance they are not concerned if the government loses licencing revenue from having fewer Japanese longliners in New Zealand waters.

5.2 Assumptions

The following assumptions were made regarding a southern bluefin tuna fishery:

1. Only a two month fishing season in the region although fish can be readily caught for four months of the year.

2. Twenty fishing days over the two month period.

3. Inshore vessels will fish to a maximum of 30 miles off the coast.

4. Only 24 vessels transfer to bluefin tuna fishing and no vessels enter from other regions.

5. Catch rate of six fish/fishing day.

6. $10/kg for bluefin on the Japanese auction floor.

5.3 Costs and Revenue

Estimates of costs and revenue are given in Table 14. Marketing costs were derived from discussions with exporters and fishing companies. Vessel costs are derived from fishermen, and published Fishing Industry Board cost and earnings data.

5.4 Sensitivity Analysis

There is less certainty about the expected catch rate and price from southern bluefin tuna fishing than from trawling so a sensitivity analysis for a number of factors has been included (Tables 15–17).

5.4.1 Sensitivity to Market Price

New Zealand bluefin sold from Gisborne waters earnt around $7/kg in 1982, a little less than the first shipment of West Coast bluefin which sold for $8.15 on the Japanese auction floor. The 1982 West Coast shipment earnt $10.50/kg but considerably higher returns are expected if the

TABLE 14

Estimated Costs and Earnings for South Canterbury/Otago Southern Bluefin Tuna Fishery

	$	$
REVENUE		66,000
MARKETING COSTS		
Freezer vessel — costs $1.60/kg	10,560	
Insurance (0.75% of declared value)	500	
Import Duty (5% of declared value)	3,300	
Bank charges (0.5% of declared value)	330	
Agent fees (5% of declared value)	3,300	
TOTAL MARKETING COSTS		17,990
VESSEL INCOME		48,010
VESSEL COSTS		
Variable Costs		
Crew Remuneration (22.4% of Gross Vessel Income)	10,754	
Stores	725	
Ice ($40/tonne)	800	
Gear Replacement	200	
Fuel and Oil	5,000	
Miscellaneous	788	
TOTAL VARIABLE COSTS		18,267
GROSS MARGIN		29,743
Fixed Costs		
Repairs and Maintenance	6,115	
Insurance	961	
Wharfage	62	
Power, Rent and Rates	5	
Auditing, Accounting and Legal	72	
Sundry Administration	800	
Interest	1,930	
Depreciation	2,828	
TOTAL FIXED COSTS		12,773
NET INCOME BEFORE TAX (2 MONTHS) (for owner/skipper remuneration)		$16,970

quality problem of burning can be solved. Bluefin caught off the Otago coastline are higher quality than the same fish caught further north because of their higher oil content and can expect to earn about $16/kg on average on the Japanese auction floor. The market tends to have a low price elasticity of demand which could force the price up further as world catches are declining.

The price that New Zealand fishermen can expect from fish caught off the South Canterbury/Otago coastline is $16/kg or $10/kg if their handling technique results in a burning problem.

TABLE 15

Sensitivity to Market Price

	Market Price $/kg				
	7	10	13	16	19
Revenue	($)46,200	66,000	85,800	105,600	125,400
Marketing Costs	($)15,758	17,990	20,213	22,440	24,668
Vessel Variable Costs	($)14,332	18,267	22,204	26,141	30,077
Vessel Fixed Costs	($)12,773	12,773	12,773	12,773	12,773
Profit/Loss (2 mths owner/skipper)	($) 3,337	16,970	30,610	44,246	57,882

The profit equation is: Net Profit = $(4545.2 x price) — 28,480. Thus a $1 increase in price results in an increase in net profit of $4,542 for the two months. Catching an average of six fish/day a vessel would expect to break even at a market price of $6.27/kg.

5.4.2 Sensitivity to Number of Fish Caught Per Day

The Japanese East Coast fleet have experienced a dramatic drop in catch rate from 11.8 fish per day in 1980 to 5.6 fish per day in 1982. Reports for the beginning of the 1983 season suggest a catch rate of as low as two fish per day but this may simply be that the start of the fishery was delayed by three months because of water temperatures. Also, it is likely that increased Australian effort has reduced the recruitment into the New Zealand fishery.

West Coast experience using the New Zealand technique resulted in 6.5 fish/day being caught on average by novices in 1982. In 1983 the catch rate has dropped drastically to estimates of 3 fish/day. It is not known whether the fish have learned not to take the hook or whether the good hoki season meant the fish were already too well fed. Fishermen complain that bluefin marks are plentiful on their echo sounders but the fish are not moving up into the feeding zone near the surface. This was the same complaint that Otago fishermen had from their brief trial in 1982.

TABLE 16

Sensitivity to Catch Rate

		No. of Fish Caught/Day				
		2	4	6	8	10
Revenue	($)	22,000	44,000	66,000	88,000	110,000
Marketing Costs	($)	5,997	11,993	17,990	23,987	29,983
Vessel Variable Costs	($)	10,562	14,411	18,267	22,108	25,957
Vessel Fixed Costs	($)	12,773	12,773	12,773	12,773	12,773
Profit/Loss (2 mths owner/skipper)	($)	−7,332	4,823	16,970	29,132	41,287

The profit equation is: Net Profit = $(6075.96 x Fish Caught per Day)−19,486. Catching one extra fish each day would increase net profit by $6,076 for the two months. At an average market price of $10/kg a vessel would expect to break even at an average catch rate of 3.2 fish per day.

5.4.3 Sensitivity to Number of Days at Sea

Vessels exceeding 12 metres in the South Canterbury/Otago region can expect to get about 200 fishing days per year at sea. This equates to 33 fishing days per two month period. Since bluefin are further offshore than traditional fisheries, weather becomes a more significant factor and so expected fishing days are less. If there is no mother ship then fishermen must frequently return to port to land their fish. Again this lowers the expected time at sea especially as there is more steaming time to get to port than from the traditional fishing grounds.

In all fisheries, catch is directly related to the amount of time that the gear is in the water. Double the time and the catch is doubled, at least in the short term. In later years increased fishing effort now may result in a lower catch because of excess pressure on the fish stock.

The profitability analysis has assumed 20 fishing days during a two month period. This may be viewed as conservative.

TABLE 17

Sensitivity to No. of Days Fishing

		No. of Days Fishing			
		15	20	25	30
Revenue	($)	49,500	66,000	82,500	99,000
Marketing Costs	($)	13,493	17,990	22,488	26,985
Vessel Variable Costs	($)	13,948	18,267	22,587	26,907
Vessel Fixed Costs	($)	12,773	12,773	12,773	12,773
Profit/Loss (2 months owner/skipper)	($)	9,286	16,970	24,652	32,335

The profit equation is: Net profit = $(1536.6 x No. of days) − 13,762. Thus one extra day's fishing would increase net profit by $1,537. A vessel would break even if it was only fishing for nine days during the two month season.

5.4.4 Summary of Sensitivity Analyses

The above tables show that the profitability of southern bluefin tuna fishing is very sensitive to the market price, catch rate and the number of fishing days. For most fishermen in traditional fisheries the market price is fairly stable but they expect the catch rate and number of fishing days to vary markedly. With bluefin the market price, catch rate and number of fishing days are all likely to vary greatly. Because bluefin are further offshore than traditional fisheries then the number of fishing days is more dependent on the vagaries of the weather than fishermen are accustomed.

5.5 Comparative Gross Margins

Vessels exceeding 12 metres in the South Canterbury/Otago region have similar costs and earnings to those for "All Trawlers" in the Fishing Industry Board's 1982 analysis (Bulletin No. 68). The Board has projected costs and earnings for all trawlers to 31 March 1983. These figures can be taken as reasonable estimates of the costs and earnings of South Canterbury/Otago vessels exceeding 12 metres for the 1983 financial year. Costs and earnings have been reduced to apply to a two month period (Table 18) by assuming that March and April are average fishing months. The value of landings in 1980 show this to be approximately the case since the rise in landings over this period was compensated for by a fall in price (Chapter 2).

TABLE 18

Estimated Costs and Earnings for the South Canterbury/Otago Traditional Fishery for Vessels Exceeding 12 Metres For Two Months

	$	$
VESSEL INCOME		29,183
VESSEL COSTS		
Variable Costs		
Crew Remuneration (22.4% of Gross Vessel Income)	6,537	
Stores	725	
Ice	305	
Gear Replacement	1,880	
Fuel and Oil	7,986	
Miscellaneous	787	
TOTAL VARIABLE COSTS		18,220
GROSS MARGIN		10,963
Fixed Costs	6,115	
Insurance	961	
Wharfage	62	
Power, Rent and Rates	5	
Auditing, Accounting and Legal	72	
Sundry Administration	800	
Interest	1,930	
Depreciation	2,828	
TOTAL FIXED COSTS		12,773
NET INCOME BEFORE TAX (2 MONTHS) (for owner/ skipper remuneration)		−1,810

Source: N.Z. Fishing Industry Board Bulletin No. 68.

The comparative gross margins for the two months are $29,743 for southern bluefin tuna fishing (Table 14) compared with $10,963 for traditional fisheries (Table 18). The bluefin estimate is based on conservative assumptions and the traditional fishing estimate is based on aggregation of fishermen's accounts. These figures show that bluefin fishing is likely to be substantially more profitable than the traditional fisheries.

The profitability analysis assumes that four vessels initially experiment with bluefin capture. If they succeed they would have to airfreight the fish reducing their gross margin to $14,695[3], still better than for traditional fishing but not substantially better. If they fail to catch bluefin then each vessel's opportunity cost is $10,963 for the two month period.

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3 It is assumed that bluefin will be airfreighted to Japan in the initial trial period. The catch in subsequent years will be freighted by sea.

CHAPTER 6

NATIONAL COST BENEFIT ANALYSIS

Discussion in the previous chapter was concerned with returns to individual vessel operators involved in the bluefin project. However, it must be recognised that governments are concerned with maximising the present and future welfare of all its citizens. Thus from a national point of view it is necessary to take into account all benefits and costs of a project, regardless of who bears the costs or reaps the benefits.

Cost-benefit analysis (CBA) is used to aid decision making, and differs from the Investment Analysis approach used in Chapter 5 in that externalities are included in the calculations. These externalities are benefits and costs from the project which do not directly affect the operator undertaking the project. Furthermore, these externalities can be divided into tangible (directly measurable) and intangible (difficult to measure) benefits and costs. Examples of each category will be discussed in the text. Only the additional costs and benefits of the project need to be considered, and costs to one group in society may be balanced by an equal benefit to another group, or merely a transfer payment. The wages paid to crew members are a direct cost to vessel operators but a benefit to the crew members, thus are an example of a transfer payment.

The relevant benefits and costs are listed in Table 19, and this chapter is concerned with identifying and quantifying, where possible, these costs and benefits. This will enable the net present value and internal rate of return to the project to be calculated to indicate the value to society of the government taking an organising role in the South Canterbury/Otago bluefin tuna fishery.

The net present value is a single lump sum and depends on the time horizon used for the project. For this reason the equivalent annual return has been used in the text to describe the impact of developing the bluefin fishery under different scenarios. This measure is found by dividing the net present value by the capital recovery factor. The equivalent annual return describes the value of the project to society as a yearly net benefit rather than a single lump sum.

The internal rate of return is commonly used to evaluate projects but should only be used as a guide. It measures the interest rate at which the project would break even. With the bluefin project, the internal rate of return is approaching infinity because the costs of establishing the fishery are recouped in the same year if the project succeeds.

The east coast bluefin fishery is unlikely to develop without some government or quasi-government influence. An individual fisherman seeking to develop a fishery must learn how to locate, catch, process, and market bluefin. Such a project is costly and risky to an individual, with the major cost being the opportunity cost of foregoing traditional fishing. The risks of pioneering a fishery appear larger for an individual than government because the costs of failure represent a larger proportion of an individual's income.

TABLE 19

Benefits and Costs of Developing South Canterbury/Otago Southern Bluefin Tuna Fishery

A. Primary	
(a) Tangible	
BP1 Value of SBT (Japanese auction floor)	CP1 Cost of catching bluefin (including crew's wages)
BP2 Possible saved vessel buy back cost to SBT fishermen.	CP2 SBT marketing cost
BP3 Cost saved by not fishing for the traditional inshore stock.	CP3 Initial cost of gear
	CP4 Income foregone from not fishing the traditional inshore fishery (ex vessel)
(b) Intangible	
BP4 Conservation of inshore resource	
BP5 Saved social upheaval from removing fishermen from the industry.	CP5 Increased danger from working facilities further off the coast.
B. Externalities	
(a) Tangible	
BE1 Crew's wages (N.B. transfer from CP1)	CE1 Lost licence revenue from foreign bluefin fleet
BE2 Possible saved vessel buyback cost to non-SBT fishermen.	CE2 Cost of providing extension and advisory services.
BE3 Possible extra catch to fishermen not fishing for bluefin.	CE3 Cost of providing intial training services.
	CE4 Providing marketing information.
(b) Intangible	CE5 Possible increased search and rescue cost.
	CE6 Possible political cost of excluding foreign bluefin vessels

6.1 Transferring Fishing Effort

The fishing industry is facing retrenchment because of overfishing of some high valued inshore species. Market forces are unlikely to solve this overfishing problem because of the common property nature of the resource, and government intervention is proposed to rectify this market failure by introducing legislation to reduce fishing effort (NAFMAF, 1983). A major objective of this bluefin study is to show that transferring vessels to an alternative fishery may alleviate the need to delicense existing vessels in the traditional fisheries.

Two separate issues must be considered. Firstly, if only half of the boats remain in the inshore fishery, will the catch decline and if so by how much? Secondly, would transferring effort to the bluefin fishery mean that fishermen will no longer need to be excluded from the inshore fishery? This paper does not attempt to answer these questions but instead gives a sensitivity analysis by presenting different scenarios.

The first issue of declining inshore catch is considered under three alternative scenarios;

(a) no overcapitalisation in the existing inshore fishing fleet

(b) some overcapitalisation

(c) severe overcapitalisation

Scenario (a) assumes that if fishing effort is transferred from the traditional inshore fishery to bluefin then the total traditional catch would decline by the amount that the transferred vessels would have been catching (i.e. the extra vessels' marginal physical product equals the regional fishing industry's average physical product). This scenario implies there is no overcapitalisation or overfishing in the region. This is unlikely. However, the scenario is included in the analysis because it gives the maximum possible opportunity cost of developing the bluefin fishery.

Scenario (c) suggests there is no change in the region's total traditional catch because the remaining vessels now catch what the vessels that transferred to southern bluefin tuna would have caught (i.e. the marginal physical product of the transferred vessels is zero). This scenario suggests severe overcapitalisation. If there is overfishing and fishing effort is not reduced then the fishery may collapse. Conversely if fishing effort is reduced then in the short term there is no gain for the remaining vessels, but in the long run their catch may increase as the fishery recovers. Scenario (c) is not intended to represent overfishing. Overfishing implies a negative marginal physical product of the extra vessels. If overfishing considerations were included in the analysis it would have the effect of making any investment in bluefin more attractive.

Scenario (b) is intermediate between scenarios (a) and (c). Under (b) the effect of transferring fishing effort from the traditional inshore fishery to bluefin will be a reduction in the total catch which is partly recouped by the remaining vessels.

The second issue concerns vessel buy-back. The "Future policy for the inshore fishery" paper (NAFMAC, 1983) proposes spending $28 million to remove vessels and licences from commercial fishermen by buying them out. It is not clear whether these funds are sought from the fishing industry or from government. Transferring fishing effort into southern bluefin tuna may alleviate the vessel buy-back cost to the South Canterbury/Otago fishermen. Two scenarios are given;

1. No savings on vessel buy-back.

2. A saving on vessel buy-back costs of 4 vessels (the annual equivalent of 24 vessels for 2 months).

Combining these two issues allows calculations to be presented under six alternative scenarios: 1 (a), (b), and (c) and 2 (a), (b) and (c). The seventh scenario estimates the cost of attempting to develop a bluefin fishery and failing.

So far only the physical catch has been described. It can be assumed that changes in the catch level will have no effect on the price of fish because:

* the price of New Zealand fish is largely determined by export prices; and

* any regional shortfalls will be supplemented by importing fish from other regions.

This allows the catch scenarios to be expressed in dollar terms instead of physical terms.

The Fishing Industry Board estimated from accounts that the average revenue product of vessels exceeding 12 metres in the South Canterbury/ Otago fishery was $152,000 in 1982 of which 72 per cent were variable costs. These figures are very similar to the 1982 figures for "All trawlers costs and earnings" published in the December 1982 Fishing Industry Board Bulletin (No. 68). Projected cost and earnings for all trawlers to March 1983 were also given in the Board's Bulletin. These figures are used in this study. (see Section 5.3).

6.2 Primary Costs and Benefits

These are costs and benefits borne directly by the individual fishermen involved in the capture of bluefin. In the initial trial four vessels only will attempt to fish for bluefin and the product will be airfreighted to Japan. The following season half of the vessels exceeding 12 metres (i.e. 24 vessels) are assumed to enter the bluefin fishery for two months.

6.2.1 Primary Benefits

The following discussion is summarised in Table 19.

1. The value of bluefin sales are the estimated Japanese auction floor prices accruing directly to the fishermen participating in the project (BPI).

2. Under scenario 2, the transfer of fishing effort to bluefin alleviates the necessity to operate a vessel buyback scheme. If 24 vessels convert to bluefin fishing for two months it would have the same impact as four vessels not fishing the traditional inshore grounds for 12 months. This could be achieved by the Federation of Commercial Fishermen's proposed plan of buying up surplus fishing vessels and permanently excluding them from the fishing industry. The Federation suggested $150,000 per vessel may be all that is needed in the South Canterbury/Otago region to buy back vessels.[4] Thus if development of the bluefin fishery means that four fulltime vessels will not need to be bought out then there is a saving to the region of $150,000 x 4 = $600,000. Only half of this buyback cost would be paid by the bluefin fishermen, the other half would be paid by the vessels remaining in the inshore fishery. Hence $300,000 are primary benefits (BP2) and $300,000 are external benefits (BE2). If the Government funds a vessel buyback scheme then the saved cost would be an entirely external cost.

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4 P. Stevens, Secretary, Federation of Commercial Fishermen, pers. comm., July 1983.

In 1980, Timaru and Port Chalmers vessels caught 16.1 per cent of the year's finfish landings in the months of March and April, and 34.9 per cent in the months of February to May inclusive. This study assumes that 1980 is a representative year.

3. Those vessels engaged in the bluefin project benefit because they do not have to pay the costs they would normally incur in fishing the traditional resource (BP3). However, this is balanced by the direct costs of catching bluefin, and can be deleted if only extra variable costs for bluefin harvest are included in subsequent analysis.

4. Reduced pressure on finfish stocks is an intangible benefit, thus difficult to quantify. The estimate in (2) of $600,000 is an amount that the industry may be prepared to pay for reduced fishing effort in the region. This estimate is derived from a fair market value for the vessels, not from the estimated long run benefits of reducing fishing pressure. No value has been attributed to this latter benefit (BP4).

5. Excluding fishermen through legislation or vessel buyback schemes can cause social upheaval to the fishermen and their families. Developing the bluefin fishery may alleviate this problem. Again no quantitative estimate has been made for this benefit (BP5).

6.2.2 Primary Costs

1. The variable cost of catching bluefin, including wages to the crew is a tangible primary cost. Introducing only extra variable costs over and above the traditional fishing cost enables primary benefit (PB3) (Table 19) to be deleted. (CP1)

2. Direct marketing costs for bluefin, including the cost of airfreighting fish in the first trial year are costs accruing to the project (CP2). The marketing costs for the traditional fishery are not considered because their earnings are expressed ex vessel, whereas bluefin are expressed ex Japanese fish auction.

3. The initial cost of bluefin gear is estimated at about $400 per vessel (CP3). Annual gear replacement is estimated at $200, and this has been included in calculations of variable cost, thus leaving an additional cost of $200 per vessel in the first year. Four vessels begin bluefin fishing in year 0 ($200 x 4 vessels = $800) and the remaining 20 vessels begin in Year 1 ($200 x 20 vessels = $4,000).

4. Those vessels fishing for bluefin must forego income from their traditional fishing operation of $29,183 per vessel for the two months (Section 5.3): $29,183 x 24 vessels = $700,392 (CP4).

5. One intangible cost which has not been included in subsequent analysis is the extra risk that fishermen face in operating further from shore than usual. This may be a real factor, especially during early years of a bluefin project until fishermen gain experience in a different situation. (CP5)

6.3 Externalities

Externalities are costs and benefits that affect people other than the sponsors of the project. They may also be tangible or intangible but only the additional costs and benefits of the project needs to be considered.

6.3.1 External Benefits

1. The crew's wages are higher in the bluefin fishery than in the traditional inshore fishery because of greater value of the catch. When the bluefin price is $10/kg crew earn an additional $4,217 x 24 vessels = $101,208 and at $16/kg crew earn an additional $12,091 x 24 vessels = $290,184 (BE1).

   Note this is a transfer payment only, as the same amount has been included as a cost in CP1 (Table 19).

2. Under scenario 2 there is a saved cost of not needing to buy and dispose of as many surplus vessels from the inshore fishery. Transferring 24 vessels for two months into the bluefin fishery would save disposing of four full time vessels at an estimated vessel buyback cost of $600,000. Because half of the vessels transferred to bluefin then half of this saved cost has been accounted for as a primary benefit to bluefin fishermen. The other half of $300,000 is an external benefit to the remaining inshore vessels (BE2).

3. Transferring fishing effort to bluefin may result in more fish being caught by the remaining inshore vessels (BE3). These effects are summarised in catch scenarios (a), (b) and (c) (see Section 6.2).

   It is estimated in Section 5.3 that the average gross income of the traditional inshore vessels exceeding 12 metres was $29,183 for two months. Therefore, the benefit to the remaining inshore vessels is:

Scenario (a)	$0	x 24 vessels	= $0
Scenario (b)	$29,183/2	x 24 vessels	= $350,196
Scenario (c)	$29,183	x 24 vessels	= $700,392

6.3.2 External Costs

1. New Zealand would lose licence fee revenue from displacing some of the Japanese fishing effort (CE1). It is assumed that two Japanese longliners would be displaced by 24 inshore vessels fishing for two months; 24 vessels catching six fish per day on 20 fishing days is equal to one longliner fishing for seven months every day in all weather conditions catching eight fish per day. The lost licence fee revenue of one vessel is $59,000 (1982 figure).

2. The southern bluefin tuna industry is unlikely to develop unless the responsibility for providing information, co-ordinating the catching, training, processing, transportation and exporting is organised by one authority. Assuming one person is employed full time for six months and incurs some administrative expenses then the cost of the extension service would be in the order of $15,000 (CE2).

3. The Fishing Industry Board have available a training programme for bluefin fishermen. Providing this service to the South Canterbury/Otago fishermen would cost approximately $2,000 (CE3).

4. The Fishing Industry Board is able to provide an ongoing southern bluefin tuna market information service of which about $1,000 per year could be credited to the South Canterbury/Otago fishery (CE4).

5. With an increased number of vessels fishing further from the coast, there may be increased costs involved in search and rescue operations. These costs would be borne by the nation (CE5).

6. The political backlash from displacing Japanese longliner fishing effort could be serious (CE6). The Japanese may place tariffs, quotas or non tariff barriers on imported New Zealand caught southern bluefin tuna. They may intensify their fishing effort in areas outside the New Zealand fishing zone for juveniles thus further reducing the southern bluefin tuna stock.

Both of these options seem unlikely. Japanese longliners are becoming increasingly uneconomic because of declining catches, and rising fuel and labour costs. Some of these costs are offset by the rising prices for bluefin because of a low price elasticity of demand (Kitson, 1978). Japanese consumers would be unwilling to sacrifice southern bluefin tuna consumption. Gibson (pers. comm., 1983)[5] estimates that for every job aboard a longliner, about 12 onshore jobs are generated . He modified the known job multipliers for the English fishing industry to account for differences in Japanese marketing methods. The shore workers are not concerned with which country's vessels catch the fish, so long as the fish continue to be landed and are of comparable quality.

Nor is there any evidence to show that withdrawal of New Zealand fishing rights has any repercussions on access rights for non fisheries exports to Japan. There were no noticeable gains from the 1977 'Beef for Fish' campaign and the Minister for Foreign Affairs, Mr Cooper (pers. comm., 1982) doubts if Japan would retaliate if New Zealand keeps within the International Law of the Sea.

As only two Japanese vessels would need to be excluded to accommodate 24 small vessels fishing for bluefin for two months, no political backlash is likely. However, further development of the east coast bluefin fishery by inshore vessels could potentially displace about half the 96 strong Japanese fishing fleet.

6.4 Quantification of Costs and Benefits

This section is concerned with quantifying, where possible, the costs and benefits listed in Table 19 and discussed in section 6.3. From these results, net present values and equivalent annual returns are later calculated. These results are presented in Table 20, with the seven scenarios discussed in Section 6.2 included to ascertain the sensitivity of the different assumptions to final calculations of net present values and equivalent annual returns.

Table 20 shows benefits and costs for years 0 (the trial year with four vessels) and year 1 where 20 extra vessels are included in the project. Subsequent years (shown as year 1), have the 24 vessels fishing for bluefin, and most of the benefits and costs continue in subsequent years. The exception to benefits continuing is the possible saved cost on vessel buyback under scenario (2), and the exceptions to costs continuing are the extension and training costs and initial gear additional costs. Scenario 7, where the project is unsuccessful is shown to complete the analysis.

A sensitivity analysis is conducted by calculating benefits using a bluefin price of $16/kg (refer to Table 15). The subsequent results are

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5 D.J.M. Gibson, Scientist, Fisheries Research Division, Ministry of Agriculture and Fisheries, pers. comm., July 1983

TABLE 20

Southern Bluefin Tuna Fishery Cost Benefit Analysis

South Canterbury/Otago Region: $10/kg

Assume: Chapter 5 costs and revenues, 4 vessels transfer to southern bluefin tuna fishing in Year 0, and 24 vessels transfer in Years 1+ for 2 months.
Years 2 to 20 have the same cost in year 1 less $4,000 for the initial gear cost and $1,000 for the initial training.
Price = $10/kg Japanese auction floor. Discount rate = 10 per cent. All figures refer to $.

		Scenario						[1]
	Yr 0 Trial	1a Year 1	1b Year 1	1c Year 1	2a Year 1	2b Year 1	2c Year 1	No fish caught Yr 0
Primary Costs and Benefits								
Benefits								
SBT sales	264,000	1,584,000	1,584,000	1,584,000	1,584,000	1,584,000	1,584,000	
Saved cost on vessel buyback					300,000	300,000	300,000	
Saved traditional fishing variable costs	72,880	437,280	437,280	437,280	437,280	437,280	437,280	72,880
Costs								
SBT variable costs	59,584	438,408	438,408	438,408	438,408	438,408	438,408	30,052
Marketing costs	132,152	431,760	431,760	431,760	431,760	431,760	431,760	
Lost revenue from traditional fishing	116,732	700,392	700,392	700,392	700,392	700,392	700,392	116,732
Initial additional gear costs	800	4,000	4,000	4,000	4,000	4,000	4,000	800
Primary Net Benefits	27,612	446,720	446,720	446,720	746,720	746,720	746,720	−74,704
Externalities								
Benefits								
Higher Wages	3,384	101,208	101,208	101,208	101,208	101,208	101,208	−26,148
Saved cost on vessel buyback					300,000	300,000	300,000	
Extra fish caught by other vessels			350,196	700,392		350,196	700,392	
Costs								
Lost licence fee revenue		118,000	118,000	118,000	118,000	118,000	118,000	
Extension	15,000							15,000
Training	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Marketing information	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total Net Benefits	13,996	427,928	778,124	1,128,320	1,027,928	1,378,124	1,728,320	−117,852
Net Present Value to 20 years NPV 0.1, 20		3,695,211	6,676,627	9,658,043	8,803,349	11,784,765	14,766,181	−117,852
Equivalent Annual Return to 20 years EAR 0.1, 20		434,039	784,237	1,134,434	1,034,041	1,384,238	1,734,436	−13,843
Primary Net Present Value to 20 years PNPV 01, 20		3,861,209			6,415,278			−74,704

TABLE 21

Southern Bluefin Tuna Fishery Cost Benefit Analysis

South Canterbury/Otago Region: $16/kg

Assume: Chapter 5 costs and revenues, 4 vessels transfer to southern bluefin tuna fishing in Year 0, and 24 vessels transfer in Years 1+ for 2 months
Years 2 to 20 have the same costs in year 1 less $4,000 for the initial gear cost and $1,000 for the initial training.
Price = $16/kg Japanese auction floor. Discount rate = 10 per cent. All figures refer to $.

		Scenario						7
	Yr 0 Trial	1a Year 1	1b Year 1	1c Year 1	2a Year 1	2b Year 1	2c Year 1	No fish caught Yr 0
Primary Costs and Benefits								
Benefits								
SBT sales	422,400	2,534,400	2,534,400	2,534,400	2,534,400	2,534,400	2,534,400	
Saved cost on vessel buyback					300,000	300,000	300,000	
Saved traditional fishing variable cost	72,880	437,280	437,280	437,280	437,280	437,280	437,280	72,880
Costs								
SBT variable costs	91,052	627,384	627,384	627,384	627,384	627,384	627,384	30,052
Marketing costs	149,952	538,560	538,560	538,560	538,560	538,560	538,560	
Lost revenue from traditional fishing	116,732	700,392	700,392	700,392	700,392	700,392	700,392	116,732
Initial additional gear costs	800	4,000	4,000	4,000	4,000	4,000	4,000	800
Primary Net Benefits	136,744	1,101,344	1,101,344	1,101,344	1,401,344	1,401,344	1,401,344	−74,704
Externalities								
Benefits								
Higher Wages	34,880	290,184	290,184	290,184	290,184	290,184	290,184	−26,148
Saved cost on vessel buyback					300,000	300,000	300,000	
Extra fish caught by other vessels			350,196	700,392		350,196	700,392	
Costs								
Lost licence fee revenue		118,000	118,000	118,000	118,000	118,000	118,000	
Extension	15,000							15,000
Training	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Marketing information	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total Net Benefit	154,624	1,271,528	1,621,724	1,971,920	1,871,528	2,221,724	2,571,920	−117,852
Net Present Value to 20 years NPV 0.1, 20		11,017,881	13,999,297	16,980,713	16,126,019	19,107,435	22,088,851	−117,852
Equivalent Annual Return to 20 years EAR 0.1, 20		1,294,160	1,644,357	1,994,555	1,894,162	2,244,359	2,594,556	−13,843
Primary Net Present Value to 20 years PNPV 0.1, 20		9,543,524			12,097,593			

presented in Table 21, where the bluefin price is the only variable altered from Table 20. Discussion will refer to Table 20, with a bluefin price of $10/kg.

6.4.1 Primary Benefits and Costs

1. Primary benefits from bluefin sales at $10 kg are $66,000 per vessel for the two month period (Table 14. Chapter 5 refers to assumptions made). This gives a total benefit of $1,584,000 in year 1 and subsequent years. At $16 kg each vessel would earn $105,600 for the two months, for a total benefit of $2,534,000, the figure used in Table 21.

2. Saved cost of vessel buyback under scenario (2) is $300,000 in year 1 only (Section 6.2.1).

3. Difference in variable costs. A vessel working the traditional inshore fishery spends $18,220 on variable costs in two months compared with $18,267 bluefinning at a price of $10/kg and $22,770 bluefinning when the price is $16/kg. (Refer to Chapter 5). The price of bluefin affects the variable costs because deckhands are paid a share of the catch value. At $10/kg crew earn $4,217 more than if they were fishing the traditional inshore grounds and $12,091 more at $16/kg. The difference in variable costs is $47 x 24 = $1,128 at $10/kg and $7,914 x 24 = $189,936 at $16/kg. Wages are a transfer payment to external benefits.

4. Total marketing costs for the project are $431,760 (Chapter 5). A higher cost per kg is incurred in the trial year because bluefin is airfreighted to Japan at a cost of $2.01/kg plus an allowance made for the extra weight of a coffin and ice.

5. Lost revenue to each boat from traditional fishing totals $116,732 in year 0 and $700,392 in subsequent years (Section 6.2.2).

6. Additional extra cost of gear in the first year of each vessel's operation is estimated at $200 per vessel (Section 6.2.2).

6.4.2 External Benefits and Costs

1. External benefits from:

   (a) crews' wages (transfer payment),

   (b) saved vessel buyback under scenario (2),

   (c) transferring fishing effort benefits in the form of external fish caught by existing fishermen.

2. External costs from:

   (a) lost licence revenue,

   (b) extension cost (year 0 only),

   (c) training programme (year 0 and year 1 only),

   (d) marketing information

6.5 Net Present Value and Equivalent Annual Return Calculations

In line with current Treasury practice, a 10 per cent discount rate has been used in this section to convert future benefits to a present value. Although with good fisheries management there is no reason why the bluefin fishery cannot continue indefinitely, a time horizon of 20 years has been used to calculate net present values. This results in a figure less than a calculation to infinity would produce, so the results can be viewed as being conservative. Both the primary net present value (excluding externalities) and the national net present value are shown in Table 20 and Table 21 for bluefin at $10/kg and Table 21 for bluefin at $16/kg.

6.5.1 Equivalent Annual Return

Table 22 summarises the equivalent annual return calculations under the following sub-headings:

(a) national equivalent annual return, where all benefits and costs, both primary and externalities are included.

(b) primary equivalent annual returns, where only those benefits accruing to fishermen involved in the bluefin project are shown.

Treasury routinely add a 10 per cent premium for foreign exchange because export subsidies indicate that New Zealand values export dollars more than domestic dollars. In keeping with Treasury practices a 10 per cent premium on foreign exchange has been assumed and both with and without the 10 per cent premium calculations are shown.

Finally, calculations are presented for both a $10/kg price for bluefin from Table 20 and a $16/kg price from Table 21.

For the sponsors the project is worth half a million dollars per year if the price is $10/kg and over one million dollars per year at $16/kg. The sponsors are not concerned by the effect of transferring fishing effort on the traditional inshore fishery (Scenarios a, b and c), and the operation of a vessel buyback scheme has very little impact (Scenarios 1 and 2). Failure to catch any fish results in a cost of $74,704 which when discounted over 20 years, gives an annual equivalent cost of $8,775. A 10 per cent foreign exchange premium raises the net present value of bluefin fishing by between 17 and 27 per cent.

Externalities greatly increase the benefits from the bluefin fishery. Equivalent annual returns to the country range from $0.47 million to $2.13 million with the most sensitive variable being the price. If a price of $16/kg is received the net benefits to New Zealand double. Also significant are the assumptions on the effect of transferring fishing effort from the traditional inshore fishery to bluefin. The industry's call of too many boats chasing too few fish implies that a reduction in fishing effort will increase the catch for those remaining. It also implies conservation, the total catch can be expected to decline from effort reduction at least in the short to medium term. So scenario (b) probably best describes the effect of transferring fishing effort to bluefin.

The equivalent annual return for scenario (c) is about double that for scenario (a) with scenario (b) intermediate between the two.

TABLE 22

Equivalent Annual Return for the Southern Bluefin Tuna Fishery in the South Canterbury/Otago Region

	Scenario						No Fish Caught
	1a	1b	1c	2a	2b	2c	
	$ million	$ million	$ million	$ million	$ million	$ million	$
National Equivalent Annual Return							
$10/kg no foreign exchange premium	0.43	0.78	1.13	1.03	1.38	1.73	−13,843
$10/kg 10% foreign exchange premium	0.54	0.89	1.24	1.14	1.50	1.84	−14,087
$16/kg no foreign exchange premium	1.29	1.64	1.99	1.89	2.24	2.59	−13,843
$16/kg 10% foreign exchange premium	1.47	1.81	2.16	1.98	2.20	2.78	−14,087
Primary Equivalent Annual Return							
$10/kg no foreign exchange premium		0.39			0.64		−8,775
$10/kg 10% foreign exchange premium		0.50			0.75		−8,775
$16/kg no foreign exchange premium		0.95			1.21		−8,775
$16/kg 10% foreign exchange premium		1.14			1.38		−8,775

A 10 per cent premium of foreign exchange increases net present value by between 9 per cent and 23 per cent. The greatest impact occurs when the price of bluefin is low ($10/kg) and the remaining inshore fishermen's catch remains static (scenario (a)).

Cost savings by alleviating the need for a vessel buyback scheme had little impact. The increase in the equivalent annual return was $64,000 which accounted for a 12 per cent increase at a price of $10/kg under scenario (a), but only a three per cent increase at a price of $16/kg under scenario (c).

If the project fails it will have cost the country $117,852 or an equivalent annual cost of $13,843.

CHAPTER 7

REGIONAL AND NATIONAL MULTIPLIERS

The Government has set a premium on regional development in Otago evidenced by the suspensory loans and grants that are offered through the Department of Trade and Industry. This premium has not been taken into account in the cost benefit calculations.

Nor do the analyses include any multiplier effects. If fishing output increases in the South Canterbury/Otago region, then fishing companies and fishermen will benefit directly. In addition, the spending of their extra income will increase the income and employment levels of others in the region.

Hubbard and Brown (1981) estimated multipliers from regional non survey input-ouput tables which are summarised in Table 23. (Fishing and hunting are an aggregated industry sector.)

If half of the vessels exceeding 12m in South Canterbury and Otago transfer into the southern bluefin tuna fishery then 13 vessels in South Canterbury would annually gross ex-vessel $642,130 at $10/kg and $1,091,080 at $16/kg, while 11 vessels in Otago would annually gross ex-vessel $528,110 at $10/kg and $914,760 at $16/kg (see Tables 20 and 21). The regional and national multiplier effects have been calculated for output, income and employment from these values under scenario (c).

By completely displacing the littoral Japanese fishing effort the bluefin fishery could be expected to sustain 72 inshore vessels in the region over a longer period (Chapter 2). This analysis does not consider the potential of the fishery, only the effects of half of the existing fleet over 12 metres (i.e. 24 vessels) transferring for two months into catching bluefin. The annual impacts shown in Table 23 could therefore be multiplied by three to get an estimate of the potential impact.

To interpret these results consider the $16/kg column showing the annual national impact from 24 vessels transferring into the southern bluefin tuna fishery. This shows that additional output of $3.07 million is generated in the fishing industry and related industries such as engineering, transport, storage, finance, and electronic sectors. In turn this extra output draws off other industries resulting in a total added value generated of $5.19 million.

Additional wages must be paid for additional output. The table estimates that fishermen will receive an extra $0.67 million. Fishermen and workers in industries related to the fishing industry can expect to earn an additional $0.97 million and the total impact through the economy is for an extra $1.53 million to be paid out in wages and salaries.

Jobs should also be created — an extra 277 in the fishing industry according to the table. It is more likely that the existing fishermen will simply earn more so this figure better represents the jobs that will not be lost through attrition rather than the additional jobs that will be created. Some 369 jobs are estimated to be created in the fishing and related industries, while 551 jobs may be needed throughout the economy to develop the fishery.

TABLE 23

"Fishing and Hunting" Sector Multipliers for the Canterbury, Otago and National Statistical Areas and Estimated Impacts of Developing the South Canterbury/Otago Southern Bluefin Tuna Fishery

	Canterbury			Otago			New Zealand		
	Multiplier	Annual Impact $10/kg	Annual Impact $16/kg	Multiplier	Annual Impact $10/kg	Annual Impact $16/kg	Multiplier	Annual Impact $10/kg	Annual Impact $16/kg
		$ million	$ million		$ million	$ million		$ million	$ million
Output Multipliers									
Simple	1.477	0.92	1.60	1.355	0.72	1.24	1.539	1.77	3.07
Total	2.337	1.46	2.53	2.001	1.06	1.83	2.599	2.99	5.19
Income Multipliers									
Direct	0.336	0.21	0.36	0.342	0.18	0.31	0.335	0.39	0.67
Direct + Indirect	0.478	0.30	0.52	0.447	0.24	0.41	0.485	0.56	0.97
Direct + Indirect + Induced	0.722	0.45	0.78	0.635	0.34	0.58	0.766	0.88	1.53
Employment Multipliers ($\times 10^{-3}$)		Jobs	Jobs		Jobs	Jobs		Jobs	Jobs
Direct	0.139	87	150	0.136	72	124	0.139	160	277
Direct + Indirect	0.182	114	197	0.170	90	156	0.185	213	369
Direct + Indirect + Induced	0.260	162	281	0.230	121	210	0.276	318	551

Source: Hubbard and Brown (1981)

The regional multipliers are always less than the national multipliers because some of the inputs are drawn from outside the region. The table estimates that if 13 Canterbury based vessels transfer into bluefin for two months, an additional 281 jobs will be created in the Canterbury region if the fish are sold at $16/kg. In Otago an extra 210 jobs are possible from 11 Otago based vessels transferring.

CHAPTER 8

SUMMARY AND POLICY IMPLICATIONS

8.1 Summary

This study estimates the value to fishermen and the country of developing an alternative fishing industry. In particular it looks at development of the South Canterbury/Otago southern bluefin tuna fishery. Like most other regions in New Zealand, the South Canterbury/Otago littoral fishing industry is depressed as a result of an increased number of vessels and a sharply falling catch to effort ratio. A large southern bluefin tuna resource caught by Japanese vessels exists off the coast. Success by New Zealanders on the West Coast to catch bluefin using their own highly efficient technique has prompted interest in New Zealand vessels adopting the technique on the East Coast. Nobody yet knows if it will work. Bluefin are a highly valued fish on the Japanese market usually selling up to $900/fish on the auction floor.

A survey of skippers in the South Canterbury/Otago region was conducted to ascertain the inputs needed to develop the fishery. Many fishermen were willing to try catching bluefin and to take their vessels up to 75 miles off the coast. However, knowledge of the southern bluefin tuna fishery was scanty and survey results showed a need for information on location, catching and handling of bluefin, an organised catching and marketing operation and reduced risk of incurring loss. A guarantee to repay any losses incurred by fishermen in the initial trial, notably fuel, was strongly favoured but extra assistance such as a gear subsidy or charter agreement was not generally seen as necessary.

If bluefin can be successfully caught by East Coast fishermen, then it is estimated to be considerably more profitable than their traditional operation. The region is also likely to benefit from a simple transfer of 24 vessels for two months to bluefin fishing. Including multiplier effects between $2.5 million and $5 million in output and $0.8 to $1.5 million in extra income would be generated annually. An extra 300 to 500 jobs in the region was estimated but this is more likely to be jobs that are not lost rather than jobs that are created.

The equivalent annual return from the government providing $15,000 of extension assistance and $2,000 of training lies between $0.5 million and $2.1 million. This range covers six different scenarios but does not include multiplier effects. These six scenarios are developed under different assumptions made about the extent of overcapitalisation currently existing in the inshore fishing industry and the need to delicence that industry by instigating a vessel buyback scheme. Calculating benefits under two alternative bluefin price scenarios, $10/kg and $16/kg, enabled limited sensitivity analysis to be conducted. A trial which fails to develop the bluefin fishery was estimated to cost the government $17,000 and the country $118,000 (an equivalent annual return of −$14,000).

These results suggest that the costs of an extension service that provides information and encouragement to the fishing industry is very small compared with the expected benefits.

8.2 Policy Implications

1. There is considerable potential for transferring fishing effort from traditional inshore fisheries to bluefin tuna capture. Existing technology developed on the West Coast of New Zealand should be transferrable to East Coast bluefin resource.

2. Transferring from traditional inshore fishing to bluefin is profitable to the individual fisherman, the fishing industry, the South Canterbury/ Otago region, and the nation.

3. There is a major potential cost in not developing alternative fisheries. Given that the inshore fisheries face attrition, these costs are in the form of buyback schemes, collapsed fisheries, loss of jobs, and loss of income to fisherman. Bluefin tuna is an example of alternative species to which effort can be transferred from traditional resources.

4. Information needs to be transferred to the fishermen on locating bluefin. Knowledge of bluefin location was very poor with many fishermen having no idea on how far off the coast the nearest school of bluefin are, where to search, or how to catch bluefin. Limited further extension on marketing research and fish handling techniques may also be required.

5. Individual fishermen face a high opportunity cost in conducting a trial on bluefin capture. This cost is the foregone income from fishing the traditional inshore resource. However, fishermen are willing to experiment with bluefin capture provided some means of reducing the financial risk to the individual can be provided. A repayment of fuel costs, if the venture is unsuccessful, was favoured to alleviate this financial risk to individuals.

6. Externalities in developing the bluefin industry are as important as primary costs and benefits. This suggests a strong justification for either government or aggregate fishing industry involvement.

7. The regional benefits to South Canterbury and Otago are high. Extending the project to other areas such as Gisborne may also be practical.

8. Developing a New Zealand southern bluefin tuna industry should not place the resource under increased pressure, as foreign (Japanese) vessels could be restricted. This is unlikely to have a backlash effect upon New Zealand — Japanese trade relations.

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SOUTHERN BLUEFIN TUNA DEVELOPMENT SURVEY

Lincoln University College of Agriculture

Official Use Only ☐

Date _____ Port _____ Vessel Name _____

Please tick ☑ *the appropriate box.*

1. Which port do you normally fish from? ☐

Chalmers	1 ☐
Timaru	2 ☐
Lyttelton/Akaroa	3 ☐
Wellington	4 ☐
Napier	5 ☐
Gisborne	6 ☐
Greymouth/Westport	7 ☐
Nelson	8 ☐
Other *(please state)* _____	9 ☐

2. What is the overall length of your vessel? ☐

Less than 12m (<39')	1 ☐
12m - (39' -)	2 ☐
15m - (49' -)	3 ☐
18m - (59' -)	4 ☐
21m - (68' -)	5 ☐
More than 24m (>78')	6 ☐

3. What electronic gear does the vessel have? ☐

Radar with a range of: less than 25 nautical miles	1 ☐
25 - 50 nautical miles	2 ☐
51 - 75 nautical miles	3 ☐
more than 75 nautical miles	4 ☐
Echosounder	5 ☐
Satellite Navigator	6 ☐
Sonar	7 ☐
Sea surface temperature recorder	8 ☐
Other *(please state)* _____	9 ☐

4. Which survey certificates does your vessel hold?

Inshore Fishing Vessel	1
Coastal Fishing Vessel	2
Deep Sea Fishing Vessel	3

B. EXTENSION SERVICES

5. How often do you read each of the following magazines?

	Catch	Fishing Industry Board Bulletin	Commercial Fishing
Often	1	1	1
Sometimes	2	2	2
Seldom	3	3	3
Never	4	4	4

6. How useful are each of these magazines to your fishing operation?

	Catch	Fishing Industry Board Bulletin	Commercial Fishing
Very useful	1	1	1
Useful	2	2	2
Not very useful	3	3	3
Useless	4	4	4
I do not receive the magazine	5	5	5

7. Have you ever attended a Fishing Industry Training Council seminar?

Yes 1 No 4 *(Go to question 8)*

How worthwhile did you find the seminar(s)?

Very worthwhile	3
Worthwhile	4
Not very worthwhile	5
Worthless	6

8. Have you ever attended a "Fishex" trade fair?

Yes 1 No 2 *(Go to question 9)*

How worthwhile did you find the trade fair(s)?

Very worthwhile	3
Worthwhile	4
Not very worthwhile	5
Worthless	6

9. Fishdex are a series of technical reports produced by the Ministry of Agriculture and Fisheries for use by fishermen. Were you aware of their existence?

Yes [1] ☐ No [2] ☐ ☐

10. If a radio programme for fishermen was broadcasted daily, do you think you would tune in?

Often [1] ☐
Sometimes [2] ☐
Occasionally [3] ☐
Never [4] ☐ ☐

11. The government currently provides an advisory service for farming but no such service exists for fishermen. Do you think you would make use of such a service if it became available?

Yes [1] ☐ No [2] ☐ ☐

12. If you wanted information on a new fishing idea where would you seek it?

Other fishermen [1] ☐
Ministry of Agriculture & Fisheries' Fisheries Officers [2] ☐
Ministry of Agriculture & Fisheries' Scientists [3] ☐
Nelson Gear Technology Unit [4] ☐
Fishing Industry Board [5] ☐
Fishing Industry Training Council [6] ☐
Federation of Commercial Fishermen [7] ☐
Magazines *(please state)* _____ [8] ☐
Other *(please state)* _____ [9] ☐ ☐

13. If you were developing a fishery and needed finance where would you seek it?

Fishing Industry Development Grant Finance Advisory Committee [1] ☐
Rural Banking and Finance Corporation [2] ☐
Development Finance Corporation [3] ☐
Banks [4] ☐
Insurance Companies [5] ☐
Wholesalers [6] ☐
Relatives or Friends [7] ☐
Others *(please state)* _____ [8] ☐ ☐

C. SOUTHERN BLUEFIN TUNA

14. Which port do you fish from during the months of February, March and April?

_____ ☐

15. Southern bluefin tuna migrate past this coastline during the months of February, March and April. How profitable are each of these months to your fishing operation?

	Feb.	March	April
Very profitable month	1	1	1
Profitable month	2	2	2
Not very profitable month	3	3	3
Poor month	4	4	4

☐☐☐

16. Over the full moon, does your catch usually rise, fall or stay the same during the months of February, March and April?

Rise	1
Fall	2
Stay the same	3

☐

17. How far off this coastline do you think you would have to go to find the nearest school of southern bluefin tuna?

Less than 20 nautical miles	1
20 - 40 nautical miles	2
41 - 60 nautical miles	3
61 - 80 nautical miles	4
81 - 100 nautical miles	5
More than 100 nautical miles	6
Don't know	7

☐

18. How far from the coast would you be prepared to take your vessel?

_____ nautical miles ☐☐

19. Have you, or any of your deckhands, attended a course on processing southern bluefin tuna?

Yes 1☐ No 2☐ ☐

20. Are you sufficiently familiar with the West Coast bluefin tuna catching operation to be confident of using it on your vessel?

Yes 1☐ No 2☐ ☐

21. The Ministry of Agriculture and Fisheries have suggested a project for next March or April to determine the feasibility of catching southern bluefin tuna on the East Coast. They are offering to guarantee the costs of the fishermen involved. How interested would you be in taking part in this project?

Very interested	1 ☐
Interested	2 ☐
Not very interested	3 ☐
Not at all interested	4 ☐

☐

22. A. What is the likelihood of you fishing for southern bluefin tuna on the East Coast?

Very likely	1 ☐
Likely	2 ☐
Not very likely	3 ☐
Unlikely	4 ☐
Under no circumstances *(please explain)*	5 ☐

☐

_____

_____

_____

B. How necessary would each of the following factors be in encouraging you to fish for coastal southern bluefin tuna (SBT)?

	Very Necessary	Quite Necessary	Not Necessary	
More information on location of SBT	☐	☐	☐	☐
More information on catching methods	☐	☐	☐	☐
More information on handling of SBT	☐	☐	☐	☐
More information on marketing of SBT	☐	☐	☐	☐
An organised SBT catching and marketing operation	☐	☐	☐	☐
An experienced SBT fisherman on board	☐	☐	☐	☐
Gear subsidy	☐	☐	☐	☐
Repayment of any loss incurred	☐	☐	☐	☐
Charter agreement	☐	☐	☐	☐
Previous success with SBT by other vessels in the port	☐	☐	☐	☐

Please state any other factors which would influence you in your decision.

_____

_____

D. ABOUT YOURSELF

23. Which age group do you belong to?

Under 20 years old	1 ☐
20 - 30 years old	2 ☐
31 - 40 years old	3 ☐
41 - 50 years old	4 ☐
51 - 60 years old	5 ☐
Over 60 years old	6 ☐

☐

24. Are you married?

Yes 1 ☐ No 2 ☐

☐

25. Are you the skipper?

Yes 1 ☐ No 2 ☐

☐

If you answered 'No' could you please explain your involvement in the vessel.

_____

26. Do you have capital invested in the vessel?

Yes 1 ☐ No 2 ☐

☐

27. Which fishing qualifications do you hold?

Qualified Fishing Deckhand	1 ☐
Inshore Fishing Skipper	2 ☐
Coastal Fishing Skipper	3 ☐
Deep Sea Mate	4 ☐
Deep Sea Fishing Vessel Skipper	5 ☐
Second Class Diesel Trawler Engineer	6 ☐
First Class Diesel Trawler Engineer	7 ☐

☐

E. ADDITIONAL COMMENTS

28. Do you have any additional comments to this survey which you would like to make?

_____

_____

_____

Thank you for answering this survey. Your response will be held strictly confidential. Could you please send this questionnaire to me in the stamped addressed envelope provided.

Thank you for your co-operation

D.K. O'Donnell

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