Economic Study of the Victorian Rock Lobster Fishery

Mike Read and Neil Sturgess

READ STURGESS AND ASSOCIATES
CONSULTING ECONOMISTS
89 GLADSTONE ST, KEW 3101

FISHERIES
RESEARCH &
DEVELOPMENT
CORPORATION

Project 95/115

TABLE OF CONTENTS

NON TECHNICAL SUMMARY

This study was requested by lobster fishermen in Victoria. Lobster fishermen wanted the Study because the manager of the fishery, the Department of Conservation and Natural Resources Victoria (DCNR), is proposing a reduction in fishing effort for the fishery. The industry recognises the need to reduce fishing levels, but there are many ways in which this could be done and the industry requires advice about the pros and cons of each option from economic and financial viewpoints.

Present financial performance

There are major differences between the western and eastern zones of the fishery. The western zone comprises mainly specialist lobster fishermen who have typically invested $400,000 to $900,000 in their lobster fishing enterprises and rely solely on lobster fishing for their livelihood. By contrast, many of the fishermen in the eastern zone appear to devote only some of their available time to lobster fishing, often they have a second source of income and most have invested $80,000 to $200,000 in their lobster fishing enterprises.

Western zone financial performance

The mean level of profit for the western zone sample was $78,274 for 1993/94 and $49,154 for 1994/95. By "profit", we mean the return to owner's equity capital remaining after paying the owner an allowance of $36,000 for their own labour and after paying interest on loans and after setting aside an amount to cover depreciation. Profit, as a percentage return on total assets, averaged 11.3 and 7.9 per cent in 1993/94 and 1994/95 respectively.

Performance varied considerably between fishermen. The financial performance of enterprises was extremely sensitive to two variables; namely, the price received for lobsters and the level of catch per pot lift. For example, the rate of return on assets for a "typical" fisherman in the western zone was 10 per cent with a catch rate of 0.65 kg per pot lift and a lobster price of $30 per kg. By contrast, prices for the opening of the 1995/96 season, at about $24 per kg, have been markedly lower than the previous season. If lobster prices of $24 were sustained for an entire season instead of $30 per kg, then the rate of return on assets would decline from 10 per cent to 4 per cent if nothing else changed. Similarly if the price remained at $30 per kg, but his catch rate increased to 0.75 kg per lift, then his rate of return would rise to 14.5%.

Eastern zone financial performance

The mean level of boat profit for the eastern zone sample was much lower that for the western zone. The mean profit for 1993/94 was $7,325 while for 1994/95 there was a mean **loss** of $9,178. The corresponding rates of return on total assets were 3.2 and -4.8 per cent. Performance varied between fishermen, but not by the same extent as was observed for the western zone. Participation in the rock lobster fishery in the eastern zone has the reputation of being much more to do with "lifestyle" compared to the much more business-oriented attitudes in the western zone.

The need for a change in management

The two zones constitute separately managed fisheries in which the main management instruments are all input controls; namely, licence and pot limitations, size limits, closed seasons and gear restrictions. Even so, it is generally accepted that high levels of fishing effort for rock lobster have depleted the resource and that the current level of fishing is putting the long term future of the industry at risk. Change is needed to achieve a restructure of the industry such that the basic productivity of the stock is protected and harvest is economically efficient.

Proposals for change

Two broad types of changes to management have been proposed to attempt to rectify the problem of too much effort in the fishery. The first type of proposal is to tighten the existing input controls, either by reducing the number of pots in each zone (by government purchase ("buy-back") of pot entitlements or by cancellation of pot entitlements) or by increasing the length of the closed season. The second type of proposal is to restrict the output from the fishery by imposing a total allowable catch and allocating this amongst fishermen in the form of individual transferable quotas.

Discussion

A new management structure is needed to achieve a restructure of the industry such that the productivity of the stock is protected and harvesting is conducted in an economically efficient manner, in both the short and long term future. As is so often the case, it would be much easier to redress the present level of decline in catch rates and stocks if the longer term did not have to be considered. It is much easier to introduce a quick fix than to provide for a lasting solution.

Input controls restrict the inputs that fishermen can use and fishermen are free to maximise their catch within those constraints. A tightening of input controls would achieve almost immediately the desired reduction in catch, but fishermen would eventually find means of increasing their catch again. Only the immediate imposition of output controls could lead to a **sustained** reduction in total catch. Unfortunately the initial implementation of output controls would create both winners and losers.

The consultants believe that the important question that must be addressed by fishermen is:

> How many rounds of adjustment do fishermen want to endure in order to meet the objectives of re-structure?

If the goal is to set the scene now for the achievement of **long-term** sustainability and profitability for the fishery, and to reduce the need for future rounds of adjustment, then output controls should be adopted now.

1. INTRODUCTION

BACKGROUND

This Study was requested by lobster fishermen, through their industry association, the Victorian Fishing Industry Federation, and funding was provided by the Fisheries Research and Development Corporation. Lobster fishermen requested the study because the manager of the fishery, the Department of Conservation and Natural Resources Victoria (DCNR), is proposing a reduction in fishing effort for the fishery.

DCNR has recently undertaken a referendum of lobster fishermen to ascertain their preferred choice from a range of management options for the fishery. The Summary and Conclusions from this report (see Section 6) were distributed to all fishermen for their consideration prior to completing their referendum. DCNR expects to implement a new management structure in 1996/97, but has yet to announce its chosen approach.

NEED FOR THE STUDY

The industry recognises the need to reduce fishing levels, but there are many ways in which this could be managed and the industry requires objective advice about the pros and cons of each option from economic and financial viewpoints. It is the purpose of this Study to evaluate a range of options from economic and financial viewpoints.

OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. To provide baseline economic data to describe the present industry structure.

2. To examine the implications of a range of options for reducing fishing levels.

3. To recommend preferred options for reducing fishing capacity from the viewpoint of the industry as well as from the viewpoint of economic efficiency.

2. METHODS

Baseline economic data was collected based on a survey of fishermen. The data collected from fishers included fishing effort information, vessel and gear specification, operating costs, and income from all fisheries.

The analysis involved firstly the construction of a current economic profile of the fishery and the industry which is based on it. Financial models were then specified to investigate the consequences of each management option.

That is, in place of asking industry for a consensus on its preferred option, we have used the results of our financial modelling as a rough guide to the expected behaviour of fishermen.

The survey has been undertaken in order to provide baseline economic data to describe the present industry structure. These data were required primarily in order to develop financial and economic models for the purposes of examining the implications of a range of options for reducing fishing levels. Further, the baseline data serves to assure the industry that the evaluation has been based on a factual description of the fishery. The latter is important since there is rarely agreement about solutions without agreement about the facts on which a solution was determined.

2.1 SURVEY SAMPLE

A sample of thirty fishermen has been used. The sample of fishermen was allocated between the western and eastern zones, in proportion to the total number of pots used in each zone:

	Western Zone	Eastern Zone	Total
Total number of pots in each zone 1995	5537	2636	8173
Proportion of total pots in each zone 1995	67.7%	32.3%	100%
Number of fishermen in survey sample	20	10	30
Proportion of total sample	66.6%	33.3%	100%

DCNR provided the consultants with a list of all boat licences for each zone which included details of the number of pots endorsed for each licence. The samples in each zone were selected randomly from the total list of licences, stratified only by zone.

Each fisherman selected in the random sample for each zone was contacted and invited to participate in the survey. All fishermen were assured that their individual results would remain confidential and that the consultants would not divulge results for individual fishermen to anyone outside of the consultants' office. Overall, fishermen were very cooperative and willing to participate, and the consultants are grateful for that cooperation.

Some of the fishermen drawn in the initial sample could not be contacted and, for a variety of reasons, a minority of the fishermen contacted were either unable or unwilling to participate, in which cases an additional fishermen in the same zone was selected randomly from the total list of licences. In all, 37 fishermen were contacted in order to achieve the total sample of 30 fishermen.

The sample size is similar to that used in two previous economic surveys of the Victorian lobster fishery. The Australian Bureau of Agricultural and Resource Economics (ABARE, then known as the BAE) undertook a survey in 1983 and used a sample of 29 fishermen while the consulting firm ACIL undertook a survey in 1988 and used a sample of 28 fishermen.

2.1.1 Western zone sample

Of the 20 fishermen interviewed in the western zone, the majority owned the licence and boat and skippered the boat themselves:

Ownership structure	Number in western zone sample
Owned boat and licence and skippered the boat themselves	15
Leased licence but skippered own boat	3
Owned licence and boat, but employed a skipper on a share basis	2
TOTAL	**20**

Four fishermen also held a lobster licence in another State. The average number of pots, licensed in Victoria, for fishermen in the sample was 62, which compares to an average of 57 for the entire western zone. The distribution of pot holdings for the sample and entire western zone are presented in Figures 2.1 and 2.2 respectively. It appears that the sample was slightly skewed towards an over-representation of larger pot holdings. In particular the sample for the western zone did not include any licences with less than 40 pots, whereas 9 per cent of licences in the total population are less than 40 pots.

The consultants judge that the sample was fairly representative of the distribution of pot holdings for the entire western zone. As well, the consultants judge that the sample for the western zone was also fairly representative of the distribution of licences between each port in the western zone. The actual distribution of fishermen in the sample by port is not presented here as it could be used to identify some of the individual fishermen in the sample.

Fig 2.1 Number of licences by size of pot holding
Western zone SAMPLE

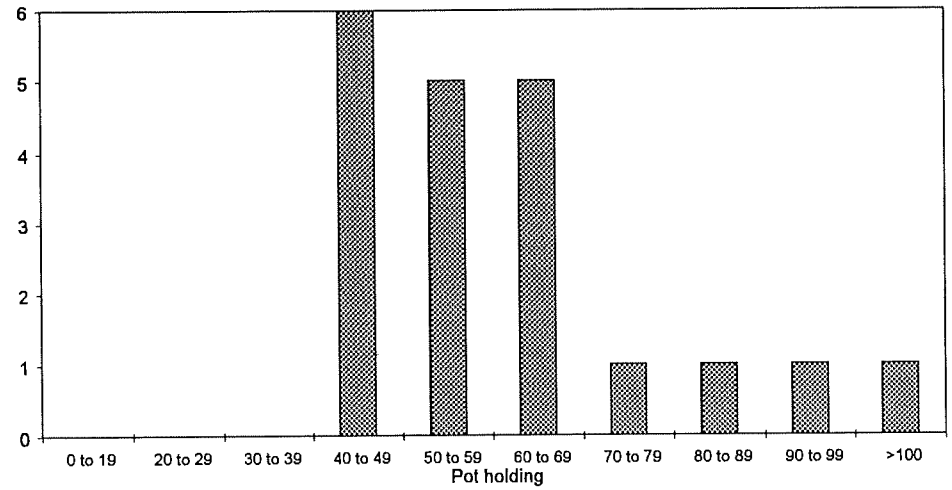


Fig 2.2 Number of licences by size of pot holding
Western zone POPULATION

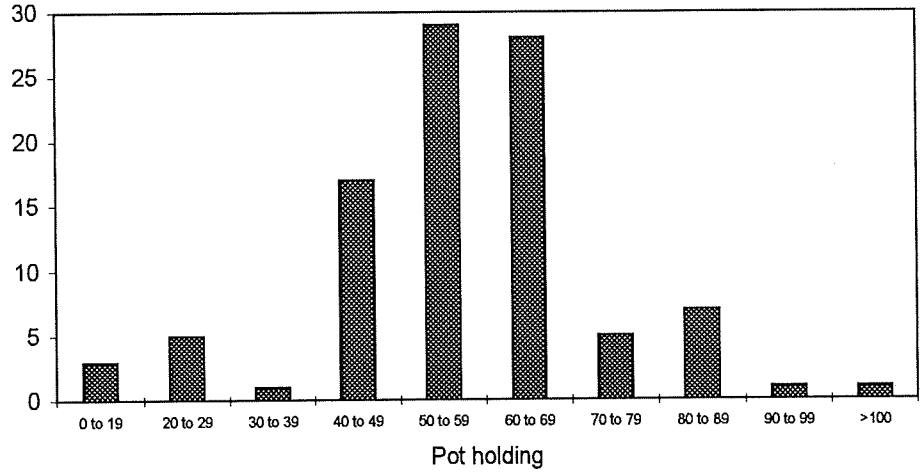


Fig 2.3 Number of licences by size of pot holding
Eastern zone SAMPLE

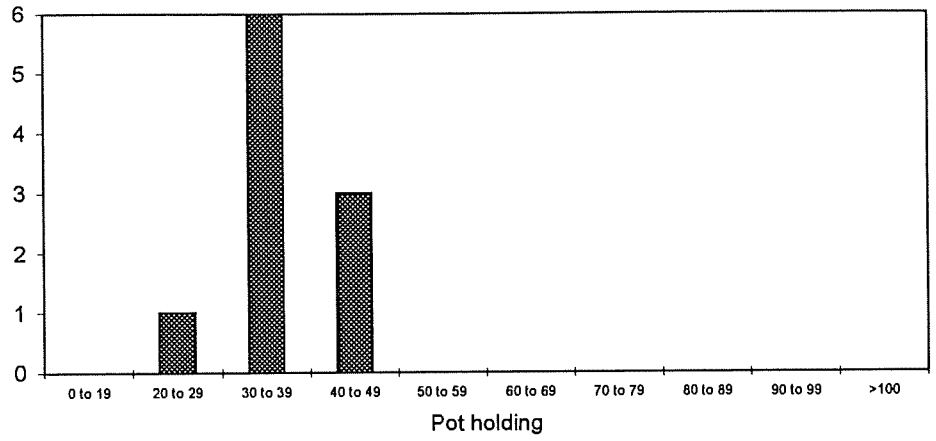
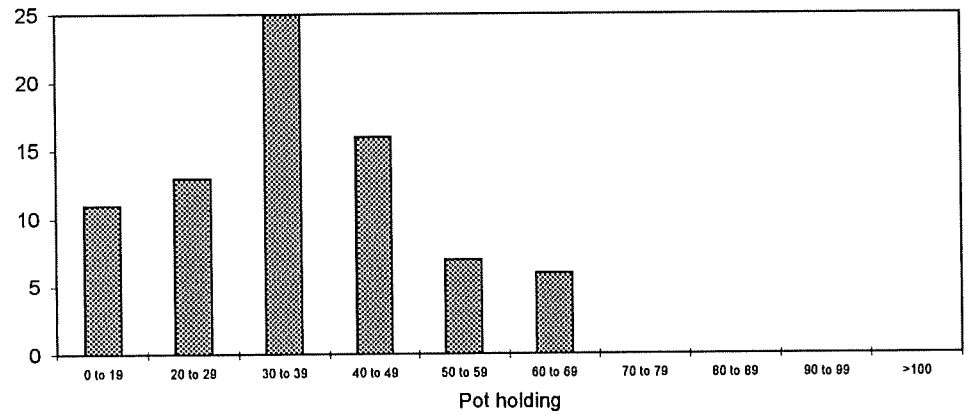


Fig 2.4 Number of licences by size of pot holding
Eastern zone POPULATION



2.1.2 Eastern zone sample

All of the eastern zone fishermen interviewed, owned the licence and boat and skippered the boat themselves. One fisherman also held a lobster licence in another State. The average number of pots for fishermen in the eastern zone sample was 36 which compares to an average of 34 for the entire western zone. The distribution of pot holdings for the sample and entire eastern zone are presented in Figures 2.3 and 2.4 respectively.

The smaller pot holdings in the eastern zone are reflected also in other characteristics for the zone. Notably, eastern zone fishermen generally have smaller boats than used in the western zone and do not employ deckhands. By contrast all fishermen in the western zone sample employed deckhands.

After correcting for pot holdings recorded as zero, the sample seems to be a reasonable representation of the eastern zone, except that pot holdings over 50

pots were not represented. The eastern zone has a vast coastline with many ports. The main ports are Queenscliff, Lakes Entrance and, to a lesser, extent, San Remo. These ports account for about 50 per cent of boats while the remaining 50 per cent are sheltered in small ports over the length of the zone. Some of these ports may shelter only one or two boats. As for the western zone, the actual distribution of fishermen in the sample by port in the eastern zone is not presented here as it could be used to identify some of the individual fishermen in the sample. The sample under-represented Lakes Entrance relative to other ports.

2.2 QUESTIONNAIRE

The questionnaire sought information about each fisherman's:

- boat and licence details
- capital equipment used for fishing in 1995
- receipts and expenditure for fishing in 1993/94 and 1994/95
- liabilities
- catch and effort for the lobster fishery in 1993/94 and 1994/95

Information was collected by interviewing the fishermen. In some cases, written approval was obtained from the fishermen to obtain additional information regarding financial details from accountants or fishing co-ops, and/or additional information regarding fishing catch and effort were obtained from DCNR. A copy of the questionnaire used is presented in Appendix 1.

3 RESULTS

3.1 CATCH AND EFFORT

Estimates of the number of pot lifts and the weight of lobster caught were sought for 1993/94 and 1994/95. Some fishermen provided this information based on their own records while others did not have those details in their own records, and in those cases the fishermen provided written approval for the consultants to obtain additional information regarding their fishing catch and effort from DCNR.

As would be expected, given differences in pot holdings, there was considerable variation between the samples in the two zones with respect to the average size of total catch and the average level of catch per pot lift, as summarised in Table 3.1. Standard errors are also presented as these provide an indication of the extent of variation observed between fishermen[1]. The higher catches within the samples for both zones in 1993/94 were consistent with total catches across the total fishery.

While the lower average catch in the eastern zone can be partly explained by the lower average size of pot holding in the eastern zone, perhaps the most important difference from an economic perspective is the lower level of catch per unit effort in the eastern zone.

As will be discussed later, the number of kg per pot lift (termed the "catch rate" or "CPUE" for the purposes of this report) is a major determinant of financial performance. The sample means for catch rate in both zones are fairly similar to those reported by DCNR for the total population of licences in each zone for 1994/95, but the sample means are higher than the population means for 1993/94:

	Sample mean catch rate (kg/lift)	**Total population catch rate (kg/lift)**
Eastern zone 1993/94	0.33	0.29
Eastern zone 1994/95	0.26	0.29
Western zone 1993/94	0.70	0.58
Western zone 1994/95	0.62	0.56

There was considerable variation between individual fishermen with the number of kilograms of lobster caught per pot lift in the western zone varying from 0.48 to 0.98 in 1993/94 and from 0.26 to 0.91 in 1994/95. Similarly, in the eastern zone, the

---

1 For example, if the actual values for individual fishermen were normally distributed about the sample mean values for a particular parameter, then there would be a two in three chance that the true population mean value falls in the range given by the sample mean plus or minus the relative standard error.

number of kilograms of lobster caught per pot lift varied from 0.15 to about 1.00 in 1993/94 and from 0.15 to 0.37 in 1994/95.

TABLE 3.1
AVERAGE CATCH AND EFFORT FOR SURVEY SAMPLE
(standard errors shown in brackets)

	Eastern zone	Western zone
Number of pots	36 (17%)	62 (28%)
1993/94		
Kg caught p.a.	1,358 (38%)	7,012 (33%)
Pot lifts per boat p.a.	4,089 (50%)	10,365 (28%)
Kg per pot p.a.	35 (35%)	113 (25%)
Kg per pot lift	0.33 (74%)	0.70 (26%)
Pot lifts per pot	103 (49%)	170 (29%)
1994/95		
Kg caught p.a.	1,176 (35%)	6,361 (40%)
Pot lifts per boat p.a.	4,596 (51%)	10,365 (29%)
Kg per pot p.a.	32 (51%)	105 (18%)
Kg per pot lift	0.26 (32%)	0.62 (26%)
Pot lifts per pot	128 (38%)	173 (17%)

3.2 EXPLANATION OF FINANCIAL MEASURES USED

The consultants have deliberately adopted the same classification of costs as used by ABARE in its surveys of Australian fisheries. An explanation of the financial measures presented here is presented in Box 1.

3.3 WESTERN ZONE RESULTS

Lobster fishing in the western zone involves relatively large capital investments and fishermen working mainly full time and employing deckhands. The average investment of equity capital is $521,196 (see Table 3.2) and the level of debt:equity is 24 per cent.

The mean level of boat profit for the western zone sample was $78,274 for 1993/94 and $49,154 for 1994/95. This represents the return to owner's equity capital after paying the owner an allowance of $36,000 for their own labour, paying interest on loans and after setting aside an amount to cover depreciation. Profit represented a return on total assets of 11.3 and 7.9 per cent in 1993/94 and 1994/95 respectively.

A detailed breakdown of the calculation of these average levels of boat profit is presented in Table 3.3. While these mean levels of return reveal the variation

BOX 1 Explanation of the financial measures

Fixed costs

Fixed costs are those cash costs that would be incurred regardless of how much fishing occurs and include:

- licence fees
- telephone
- bank charges
- office costs
- insurance and
- other administration costs

Variable trip costs

Variable trip costs are those cash costs that would vary in proportion with how many boat trips and pot lifts are made and include:

- fuels
- bait
- ice
- lobster gear replacement and
- food and provisions

Labour costs

Labour costs are considered as cash costs but include employed labour (both payments made on a share basis as well as time basis) and also include the owners' labour. The actual methods for paying the licensee for their own time varies between the fishermen interviewed, so we have excluded the actual payments to the owners and used a standard allowance of $36,000 per year for each fishermen who worked full time as the skipper. The standard allowance has been adopted to ensure that all boats are treated in a comparable manner, and the amount is based on the Australian Average Weekly Earnings across the entire workforce for 1994/95. Many skippers in the eastern zone worked only part of the year in the lobster fishery and the allowance was allocated on a *pro rata* basis.

Repairs and maintenance (R&M)

R&M costs are cash costs and include repairs and maintenance to boats, engines and vehicles as well as the running costs for shore-based vehicles.

Other cash costs

Other cash costs comprise interest payments, lease payments for licences, and selling costs.

Boat cash income

Boat cash income is the difference between total cash receipts from fishing and the total cash costs. Boat cash income is a measure of the boat owner's capacity to continue operating in the short term. It represents the money left over to set aside for replacement of capital items (depreciation) and as a return on capital investment.

Depreciation

We have calculated depreciation as the amount that would need to be put aside each year and invested in an interest bearing account such that all assets would be able to be replaced fully at the end of their useful life. Current market values are used as the replacement cost where an asset was purchased new, but it would be unrealistic to use current market values for a new asset when in fact the fisherman had purchased a second hand asset. For example, a fishermen may have purchased a 20 year old boat for $65,000, but a new boat would cost $150,000. For assets that were purchased second hand, fishermen were asked the replacement cost at current (second hand) market values for the asset at the same age/condition as applicable to time of purchase. In some cases fishermen could not provide an estimate of the replacement cost at current (second hand) market values for the asset at the same age/condition as applicable to time of purchase, in which case the consultants estimated this as the written down value of the asset at date of purchase.

Boat profit

Boat profit is estimated by deducting the depreciation from the boat cash income. It represents the return on total equity.

Performance measures

In estimating receipts and costs per pot for fishermen who fished species other than lobster, costs for the other fishery(s) are excluded. In such cases, costs have been apportioned to lobster fishing according to the proportion of total fishing receipts from lobsters. In calculating sample means of percentage return on assets, the percentage rates of return for individual fishermen have been averaged.

between seasons, they disguise the variability between fishermen. Performance does actually vary quite considerably between fishermen, and Figure 3.1 presents the actual level of boat profit for some of the fishermen in the western zone sample. This demonstrates that at one extreme there are fishermen earning a profit of $200,000 or more per year, while at the other extreme there are fishermen who make a small loss.

The relative standard errors reveal that the variability for individual items of receipts and expenditure is lower when expressed on a per pot basis. This would reflect the fact that the total level of expenditure and receipts is proportional to the number of pots and emphasises that it is more meaningful to extrapolate sample means expressed on a per pot basis rather than to extrapolate absolute values of receipts and expenditure per year.

TABLE 3.2
AVERAGE LEVEL OF CAPITAL INVESTMENT FOR WESTERN ZONE SAMPLE

	Average for western zone
Fixed assets	$262,236
Licence value (@$6,000 per pot)	$385,800
Total assets	$648,036
Liabilities	$126,840
Net equity (assets LESS liabilities)	$521,196

FIG 3.1 PROFIT FOR THE SAMPLE OF WESTERN ZONE LICENCE OWNERS
(after paying $36,000 allowance plus depreciation and debt servicing)

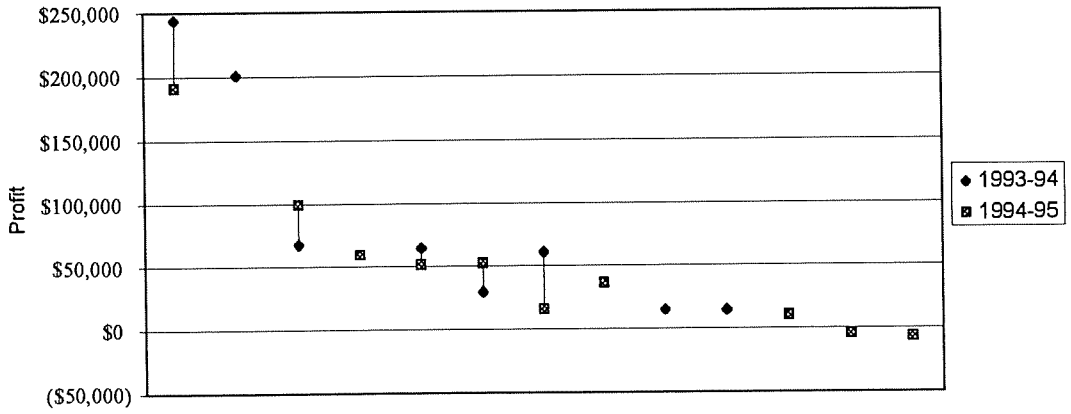


TABLE 3.3
AVERAGE RECEIPTS AND EXPENDITURE FOR WESTERN ZONE SAMPLE
(standard errors in brackets)

	1993/94	1994/95
PER YEAR		
Receipts		
Lobster	$200,675	$176,702
Other fish	$16,945	$7,454
	$217,620 (52%)	$184,156 (43%)
Expenditure		
Fixed costs	$14,393 (68%)	$11,488 (44%)
Variable trip costs	$24,875 (56%)	$24,799 (64%)
Labour costs	$66,846 (69%)	$59,345 (65%)
Repairs & maintenance	$10,187 (44%)	$13,669 (55%)
Interest costs	$8,854 (111%)	$12,799 (107%)
Licence leasing costs	$7,943 (241%)	$6,531 (270%)
Selling costs	$71 (320%)	$38 (229%)
	$133,170	$128,669
Boat cash income	**$84,450**	**$55,487**
Depreciation	$6,176 (60%)	$6,333 (63%)
Boat profit	**$78,274**	**$49,154**
% return on assets	**11.3%**	**7.9%**
PER POT		
Receipts		
Lobster	$3,167 (31%)	$2,903 (30%)
Other fish	$255 (227%)	$132 (215%)
	$3,421 (40%)	$3,036 (28%)
Expenditure		
Fixed costs	$203 (41%)	$177 (39%)
Variable trip costs	$376 (54%)	$382 (46%)
Labour costs	$1,027 (51%)	$949 (41%)
Repairs & maintenance	$166 (57%)	$216 (53%)
Interest costs	$146 (62%)	$213 (78%)
Licence leasing costs	$121 (156%)	$111 (178%)
Selling costs	$1 (324%)	$1 (187%)

3.4 EASTERN ZONE RESULTS

The average investment of equity capital is $161,720 (see Table 3.4) which is much lower than for the western zone. This reflects a combination of less investment in fixed assets and a lower value of pot entitlements. The level of debt:equity is lower than for the western zone, at 17 per cent.

TABLE 3.4
AVERAGE LEVEL OF CAPITAL INVESTMENT FOR EASTERN ZONE SAMPLE

	Average for eastern zone 1994/95
Fixed assets	$103,420
Licence value (@$1500 per pot)	$86,300
Total assets	$189,720
Liabilities	$28,000
Net equity (assets LESS liabilities)	$161,720

The mean level of boat profit for the eastern zone sample was much lower that for the western zone. The mean profit for 1993/94 was $7,325 while for 1994/95 there was a mean **loss** of $9,178. This represents the return to owner's equity capital after paying the owner an allowance for their own labour (based on their actual input being paid at a rate of $36,000 for full time employment), paying interest on loans and after setting aside an amount to cover depreciation.

A detailed breakdown of the calculation of these average levels of boat profit is presented in Table 3.5.

Mean rates of return on total assets were 3.2 and **minus** 4.8 per cent in 1993/94 and 1994/95 respectively. Performance varies between fishermen, but not by the same extent as was observed for the western zone. While the performance in the western zone ranged across a continuum from very good to poor, with one notable exception, the vast majority of fishermen achieved poor performance relative to fishermen in the western zone in that they made small losses or small profits. Figure 3.2 below presents the actual level of boat profit for the fishermen in the eastern zone sample. This demonstrates that at one extreme there was one fisherman earning a profit of about $80,000, while the remainder made mainly losses of around $10,000 to $20,000 per year or profits of around $10,000.

FIG 3.2 PROFIT FOR THE SAMPLE OF EASTERN ZONE LICENCE OWNERS (after paying owner plus depreciation and debt servicing)

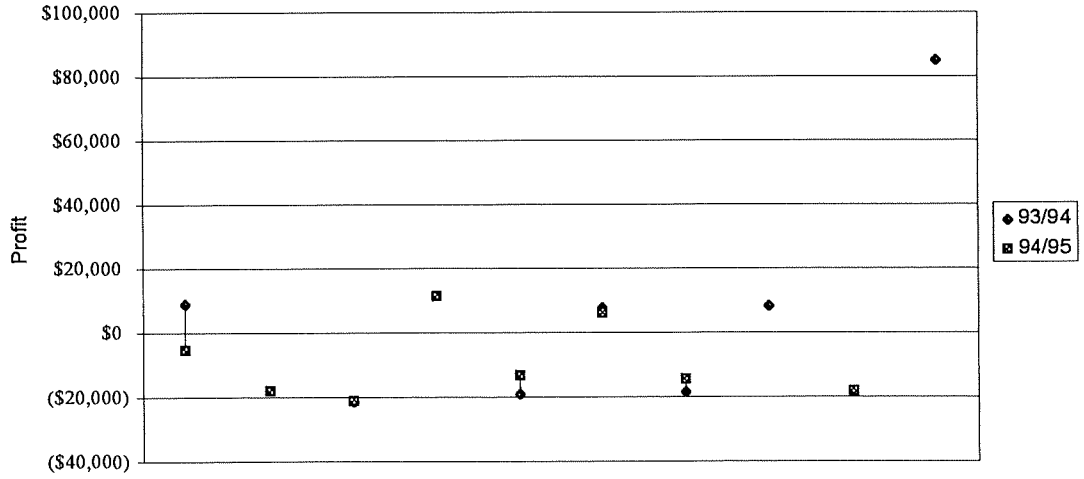


TABLE 3.5
AVERAGE RECEIPTS AND EXPENDITURE FOR EASTERN ZONE SAMPLE
(standard errors shown in brackets)

	1993/94	1994/95
PER YEAR		
Receipts		
Lobster	$61,835 (85%)	$29,230 (32%)
Other fish	$11,999	$9,510
	$73,834 (98%)	**$38,740** (31%)
Expenditure		
Fixed costs	$8,927 (73%)	$5,770 (52%)
Variable trip costs	$11,017 (100%)	$7,827 (71%)
Labour costs	$30,930 (31%)	$26,192 (35%)
Repairs & maintenance	$6,540 (71%)	$3,257 (40%)
Interest costs	$4,877 (194%)	$1,776 (148%)
Licence leasing costs	$0	$0
Selling costs	$109 (265%)	$356 (283%)
	$62,400 (61%)	**$45,178** (32%)
Boat cash income	**$11,434**	**-$6,438**
Depreciation	$4,109 (68%)	$2,739 (52%)
Boat profit	**$7,325**	**-$9,179**
% return on assets	**3.2%**	**-4.8%**
PER POT		
Receipts		
Lobster	$1,557 (69%)	$1,063 (25%)
Other fish	$302 (225%)	$19 (205%)
	$1,859 (81%)	**$1,082** (24%)
Expenditure		
Fixed costs	$225 (58%)	$161 (55%)
Variable trip costs	$277 (52%)	$219 (57%)
Labour costs	$779 (25%)	$732 (23%)
Repairs & maintenance	$165 (46%)	$91 (46%)
Interest costs	$123 (132%)	$50 (138%)
Licence leasing costs	0	0
Selling costs	$3 (265%)	$10 (283%)

3.5 COMPARISON TO PREVIOUS SURVEYS

The broad financial landscape of the fishery seems to have changed relatively little since the last survey which was conducted for the years 1986-87 and 1987-88 (ACIL Australia 1988). In both surveys, operator's labour was valued at Australian average weekly earning and both surveys indicated that the average return to total capital (total assets) in the western zone were positive and at rates which are

comparable with other industries. The estimated average rates of return on total asset in the eastern zone were -15 per cent in each of the two years of the earlier survey and estimated to be 3.2 per cent in 1993-94 and -4.8 per cent in 1994-95. The considerable variability attached to the estimates of profit and total assets makes it very doubtful that the average rates of return on total assets estimated for the two recent financial years represents a real improvement in the eastern zone fishery.

The gap in boat profit per pot between the two zones seems to have widened as reflected in the widening gap in reported prices for pot entitlements. The estimated average boat profit per pot in the western zone was $1,262 in 1993-94 and $792 in 1994-95, compared to $203 in 1993-94 and -$254 in 1994-95 in the eastern zone. These figures for profit per pot can be compared with the four-fold difference in prices for pot entitlements, namely about $1,500 in the eastern zone and about $6,000 in the western zone. At the time of the earlier survey, prices for pot entitlements in the western zone were about twice those in the eastern zone and profits per pot were relatively closer together.

These figures suggest that the differences in economic and financial performance between the two zones, which seems to have become apparent in about 1976-77 (ACIL Australia 1988 p.12), have continued to widen. While no firm generalisations can be made about the reasons for this, the differences in fish abundance and fishing technology, as reflected in catch per pot lift are likely to play a large part. Average catch per pot lift in 1987-88 in the western zone (about 0.69 kg) was a little over 50 per cent higher than in the eastern zone (about 0.44), whereas the two-year average for the entire population for the years reported here in the western zone (about 0.6) was twice the average catch per pot lift of the eastern zone (0.3). As these numbers show, the changing ratio has been due to a greater decline in catch per pot lift in the eastern zone. The average number of days fished in the eastern zone has hardly altered between the two surveys (about 110) but has increased in the western zone from about 147 days in the earlier survey to about 170 days now. Also, from about the same time, the size of enterprise in the western zone grew much more quickly than in the eastern zone.

It might be expected that the negative average returns to capital which have been consistently observed in the eastern zone over many years would have led to a massive re-organisation of the fishery in that zone. In theory, enterprises could not exist with negative returns for so long because they could not replace their capital equipment. Yet, it appears there has not been such a re-organisation with a smaller, more efficient fleet emerging. There are many reasons why this might not be occurring. Participation in the rock lobster fishery in the eastern zone has the reputation of being much more to do with "lifestyle" compared to the much more business-oriented attitudes in the western zone. This is expressed in a number of ways, such as a higher levels of equity, fishermen with several sources of income, including other small fishing activities, fishermen who have retired from other work, the vast geographical spread of the fishery and a willingness to work for lower returns to labour than the *pro rata* equivalent of average weekly earnings. Furthermore, from the assessment of "latent effort" in the two zones, it appears that some fishermen in the eastern zone would rather use their pots sparingly than dispose of them.

The differences in fishing activity between the two zones are demonstrated by the above estimates of fishing days and by the costs per pot shown in Tables 3.3 and 3.5. Although there is little difference in fixed costs per pot, trip costs per pot and

labour costs per pot are markedly higher in the western zone than in the eastern zone. This relativity was also reflected in the earlier survey.

These observations suggest that a good number of fishermen in the eastern zone receive significant non-monetary income from fishing for rock lobsters. If this is the case, it creates an interesting challenge for the managers in relation to how to reduce the actual and potential effort in the zone. The existence of a marketable asset in the form of pot entitlements seems not to have induced significant retirement from the fishery.

3.6 DEVELOPMENT OF FINANCIAL MODELS

3.6.1 Western zone

An examination of the estimates of profit for each fisherman leads us to suggest that there are three distinct groups of fishermen in the western zone, with respect financial performance:

1. Those with 70 pots or greater. About 20 per cent of the sample fitted this description in 1994/95 and they mostly had a catch rate of 0.45 kg per pot lift or greater, and achieved profit levels of between $70,000 and $200,000.

2. Those with catch rates of 0.45 kg per pot lift or greater and less than 70 pots. About 50 per cent of the sample fitted this description in 1994/95 and they mostly achieved profit levels of between $30,000 and $70,000.

3. Those whose catch rate is less than 0.45 kg per pot lift. About 30 per cent of the sample fitted this description in 1994/95 and they mostly achieved profit levels of less than $20,000.

This generalisation applies whether the fishermen were leasing their licences or owned their licences. Accordingly we have formulated three models to depict the financial performance based on the average receipts and expenditure per pot for 1993/94 and 1994/95 identified for those members of the survey sample that fitted each of the above the three groups, and these are presented in Table 3.6.

3.6.1.1 Applicability of models to the wider industry

As explained above, the criteria used to specify the three financial model, were; namely:

1. MODEL 1: 70 pots or greater with catch rates of 0.45 kg per pot lift or greater.

2. MODEL 2: less than 70 pots with catch rates of 0.45 kg per pot lift or greater.

3. MODEL 3: Catch rate of less than 0.45 kg per pot lift.

DCNR has provided information on the distribution of licences with respect to catch rate and to pot holdings. This has enabled the consultants to examine how representative of the entire western zone is the survey sample with respect to the

TABLE 3.6
BASE FINANCIAL MODELS FOR WESTERN ZONE

TO REFLECT SURVEY SAMPLE AVERAGE 1993/94 & 1994/95	MODEL 1	MODEL 2	MODEL 3
CATCH AND EFFORT			
Pots	86	55	45
Lifts per pot	180	180	200
Pot lifts p.a.	15,480	9,954	9,000
Kg per pot lift	0.75	0.65	0.45
Kg p.a.	11,610	6,470	4,050
RECEIPTS			
Average price	$30.00	$30.00	$30.00
Gross receipts p.a.	$348,300	$194,103	$121,500
CASH COSTS p.a.			
Fixed costs	$22,000	$11,000	$11,000
Trip costs	$39,000	$25,000	$23,000
Labour costs	$58,000	$33,000	$24,000
Repairs & maintenance	$11,000	$8,000	$12,000
Interest & loan costs	$18,000	$11,000	$15,000
Total	$148,000	$88,000	$85,000
BOAT CASH INCOME (Receipts LESS Cash costs)	$200,300	$106,103	$36,500
IMPUTED COSTS			
Depreciation	$7,600	$4,300	$2,100
Owner-operator allowance	$36,000	$36,000	$36,000
TOTAL COSTS (Cash costs PLUS imputed costs)	$191,600	$128,300	$123,100
PROFIT (Gross receipts LESS Total costs)	$156,700	$65,803	($1,600)
ASSETS			
Licence value	$516,000	$331,800	$270,000
Fixed assets	$585,000	$320,000	$180,000
Total Assets	$1,100,000	$650,000	$450,000
PROFIT AS % RETURN ON ASSETS	14.2%	10.1%	-0.4%
LIABILITIES	$165,000	$100,000	$140,000
PROFIT AS % RETURN ON EQUITY	16.8%	12.0%	-0.5%

numbers of fishermen that would fit the criterion used for specifying each of the three models. For the sole criterion for MODEL 3; namely, catch rate less than 0.45 kg per pot lift, thirty per cent of fishermen in the consultants' sample met this criterion, whereas DCNR's information for the entire western zone suggests 37 per cent.

The information provided by DCNR does not enable us to check directly how many fishermen would meet the dual criteria for MODEL 1 (about 20 per cent of our sample) and MODEL 2 (about 50 per cent of our sample). This is because DCNR could not provide details of the number of pots licensed to individual boats due to confidentiality arrangements with fishermen. However, as shown in Section 2.1.1, DCNR does publish information to describe the distribution of licences by pot holdings for the entire western zone. That indicates that the survey sample is

slightly skewed towards the larger enterprises because only 15 per cent of licences in western zone have more than 70 pots.

The consultants would expect financial performance to vary considerably across a continuum for the total population of about 96 lobster enterprises in the western zone. Nevertheless use of the three models provides a convenient method for demonstrating, at least to some extent, the range of consequences for financial performance of the management options that are examined in Section 5 of this report. MODEL 2 can be interpreted as representing the "typical", or modal, group of fishermen while MODEL 1 would represent the above-average group and MODEL 3 would represent the below-average group (from a perspective of financial performance).

3.6.1.2 Sensitivity analyses

The consultants have used MODEL 2 to demonstrate how profit as a rate of return on total assets would vary with changes in lobster price and catch rate[2] and the results of that analysis are presented in Table 3.7. While the rate of return on assets for BASE MODEL 2 was 10 per cent with a catch rate of 0.65 kg per pot lift and a lobster price of $30 per kg, this analysis demonstrates that the rate of return is extremely sensitive to the price received for lobsters and to the level of catch rate. For example, prices for the opening of the 1995/96 season have been markedly lower at about $24 per kg. This analysis suggests that if lobster prices of $24 were sustained for an entire season instead of the $30 per kg used in specifying the base models, then the rate of return on assets would reduce from 10 per cent to 4 per cent if nothing else changed.

3.6.2 Eastern zone

Examination of the profits for each fisherman in the sample for the eastern zone provided little firm information about any distinct groups of enterprises on the basis of financial performance. There was a tendency for pot numbers to be clustered fairly close to the mean for both the sample and the population, as well as a strong tendency for catch per pot to be clustered around the mean of 0.3 kg per pot lift. These observations suggested that one financial model to be evaluated should be an enterprise of around 30 pots and averaging 0.3 kg per pot lift. Such an enterprise was regarded as representative of enterprises with pot holdings from about 25 pots to 35 pots. A lower level of financial performance is captured using an enterprise of 30 pots and a lower catch rate, namely, 0.2 kg per pot lift. Nearly all enterprises with pot numbers in this range had little debt.

The sample gave a slight suggestion that the relatively few enterprises in the eastern zone which achieved catch rates noticeably greater than the mean might be those with pot holdings in the range, say, 45 pots to 60 pots. Therefore, an enterprise holding 50 pots and achieving a catch rate of 0.5 kg per pot lift was taken as representative of enterprises with a high level of financial performance.

---

2 In estimating the rates of return for this and other sensitivity analyses, it has been assumed that trip costs and hired labour costs would vary directly in proportion to the number of pot lifts and that all other costs would remain constant.

In summary, the three models for the eastern zone are:

1. Fifty (50) pots and a catch rate of 0.5 kg per pot lift - achieving a profit of about $35,000 and a return on total assets of about 12.5 per cent.

2. Thirty (30) pots and a catch rate of 0.2 kg per pot lift - achieving a loss of around $16,000 and a return on total assets of about -10 per cent[3].

3. Thirty (30) pots and a catch rate of 0.3 kg per pot lift - achieving a small loss and a return on total assets of about -3.5 per cent[4].

It is important to remember the implication of a negative return on total assets as shown for Models 2 and 3 in Table 3.8. Unless fishermen conducting enterprises represented by these models are prepared to persist in either cross-subsidising their fishing enterprise from other income, or taking much lower returns to labour than assumed here, they will be unable to continue in the fishery over the ten-year period used in the following simulations. For purposes of comparing the options it is assumed that they would be prepared to persist.

Accordingly we have formulated three models to depict the financial performance based on the average receipts and expenditure per pot for 1993/94 and 1994/95 identified for those members of the survey sample that fitted each of the above the three groups, and these are presented in Table 3.8.

---

3 The largest observed losses in the survey were for enterprises with about these characteristics.

4 The breakeven catch rate for a 30-pot enterprise (that is, the catch rate that produces zero profit) using the financial performance from the sample would be about 0.35 kg per pot lift.

TABLE 3.7

SENSITIVITY OF RATE OF RETURN ON ASSETS TO CHANGES IN LOBSTER PRICE AND CATCH RATE

Lobster price ($ per kg)	Catch rate (Kg per pot lift)									
	0.45	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9
$20.00	-9.4%	-7.4%	-3.0%	-1.5%	0.1%	1.6%	3.1%	4.6%	6.2%	7.7%
$22.00	-7.6%	-5.4%	-1.3%	0.4%	2.0%	3.7%	5.4%	7.1%	8.7%	10.4%
$24.00	-5.8%	-3.4%	0.4%	2.2%	4.0%	5.8%	7.7%	9.5%	11.3%	13.2%
$26.00	-4.0%	-1.4%	2.0%	4.0%	6.0%	8.0%	10.0%	11.9%	13.9%	15.9%
$28.00	-2.2%	0.6%	3.7%	5.8%	8.0%	10.1%	12.2%	14.4%	16.5%	18.6%
$30.00	-0.4%	2.6%	5.4%	7.7%	10.0%	12.2%	14.5%	16.8%	19.1%	21.4%
$32.00	1.4%	4.6%	7.1%	9.5%	11.9%	14.4%	16.8%	19.3%	21.7%	24.1%
$34.00	3.2%	6.6%	8.7%	11.3%	13.9%	16.5%	19.1%	21.7%	24.3%	26.9%
$36.00	5.0%	8.6%	10.4%	13.2%	15.9%	18.6%	21.4%	24.1%	26.9%	29.6%
$38.00	6.8%	10.6%	12.1%	15.0%	17.9%	20.8%	23.7%	26.6%	29.5%	32.4%

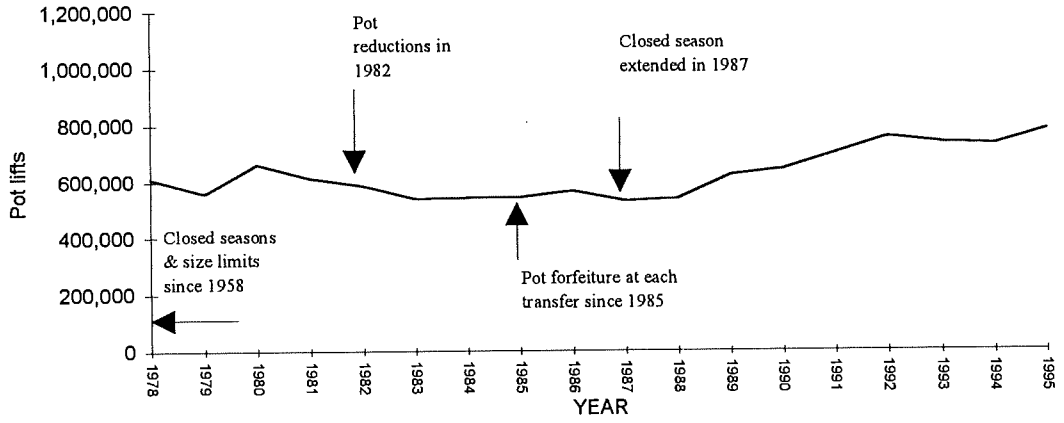
TABLE 3.8
BASE FINANCIAL MODELS FOR EASTERN ZONE

TO REFLECT SURVEY SAMPLE AVERAGE 1993/94 & 1994/95	MODEL 1	MODEL 2	MODEL 3
CATCH AND EFFORT			
Pots	50	30	30
Lifts per pot	128	107	107
Pot lifts p.a.	6,400	3,210	3,210
Kg per pot lift	0.50	0.20	0.30
Kg p.a.	3,200	642	963
RECEIPTS			
Average price	$33.00	$33.00	$33.00
Gross receipts p.a.	$105,600	$21,186	$31,779
CASH COSTS p.a.			
Fixed costs	$5,750	$5,760	$5,760
Trip costs	$11,900	$4,830	$4,830
Hired labour costs	$3,900	$2,520	$2,520
Repairs & maintenance	$4,700	$3,210	$3,210
Interest & loan costs	$7,950	$660	$660
Total	$34,200	$16,980	$16,980
BOAT CASH INCOME (Receipts LESS Cash costs)	$71,400	$4,206	$14,799
IMPUTED COSTS			
Depreciation	$3,750	$3,090	$3,090
Owner-operator allowance	$33,150	$17,100	$17,100
TOTAL COSTS (Cash costs PLUS imputed costs)	$71,100	$37,170	$37,170
PROFIT (Gross receipts LESS Total costs)	$34,500	($15,984)	($5,391)
ASSETS			
Licence value	$75,000	$45,000	$45,000
Fixed assets	$200,000	$110,000	$110,000
Total Assets	$275,000	$155,000	$155,000
PROFIT AS % RETURN ON ASSETS	12.5%	-10.3%	-3.5%
LIABILITIES	$60,000	$6,000	$6,000
PROFIT AS % RETURN ON EQUITY	16.0%	-10.7%	-3.6%

4. THE FISHERY AND OPTIONS FOR ITS MANAGEMENT

Regulation of the fishery has relied on input controls which have been aimed at reducing the amount of fishing effort but, despite those attempts, fishing effort is presently at an all time high (see Figure 4.1 below).

FIGURE 4.1
EFFORT LEVELS AND INPUT CONTROLS FOR WESTERN ZONE



A study by DCNR (August 1994) concluded that high levels of fishing effort for rock lobster have depleted the resource for this generation of fishermen and that the current level of fishing is putting the long term future of the industry at risk. The continued long term decline in the commercial catch rates is clear evidence that the levels of commercial and recreational fishing are not sustainable. There has been a 40 per cent increase in effort since 1988 and recreational fishing has also increased, yet catch rates have declined. Increases in the proportion of live exports have led to substantially increased prices and this is likely to lead to a further increase in effort and a consequent decline in catch rates, unless the present management structure for the fishery is changed.

4.1 CURRENT MANAGEMENT OF FISHERY

A short account of the history of the Victorian rock lobster is contained in Hobday and Smith (1995) and is not repeated here except to note some of the main developments in management. The fishery began more than 100 years ago using baited hoopnets in shallow water. The modern rock lobster pot was introduced about the turn of the century and until the 1970s fishing for rock lobsters was combined with other fishing activities. Declining catches of barracouta, restrictions on the landing of school sharks and new technology (for the location of grounds and for pot hauling) appear to have led to full-time fishing for rock lobster by specialists, particularly in the western zone, while a number of part-time lobster fishermen remain in the eastern zone.

Apart from size limits and seasonal closures for female and male rock lobsters, the first major management measure using input controls occurred in 1971 when maximum numbers of pots were set for each licence using a formula involving boat length and crew numbers. In 1981, a review of management of the rock lobster fishery conducted by the Fisheries Management Committee concluded that the fishery was fully-exploited. The Committee resolved that effort, which had been steadily increasing to that time, should not be allowed to increase further (DCNR 1994). Following from that review, a once-off reduction of pots was implemented in the western zone in 1982, a five per cent forfeiture on the transfer of a licence in 1985 and extensions of the closed season in 1987 and 1988 (see Figure 4.1). These measures had some effect in reducing effort during the 1980s, but since 1988 there has been a 40 per cent increase in effort (DCNR 1994).

Current management of the Victorian commercial rock lobster fishery is based on:

- **separation of the fishery into an eastern zone and a western zone** (at longitude 143^0 40' east);
- **a limited number of licences** (76 in the eastern zone and 96 in the western zone);
- **limitations on saleable pot entitlements** (presently 2,606 in the eastern zone and 5,468 in the western zone);
- **forfeiture of pots on transfer** (an on-going pot reduction strategy of 20 per cent forfeiture of pots on transfer in both zones and five per cent forfeiture of pots on the transfer of whole licences in the western zone);
- **minimum pot holdings** (15 pots in the eastern zone and 10 pots in the western zone);
- **maximum pot holdings in the eastern zone** (60 pots);
- **an area in which the number of pots which can be worked from a boat is limited to 50** (longitude 143^0 10' east to 143^0 43' east);
- **closed seasons** (1 June to 15 November for female lobsters and 1 September to 15 November for male lobsters);
- **minimum legal lengths** (105 mm carapace for females and 110 mm for males); and
- **pots must be fitted with "escape gaps".**

The fees charged for the various licences and entitlements needed by a rock lobster fisherman include annual renewal fees of $63 for the boat licence and $16/pot for the pot licence. Fees levied on the transfer are $63 for the boat licence and $23/pot entitlement. It is understood that the aggregate value of these fees falls considerably short of covering the costs of management.

The recreational fishery is managed with the same closed seasons and minimum lengths. In addition, fishermen must hold an amateur fishing licence which restricts them to taking no more than four lobsters per day by hand or using a maximum of two hoop nets. It is not permitted to use spears or snares.

The production and productivity of the two zones are markedly different. In 1994-95, the recorded catch in the eastern zone was 69.9 tonnes, valued at $2.241 million (at beach prices), from the recorded 244,957 pot lifts (0.29 kg/pot lift). The recorded catch for the same year in the western zone was 434.0 tonnes, valued at $13.475 million, from 781,411 recorded pot lifts (0.56 kg/pot lift). Traditionally, the highest prices are recorded late in the fishing season (June to August) while about two-thirds of the total catch in each zone is taken between December and March.

The main port of the western zone is Portland with other significant numbers of fishermen based at Apollo Bay, Warrnambool, Port Fairy, Port Campbell Port MacDonnell.

The main ports of the eastern zone are Queenscliff, Lakes Entrance and, to a lesser, extent, San Remo. These ports account for about 50 per cent of boats while the remaining 50 per cent are sheltered in small ports over the length of the zone.

In recent years fishing technology has improved dramatically with the advent of specialist high-speed vessels with planing hulls and wide uncluttered working areas. Use of the global positioning system (GPS) and colour echo sounders has greatly increased fishermens' ability to locate grounds and pots. The adoption of such technology has been greater in the western zone.

4.2 OBJECTIVES OF MANAGEMENT

The most recent statement of goals, objectives and strategies for management of the Victorian rock lobster fishery is set out in Hobday and Smith (1995). The set of long-term goals contained in that publication is a precis of that contained in DCNR (1994). The latter is reproduced here for completeness[5].

1. To ensure the rehabilitation and conservation of the southern rock lobster resource, and the habitats which support it.

2. To ensure the optimum sustainable utilisation of the resource, taking account of economic, social and environmental considerations in accordance with ESD principles.

3. To ensure a prosperous commercial fishery continues in the long term.

4. To provide recreational fishing opportunities and to ensure that recreational fishermen have an appropriate and equitable allocation of the resource.

5. To ensure that management arrangements are effectively implemented and monitored.

6. To ensure co-operative and participative management between the Department and major client groups.

---

5 It is interesting to note that the goals of management rightly change and evolve with time. In 1993, for example, the word "rehabilitation" was absent from 1 and "prosperous" in 3 was "viable".

DCNR (1994) sets out management objectives for the fishery for each of these goals. Since these goals and objectives were formulated, a new Fisheries Act (1995) has been introduced. The above goals appear to be consistent with the objectives of the Act, although there may be more emphasis on some goals in the future, for example, the goal of co-operative and participative management may be enhanced by the notion of co-management in the new Act. The Act also requires the preparation of management plans for each fishery declared by the Minister to require such a plan. We work on the assumption that the objectives of the management plan for the rock lobster fishery will not depart significantly from the above goals and the current objectives for management of the fishery.

The present goals (particularly 2 and 3 above) and objectives firmly establish the importance of economic considerations in the management of the Victorian rock lobster fishery. Furthermore, DCNR (1993 & 1994) and Hobday and Smith (1995) have established the need for a change in management to meet these goals and objectives, and have set some measures to be achieved, namely, reducing effort, boats and fishing costs. The aim is to reduce pot lifts in the western zone by 25 per cent and by 50 per cent in the eastern zone (DCNR 1995).

To guide our consideration of changes to management and the choice of future management programs, we have constructed a more detailed set of objectives. In doing so we have drawn on the proposals of Crutchfield (1982), Anderson (1986) and Commonwealth of Australia (1989) as well as the above goals. These objectives for the choice of a management program are as follows.

A. **The program must provide the ability to protect the basic productivity of the stock.** Many matters which influence the size of a stock are beyond human control and the management program should include mechanisms which permit prompt and decisive action when unanticipated changes in stock size and composition make planned levels of catch dangerous.

B. **The program must provide the incentive and the pressure for economically efficient harvesting, processing and marketing.** From the standpoint of the fishing sector, this involves four main requirements.

   B1. To encourage the level of catch at which further expansion of effort would bring greater costs (including management costs) than the value of the additional fish.

   B2. To encourage the size composition such that no further gains can be made from investing in further growth.

   B3. To encourage fishing units and innovation in fishing methods that allow provision of fishing effort for a given catch at the lowest cost.

   B4. To encourage optimal deployment of the fleet over time and space.

C. **The program should identify and account for the costs of negotiation, research, monitoring and enforcement necessary to**

undertake the program. The program cannot be justified if these costs are more than the benefits of the program[6].

D. **The program should practical.** To this end, three additional objectives might be considered.

D1. **Acceptability.** Regardless of its theoretical niceties, there is little point discussing a new management program that will be totally unacceptable either to government or to the majority of industry. This does not deny, however, that some programs could win acceptance after educational effort, but the cost of that effort would need to be taken into account.

D2. **Flexibility.** The abundance and catchability of fish vary from season to season, therefore, the management program should be sufficiently flexible to permit timely decisions if biological and economic conditions change.

D3. **Identification and minimisation of adverse distributional effects.** Any change of program will produce winners and losers, therefore, in terms of equitable implementation, the program should permit identification of the groups which would benefit and those which would suffer from both short-term and long-term effects and provide mechanisms to minimise the adverse impacts.

Simultaneous achievement of all these objectives is a difficult task. There will always be tension between objectives related to both economic efficiency and the conservation of stocks and those related to the welfare of the current generation of fishermen. The latter brings the issues of equity and fairness into the debate. This tension becomes particularly important for Objective B1 because the government has an obligation to the community to strive towards this objective so that the resources of capital and labour are put to their best uses.

Even though a serious attempt must be made to minimise adverse effects, some fishermen will be dissatisfied with any change. For this reason it is emphasised that the practical objective of "acceptability" has two sides which will need to be traded off - acceptable to a majority of fishermen and acceptable to government which acts on behalf of the community, including future generations, and which should reject waste of the community's resources.

In this Study we are not concerned with complete programs of management, only with the main weapons of those programs. Therefore, we will be able to make only a partial evaluation against the objectives. That evaluation, however, may indicate any additional aspects which would need to be added to the relevant centre piece to assemble a full program of management. For example, any program may need supplementation with emergency measures, such as the ability to stop fishing, if there is an obvious short-term threat to the resource (related to Objective A). We

---

6 The question about who is to meet these costs is a separate issue, except that the answer should be consistent with current policy.

give some consideration to the issue of how likely it would be that a program would require this and other supplements in conjunction with the main measure.

An issue which bears on management and its objectives is the matter of recovering the costs of management. Management is a service for which there is a growing expectation that the beneficiaries of the service should pay. Fishermen are a major, but not the only, beneficiary of management. At present, it is believed that the degree of recovery of management cost is low. If the degree of cost recovery is likely to increase in the future, fishermen should take this into consideration in forming their judgements about the various options. Furthermore, the issue of recovering some or all of the costs of management from fishermen is a separate issue from that of imposing some charge for exploiting the Crown's resource for private gain[7].

It is not our intention to go into detail about the economics of fisheries management or to provide a detailed evaluation of the general economic and management questions surrounding the various management options. These matters have been treated extensively in readily available publications which should be familiar to all connected with the fishery (DCNR 1993 and 1994). We will attempt to minimise repetition of what has already been considered in detailed evaluations of alternative management arrangements in those publications and by the managers of rock lobster fisheries in other States, particularly Western Australia (Bowen 1994) and South Australia (SZRLFMC 1995 and NZRLFMC 1995).

Before commencing the discussion of options for changing management, it is important to recall that there are three important economic consequences of the excessive effort employed in an open-access fishery, namely:

- the incomes of fishermen are low;
- economic surplus from the whole industry (called "economic rent") is reduced to zero; and
- at the margin resources of labour and capital which produce that effort earn less than they could in other sectors of the economy[8].

These consequences are of concern to industry and to government - the latter in its custodial role as manager of the resource.

Thus, not only is life in an open-access fishery tough for the fishermen, but the fishery operates in a way that is economically wasteful for the whole community. Management must reduce effort to raise the incomes of remaining fishermen and halt the economic waste. In the rock lobster fishery, management has been by a mixture of biological measures (with economic effects) and by attempting to reduce the amount of effort by controlling inputs, such as boats and pots.

---

7 Since the Fisheries Act 1995 was passed, unharvested fish in Victorian waters are recognised as the Crown's resource.

8 See, for example, Anderson (1986).

Fishermens' incomes can be improved to the greatest possible extent, and economic waste eliminated, by using the quantity of effort such that the return to the last unit of effort exactly matches its opportunity cost (what it could earn elsewhere). It is this condition which gives rise to Objective B1. The quantity of effort which produces this maximum economic yield can never be greater than that which produces the maximum sustainable from the fishery and almost invariably will be at lower quantities of effort than that which gives the maximum sustainable yield.

We make this observation to emphasise two points, namely:

- managers must aim eventually for the maximum economic yield if economic waste is to be eliminated; and
- even if the sustainable yield curve proves to have a plateau at the maximum sustainable yield, it will still be in the interests of economic efficiency to reduce effort and catch below the maximum sustainable yield.

4.3 INPUT CONTROLS

Economic theory and the practice of fisheries management in many countries, including many fisheries in Australia, have established that managing a fishery by controlling inputs causes inefficiencies in the production of fishing effort[9]. The greater the ease in substituting uncontrolled inputs for controlled inputs, the greater the opportunity for substitution to occur and for the effective effort to increase. This means that, at any time, there must be a suite of controls on different inputs. When there is a technological advance in the use of one input the whole suite may need revision. This process raises the average cost of effort and works to drive economic rent towards zero again. Further controls on effort are required to offset fishermen ingenuity at input substitution and the process will be repeated. At each turn of the "spiral", the inefficiencies imposed on fishermen increase (more severe controls) and additional administration and managerial costs are required. This is not a good position for an export-oriented fishery with no control over price and many competitors (Morrow 1992).

4.3.1 Further limitations on pot numbers

This "spiral" has been evident in the Victorian rock lobster fishery where the emphasis in management has been on controlling effort by tightening control over pot numbers[10]. In the last 13 years there has been a once-off pot reduction of 17

---

9 See, for example, Anderson (1986) and Commonwealth of Australia (1989), Hannesson (1993) and Lindner (1994).

10 There seems to be a consensus amongst scientists and managers that a "pot lift" is a valid and useable measure of effort for rock lobster fisheries. However, under current surveillance techniques pot lifts can only be controlled indirectly by controlling pot numbers, fishing days or boats. Even if it were possible to control and monitor pot lifts directly, it would not be outside the ingenuity of fishers to invent ways of improving the fishing power of a pot lift.

per cent and an ongoing forfeiture (still in place) on the transfer of pot entitlements and whole licences. It is noted in the Options Paper (DCNR 1994, p.21) that the forfeiture provisions, in fact, may have acted as a disincentive to licence amalgamations and encouraged leasing of pot entitlements as a means of avoiding forfeiture. Effort is now at record levels (some 40 per cent higher than when effort was judged to be too high) and the fishery is poised for the next round of the spiral if reliance on effort reduction by input control is to continue.

South Australia implemented a 15 per cent pot reduction scheme in the southern zone of its rock lobster fishery in 1984. Subsequently:

> Analysis of the pot reduction showed that whilst it had a small effect on fishing effort, it failed to induce significant rationalisation within the fishery. Remaining fishermen responded by working a smaller number of pots more intensively than they had prior to the introduction of the scheme (SZRLFMC 1995 p.7, see also Sandiford 1988).

So good were South Australian fishermen at this process that a buy-back scheme was deemed necessary just three years later in 1987. Although the scheme removed 41 boats and 2,455 pots from the fishery,

> the remaining fishermen increased their effort by increasing the amount of time spent fishing, dissipating potential benefits derived from the scheme" (SZRLFMC 1995 p.7, see also Sandiford 1993).

The management of the southern zone is now based on output controls (individual transferable quotas) to correct the biological and economic problems of the fishery and to stem the need for ever-increasing controls on inputs.

The northern zone of the South Australian fishery has a similar history with pot reductions of 10 per cent in 1985 and again in 1992 as well as a progressive shortening of the fishing season (NZRLFMC 1995). This zone is an interesting fishery because it has a relatively small number of fishermen (less than 90) who seem to form a well organised and cohesive group. Government and fishermen in that zone have elected to remain with input controls, which include a complex set of time closures, because it is believed that "the sustainability of the fishery is not under immediate threat from the current rate of fishing" (NZRLFMC 1995, p.12). It will be very interesting to see if the cohesion amongst the current group of fishermen, as they commit themselves to follow their highly-structured strategic plan (SA Northern Zone Rock Lobster Fishermen's Association Incorporated 1995) will enable them to cap effort in an effective way. Even if successful in the short term, the permanence of success will be a key issue. The managers, of course, will be closely monitoring developments.

The Western Australia rock lobster fishery has had a history of ever-tightening controls involving shortening the season, boat replacement policies, changing minimum lengths, and temporary and permanent pot reductions. The most recent change being a temporary reduction of 18 per cent for the 1993-94 and 1994-95 seasons. In commenting on these measures Bowen noted that:

> [A]lthough the number of boats and the number of pots in the fishery has been reduced during the five years to 1991-92, the reductions to that time appeared to have only slowed the rate of increase in the exploitation rate

> because of the continuing increase in efficiency of each boat operating in the fishery (1994 p.2).

While there is some evidence that the 18 per cent pot reduction may have reduced effort in the most recent season, there is considerable doubt that this can be permanent (Lindner 1994). Some idea of the increase in fishing power which has taken place in Western Australia as a result of changes in boats, gear and technology is indicated by the findings of Brown, Caputi and Barker, namely:

> Our preliminary estimate of the increase in fishing power between 1971-72 and 1992-93 in shallow water was 29% (0.5 to 2% per annum), in deep water 53% (1 to 4% per annum), and for overall effort 36% (quoted in Bowen 1994, p.11).

After considerable debate and consultation with industry, it has been decided that the Western rock lobster fishery will remain with input controls for the foreseeable future but the Rock Lobster Industry Advisory Committee (1995) recognises the dilemma the industry faces.

> The Committee's view is that the current management system appears to be working well and *provided the input controls continue to be adjusted to balance increases in catching efficiency* it will sustain the stock for the near future (p.14, emphasis added).
>
> If we are not successful in managing fishing effort in this way[11], there is no doubt that quota management will come under discussion again at some time in the future. However, for the near future the challenge is to make input controls work to prevent effective effort increasing to unsustainable levels (p.15).

One has to have an optimistic outlook to believe that the Western Australian managers will be able to meet this challenge. It must also be recognised that the problem of preventing "effective effort increasing to unsustainable levels is only part of the problem. Apart from the economic inefficiencies to fishermen resulting from control of inputs, there are also the issues of increasing administration and management costs which are part of the costs of delaying the inevitable[12].

In an analysis of proposals for pot reductions and a buy-back of pots in the Tasmanian rock lobster fishery, Morrow (1992 p.16) concluded:

> The move towards reducing fishermen and pot numbers will provide increased returns for fishermen in the short run and ... protect the lobster biomass. To survive in the longer term the fleet must be efficient and be allowed to harvest the available stocks at the lowest possible cost. An output control if properly managed will allow many of the present input controls to be lifted assisting the fleet to become more efficient.

---

11 Using what are referred to as variable input controls, including pot reductions, reductions in fishing time and gauge size.

12 The other part of the cost of delay would be the discounted value of the difference in the economic surplus generated by the fishery with quotas now rather than later.

Furthermore,

> If input controls continue to be the basis of the management then the socio-economic structure of the fishing villages around Tasmania is unlikely to change rapidly but gradually slip backwards as the economic climate of the fishery declines.

The evidence is mounting that pot reduction schemes and pot buy-back schemes are not an economically desirable means of achieving **sustained** reductions in fishing effort. Indeed, the need for further reductions is a direct result of attempting to rely on input controls to overcome the waste involved in an open-access fishery. If one proceeds down the path of pot reduction or buy-back, the inevitable question which must be asked is: "How long until the next round"?

An advantage of a buy-back scheme relative to a pot reduction is that the former is more likely to remove fishermen and their boats from the fishery in a less painful fashion than the latter. Under a uniform pot reduction scheme, that is, one that removes a given number of pots from each operator irrespective of the size of their pot holding, some small operators will be forced below a pot holding that allows the enterprise to remain viable. Such operators may push themselves and their equipment in an attempt to survive before the inevitable overtakes them. With a buy-back they can see the implications immediately and sell with dignity. From the government's viewpoint, the quicker whole enterprises are removed from the fishery, the lower the total cost with which the fishery operates.

Depending on the number of pots removed from each operator under a uniform scheme, operators with large numbers of pots would be relatively less affected than operators with small numbers of pots. Under a proportional pot reduction, where a percentage of the pot holding of each operator is cancelled, small operators would be less affected than large operators in absolute terms. Even so, the reduction in pots may be sufficient to cause financial concern to some small operators in the eastern zone.

A scheme that is being discussed in the eastern zone is a uniform reduction of five pots per year for three years. This proposal is likely to have a marked impact on the fishery in that zone because of the many small operators. At the present time, there are 27 operators (over one-third of all operators in the eastern zone) with non-zero entitlements of 30 pots or less, of which two licensees have 15 pots. Operators with 30 pots and average catch rates are likely to make negative returns in most years (see Section 2). Therefore, at the two extremes, a pot reduction like the one proposed could cause significant reorganisation in the zone (sale or lease of small parcels), or the part-time almost artisanal nature of the fishery will become more entrenched. No doubt the actual position would be a mix of these possibilities but, because 12 of the 27 operators have 25 pots or less which would leave them with between zero and 10 pots after the reduction, we suspect that selling or leasing would be more likely. In any event, if adjustment and consolidation of the fishery in the zone is to be encouraged by using such a pot reduction scheme, the upper limit of 60 pots should be eliminated. The potential to eliminate what might be a significant amount of "latent" effort under such a scheme, and the opportunity for the larger operators to grow, may delay the on-set of compensatory effort increases.

A proportional pot reduction would not have the potential to cause the same adjustment of effort nor cause the same degree of hardship to small operators. Because of this, a proportional pot reduction would be more likely to see a quicker

return to pre-reduction levels of effort as most operators attempted to compensate for fewer pots, but the impact would be less-harsh on small operators.

4.3.2 Further limitations on the open season

The likely effects of further closures to the fishing season have been considered in the Options Paper (DCNR 1994). In order to achieve the desired reduction in effort in each zone, the closures would need to be for about an additional three to five months in those times of the year when effort is low (between April and August). It is highly unlikely, however, that the planned reduction in effort would be sustained. Reductions in effort resulting from further closures have been shown to be short lived in other lobster fisheries as fishermen compete to maximise their share of the catch in the shorter season. Average costs of producing effort are increased as fishermen use inputs more intensively in the rush to catch fish in the shorter season. As Anderson (1986) points out, seasonal closures are an indirect way of setting a competitive TAC for the fishery and suffer from many of the same types of problems as would be present if a competitive quota were the sole management instrument.

The potential for marketing and processing consequences from long closures have been noted in the Options Paper along with an advantage of such a control, namely, the ease of policing. While there may be some benefit in allowing more time for maintenance of boat and gear, from the economy-wide perspective there is the potential for considerable loss due to the enforced idleness of men and capital, particularly if they are used in other over-exploited fisheries.

Extensions to the closed season may appear to fishermen to involve relatively little sacrifice and so be judged as acceptable. There is not the fear of the unknown, nor the allocation problem as with quotas, nor the loss of pots or the imposition of a buy-back levy as with tightening input controls. Depending on the extent of further closure, however, there may be losses to fishermen, including the higher costs and risks of racing to catch fish in a shorter season, as well as losses to the economy.

4.4 OUTPUT CONTROLS

Economic theory and the practice of fisheries management show that controls on either the price or the quantity of output of a fishery are able to reduce effort without causing inefficiencies in the production of effort. The two main methods proposed for such controls are a landings tax[13] and a quantitative restriction on the total allowable catch (TAC) which is shared between eligible fishermen in the form of individual transferable quotas (ITQs).

4.4.1 A landings tax

The imposition of a landings tax (say, per kg) has several virtues that have the potential to make it an effective mechanism from an economic point of view. Ideally, a tax on catch would be the best arrangement but this would be extremely difficult to police. A landings tax alters the price a fisherman receives for output and, if the tax is set at the correct level, it will lead directly to the quantity of effort

[13] A tax on effort is also feasible but difficult to implement effectively (see, Anderson 1986).

(and catch) which maximises the economic yield of the fishery. No other management mechanisms are required and anyone who pays the tax can fish. The correct level of tax can also extract the entire economic rent from the fishery for the community while fishermen earn rewards equivalent to what their resources of labour and capital could earn elsewhere in the economy. A tax on catch is a non-intrusive, non-distorting management device which corrects, in the simplest possible way, for the cost each fisherman imposes on others by reducing the available catch. With such a tax in place the amount of fishing effort, and its distribution over time and space could be left to the individual fishermen.

The information required to implement a landings tax is considerable if the tax is to do its job effectively. Sound biological knowledge of the stocks is required along with financial information on the catching sector so that the maximum economic yield can be established for each fishing ground or zone. While this information is also required for management by quotas, the setting of optimal taxes with fluctuating availability of fish and fluctuating prices is likely to be more difficult than setting a TAC. The optimal tax should change as these variables change and may be seen as adding to the uncertainty that fishermen face. Other technical problems include the difficulties of enforcement, particularly with zones of differing productivity which require different taxes. There might also a problem of discarding some of the catch in order to land only the highest value fish.

Apart from the difficulty of altering the tax as frequently as may be required, it is generally suggested that the main problem associated with a landings tax would be the opposition from fishermen.

> Somehow I would feel uncomfortable addressing a large body of fishermen and telling them that the cure for over-capacity, declining landings, and restricted earnings is to tax them ... (Crutchfield 1982 p.14).

While it may be true that it is hard to sell a tax, there has been no serious attempt to consider this device for fisheries management in this country. It may be that fishermen who are not in dire financial straits may find the "hands-off" approach of tax-based management worth considering. Furthermore, it is worth noting that under such a management system the question of "latent" effort becomes irrelevant.

Because taxes are not on the agenda for management of the rock lobster fishery in Victoria, so we do not pursue the issue further. If pressure builds for some or all of the resource rent from the rock lobster fishery to be returned to the community, landings taxes will return to the policy agenda (see Campbell and Haynes 1990).

4.4.2 Management by quotas

Direct control over the quantity of catch by setting a TAC and the distribution of that TAC to fishermen in the form of ITQs is emerging in many countries and for many fisheries as the preferred method of fisheries management. Like a landings tax it does not distort the production of effort and fishermen are free to choose their least-cost combination of how, when and with what gear they will fish. The freedom that ITQs give to fishermen about when to fish allows them to have safer and more "normal" lifestyles (SZRLFMC 1995). The trading of ITQs permits the autonomous adjustment of fishing fleets and experience in ITQ-managed fisheries has often been that this adjustment is rapid. If the TAC from which the ITQs are derived is set

at the level which maximises resource rent, overall economic efficiency is maximised.

ITQs must be strongly favoured if one were to choose between this form of management and tightening input controls solely on the potential to provide effective management for biological reasons and economic efficiency, that is Objectives A and B1 to B4. Compared to effort control, ITQs provide firm control over catch and, therefore, stronger protection of stock productivity. Through transferability and by reducing fishermens' competition against each other and against time, they provide far greater opportunity to achieve Objectives B1, B3 and B4. As discussed below, however, the possibility of "high-grading" may create difficulties for Objective B2.

It must never be forgotten, however, that ITQs are a new concept to Victorian rock lobster fishermen. Under quota management fishermen would need to reorganise the way they think about their fishing enterprise. They would become much more conscious of maximising the value of their catch rather than maximising the volume of catch. ITQs would remove much of the competitive approach which is necessary to survive under current management but some fishermen thrive on competing against their fellows and the elements. For these sorts of reasons, ITQs may rank lowly on acceptability to those fishermen and they would need careful introduction to quota-based management.

The main problems associated with management based on ITQs are those concerned with:

- the choice of a mechanism for the initial allocation of the TAC amongst fishermen;
- setting the TAC; and
- the system for monitoring and enforcing the quotas.

The first of these is an equity issue which can cause serious problems for the introduction of an ITQ system of management. It has implications for acceptability and minimising distributional effects (Objectives D1 and D3). From the viewpoint of economic efficiency, the way the rights are initially distributed will have little lasting effect, as long as they are transferable. We consider the allocation issue separately from the other two technical matters.

Relative to input controls, a management program employing a TAC and ITQs has far greater flexibility from year to year in the ability to alter the TAC in response to changing conditions (Objective D2). Within a season, however, the TAC can be a constraint on catch when conditions, such as abundance, suggest a greater catch would be desirable. This is discussed below when considering issues related to setting the TAC.

4.4.2.1 Setting the TAC

The rock lobster fishery is Victoria's second or third most valuable fishery, the exact rank usually depends on the catch of scallops. In past years, the small amount of research on the fishery has not reflected this importance, particularly as surveys of costs and returns in the fishery had shown that problems were developing. Effective management of a fishery, whether by input or output controls, is enhanced

by sound knowledge of the stock and its productivity. An impression of the research needs for stock assessment under quota management is contained in Bowen (1994 Attachment 5). Serious management-oriented research aimed at obtaining this understanding for the Victorian rock lobster fishery has commenced only relatively recently (Hobday and Smith 1995). Given the more extensive research which has taken place in other States, the catching-up exercise in Victoria should not be too protracted.

Fishing is a very risky process due to natural fluctuations in the abundance of rock lobsters, fluctuations in weather and the failure of boats and gear. Sound knowledge of the yield relationship and population dynamics is needed for the setting of the TAC from season to season, particularly to ensure that it is set at "safe" levels from the viewpoint of the continued productivity of the species. In the longer-term, it becomes important to understand the causes of fluctuations in abundance and to develop predictors of abundance. This is because a TAC acts as a short-term constraint on catch in years of high abundance with potential losses in production. It would be difficult from the viewpoint of equity, but not impossible, to alter the TAC upwards during the course of the year as more information on abundance became available. The difficulty would arise because some fishermen might choose to catch their quota early in the season and be about other productive activities. It might be argued that this inflexibility upwards is a disadvantage of quota management compared to input controls. Under the latter form of management fishermen can work their gear harder in good years. We would suggest that this is an argument for good predictors of abundance rather than a flaw in the management instrument, particularly when balanced against the damage to the stocks which could be done with blunt management instruments, such as input controls.

In the longer-term, as biological and economic knowledge of the fishery grows, it would be important to strive towards setting the TAC at the maximum economic yield of the fishery (Objective B1)[14]. In the early stages of the quota regime and with the information currently available, that would probably be less important relative to conserving the productivity of the stock. The ability to alter the TAC in accord with predicted changes in the biological and economic conditions of the fishery would eventually allow a degree of fine-tuning that is not possible with input controls.

4.4.2.2 Monitoring and enforcement

Critics of quota are quick to point out that the costs of monitoring the progressive catch during the season, in aggregate and for each fisher, policing for illegal

---

14 Using yield-effort relationships described in Hobday and Smith (1995) and estimates of the marginal total cost of effort derived from the survey data from each zone, a rough preliminary estimate of the static maximum economic yield at the present time can be made for each zone. Our estimate of the average total cost = marginal total cost of effort is $13.23 per pot lift for the western zone (average lobster price at $30/kg) and $13.35 per pot lift for the eastern zone (average lobster price at $33/kg). By equating marginal total cost with marginal revenue, the estimate of the static maximum economic yield for the western zone is about 380 tonnes at an effort of about 390,000 pot lifts (roughly 50 per cent of present effort). For the eastern zone the estimate of static maximum economic yield is about 110 tonnes at about 120,000 pot lifts (roughly 50 per cent of present effort).

landings, and keeping appropriate registers of quota holdings and transactions are likely to be much greater than the present costs of monitoring and policing. Proponents of this view point to the many possible landing places in remote areas for a high value commodity which is easily transported, and to the incentives for collusion between processors and fishermen.

Indeed, it is most likely to be true that monitoring, surveillance and enforcement would be costly but it is an observation which misses the important point. The important question is: would the net gains from quota management (benefits from the management program minus all costs of the program) exceed the net gains from other forms of management. It is almost impossible to answer this question definitively. Certainly, it would help to have a better understanding of the industry and the biology of the fishery and to be able to simulate the running costs of a quota program, but the main reason is that we do not have sufficient information to predict future rises in costs and, therefore, the net gains from continuation of input controls. The costs of the latter can include a greater risk of serious damage to the resource.

With the resources available for this project we have not undertaken a simulation of the costs to Victoria of running a quota scheme. Indeed, that would best be done by experts in fisheries' law enforcement. Nevertheless, an appraisal of likely monitoring and enforcement costs for a proposed quota scheme in Western Australia is available, along with the actual experience of running the quota scheme in the southern zone of the South Australia rock lobster fishery.

A detailed analysis of the issues of monitoring and law enforcement which might be associated with a quota scheme in Western Australia was conducted by McLaughlan (1994). McLaughlan estimated that the cost of the proposed scheme might be about $2.1 million (about $30/pot) in the first year and about $1.8 million (about $26/pot) per annum thereafter.

These costs are somewhat lower but comparable with the actual costs of operating the scheme in the southern zone rock lobster fishery of South Australia in 1993-94 and 1994/95. The SZRLFMC (1995) estimated the actual costs as $373,000 (About $31/pot) in the first year (1993-94) rising to about $433,000 (about $36/pot) in 1994-95. The South Australian scheme differs in detail from that which was proposed for Western Australia and the Western Australian fishery is considerably larger than the southern zone fishery of South Australia (about five times the number of pots, about three times the number of boats and about six times the catch). To the extent that economies of size are important in explaining part of the cost difference between Western Australia and South Australia, it might be expected that cost for a similar scheme in Victoria would be higher than in South Australia.

If these costs in Victoria were, say:

- $40/pot/year in the western zone, and
- $50/pot/year in the eastern zone,

then a very rough and ready calculation suggests that the additional yield required from quota management to cover monitoring and enforcement costs at current

lobster prices would be about 2 kg of lobster or less per pot per year[15]. Current annual recorded catches per pot are about 78 kg in the western zone and about 27 kg in the eastern zone. Across the present numbers of pots in each zone this would represent an increase in annual yield **relative to the yield under continued input controls** of about 11 tonnes (two per cent) in the western zone and about 5 tonnes (seven per cent) in the eastern zone.

As discussed in the Options Paper (DCNR 1994), requiring that fish be tagged between capture and consumption (or export) with tags which could not be reused, as well as a defined paper trail may help to reduce enforcement costs. In any event, serious attention would be given to the system of penalties so as to discourage avoidance of the quota regulations.

4.4.2.3 High-grading

A phenomenon which could be problem with quota management is what is known as "high-grading", that is, a fisherman retains only the highest value fish from the catch and discards the rest. With rock lobster at the present time there is a premium in the price per kg for lobsters which are just over the legal limit. If this were to continue under quota management, fishermen may discard large lobsters in order to maximise the number of small lobsters in their catch quota.

For many species, high-grading can be a serious problem because a fish which is caught is usually dead when returned to the water. Not only is this wasteful but, if widespread, may have serious implications for the stock as well as scientific understanding of the stock because discarded fish are not reported. Lobsters, however, are often kept alive as well as being fairly resilient creatures. They stand a good chance of survival on return to the water provided they are not damaged and returned close to their original site of capture. Large lobsters are often prolific breeders so that there may be some compensation if high-grading for small lobsters were to occur. The ability to survive may not make the reverse situation of high-grading for large fish (if that were to occur) as serious as it might otherwise be. The problem is, of course, that the decision to discard may not be made until towards the end of the day when the overall size composition of the catch is established. This means that any fish which might be discarded could be a long way from its site of capture, thus reducing its chances of survival.

Other than an extraordinary level of on-water surveillance, high-grading seems difficult to combat. If it were to occur (and it may not) it would likely to be evident early in the application of quotas when fishermen might have reduced catches due to reductions in the TAC (Geen, Nielander and Meany 1993). High grading may be a means of attempting to maintain their incomes at previous levels. The practice might be reduced, however, as the fleet adjusts when operators sell quota and leave the fishery, or lease quota. Remaining quota holders will have more incentive to husband the stocks.

---

15 This is a very rough calculation because it assumes all other things constant; for example, there is no adjustment in pot numbers and no extra costs to take the extra lobsters, relative to continued input controls.

In the initial stages, therefore, ITQs may not do as much as might be desired in relation to objective B2 (optimal size composition). On the other hand, tightening input controls may do less by providing an incentive to violate current size limits.

4.5 SUMMARY

Our review of options against management objectives is summarised in Table 4.1. An important conclusion is that any management measures which are chosen now to reduce effort in the rock lobster fishery should facilitate any possible changes to the style of management for the **long term**.

The current licensing arrangements impart certain rights to participate in the fishery, namely, the right to use pots for the taking of rock lobsters. A management system based on ITQs would delineate quota holders' rights more finely in terms of a right to take a specified share of the TAC or, in a given year, the right to take a specified quantity of rock lobsters. Neither of these is necessarily the most efficient economic and biological regime in the long run. Government is not necessarily the best equipped to determine management regimes or the level and form of quotas. The way government services for fisheries management are structured they do not have the incentive or the ability to respond quickly and decisively to changes in the economics of the fishery or technical change in fishing methods.

Civil servants can hardly be expected to try to achieve maximum profit in an industry they are supposed to regulate unless they are given a clear mandate to do so and their salaries and careers made contingent upon how successful they are. Without such incentives, civil servants are more likely to see themselves as referees in a sportsmanlike game for hunting fish, trying to achieve equal and equitable treatment of the players in the game. Indeed their careers are likely to be determined on the basis of how well they accomplish this and how aptly they follow established rules of procedure (Hannesson 1993 pp. 118-119). Furthermore, the (then) Industries Assistance Commission (1984 p.33) noted:

> as long as government determines management policy, there remains the likelihood that it will use it to achieve social and political objectives that conflict with the more strictly economic and biological objectives ....

There is a growing trend in fisheries management towards giving more of the responsibility for management to those who have the greatest interest in keeping a fishery profitable - the owners of the access rights. Some have mounted arguments that this trend will continue until they have a joint owner's share of the fish stock and its environment (IAC 1984, KPMG Peat Marwick Hungerfords 1988, Appendix A22, and Scott 1989). While there may be reluctance in Victoria to go that far yet, there is a strong interest in what is termed "co-management". Co-management has been defined by the Minister for Natural Resources as meaning "joint management by government and stakeholders. It involves both the sharing of resources and outcomes and the sharing of responsibility for outcomes" (Hansard, 09 March 1995). While co-management may not be as strong as the arrangement envisaged by the Industries Assistance Commission (1984) for the southern bluefin tuna fishery[16] (because the Minister maintains overall responsibility for management), it is pointing down that road.

---

[16] The thrust of the IAC's suggestion was not that fishers should participate in management but that "the entitlement holders should have the sole carriage of responsibility for management" (Industries Assistance Commission 1984 p.34).

TABLE 4.1 SUMMARY REVIEW OF OPTIONS AGAINST MANAGEMENT OBJECTIVES

OBJECTIVE	POT REDUCTION	POT BUY-BACK	INCREASE CLOSED SEASON	TAC with ITQs
A. To provide the ability to protect the basic productivity of the stock.	Loose control over effort and catch. A range of extra measures needed.	Loose control over effort and catch. A range of extra measures needed.	Loose control over effort and catch. Encourages rush to fish. Extra controls needed.	Would achieve objective with selection of appropriate TAC.
B1. To encourage the level of catch at which further expansion of effort would bring greater costs (including management costs) than the value of the additional fish.	Unlikely unless continual adjustments occur.	Unlikely unless continual adjustments occur but less hardship to fishing sector than pot reduction.	Unlikely and encourages highly competitive fishing in shortened open season. Enforced idleness can be costly to economy.	Would achieve objective with selection of appropriate TAC.
B2. To encourage the size composition such that no further gains can be made from investing in further growth.	Possible with extra measures to control size.	Possible with extra measures to control size.	Possible with extra measures to control size.	Possible with extra measures to control size. High-grading may be problem.
B3. To encourage fishing units and innovation in fishing methods that allow provision of fishing effort for a given catch at the lowest cost.	Imposes high level of inefficiency initially. Tendency to adjust as remaining pots are transferred but painful to some fishermen. Uniform reduction may speed adjustment but at greater hardship. Innovation would make further pot reductions necessary.	Better chances than pot reduction as remaining pots transferred since whole enterprises removed. Continual application needed fully to meet objective. Innovation would increase effort making further pot reductions necessary.	Encourages high cost competition for each fisherman to maximise catch during shortened open season.	Low-cost fishermen have incentive to purchase quota from high-cost fishermen until lowest-cost fishing is attained.

Table 4.1 Continued

OBJECTIVE	POT REDUCTION	POT BUY-BACK	INCREASE CLOSED SEASON	TAC with ITQs
B4. To encourage optimal deployment of the fleet over time and space.	Some encouragement but small units (both pot numbers and size and power of boat) reduce opportunities.	More encouragement than pot reductions because less inefficiency forced on fleet.	Little, if any.	More than other regimes since fishermen free to choose when and where they fish due to greater opportunity to match catch with catching power.
C. The program should identify and account for the costs of negotiation, research, monitoring and enforcement necessary to undertake the program.	No impediments to this objective. Management costs likely to be higher than closed season but less than buy-back.	No impediments to this objective. Management costs significant but less than for quotas.	No impediments to this objective. Management costs may be lowest.	No impediments to this objective. Management costs may be higher than other regimes.
D1. The program should be acceptable	To be tested. Acceptable to some fishermen in eastern zone. Political and community support unknown. Number of fishermen may be reduced and can impose hardship.	To be tested. Acceptable to some fishermen in western zone. Political and community support unknown. Reduces number of fishermen and less hardship.	To be tested. Acceptable to some fishermen in western zone. Political and community support unknown. May leave number of fishermen unchanged. Can create impression that that fishermen have to sacrifice little.	To be tested. Some support in eastern zone and western zone. Political and community support unknown. Has the potential to reduce numbers of fishermen considerably to long term economic benefit of fishery.

Table 4.1 Continued

OBJECTIVE	POT REDUCTION	POT BUY-BACK	INCREASE CLOSED SEASON	TAC with ITQs
D2. The program should be flexible	Limited opportunity to adjust catch within season. Little flexibility between seasons except by more pot reductions or additional allocations.	Limited opportunity to adjust catch within season. Flexibility between seasons comes only by purchasing or auctioning more pots.	Can provide considerable flexibility to respond to changing conditions between the extremes of no fishing and no closure.	Considerable flexibility from year to year in the ability to alter catch in response to changing conditions. TAC imposes constraint on catch in years when abundance is unexpectedly high.
D3. The program should allow identification and minimisation of adverse distributional effects.	Appropriate arrangements can be made. Needs to be done each at each pot reduction.	Appropriate arrangements can be made. Needs to be done at each round of buy-back.	Appropriate arrangements can be made. Needs to be done at each shortening of the season.	Appropriate arrangements can be made. Needs to be done once-only at initial allocation of quota.

The opportunity for co-management is now contained in the Fisheries Act 1995 and it is to be expected that the holders of access rights to the rock lobster fishery would, at some time, want to avail themselves of that opportunity. The gains from a fishery moving towards co-management could be considerable since there would be a closer relationship between those who make the decisions and those bear the costs or reap the rewards. Under such conditions it is to be expected that management would be much more responsive to changes in the economic environment of the fishery, technical change in fishing methods and changes in the abundance of fish.

The consultants believe that holders of ITQs, rather than holders of the right to use pots, are more likely to take a cohesive long-term interest in improving the fishery. To draw an analogy, an ITQ is closer to a share certificate in what is hoped to be a growing enterprise than is a pot licence. Just as the holders of share certificates have a strong **collective** interest in the future welfare of the company so quota holders can be expected to have a collective interest in the welfare of the fishery. An entitlement to compete against all other entitlement holders for the company profits - comparable to a pot entitlement -is unlikely to engender the same collective interest in the future welfare of the company (fishery). Therefore, we believe that a quota-managed fishery is likely to be a more effective precursor to co-management than a fishery managed by access rights in the form of the right to use pots.

Tightening controls over pots and lengthening the closed season cannot score highly against the biological and economic objectives we have set up to for judging the choice of a management program or changes to it - Objectives A and B1 to B4. This is because input controls themselves do not score highly against these objectives. They are blunt instruments which do not provide sufficiently firm control over effort and catch to protect the stock and point towards the best operating conditions for economic efficiency. Reductions in effort are never sustained for long, and continual alteration of the controls is needed in an attempt to attain these objectives. It is possible, however, that a uniform reduction of a sufficiently large number of pots in the eastern zone may delay the advent of compensatory effort longer than other controls.

The current program, based on input controls with control over pot numbers as its centre piece, was effective at the time it was first introduced. It brought a quick halt to deteriorating conditions in the fishery and the components of the program were tangible forms of management readily understood by a generation of fishermen with no prior experience of a managed fishery. It gave the industry and government time for reassessment, planning and refining management but, unfortunately, there still remains the need for further changes in management.

The costs associated with a buy-back program (relevant to Objective C) cannot be ignored since appropriate administrative mechanisms and staff will need to be established for the purchase of pots and the collection of levies from remaining fishermen. Administration costs of a pot reduction scheme can be expected to be considerably lower. Additional resources will be required for both schemes for surveillance and policing of the reduced numbers of pots since the incentive to "over pot" would be greater than now. As indicated above, the administration and policing costs of extensions to a closed season are likely to be the lowest amongst the various options.

Once input controls are installed, tightening those controls as the need arises seems to rank highly in terms of industry acceptance (Objective D1). It would be

unfortunate if this acceptability were for no other reason than a fear of change ("better the devil you know than the one you don't") or to protect those individuals who would lose from change[17].

Input controls tend to permit some flexibility (Objective D2) in the "upward" direction during the course of a season, that is, fishermen and managers can respond to some extent to rises in price and abundance. In the event of permanent improvement in conditions, controls could be lessened with relative ease, for example, by auctioning extra pot entitlements. Tightening controls, however, as the call for this study indicates, is not done easily or quickly so that there is less opportunity for timely decisions when things are going badly, either within a season or between seasons. Minimising the adverse distributional effects of a program (Objective D3) will require additional information and may depend on the way it is implemented. Part of this study is to attempt to identify the distributional effects of tightening input controls.

---

17 Even though it has become something of a cliche it is never out of place to recall that:

> *There is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. For the reformer has enemies in all who profit by the old order, and only lukewarm defenders in all those who would profit by the new order. The lukewarmness arises partly from fear of their adversaries who have law in their favour; and partly from the incredulity of mankind, who do not truly believe in anything new until they have had actual experience of it.* [Machiavelli, The Prince]

5. EVALUATION OF SELECTED OPTIONS FROM VIEWPOINT OF FISHERMEN

The major focus for our examination of management options from the viewpoint of fishermen is a financial analysis using the models that were proposed in Section 3.6. Three models were proposed for each of the western and the eastern zones. While six models cannot possibly describe the full extent of variation over the total population of the 96 lobster enterprises in the western zone and the 77 enterprises in the eastern zone, use of the six models provides a convenient method for demonstrating, to at least some extent, some of the range of consequences for financial performance of management options.

The financial modelling which is reported here has been conducted from the viewpoint of individual enterprises in the fishery which are judged to be representative of groups of enterprises. The analyses using these models of the various options for effort reduction are designed to complement the analyses of DCNR Fisheries (1995). We have not constructed bioeconomic models of the fishery to investigate the overall performance of the fishery under the various schemes. Such fishery-wide bioeconomic modelling, which would consider the interactions between effort and the stock and how the actions of any fisherman would affect the activity of all other fishermen, is only beginning to become possible with the most recent stock assessment of the fishery (Hobday and Smith 1995). Such modelling must be the next step in fine-tuning the chosen option. There is probably sufficient qualitative evidence and experience from other rock lobster fisheries, coupled with the enterprise-oriented analyses presented here to choose the preferred management regime.

The models proposed in Section 3.6 were based on average values of receipts and expenditure per pot from groups within the consultants' survey sample and were expressed in 1995 dollar values. For the purposes of evaluating management options, it is necessary to consider the effects over a number of years, so the consultants have re-specified those models to describe the financial performance for fishermen over a ten year period. A number of important assumptions are made in these models, notably that:

- all fishermen are assumed to pay tax in the year that income is received and at an average tax rate of 32 per cent;
- lobster prices are specified in Year 1 as $30 per kg in the western zone and $33 per kg in the eastern zone, and are inflated thereafter, as are costs, in line with an assumed inflation rate of 5 per cent; and that
- trip costs and hired labour costs vary in direct proportion to the number of pot lifts, but all other expenditure remains fixed.

All fishermen are assumed to have no accumulated funds at the start of the period, and the performance measure used is the level of accumulated funds at the end of the ten year period.

TABLE 5.1 FINANCIAL MODEL 1 - WESTERN ZONE

MODEL 1
PRESENT ARRANGEMENTS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Kg p.a.	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$348,300	$365,715	$384,001	$403,201	$423,361	$444,529	$466,755	$490,093	$514,598	$540,328	$567,344
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$148,360	$154,878	$161,722	$168,908	$176,453	$184,376	$192,695	$201,430	$210,601	$220,231	$230,343
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$61,549	$64,914	$68,448	$72,158	$76,054	$80,145	$84,440	$88,950	$93,686	$98,658	$103,879
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$94,791	$100,143	$105,762	$111,662	$117,857	$124,362	$131,192	$138,364	$145,894	$153,801	$162,103
ACCUMULATED FUNDS	N.A.	$100,143	$205,905	$317,567	$435,424	$559,786	$690,978	$829,341	$975,235	$1,129,036	**$1,291,138**

TABLE 5.2 FINANCIAL MODEL 2 - WESTERN ZONE

MODEL 2
PRESENT ARRANGEMENTS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Kg p.a.	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$193,050	$202,703	$212,838	$223,480	$234,653	$246,386	$258,705	$271,641	$285,223	$299,484	$314,458
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$88,000	$91,850	$95,893	$100,137	$104,594	$109,274	$114,187	$119,347	$124,764	$130,452	$136,425
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$32,240	$34,028	$35,905	$37,877	$39,947	$42,120	$44,402	$46,798	$49,314	$51,955	$54,729
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$32,510	$34,510	$36,609	$38,813	$41,128	$43,558	$46,110	$48,790	$51,603	$54,558	$57,659
ACCUMULATED FUNDS	N.A.	$34,510	$71,118	$109,932	$151,060	$194,618	$240,729	$289,519	$341,122	$395,680	**$453,339**

TABLE 5.3 FINANCIAL MODEL 3 - WESTERN ZONE

MODEL 3
PRESENT ARRANGEMENTS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Kg p.a.	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$121,500	$127,575	$133,954	$140,651	$147,684	$155,068	$162,822	$170,963	$179,511	$188,486	$197,911
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$85,000	$88,500	$92,175	$96,034	$100,085	$104,340	$108,807	$113,497	$118,422	$123,593	$129,023
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$11,008	$11,798	$12,628	$13,500	$14,415	$15,375	$16,384	$17,443	$18,556	$19,723	$20,950
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($12,608)	($12,728)	($12,855)	($12,988)	($13,127)	($13,273)	($13,427)	($13,588)	($13,758)	($13,936)	($14,122)
ACCUMULATED FUNDS	N.A.	($12,728)	($25,583)	($38,571)	($51,698)	($64,971)	($78,398)	($91,986)	($105,744)	($119,680)	**($133,802)**

TABLE 5.4 FINANCIAL MODEL 1 - EASTERN ZONE

MODEL 1
PRESENT ARRANGEMENTS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	50	50	50	50	50	50	50	50	50	50	50
Lifts per pot	128	128	128	128	128	128	128	128	128	128	128
Pot lifts p.a.	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
Kg per pot lift	0.50	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Kg p.a.	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200
RECEIPTS											
Average price	$33.00	$34.65	$36.38	$38.20	$40.11	$42.12	$44.22	$46.43	$48.76	$51.19	$53.75
Gross receipts p.a.	$105,600	$110,880	$116,424	$122,245	$128,357	$134,775	$141,514	$148,590	$156,019	$163,820	$172,011
CASH COSTS p.a.											
Fixed costs	$5,750	$6,038	$6,339	$6,656	$6,989	$7,339	$7,706	$8,091	$8,495	$8,920	$9,366
Trip costs	$11,900	$12,495	$13,120	$13,776	$14,465	$15,188	$15,947	$16,744	$17,582	$18,461	$19,384
Hired labour costs	$3,900	$4,095	$4,300	$4,515	$4,740	$4,977	$5,226	$5,488	$5,762	$6,050	$6,353
Repairs & maintenance	$4,700	$4,935	$5,182	$5,441	$5,713	$5,999	$6,298	$6,613	$6,944	$7,291	$7,656
Interest & loan costs	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$34,200	$35,513	$36,891	$38,338	$39,857	$41,452	$43,128	$44,886	$46,733	$48,672	$50,708
IMPUTED COSTS p.a.											
Living expenses	$33,150	$34,808	$36,548	$38,375	$40,294	$42,309	$44,424	$46,645	$48,978	$51,427	$53,998
Depreciation	$3,750	$3,938	$4,134	$4,341	$4,558	$4,786	$5,025	$5,277	$5,540	$5,817	$6,108
Tax	$21,648	$22,858	$24,128	$25,461	$26,862	$28,332	$29,876	$31,497	$33,199	$34,986	$36,862
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$12,852	$13,765	$14,723	$15,730	$16,787	$17,896	$19,061	$20,285	$21,569	$22,918	$24,334
ACCUMULATED FUNDS	N.A.	$13,765	$28,488	$44,218	$61,005	$78,901	$97,963	$118,248	$139,817	$162,735	**$187,070**

TABLE 5.5 FINANCIAL MODEL 2 - EASTERN ZONE

MODEL 2
PRESENT ARRANGEMENTS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	30	30	30	30	30	30	30	30	30	30	30
Lifts per pot	107	107	107	107	107	107	107	107	107	107	107
Pot lifts p.a.	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210
Kg per pot lift	0.20	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Kg p.a.	642	642	642	642	642	642	642	642	642	642	642
RECEIPTS											
Average price	$33.00	$34.65	$36.38	$38.20	$40.11	$42.12	$44.22	$46.43	$48.76	$51.19	$53.75
Gross receipts p.a.	$21,186	$22,245	$23,358	$24,525	$25,752	$27,039	$28,391	$29,811	$31,301	$32,866	$34,510
CASH COSTS p.a.											
Fixed costs	$5,760	$6,048	$6,350	$6,668	$7,001	$7,351	$7,719	$8,105	$8,510	$8,936	$9,382
Trip costs	$4,830	$5,072	$5,325	$5,591	$5,871	$6,164	$6,473	$6,796	$7,136	$7,493	$7,868
Hired labour costs	$2,520	$2,646	$2,778	$2,917	$3,063	$3,216	$3,377	$3,546	$3,723	$3,909	$4,105
Repairs & maintenance	$3,210	$3,371	$3,539	$3,716	$3,902	$4,097	$4,302	$4,517	$4,743	$4,980	$5,229
Interest & loan costs	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$16,980	$17,796	$18,653	$19,552	$20,497	$21,489	$22,530	$23,624	$24,772	$25,978	$27,244
IMPUTED COSTS p.a.											
Living expenses	$17,100	$17,955	$18,853	$19,795	$20,785	$21,824	$22,916	$24,061	$25,264	$26,528	$27,854
Depreciation	$3,090	$3,245	$3,407	$3,577	$3,756	$3,944	$4,141	$4,348	$4,565	$4,794	$5,033
Tax	$357	$386	$415	$447	$480	$514	$550	$588	$628	$670	$715
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($16,341)	($17,136)	($17,970)	($18,846)	($19,766)	($20,732)	($21,746)	($22,811)	($23,929)	($25,103)	($26,336)
ACCUMULATED FUNDS	N.A.	($17,136)	($35,106)	($53,952)	($73,718)	($94,450)	($116,196)	($139,007)	($162,936)	($188,039)	**($214,374)**

TABLE 5.6 FINANCIAL MODEL 3 - EASTERN ZONE

MODEL 3
PRESENT ARRANGEMENTS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	30	30	30	30	30	30	30	30	30	30	30
Lifts per pot	107	107	107	107	107	107	107	107	107	107	107
Pot lifts p.a.	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210
Kg per pot lift	0.30	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Kg p.a.	963	963	963	963	963	963	963	963	963	963	963
RECEIPTS											
Average price	$33.00	$34.65	$36.38	$38.20	$40.11	$42.12	$44.22	$46.43	$48.76	$51.19	$53.75
Gross receipts p.a.	$31,779	$33,368	$35,036	$36,788	$38,628	$40,559	$42,587	$44,716	$46,952	$49,300	$51,765
CASH COSTS p.a.											
Fixed costs	$5,760	$6,048	$6,350	$6,668	$7,001	$7,351	$7,719	$8,105	$8,510	$8,936	$9,382
Trip costs	$4,830	$5,072	$5,325	$5,591	$5,871	$6,164	$6,473	$6,796	$7,136	$7,493	$7,868
Hired labour costs	$2,520	$2,646	$2,778	$2,917	$3,063	$3,216	$3,377	$3,546	$3,723	$3,909	$4,105
Repairs & maintenance	$3,210	$3,371	$3,539	$3,716	$3,902	$4,097	$4,302	$4,517	$4,743	$4,980	$5,229
Interest & loan costs	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$16,980	$17,796	$18,653	$19,552	$20,497	$21,489	$22,530	$23,624	$24,772	$25,978	$27,244
IMPUTED COSTS p.a.											
Living expenses	$17,100	$17,955	$18,853	$19,795	$20,785	$21,824	$22,916	$24,061	$25,264	$26,528	$27,854
Depreciation	$3,090	$3,245	$3,407	$3,577	$3,756	$3,944	$4,141	$4,348	$4,565	$4,794	$5,033
Tax	$3,747	$3,945	$4,153	$4,371	$4,600	$4,840	$5,093	$5,358	$5,637	$5,929	$6,236
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($9,138)	($9,572)	($10,029)	($10,507)	($11,010)	($11,539)	($12,093)	($12,675)	($13,287)	($13,928)	($14,602)
ACCUMULATED FUNDS	N.A.	($9,572)	($19,601)	($30,108)	($41,119)	($52,657)	($64,750)	($77,425)	($90,712)	($104,640)	**($119,243)**

The level of accumulated funds represents the funds remaining after:

1. meeting all business expenses;
2. paying the owner an allowance based on a *pro rata* share of $36,000 per year;
3. setting aside (depreciation) funds to allow for the replacement of assets as they reach the end of their useful life; and
4. after paying tax[18].

The models depict the six groups of fishermen are presented in Tables 5.1 though 5.6[19]. The six models have been used to evaluate the financial impacts for fishermen of a number of management options and the results of those analyses are summarised in the following sub-sections of this report. Full details of the results are presented in Appendix 2.

As explained in Section 4, there is a range of options available for managing the fishery and there are presently a number of detailed proposals to reduce effort by various amounts. For the purpose of meaningful comparison, we evaluate in this Section a number of options which would all be aimed at to reducing effort **by 20 per cent for the western zone** and by **45 per cent for the eastern zone.**. The consultants stress that they have not chosen the 20 and 45 per cent reductions in effort based on any particular proposal by DCNR or fishermen. We just wanted a hypothetical level of reduction for each zone with which to compare a number of management changes on a consistent basis. Since we analyse buy-backs, pot reductions and closed seasons, we wanted to compare these management measures on a consistent basis for each zone. Accordingly, we have analysed

for the western zone, a buy-back, a pot reduction, and an increased close season each designed to reduce effort by 20 per cent

for the eastern zone, a buy-back and a pot reduction, each designed to reduce effort by 45 per cent

5.1 BUY-BACK

5.1.1 Western zone 20 per cent buy-back

As explained in Section 4.3.1, DCNR has proposed a buy-back of pots as one option for reducing effort in the western zone. The buy-back would involve a freeze on all transfers of pot entitlements between fishermen for a given period, but the Government would seek to purchase entire holdings of pot entitlements during that period. In this manner the Government would purchase a stated proportion of pot

---

18 For the purposes of simplifying the analysis, no interest is earned on accumulated funds nor paid against personal borrowings, and income averaging for taxation purposes is ignored.

19 These tables use the term "living expenses" to refer to the allowance paid for the owner's labour and management.

entitlements which would lead to a reduction in the number of fishermen as well as a reduction in fishing effort. The Government would fund the purchase of the pot entitlement, but the remaining fishermen would be required to pay a levy in order to repay the loan.

We have evaluated the buy-back option on the basis of the Government purchasing 20 per cent of pots and have used DCNR's own estimate of the size of levy that would be payable; namely, a levy of $261 per remaining pot per year over ten years. DCNR has assumed a buy-out price of $6,000 per pot and used a nominal interest rate of 12 per cent to calculate the loan repayment schedule on which the levy is based. The consultants are satisfied that an interest rate of 12 per cent would be consistent with the 5 per cent level of inflation assumed in the financial models.

While DCNR has assumed a pot value of $6,000, those market values do of course vary and have risen steeply over the past few in years in response to the increased lobster prices that have been available on the export market. The market value for pot entitlements in the western zone was $6,000 per pot at the end of the 1994/95 season and the average price for the total fishery was about $31 per kg (see Table 5.7).

TABLE 5.7

AVERAGE PRICES RECEIVED BY FISHERMEN FOR LOBSTERS 1993/94 AND 1994/95 ($ PER KG)

Season	Eastern zone	Western zone
1993/94	$29.84	$29.54
1994/95	$32.06	$31.12

Source: DCNR

The consultants have undertaken a sensitivity analysis on the possible effect of lobster prices on the market value of pot entitlements for the western zone. This represents an over-simplification in that it assumes that profits alone determine the price that fishermen are prepared to pay to purchase pot entitlements in a particular season. In reality the market price for pot entitlements would reflect also expectations about future lobster prices and about other characteristics in the fishery. For example, the present discussion about changes to the management of the fishery could in itself be substantially affecting the market value of pot entitlements. However, it is to be expected that, everything else being constant, the market price for pot entitlements would reflect directly the present and expected future levels of profits for fishermen.

Profit as a rate of return on assets for MODEL 2 was 10 per cent and the consultants have estimated, for a range of lobster prices, how the value of a pot entitlement would have to vary in order that a rate of return on all assets for MODEL 2 remained at 10 per cent. The results are presented in Table 5.8.

TABLE 5.8

SENSITIVITY OF PREDICTED MARKET VALUE OF A POT ENTITLEMENT TO CHANGES IN LOBSTER PRICE

Lobster price ($ per kg)	PREDICTED MARKET VALUE OF A POT ENTITLEMENT (rounded to nearest $ '00))
$24.00	$1,500
$26.00	$3,000
$28.00	$4,500
$30.00	$6,000
$32.00	$7,500
$34.00	$9,000
$36.00	$10,500

Our evaluation of the buy-back estimates the financial implications for the fishermen who would not sell their pots. There is no need to evaluate the implications of the buy-back for those fishermen who would sell their pots to the Government under the buy-back proposal. The implications for those fishermen would be straightforward; namely, they would cease to own pot entitlements and be paid a once-off price of $6,000 per pot. The additional costs for those fishermen remaining are also straightforward; namely, they would incur a levy of $261 per pot for ten years. Fishermen and DCNR officers have advised that expenditure for the remaining fishermen would not be increased providing that they did not increase their number of pot lifts.

The benefits for those remaining fishermen are by no means straightforward to estimate. It is accepted by everyone that the individual catches for the remaining fishermen would increase once 20 per cent of the pots had been withdrawn from the fishery, but there are many views as to the extent by which catches would increase.

DCNR (1995), in the report of its own evaluation of a buy-back proposal, suggested that the fishery is possibly producing less than its maximum sustainable yield and that a 25 per cent buy-back (i.e. involving a 25 per cent reduction of real effort) would lead to approximately that level of effort which is associated with the maximum sustainable yield for the western zone. That is, the new equilibrium level of total catch for the zone would be greater than the present level of catch of about 430 tonne per year. The paper suggested that the maximum sustainable yield would be achieved after Year 2 and that it would lead to an approximately 35 per cent increase in yield for remaining pots.

The consultants have identified a range of views about the likely extent and timing of improvements in yield for the fishery following a buy-back. In the first instance we have analysed the 20 per cent buy-back as if it would lead to a recovery of total catch for the zone which would be the same as the present level of catch of about 430 tonne per year and that it would take five years for this new equilibrium to be achieved[20]. The consultants then proceed to calculate what level of increase in

---

20 With 20% less pots in the fishery, this would represent a 25% increase in yield for the remaining pots. At first glance this may seem odd and the reader can be forgiven for

yield would be required for fishermen to break-even with their present level of financial performance.

The results of our initial analysis are summarised in Table 5.9. Appendix Tables 2.1 through 2.3 present the full details with the buy-back and should be compared to Tables 5.1 through 5.3 above which present the details for the present situation without a buy-back.

The initial analysis reveals that all remaining fishermen, as represented by the three financial models, would increase their wealth with the buy-back **if** the benefits achieved were as modelled; namely a progressive recovery to the present level of total catch for the western zone over five years. The majority of fishermen, as represented by MODELS 1 and 2, estimated by the consultants to be representative of 60 to 70 per cent of fishermen in the western zone, would be better off by $160,000 to $500,000 in accumulated funds at the end of ten years from the buy-back as modelled. Even the "below average" fishermen, as represented by MODEL 3, would be better off by about $140,000 in accumulated funds at the end of ten years.

The question remains as to whether these benefits would really be achieved. On one hand the actual benefits could arguably be greater than those modelled. This would be the case if the fishery were presently producing considerably less than its maximum sustainable yield and that the total catch from the zone would increase with a 20 per cent buy-back. Further it may be that the new equilibrium would be achieved in less than five years.

On the other hand, there are many reasons why the actual benefits could arguably be lower than those modelled. For example:

1. Some of the pots purchased by the Government may be presently be under-utilised or not used at all (i.e. latent effort).

2. A new equilibrium could only be achieved rapidly if the pots purchased by the Government were relinquished by fishermen who were fairly uniformly spread across the zone in a geographic, or spatial, sense. For example, in the extreme, the majority of pots relinquished might all come from in and around one particular port, in which case it would take much longer for fishermen at other ports to experience any benefit from the reduced effort.

3. Thirdly, and perhaps most importantly, the benefits could only be achieved if the reduction of 20 per cent in pot numbers did translate into 20 per cent less pot lifts. Other fisheries that have used buy-backs to reduce fishing effort have found that the potential benefits have not been sustained because the remaining fishermen increased their total fishing effort even with the reduced number of pots. Fishermen have done this

---

thinking that a buy back of 20% of pots and a recovery to present level of total catch for the zone would lead to a 20% increase in yield for the remaining pots. However, it should be thought of as a 20% increase for 80% of the pots (and of course 20% as a fraction of 80% is 25%).

by adopting different technologies and changing other inputs in order to increase the average number of lifts per pot.

TABLE 5.9
ACCUMULATED FUNDS OVER TEN YEARS
20 PER CENT BUY-BACK FOR WESTERN ZONE
(total catch for zone restored progressively over 5 years)

YEAR	MODEL 1		MODEL 2		MODEL 3	
	No change	With buy-back	No change	With buy-back	No change	With buy-back
1	$100,143	$97,314	$34,510	$31,640	-$12,728	-$16,377
2	$205,905	$213,924	$71,118	$72,961	-$25,583	-$28,110
3	$317,567	$351,450	$109,932	$124,807	-$38,571	-$34,738
4	$435,424	$511,621	$151,060	$188,087	-$51,698	-$35,766
5	$559,786	$696,289	$194,618	$263,770	-$64,971	-$30,665
6	$690,978	$891,566	$240,729	$344,099	-$78,398	-$24,398
7	$829,341	$1,097,982	$289,519	$429,306	-$91,986	-$16,910
8	$975,235	$1,316,095	$341,122	$519,636	-$105,744	-$8,137
9	$1,129,036	$1,546,488	$395,680	$615,345	-$119,680	$1,983
10	$1,291,138	$1,789,775	$453,339	$615,345	-$133,802	$13,519
Difference at end of Year 10	+$498,637		+$162,006		+$147,321	

The above results refer to a scenario involving catch rates for the remaining pots increasing by 25 per cent over five years (i.e. total catch for the western zone being restored to its present levels). Because the consultants cannot be at all certain about the actual level of benefits associated with the 20 per cent buy-back, the level of increase on catch rate that would be required for fishermen to break-even has been calculated[21]. This has produced the following estimates of the break-even rates of increase in catch rate for the remaining fishermen:

MODEL 1 5.9 per cent increase in catch rate

MODEL 2 6.8 per cent increase in catch rate

MODEL 3 8.8 per cent increase in catch rate

That is, fishermen as represented by the consultants' three base models for the western zone would need to experience only an increase in catch rate of about 6 to 9 per cent in order to justify the payment of the levy of $261 per pot. The full details of the calculations of the break-even rates of increase in catch for the base models are presented in Appendix Tables 2.4 through 2.6.

---

21 For this purpose, we have defined "break-even" as achieving the same level of accumulated funds at the end of ten years, and for simplicity have ignored the fact that the pattern of cash flows leading up to that date would be different to those pertaining to the "present situation" (i.e. without the buy back).

Some important assumptions should be borne in mind when interpreting these estimates. For example as explained above:

1. lobster prices are specified as $30 per kg in Year 1 and are inflated thereafter, as are costs, in line with an assumed inflation rate of 5 per cent; and that

2. there is no change in the number of pot lifts and consequently expenditure remains fixed except to vary in line with the assumed inflation rate.

A point that arises from this analysis is that while the number of pots and the cost structure varies between our three base models, these differences are **irrelevant** in estimating the break-even level of increase in catch that would be required to justify the payment of the buy-back levy. The break-even level of increase in catch that would be required to justify the payment of the buy-back levy depends solely on a fisherman's catch rate prior to the buy-back, for a given set of lobster prices.

The level of increase on catch rate that would be required for fishermen to break-even has been calculated for a range of lobster prices and the results are summarised in Table 5.10 (see Appendix Tables 2.13 to 2.37 for full details)[22].

TABLE 5.10
20 PER CENT BUY-BACK FOR WESTERN ZONE
BREAK-EVEN LEVEL OF INCREASED CATCH FOR REMAINING FISHERMEN
SENSITIVITY TO LOBSTER PRICE AND TO BASE LEVEL OF CATCH RATE

Lobster price:	$20/kg	$25/kg	$30/kg	$35/kg	$40/kg
Level of catch rate					
0.45 kg/lift	8.8%	7.0%	5.9%	5.0%	4.4%
0.65 kg/lift	10.1%	8.1%	6.8%	5.8%	5.1%
0.75 kg/lift	13.2%	10.6%	8.8%	7.5%	6.6%

This sensitivity analysis has suggested that all remaining fishermen would need to experience an increase in catch rate of only about 4 to 13 per cent in order to justify the payment of the levy of $261 per pot providing that average lobster prices remain in the range of $20 to $40 per kg (in 1995 dollar values).

The consultants emphasise that a number of other important conditions would need to be met in order that any increase in catch could be achieved. The extent of increase in catch for the remaining fishermen would largely depend on how many active pots were withdrawn (as distinct from latent effort being withdrawn). For

---

22 The base MODELS 1, 2 and 3 include only catch rates of 0.75, 0.65 and 0.45 kg per pot lift respectively so we have modified all three models to encompass a wider range of catch rates.

example, the chances of a recovery in the fishery to present levels of catch would fall to the extent that latent effort was withdrawn.

Similarly the chances of the fishery recovering to its present level of catch would depend greatly on the remaining fishermen not increasing their fishing effort. Fishing effort has been increasingly rapidly over the past decade, particularly due to the greater use of technologies including colour sounders, satellite navigation and faster boats.

5.1.2 Eastern zone 45 per cent buy-back

DCNR (1995), in the report of its own evaluation of an earlier buy-back proposal, suggested that the fishery is presently producing substantially less than its maximum sustainable yield and that with a buy-back of 50 per cent of real effort, the yield for remaining pots would more than double.

We have evaluated the buy-back option on the basis of the Government purchasing 45 per cent of pots and used a nominal interest rate of 12 per cent to calculate the loan repayment schedule on which the levy is based; namely, a levy of $215 per remaining pot per year over ten years for a buy-out price of $1,500 per pot.

We have used 45 per cent of the actual number of pots so as to provide a comparison with the following option for a pot reduction scheme which has been put forward by some fishermen in the eastern zone. DCNR (1995) suggested that 50 per cent reduction in actual effort would translate into almost 60 per cent of the actual number of pots have allowing for inactive pots. DCNR also assumed a purchase price of $2,000 per pot. The reader is referred to that publication for a comparison with the buy-back modelled here.

In the first instance we have analysed the 45 per cent buy-back as if it would lead to a recovery of total catch for the zone which would be the same as the present and that it would take five years for this new equilibrium to be achieved[23]. The consultants then proceed to calculate what level of increase in yield would be required for fishermen to break-even with their present level of financial performance.

Table 5.11 shows that a buy-back, all other things constant, would improve the position of the three enterprises which remain in the fishery after the buy-back, or, in the case of Model 2 make it less bad. Broadly speaking, the larger and more productive enterprises would gain most under the assumptions embodied in the proposal. Further details are presented in Tables 5.12 through 5.14.

The analysis presented in Table 5.11 through 5.14 assumes that the catch rate for the remaining fishermen would increase by 82%, but only a lesser increase would be required for fishermen to "break even".

---

23 With 45% less pots in the fishery, this would represent an 82% increase in yield for the remaining pots. It should be thought of as a 45% increase for 55% of the pots (and 45% as a fraction of 55% is 81.8%).

TABLE 5.11
ACCUMULATED FUNDS OVER TEN YEARS
45 PER CENT BUY-BACK FOR EASTERN ZONE
(total catch for zone restored progressively over 5 years)

YEAR	MODEL 1		MODEL 2		MODEL 3	
	No change	With buy-back	No change	With buy-back	No change	With buy-back
1	$13,765	$18,790	-$17,136	-$19,047	-$9,572	-$10,246
2	$28,488	$52,107	-$35,106	-$36,206	-$19,601	-$16,865
3	$44,218	$101,326	-$53,952	-$51,253	-$30,108	-$19,481
4	$61,005	$167,921	-$73,718	-$63,946	-$41,119	-$17,688
5	$78,901	$253,474	-$94,450	-$74,023	-$52,657	-$11,052
6	$97,963	$343,942	-$116,196	-$84,363	-$64,750	-$3,843
7	$118,248	$439,568	-$139,007	-$94,978	-$77,425	+$3,969
8	$139,817	$540,612	-$162,936	-$105,882	-$90,712	+$12,413
9	$162,735	$647,343	-$188,039	-$117,089	-$104,640	+$21,521
10	$187,070	$760,047	-$214,374	-$128,615	-$119,243	+$31,326
Difference at end of Year 10	+$572,977		+$85,759		+$150,569	

Our estimates of the rates of increase in catch rate that would be required for the remaining fishermen to break-even are:

MODEL 1 9.3 per cent increase in catch rate

MODEL 2 27.7 per cent increase in catch rate

MODEL 3 18.5 per cent increase in catch rate

5.1.3 Overall

It would appear from our financial analyses that using a buy-back to reduce effort would represent a very good investment of funds for the fishermen who remained after the buy-back. The consultants believe that the 20 per cent buy-back proposal has been shown to be such a good investment primarily because of two features of the scheme (as proposed and modelled); namely:

1. Both boats and pots would be withdrawn from the fishery.

2. The remaining fishermen would not increase fishing effort.

The financial success of the buy-back proposal, from the viewpoint of fishermen, would be diminished to the extent that any of these features did not eventuate. Such a diminution seems to be a real possibility and the consultants are concerned that the above analysis details only the first round effects of a buy-back and that there is a real danger that the second round of changes that would follow a buy-back would include a continuation of the spiralling increase in effort that has driven the fishery for so long.

TABLE 5.12

MODEL 1 - EASTERN ZONE
45% BUY-BACK WITH TOTAL CATCH FOR THE ZONE BEING RESTORED OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	50	50	50	50	50	50	50	50	50	50	50
Lifts per pot	128	128	128	128	128	128	128	128	128	128	128
Pot lifts p.a.	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
Kg per pot lift	0.50	0.5818	0.6636	0.7454	0.8272	0.909	0.909	0.909	0.909	0.909	0.909
Kg p.a.	3,200	3,724	4,247	4,771	5,294	5,818	5,818	5,818	5,818	5,818	5,818
RECEIPTS											
Average price	$33.00	$34.65	$36.38	$38.20	$40.11	$42.12	$44.22	$46.43	$48.76	$51.19	$53.75
Gross receipts p.a.	$105,600	$129,020	$154,518	$182,243	$212,355	$245,022	$257,273	$270,136	$283,643	$297,825	$312,716
CASH COSTS p.a.											
Fixed costs	$5,750	$6,038	$6,339	$6,656	$6,989	$7,339	$7,706	$8,091	$8,495	$8,920	$9,366
Trip costs	$11,900	$12,495	$13,120	$13,776	$14,465	$15,188	$15,947	$16,744	$17,582	$18,461	$19,384
Hired labour costs	$3,900	$4,095	$4,300	$4,515	$4,740	$4,977	$5,226	$5,488	$5,762	$6,050	$6,353
Repairs & maintenance	$4,700	$4,935	$5,182	$5,441	$5,713	$5,999	$6,298	$6,613	$6,944	$7,291	$7,656
Interest & loan costs	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950
Buy back levy	N.A.	$10,750	$10,750	$10,750	$10,750	$10,750	$10,750	$10,750	$10,750	$10,750	$10,750
Total	$34,200	$46,263	$47,641	$49,088	$50,607	$52,202	$53,878	$55,636	$57,483	$59,422	$61,458
IMPUTED COSTS p.a.											
Living expenses	$33,150	$34,808	$36,548	$38,375	$40,294	$42,309	$44,424	$46,645	$48,978	$51,427	$53,998
Depreciation	$3,750	$3,938	$4,134	$4,341	$4,558	$4,786	$5,025	$5,277	$5,540	$5,817	$6,108
Tax	$21,648	$25,222	$32,878	$41,221	$50,301	$60,171	$63,478	$66,951	$70,598	$74,427	$78,448
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$12,852	$18,790	$33,317	$49,219	$66,595	$85,554	$90,467	$95,626	$101,044	$106,732	$112,704
ACCUMULATED FUNDS	N.A.	$18,790	$52,107	$101,326	$167,921	$253,474	$343,942	$439,568	$540,612	$647,343	**$760,047**

TABLE 5.13

MODEL 2 - EASTERN ZONE
45% BUY-BACK WITH TOTAL CATCH FOR THE ZONE BEING RESTORED OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	30	30	30	30	30	30	30	30	30	30	30
Lifts per pot	107	107	107	107	107	107	107	107	107	107	107
Pot lifts p.a.	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210
Kg per pot lift	0.20	0.23272	0.26544	0.29816	0.33088	0.3636	0.3636	0.3636	0.3636	0.3636	0.3636
Kg p.a.	642	747	852	957	1,062	1,167	1,167	1,167	1,167	1,167	1,167
RECEIPTS											
Average price	$33.00	$34.65	$36.38	$38.20	$40.11	$42.12	$44.22	$46.43	$48.76	$51.19	$53.75
Gross receipts p.a.	$21,186	$25,885	$31,000	$36,563	$42,604	$49,157	$51,615	$54,196	$56,906	$59,751	$62,739
CASH COSTS p.a.											
Fixed costs	$5,760	$6,048	$6,350	$6,668	$7,001	$7,351	$7,719	$8,105	$8,510	$8,936	$9,382
Trip costs	$4,830	$5,072	$5,325	$5,591	$5,871	$6,164	$6,473	$6,796	$7,136	$7,493	$7,868
Hired labour costs	$2,520	$2,646	$2,778	$2,917	$3,063	$3,216	$3,377	$3,546	$3,723	$3,909	$4,105
Repairs & maintenance	$3,210	$3,371	$3,539	$3,716	$3,902	$4,097	$4,302	$4,517	$4,743	$4,980	$5,229
Interest & loan costs	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660
Buy back levy	N.A.	$6,450	$6,450	$6,450	$6,450	$6,450	$6,450	$6,450	$6,450	$6,450	$6,450
Total	$16,980	$24,246	$25,103	$26,002	$26,947	$27,939	$28,980	$30,074	$31,222	$32,428	$33,694
IMPUTED COSTS p.a.											
Living expenses	$17,100	$17,955	$18,853	$19,795	$20,785	$21,824	$22,916	$24,061	$25,264	$26,528	$27,854
Depreciation	$3,090	$3,245	$3,407	$3,577	$3,756	$3,944	$4,141	$4,348	$4,565	$4,794	$5,033
Tax	$357	($514)	$797	$2,235	$3,808	$5,528	$5,918	$6,328	$6,758	$7,210	$7,684
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($16,341)	($19,047)	($17,159)	($15,047)	($12,693)	($10,078)	($10,340)	($10,615)	($10,904)	($11,207)	($11,526)
ACCUMULATED FUNDS	N.A.	($19,047)	($36,206)	($51,253)	($63,946)	($74,023)	($84,363)	($94,978)	($105,882)	($117,089)	**($128,615)**

TABLE 5.14

MODEL 3 - EASTERN ZONE
45% BUY-BACK WITH TOTAL CATCH FOR THE ZONE BEING RESTORED OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	30	30	30	30	30	30	30	30	30	30	30
Lifts per pot	107	107	107	107	107	107	107	107	107	107	107
Pot lifts p.a.	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210
Kg per pot lift	0.30	0.34908	0.39816	0.44724	0.49632	0.5454	0.5454	0.5454	0.5454	0.5454	0.5454
Kg p.a.	963	1,121	1,278	1,436	1,593	1,751	1,751	1,751	1,751	1,751	1,751
RECEIPTS											
Average price	$33.00	$34.65	$36.38	$38.20	$40.11	$42.12	$44.22	$46.43	$48.76	$51.19	$53.75
Gross receipts p.a.	$31,779	$38,827	$46,500	$54,844	$63,905	$73,736	$77,423	$81,294	$85,359	$89,627	$94,108
CASH COSTS p.a.											
Fixed costs	$5,760	$6,048	$6,350	$6,668	$7,001	$7,351	$7,719	$8,105	$8,510	$8,936	$9,382
Trip costs	$4,830	$5,072	$5,325	$5,591	$5,871	$6,164	$6,473	$6,796	$7,136	$7,493	$7,868
Hired labour costs	$2,520	$2,646	$2,778	$2,917	$3,063	$3,216	$3,377	$3,546	$3,723	$3,909	$4,105
Repairs & maintenance	$3,210	$3,371	$3,539	$3,716	$3,902	$4,097	$4,302	$4,517	$4,743	$4,980	$5,229
Interest & loan costs	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660
Buy back levy	N.A.	$6,450	$6,450	$6,450	$6,450	$6,450	$6,450	$6,450	$6,450	$6,450	$6,450
Total	$16,980	$24,246	$25,103	$26,002	$26,947	$27,939	$28,980	$30,074	$31,222	$32,428	$33,694
IMPUTED COSTS p.a.											
Living expenses	$17,100	$17,955	$18,853	$19,795	$20,785	$21,824	$22,916	$24,061	$25,264	$26,528	$27,854
Depreciation	$3,090	$3,245	$3,407	$3,577	$3,756	$3,944	$4,141	$4,348	$4,565	$4,794	$5,033
Tax	$3,747	$3,628	$5,757	$8,085	$10,625	$13,393	$14,177	$14,999	$15,863	$16,770	$17,722
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($9,138)	($10,246)	($6,619)	($2,616)	$1,793	$6,636	$7,210	$7,812	$8,444	$9,108	$9,805
ACCUMULATED FUNDS	N.A.	($10,246)	($16,865)	($19,481)	($17,688)	($11,052)	($3,843)	$3,969	$12,413	$21,521	**$31,326**

5.2 UNIFORM REDUCTION IN POT NUMBERS FOR EASTERN ZONE

A group of fishermen in the eastern zone has proposed a uniform pot reduction of 15 pots per licence over three years, that is, five pots in each year. This would remove about 1,140 pots or roughly 45 per cent of the present number of pots. This proposal has been evaluated on the same basis as the buy-back proposal in the previous Section, namely, catch is assumed to be restored progressively to the present level over five years. The summary of results is shown in Table 5.15. The difference between these results and those for the buy-back is that Table 5.15 shows the implications of the pot reduction, all other things constant, for **all** fishermen represented by each of the three models, whereas Table 5.11 shows the implications of the buy-back for **remaining** fishermen of each type, that is, those who do not sell to the buy-back authority.

Comparison of these two options for the same reduction in pot numbers (45 per cent) shows that remaining fishermen under a buy-back will be considerably better-off than those who are assumed to remain (all) after a uniform pot reduction, all other things constant. As indicated in Section 3, and discussed in relation to the western zone buy-back, all other things would be far from constant under both options. In particular, under the pot reduction proposal the position of the 30-pot enterprises becomes even more tenuous than it is under the no-change scenario[24]. If the assumption that catches return to present levels is not achieved, and all evidence suggests it will not be achieved because some or all fishermen will work harder with smaller pot numbers, there is little margin of difference before these enterprises would be worse off under this scheme compared to no change. This gives rise to the arguments in Section 3 that a pot reduction scheme of this magnitude could cause considerable hardship to the smaller enterprises unless they retire from the fishery. Such an effect would be amplified by a uniform pot reduction scheme which would withdraw the same number of pots proposed under the DCNR (1995) evaluation of a buy-back, namely, 60 per cent or 1,581 pots. Such a scheme would correspond to a uniform reduction of about 21 pots per enterprise.

A proportional pot reduction scheme has not been modelled for the eastern zone because its results are fairly easily predicted. If the percentage reduction were equivalent to the above 45 per cent, the effect on the smaller enterprises would be similar to, but slightly less than, the above uniform scheme since a 30-pot enterprise would loose about 13 pots. The effect on the larger enterprise would be greater since it would lose about 23 pots compared to 15 pots under the uniform scheme. The effect of a 60 per cent reduction in total pots would be considerable on both sizes of enterprise. It could be argued that such a reduction may impose a considerable barrier to the potentially-efficient larger enterprises realising that potential because they would have to buy a large number of pots to regain their present size.

---

[24] The result shown in Table 5.15 that the lower productivity 30-pot enterprise (Model 2) would be slightly better off than the higher productivity 30-pot enterprise (Model 3) results from the assumption that catches return to current catch. As discussed in the text both enterprises would be in a difficult position if this does not occur.

TABLE 5.15
ACCUMULATED FUNDS OVER TEN YEARS
UNIFORM 15 POT REDUCTION FOR EASTERN ZONE
(total catch for zone restored progressively over 5 years)

YEAR	MODEL 1		MODEL 2		MODEL 3	
	No change	With 15 pot cut	No change	With 15 pot cut	No change	With 15 pot cut
1	$13,765	$18,455	-$17,136	-$16,720	-$9,572	-$9,386
2	$28,488	$40,437	-$35,106	-$34,683	-$19,601	-$20,322
3	$44,218	$63,519	-$53,952	-$54,882	-$30,108	-$34,306
4	$61,005	$98,021	-$73,718	-$74,637	-$41,119	-$46,818
5	$78,901	$145,014	-$94,450	-$93,852	-$52,657	-$57,677
6	$97,963	$194,627	-$116,196	-$114,006	-$64,750	-$69,056
7	$118,248	$246,991	-$139,007	-$135,146	-$77,425	-$80,982
8	$139,817	$302,244	-$162,936	-$157,319	-$90,712	-$93,482
9	$162,735	$360,529	-$188,039	-$180,576	-$104,640	-$106,584
10	$187,070	$421,999	-$214,374	-$204,980	-$119,243	-$120,319
Difference at end of Year 10	+$234,929		+$9,394		-$1,076	

TABLE 5.16

MODEL 1 - EASTERN ZONE
FORFEITURE OF 15 POTS OVER THREE YEARS WITH TOTAL CATCH FOR THE ZONE BEING RESTORED OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	50	45	40	35	35	35	35	35	35	35	35
Lifts per pot	128	128	128	128	128	128	128	128	128	128	128
Pot lifts p.a.	6,400	5,760	5,120	4,480	4,480	4,480	4,480	4,480	4,480	4,480	4,480
Kg per pot lift	0.50	0.5818	0.6636	0.7454	0.8272	0.909	0.909	0.909	0.909	0.909	0.909
Kg p.a.	3,200	3,351	3,398	3,339	3,706	4,072	4,072	4,072	4,072	4,072	4,072
RECEIPTS											
Average price	$33.00	$34.65	$36.38	$38.20	$40.11	$42.12	$44.22	$46.43	$48.76	$51.19	$53.75
Gross receipts p.a.	$105,600	$116,118	$123,614	$127,570	$148,648	$171,515	$180,091	$189,095	$198,550	$208,478	$218,902
CASH COSTS p.a.											
Fixed costs	$5,750	$6,038	$6,339	$6,656	$6,989	$7,339	$7,706	$8,091	$8,495	$8,920	$9,366
Trip costs	$11,900	$11,246	$10,496	$9,643	$10,125	$10,631	$11,163	$11,721	$12,307	$12,923	$13,569
Hired labour costs	$3,900	$3,686	$3,440	$3,160	$3,318	$3,484	$3,658	$3,841	$4,033	$4,235	$4,447
Repairs & maintenance	$4,700	$4,935	$5,182	$5,441	$5,713	$5,999	$6,298	$6,613	$6,944	$7,291	$7,656
Interest & loan costs	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$34,200	$33,854	$33,407	$32,851	$34,096	$35,403	$36,775	$38,217	$39,730	$41,319	$42,988
IMPUTED COSTS p.a.											
Living expenses	$33,150	$34,808	$36,548	$38,375	$40,294	$42,309	$44,424	$46,645	$48,978	$51,427	$53,998
Depreciation	$3,750	$3,938	$4,134	$4,341	$4,558	$4,786	$5,025	$5,277	$5,540	$5,817	$6,108
Tax	$21,648	$25,065	$27,543	$28,921	$35,198	$42,024	$44,253	$46,593	$49,049	$51,629	$54,338
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$12,852	$18,455	$21,982	$23,082	$34,502	$46,993	$49,613	$52,364	$55,253	$58,285	$61,470
ACCUMULATED FUNDS	N.A.	$18,455	$40,437	$63,519	$98,021	$145,014	$194,627	$246,991	$302,244	$360,529	**$421,999**

TABLE 5.17

MODEL 2 - EASTERN ZONE
FORFEITURE OF 15 POTS OVER THREE YEARS WITH TOTAL CATCH FOR THE ZONE BEING RESTORED OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	30	25	20	15	15	15	15	15	15	15	15
Lifts per pot	107	107	107	107	107	107	107	107	107	107	107
Pot lifts p.a.	3,210	2,675	2,140	1,605	1,605	1,605	1,605	1,605	1,605	1,605	1,605
Kg per pot lift	0.20	0.23272	0.26544	0.29816	0.33088	0.3636	0.3636	0.3636	0.3636	0.3636	0.3636
Kg p.a.	642	623	568	479	531	584	584	584	584	584	584
RECEIPTS											
Average price	$33.00	$34.65	$36.38	$38.20	$40.11	$42.12	$44.22	$46.43	$48.76	$51.19	$53.75
Gross receipts p.a.	$21,186	$21,571	$20,667	$18,281	$21,302	$24,579	$25,808	$27,098	$28,453	$29,876	$31,369
CASH COSTS p.a.											
Fixed costs	$5,760	$6,048	$6,350	$6,668	$7,001	$7,351	$7,719	$8,105	$8,510	$8,936	$9,382
Trip costs	$4,830	$4,226	$3,550	$2,796	$2,935	$3,082	$3,236	$3,398	$3,568	$3,746	$3,934
Hired labour costs	$2,520	$2,205	$1,852	$1,459	$1,532	$1,608	$1,689	$1,773	$1,862	$1,955	$2,052
Repairs & maintenance	$3,210	$3,371	$3,539	$3,716	$3,902	$4,097	$4,302	$4,517	$4,743	$4,980	$5,229
Interest & loan costs	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$16,980	$16,510	$15,952	$15,298	$16,030	$16,799	$17,606	$18,453	$19,342	$20,277	$21,257
IMPUTED COSTS p.a.											
Living expenses	$17,100	$17,955	$18,853	$19,795	$20,785	$21,824	$22,916	$24,061	$25,264	$26,528	$27,854
Depreciation	$3,090	$3,245	$3,407	$3,577	$3,756	$3,944	$4,141	$4,348	$4,565	$4,794	$5,033
Tax	$357	$581	$419	($190)	$485	$1,228	$1,300	$1,375	$1,454	$1,538	$1,625
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($16,341)	($16,720)	($17,963)	($20,199)	($19,754)	($19,216)	($20,154)	($21,139)	($22,174)	($23,260)	($24,401)
ACCUMULATED FUNDS	N.A.	($16,720)	($34,683)	($54,882)	($74,637)	($93,852)	($114,006)	($135,146)	($157,319)	($180,579)	**($204,980)**

TABLE 5.18

MODEL 3 - EASTERN ZONE
FORFEITURE OF 15 POTS OVER THREE YEARS WITH TOTAL CATCH FOR THE ZONE BEING RESTORED OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	30	25	20	15	15	15	15	15	15	15	15
Lifts per pot	107	107	107	107	107	107	107	107	107	107	107
Pot lifts p.a.	3,210	2,675	2,140	1,605	1,605	1,605	1,605	1,605	1,605	1,605	1,605
Kg per pot lift	0.30	0.34908	0.39816	0.44724	0.49632	0.5454	0.5454	0.5454	0.5454	0.5454	0.5454
Kg p.a.	963	934	852	718	797	875	875	875	875	875	875
RECEIPTS											
Average price	$33.00	$34.65	$36.38	$38.20	$40.11	$42.12	$44.22	$46.43	$48.76	$51.19	$53.75
Gross receipts p.a.	$31,779	$32,356	$31,000	$27,422	$31,953	$36,868	$38,711	$40,647	$42,679	$44,813	$47,054
CASH COSTS p.a.											
Fixed costs	$5,760	$6,048	$6,350	$6,668	$7,001	$7,351	$7,719	$8,105	$8,510	$8,936	$9,382
Trip costs	$4,830	$4,226	$3,550	$2,796	$2,935	$3,082	$3,236	$3,398	$3,568	$3,746	$3,934
Hired labour costs	$2,520	$2,205	$1,852	$1,459	$1,532	$1,608	$1,689	$1,773	$1,862	$1,955	$2,052
Repairs & maintenance	$3,210	$3,371	$3,539	$3,716	$3,902	$4,097	$4,302	$4,517	$4,743	$4,980	$5,229
Interest & loan costs	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$16,980	$16,510	$15,952	$15,298	$16,030	$16,799	$17,606	$18,453	$19,342	$20,277	$21,257
IMPUTED COSTS p.a.											
Living expenses	$17,100	$17,955	$18,853	$19,795	$20,785	$21,824	$22,916	$24,061	$25,264	$26,528	$27,854
Depreciation	$3,090	$3,245	$3,407	$3,577	$3,756	$3,944	$4,141	$4,348	$4,565	$4,794	$5,033
Tax	$3,747	$4,032	$3,725	$2,735	$3,893	$5,160	$5,429	$5,711	$6,007	$6,318	$6,644
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($9,138)	($9,386)	($10,936)	($13,984)	($12,512)	($10,859)	($11,379)	($11,926)	($12,500)	($13,102)	($13,735)
ACCUMULATED FUNDS	N.A.	($9,386)	($20,322)	($34,306)	($46,818)	($57,677)	($69,056)	($80,982)	($93,482)	($106,584)	**($120,319)**

5.3 PROPORTIONAL REDUCTION IN POT NUMBERS OR LENGTH OF SEASON

We consider here a proposal to reduce effort by imposing the same percentage reduction in pot numbers on all fishermen or by extending the closed seasons for all fishermen. Other schemes might involve changes to gear restrictions, but are not considered here.

Schemes to reduce effort by requiring all fishermen to reduce pots by a certain proportion and schemes to extend the length of closed season by a certain period for all fishermen are not analysed separately and instead we treat them both as reductions in effort by the same proportion for all fishermen. The differences between the pot reductions and closed season options would occur in the second round of adjustments that would be likely to follow subsequent to the imposition of the input controls to reduce fishing effort. Just as with a buy-back, the second round of adjustments might involve an increase in effort and hence a negation of the potential benefits from the schemes. For example, it may be that a closed season option would lead mainly to a subsequent shift of fishing effort between periods of the year, while a pot reduction option would lead mainly to a subsequent amalgamation of licences and/or each fisherman working harder.

It is with reluctance that the consultants acknowledge that we have no basis for predicting the possible set of second round effects - just as the consultants could not and did not attempt to devise scenarios to detail the second round adjustment for the buy-back proposal. These matters are discussed further below, but after examining the first round effects of the two schemes proposed to bring about an across-the-board reduction in effort.

The consultants have used their financial models to evaluate a 20 per cent across-the-board reduction in effort which considers only the first round effects. The impacts are modelled simply as:

- all fishermen having to reduce immediately their number of pot lifts by 20 per cent,
- all fishermen remaining in the industry and the fishery recovering to its present level of total catch progressively over five years; and the only other change in the model is that
- trip costs and hired labour costs are correspondingly reduced by 20 per cent.

The results are summarised in Table 5.19 and full details are presented in Appendix Tables 2.38 to 2.40 (which should be compared with Tables 5.1 to 5.3 which present comparable details for fishermen under present management). The benefit of the schemes as modelled are much smaller than for the buy-back. These results reveal that each group of fishermen (the "above-average" group as represented by MODEL 1, the "typical" group of fishermen as represented by MODEL 2 and the "below-average" group as represented by MODEL 3) would be worse off financially for about seven years, and would be only very slightly better off by the end of even ten years. In fact the slight benefit at the end of ten years is probably illusory as the financial models used do not take account of any additional interest payable on increased overdrafts.

TABLE 5.19
ACCUMULATED FUNDS OVER TEN YEARS
20 PER CENT EFFORT REDUCTION ACROSS THE BOARD FOR WESTERN ZONE (total catch for western zone restored over 5 years)

YEAR	MODEL 1		MODEL 2		MODEL 3	
	No change	With Scheme	No change	With Scheme	No change	With Scheme
1	$100,143	$74,230	$34,510	$20,738	-$12,728	-$19,897
2	$205,905	$163,229	$71,118	$48,676	-$25,583	-$36,635
3	$317,567	$268,256	$109,932	$84,463	-$38,571	-$49,875
4	$435,424	$390,663	$151,060	$128,797	-$51,698	-$59,249
5	$559,786	$531,893	$194,618	$182,423	-$64,971	-$64,364
6	$690,978	$680,796	$240,729	$239,104	-$78,398	-$69,225
7	$829,341	$837,757	$289,519	$298,993	-$91,986	-$73,820
8	$975,235	$1,003,177	$341,122	$362,250	-$105,744	-$78,133
9	$1,129,036	$1,177,481	$395,680	$429,045	-$119,680	-$82,153
10	$1,291,138	$1,361,112	$453,339	$499,553	-$133,802	-$85,863
Difference at end of Year 10	+$69,974		+$46,214		+$47,939	

As modelled, an across the board reduction in effort would represent little improvement in the financial performance of any fishermen, but there was a substantial improvement modelled for the buy-back option. The main reason why the buy-back appears superior to across the board reductions in effort is that the reduction in boat numbers occurs simultaneously with the initial reduction in pot number. In reality, fishermen would certainly proceed to initiate their own private trading to amalgamate licences following either an across-the-board pot reduction or extension of closed seasons.

Indeed it would be the fact that all fishermen would be worse off financially over the first approximately seven years that would provide the impetus for many fishermen to organise other adjustments to their own enterprises rapidly following the introduction of the schemes. That is, second round adjustments would proceed to avoid that eventuality. We have not devised scenarios for what those adjustments might involve since the analysis of the buy-back above provides the best indication of what they might be. A very rational response to across-the-board effort reduction schemes would be for fishermen to mimic exactly the first round effects that are imposed by a buy-back; namely, to

1. amalgamate licences and as such have one group of fishermen buying out the licences of other fishermen (just as the Government would buy out the licences of one group with the "buy-back" scheme); and

2. arrange finance to cover the costs of that purchase of licences (repayment of privately arranged loans would be exactly equivalent to the buy-back levy).

To demonstrate this point, the financial models have been used to show the implications of an across-the-board pot reduction of 20 per cent being followed by 20 per cent of pots being amalgamated in the following year. The results are shown

in Tables 5.20 to 5.22[25] and the consultants make no apologies for the fact that they are basically duplicates of the table used to demonstrate the effects of the 20 per cent buy-back. The only substantial difference from the buy-back scheme (see Appendix Table 2.1 to 2.3) is that instead of a "buy-back levy" of $261 per pot over ten years, we have specified repayments of a private loan equivalent to $261 per pot over ten years to repay the purchase of pots at a price of $6,000 per pot.

25 These should be compared to the base models as presented in Tables 5.1 through 5.3 above which present the details for the present situation without a scheme to reduce effort.

TABLE 5.20

MODEL 1 **20% BUY BACK IN YEAR 1 WITH FISHERMAN RE-PURCHASING THOSE POTS IN FOLLOWING YEAR AND TOTAL CATCH FOR THE ZONE BEING RESTORED PROGRESSIVELY OVER 5 YEARS**

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	69	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	12,384	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.7875	0.825	0.8625	0.9	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375
Kg p.a.	11,610	9,752	12,771	13,352	13,932	14,513	14,513	14,513	14,513	14,513	14,513
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$348,300	$307,201	$422,401	$463,681	$508,033	$555,661	$583,444	$612,616	$643,247	$675,410	$709,180
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$32,508	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$49,123	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Repayment of loan to purchase pots back	N.A.	$0	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446
Total	$148,360	$134,470	$184,168	$191,354	$198,899	$206,822	$215,141	$223,876	$233,047	$242,677	$252,789
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$61,549	$52,720	$73,553	$84,329	$95,967	$108,525	$114,598	$120,975	$127,671	$134,702	$142,084
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$94,791	$74,230	$116,611	$137,525	$160,171	$184,669	$195,277	$206,416	$218,112	$230,393	$243,288
ACCUMULATED FUNDS	N.A.	$74,230	$190,841	$328,366	$488,537	$673,206	$868,483	$1,074,899	$1,293,011	$1,523,404	**$1,766,692**

TABLE 5.21

MODEL 2 **20% BUY BACK IN YEAR 1 WITH FISHERMAN RE-PURCHASING THOSE POTS IN FOLLOWING YEAR AND TOTAL CATCH FOR THE ZONE BEING RESTORED PROGRESSIVELY OVER 5 YEARS**

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	44	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	7,920	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.6825	0.715	0.7475	0.78	0.8125	0.8125	0.8125	0.8125	0.8125	0.8125
Kg p.a.	6,435	5,405	7,079	7,400	7,722	8,044	8,044	8,044	8,044	8,044	8,044
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$193,050	$170,270	$234,121	$257,001	$281,584	$307,983	$323,382	$339,551	$356,528	$374,355	$393,073
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$21,000	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$27,720	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Repayment of loan to purchase pots back	N.A.	$11,484	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$91,154	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$32,240	$23,872	$38,123	$44,010	$50,371	$57,237	$60,505	$63,936	$67,538	$71,321	$75,292
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$32,510	$12,929	$41,321	$51,847	$63,280	$75,683	$80,329	$85,207	$90,330	$95,708	$101,356
ACCUMULATED FUNDS	N.A.	$12,929	$54,249	$106,096	$169,376	$245,059	$325,387	$410,595	$500,925	$596,633	**$697,989**

TABLE 5.22

MODEL 3 **20% BUY BACK IN YEAR 1 WITH FISHERMAN RE-PURCHASING THOSE POTS IN FOLLOWING YEAR AND TOTAL CATCH FOR THE ZONE BEING RESTORED PROGRESSIVELY OVER 5 YEARS**

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	36	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	7,200	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.4725	0.495	0.5175	0.54	0.5625	0.5625	0.5625	0.5625	0.5625	0.5625
Kg p.a.	4,050	3,402	4,455	4,658	4,860	5,063	5,063	5,063	5,063	5,063	5,063
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$121,500	$107,163	$147,349	$161,749	$177,221	$193,835	$203,527	$213,703	$224,389	$235,608	$247,388
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$19,320	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$20,160	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Repayment of loan to purchase pots back	N.A.	$9,396	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745
Total	$85,000	$88,026	$103,920	$107,779	$111,830	$116,085	$120,552	$125,242	$130,167	$135,338	$140,768
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$11,008	$5,418	$13,156	$16,493	$20,108	$24,023	$25,652	$27,362	$29,158	$31,044	$33,024
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($12,608)	($26,286)	($11,733)	($6,628)	($1,029)	$5,102	$6,266	$7,489	$8,773	$10,120	$11,536
ACCUMULATED FUNDS	N.A.	($26,286)	($38,019)	($44,647)	($45,675)	($40,573)	($34,307)	($26,818)	($18,046)	($7,925)	**$3,610**

5.4 INDIVIDUAL TRANSFERABLE QUOTAS

The consultants do not have sufficient information to use the models to look at the financial impacts that would flow from the introduction of quotas. We have no basis for knowing how the fishing techniques and inputs, and hence costs, might change after the lifting of present input controls. Instead we consider the quantitative implications of various methods of allocating the initial quotas.

As discussed below, the unit in which quota is designated should allow the greatest possible flexibility to alter the TAC in response to changes in the biological and economic conditions of the fishery. It would be difficult to alter the TAC from year to year if fishermen were allocated a long-term right to take a given quantity of fish. Greater flexibility is achieved if fishermen are granted a right to take a share of the TAC. This share could be stated simply as a percentage of the TAC which would be translated into a catch quota when the TAC for the season was announced.

The question becomes: how to determine the share of the TAC to be allocated to each fisherman? The question is complicated by the fact that current management is based on entitlements to use pots which have been traded in the market. While the price of pot entitlements within a given zone is determined by the catching performance of the efficient fishermen, there is considerable variation in the performance of fishermen as they use pots to catch lobster (see Table 3.1 for the relative standard errors around the mean catch per pot for each zone).

It must be emphasised that there is no scientific way to derive a "fair and equitable" allocation. What is fair and equitable depends on your viewpoint and, ultimately, deciding on the allocation system to be used is a political matter. Ideally, it would be decided by industry rather than government if it were to gain full support. Government would, of course, want a say in the question of whether to have quota-based management or not.

5.4.1 Allocation by pot entitlement

5.4.1.1 Demonstration of the principle

One way to determine the allocation to each fisherman would be solely on the basis of pot entitlements. Under this system each pot would receive the same allocation. If there were 1000 pots in the fishery, each pot would receive 1/1000th of the TAC. Thus, if the TAC were set at 100 tonnes each pot would receive a catch quota of 100 kg and a fisherman who held 50 pots would receive 0.050 (5 per cent) of the TAC, namely, five tonnes. Under this system of allocation, the question of "latent" (little-used pots) becomes a significant part of the problem.

This can be illustrated with a highly-simplified, hypothetical fishery (based on a similar example in Bowen 1994) consisting of the five fishermen shown in Table 5.23.

Each fisherman has 50 pots or 20 per cent of the total pots and, as shown in Table 5.24, would receive a share of 20 per cent of the TAC set for a given year.

TABLE 5.23 PARTICIPANTS IN A SIMPLIFIED, HYPOTHETICAL FISHERY

Fisherman	No. Pots	Catch (kg)	Kg/pot
V	50	2,000	40
W	50	2,500	50
X	50	3,000	60
Y	50	3,500	70
Z	50	4,000	80
Total	**250**	**15,000**	**Av. = 60**

TABLE 5.24 QUOTA ALLOCATIONS BASED ON POTS, CATCH AND THE ADJUSTED PREFERRED METHOD

Fisherman	% Based on Pots	% Based on Catch History	% Based on Adjusted Preferred Method
V	20.0	13.3	18.2
W	20.0	16.7	18.2
X	20.0	20.0	18.2
Y	20.0	23.3	20.9
Z	20.0	26.7	24.5

Allocation by pot entitlement is a very convenient and simple system of allocation because the share of the TAC allocated to each fisherman is readily determined and would allow pots to be maintained as the trading unit of quota. It is to be expected that those fishermen who catch a low weight of rock lobsters per pot will tend to favour such an allocation method but those who catch a high weight per pot will tend to oppose it. That is, favour or opposition under the pot allocation system would be influenced by a fisher's expectations of the value of the average catch in the zone, relative to his own average catch per pot.

If the catches per pot did not vary greatly between fishermen in the zone (i.e. were clustered around the average), it might be expected that relatively few fishermen would object to this method of allocation. Opposition to the system will arise when the dispersion around the average is wide so that the fishermen with high catches per pot will see themselves disadvantaged while fishermen with low productivity

would gain. These high-productivity fishermen would tend to argue that catch history should be the basis of quota allocation.

5.4.1.2 Allocation based on pot entitlements using the samples of each zone

We have expanded the above simple example to the more complex case where the fishery in each zone is assumed to consist of the sample used in our survey - 20 fishermen in the western zone and 10 fishermen in the eastern zone.

The scheme involves allocating the same level of TAC per pot to each fisherman. For reasons of confidentiality the consultants cannot present the results for individual fishermen; however, the broad effects can be demonstrated by showing the frequency distribution for discrete sets of impacts.

Having used the actual performance over two years to determine the detail of the allocation rules, we have then simulated the schemes as if they had actually been in operation for 1993/94 and 1994/95 and determined what would have been the differences for individual fishermen compared to their actual situations in 1993/94 and 1994/95.

Western zone

The actual average level of CPUE for the fishermen over the two years 1993/94 and 1994/95 was about 110 kg per pot, therefore each pot would receive this allocation. We simulated each fisherman's catch for 1993/94 and 1994/95 as if the TAC of 110 kg applied to fishermen in both years. The actual distribution of changes in catch, in absolute terms, is presented in Table 5.25.

TABLE 5.25
DISTRIBUTION OF IMPACTS FOR WESTERN ZONE SAMPLE TAC BASED ON "SAMPLE INDUSTRY" AVERAGE

Change in kg caught	Percentage of fishermen	
	1993/94	1994/95
greater increase than 1,500 kg	17%	7%
+1,001 to +1,500 kg	0%	27%
+501 to +1,000 kg	25%	13%
+1 to +500 kg	25%	13%
-1 to -500 kg	0%	13%
-501 to -1,000 kg	8%	0%
-1,001 to -1,500 kg	0%	13%
greater reduction than 1,500 kg	25%	13%
	100%	100%

Impacts would vary between fishermen with approximately the same number of gainers as losers. Most fishermen experienced gains or losses of 500 kg to 1,500

kg per year. Those fishermen who had previously achieved the highest catch rate would be the ones for whom the greatest reductions in catch would occur. Conversely those fishermen who had previously achieved the lowest catch rate would be the ones for whom the greatest increases in catch would occur.

Eastern zone

The actual average level of kg per pot for the fishermen in the eastern zone sample over the two years 1993/94 and 1994/95 was about 35 kg per pot, so we have simulated each fisherman's catch for 1993/94 and 1994/95 as if the TAC of 35 kg applied to all fishermen in both years. The actual distribution of those catch reductions in absolute terms is presented in Table 5.26.

TABLE 5.26
DISTRIBUTION OF IMPACTS FOR EASTERN ZONE SAMPLE
TAC BASED ON "SAMPLE INDUSTRY" AVERAGE

Change in kg caught	Percentage of fishermen	
	1993/94	1994/95
greater increase than 600 kg	14%	0%
+251 to +500 kg	14%	25%
+126 to +250 kg	0%	25%
+1 to +125 kg	0%	13%
-1 to -125 kg	14%	0%
-126 to -250 kg	29%	0%
-251 to -500 kg	29%	25%
greater reduction than 500 kg	0%	13%
	100%	100%

As would be expected, impacts would vary between fishermen in the eastern zone with approximately the same number of gainers as losers. Most fishermen experienced gains or losses of 125 kg to 500 kg per year which is much lower than the absolute size of gains and losses in the western zone.

We are unable to take the next step of simulating the allocation for the entire fishery in each zone because DCNR is unable to release the necessary data without the risk of breaching confidentiality. We note, however, that the sample in the western zone had a catch per pot (about 110 kg) considerably in excess of the zone average (about 78 kg). Therefore, the members of our sample would be likely to suffer a reduction in their quota relative to their current catches and would be unlikely to favour this method of allocation. The same would be true, but to a lesser extent, of our sample in the eastern zone where the sample average was 35 kg/pot compared to the zone average of 27 kg/pot.

5.4.2 Allocation by catch history

5.4.2.1 Demonstration of the principle

Under an allocation based on catch history, a fisherman would receive a share equal to his catch divided by the total catch in a given year or his average share over some number of years (which ever is taken to be the qualifying period). Thus, for example a fisherman in the western zone who caught 12 tonnes in 1994-95 (if

that were the only year considered) would receive a quota equal to 2.76 per cent (12/434) of the TAC, where the total catch in the western zone in 1994-95 was 434 tonnes. With allocation on the basis of catch history, the question of "latent" effort becomes irrelevant.

Returning to our hypothetical fishery with only five fishermen (shown in Tables 5.23 and 5.24), each fisherman receives a share equal to his catch divided by 15,000.

Those expected to oppose this system would include new entrants with high investment in pots and equipment and a short history of catch and others who would increase the potential value of their enterprise under a pot allocation system. Those who might have understated their catches in past years could be expected to be opposed to this method of allocation. If catch history is used as the sole method of allocation, or one variable among many in a formula for allocation (see Section 5.4.3), it would need to be considered how some particular types of cases would be treated, for example, where a boat was not operated in the qualifying period due to illness or serious malfunction of the boat.

Under a system based solely on catch history, or with catch history as one of several criteria, pots would cease to be the item traded because the catch associated with a pot depends on who operates the pot. The share of the catch would be traded and fishermen would be free to use as many pots as they wished, provided the quota was not exceeded[26]. It might, however, be decided to equalise the quota per pot by adjusting quota per pot towards the mean for the zone over a period of time. Such a procedure is employed in the southern zone of the South Australian fishery, where it is termed the APACHE (Adjusting Pots and Catch History for Equality) four-year model (the equalisation process will take four years)[27].

5.4.2.2 Allocation based on catch history using the samples of each zone

The consultants have used the survey data for individual fishermen to simulate the operation of the hypothetical scheme based on allocation in proportion to catch-history as if the sample constituted the fishery in each zone. Each fisherman receives a share equal to his catch divided by his average share over 1993/94 and 1994/95 (taken to be the qualifying period). Having used the actual performance of fishermen in our sample over the two years to determine the detail of the allocation rules, we have then simulated the scheme as if it had actually been in operation for 1993/94 and 1994/95, and determined what would have been the differences for individual fishermen compared to their actual situations in 1993/94 and 1994/95.

The distribution of impacts for fishermen in the western zone and eastern zone are presented in Table 5.27 and 5.28 respectively.

---

26 It has been suggested that this could lead to a fisherman "carpeting" an area with pots so as to make fishing difficult for others. As there is now no maximum number of pots per fisherman in the western zone which has the greater concentration of fishermen, this may no longer be perceived as a serious problem. Furthermore, there would be less incentive to do this under quota management.

27 Equalisation would be unnecessary if it were believed that technological change would soon cause the pot to be superseded as the main form of gear.

TABLE 5.27
DISTRIBUTION OF IMPACTS FOR WESTERN ZONE SAMPLE
TAC BASED ON INDIVIDUAL CATCH HISTORY

Change in kg caught	Percentage of fishermen	
	1993/94	1994/95
greater increase than 1,500 kg	8%	0%
+1,001 to +1,500 kg	0%	13%
+501 to +1,000 kg	0%	13%
+1 to +500 kg	33%	33%
-1 to -500 kg	25%	33%
-501 to -1,000 kg	17%	0%
-1,001 to -1,500 kg	17%	0%
greater reduction than 1,500 kg	0%	7%
	100%	100%

TABLE 5.28
DISTRIBUTION OF IMPACTS FOR EASTERN ZONE SAMPLE
TAC BASED ON INDIVIDUAL CATCH HISTORY

Change in kg caught	Percentage of fishermen	
	1993/94	1994/95
greater increase than 600 kg	0%	0%
+251 to +500 kg	0%	13%
+126 to +250 kg	29%	0%
+1 to +125 kg	43%	25%
-1 to -125 kg	14%	38%
-126 to -250 kg	0%	25%
-251 to -500 kg	14%	0%
greater reduction than 500 kg	0%	0%
	100%	100%

Fishermen who previously had below-average catch rates, either because of low efficiency or a low number of days fished, would receive the lowest TACs per pot. Impacts on the catches from an allocation of TAC based on individual catch history would once again vary widely between fishermen, but also between seasons. Particular fishermen would be gainers in years that otherwise would have been below-average catches for them. Conversely fishermen would be losers in years that otherwise would have been above-average catches for them.

We are unable to take the next step of simulating the allocation for the entire fishery in each zone because DCNR is unable to release the necessary data without the risk of breaching confidentiality. We note, however, that members of our sample in the western zone tend to have high catch histories (indicated by the high catches per pot) and would tend to favour this method of allocation relative to allocation on

the basis of pot entitlement. The same would be true in the eastern zone but to a lesser degree. By and large, members of our sample in the would be almost indifferent between these two methods of allocation.

5.4.3 Fixed weights on catch history and pot entitlements

Between the extremes of allocation by pot entitlement and catch history, the number of allocation models which attempt to reach a compromise position is limited only by one's belief about how many variables should be considered in an equitable distribution. Allocation of ITQs in the southern bluefin tuna fishery was done by a formula based on past catch (75 per cent) and investment in the fishery (25 per cent). Allocation in the south-east fishery was done by a more complicated formula involving catch history, vessel type and investment. On the other hand, the view of the dispassionate theorist might be that the only clean way to distribute the rights would be to auction them. In practice this would probably be condemned by all pot holders and certainty by those who had purchased their pot entitlements[28].

Two methods which consider both catch history and pot allocations are discussed because they have been given some attention in relation to rock lobster fisheries. The first of these is to combine allocations by pot entitlements and catch history in fixed proportions (that is, fixed weights).

The determinations of the share based on catch history and the share based on number of pots for the hypothetical fishery would be multiplied by weights and added together to give the percentage of the TAC for the fisherman in question. For example:

Your share	**equals**	your catch/total catch in zone (in qualifying period) x A
	plus	your number of pots/total pots in zone x (1-A)

Where A and 1-A are the designated weights. If A = 1-A = 0.5, equal weight is given to catch history and pot entitlements. If it were deemed appropriate for catch history to account for only 25 per cent of your share of the TAC, then A = 0.25 and 1-A = 0.75.

The shares which would be allocated to each of the five fishermen of the hypothetical fishery under three different weightings of pot entitlements and catch history are shown in Table 5.29.

---

28 The government could compulsorily acquire all pots at the going rate and auction entitlements to shares in a TAC. The net cost would be the transaction costs and any interest losses for the time the government "loan" was outstanding. In theory the total buying and selling amounts should cancel each other since the value of the fishery should be the same.

TABLE 5.29 QUOTA ALLOCATIONS WITH VARIOUS WEIGHTS FOR CATCH HISTORY AND POT ENTITLEMENTS

Fisherman	Catch (A) = 0.25 Pots (1-A) = 0.75	Catch (A) = 0.5 Pots (1-A) = 0.5	Catch (A) = 0.75 Pots (1-A) = 0.25
V	18.3	16.7	15.0
W	19.2	18.4	17.5
X	20.0	20.0	20.0
Y	20.8	21.7	22.5
Z	21.7	23.4	25.0

We have not performed a similar simulation as if our sample for each zone constituted the fishery in each zone because it would add little to the above demonstration of the principle.

5.4.4 The "Adjusted Preferred Method"

This method (also called the Presser model) was developed in South Australia and was used in the initial allocation of quota in the southern zone of the rock lobster fishery in that State (see SZRLFMC 1995 and Presser 1994). It allows each fisherman to choose their preferred basis - catch history or pot entitlements. Applied to the hypothetical fishery:

Fisherman V prefers pots (low catch)	0.20
Fisherman W prefers pots (low catch)	0.20
Fisherman X is indifferent between pots or catch	0.20
Fisherman Y prefers catch (high catch)	0.23
Fisherman Z prefers catch (high catch)	0.27

The total of the ratios is 1.10, which must be reduced to 1.00 so that all shares add to 100 per cent of the TAC. Thus, Fisherman V must have his ratio reduced to 0.20/1.10 = 0.182 or 18.2 per cent of the TAC. The resultant percentages of the TAC for fishermen in the hypothetical fishery are set out in Table 5.24 along with the shares calculated on the pots and catch history.

We have not performed a similar simulation as if our sample for each zone constituted the fishery in each zone because it would add little to the above demonstration of the principle.

5.4.5 Implications

The above demonstrations and application to the samples in each zone have shown that the method of quota allocation produces different outcomes depending on how fishermen have performed previously in the fishery. The four methods we have

demonstrated could be expanded to any number depending on what industry believes might be the important variables to consider in the interests of "fairness". Nevertheless, the four methods which have been considered show that there is considerable flexibility in attempting to reach a compromise position.

We emphasise our earlier statement that the choice to use quota-based management is one for both government and industry. If quota-based management is selected, the choice of the method for allocating initial ITQs to fishermen is best left to industry alone.

6. SUMMARY AND CONCLUSIONS

Present financial performance

There are major differences between the western and eastern zones of the fishery. The western zone comprises mainly specialist lobster fishermen who have typically invested $400,000 to $900,000 in their lobster fishing enterprises and rely solely on lobster fishing for their livelihood.

By contrast, many of the fishermen in the eastern zone appear to devote only some of their available time to lobster fishing, often they have a second source of income and most have invested $80,000 to $200,000 in their lobster fishing enterprises.

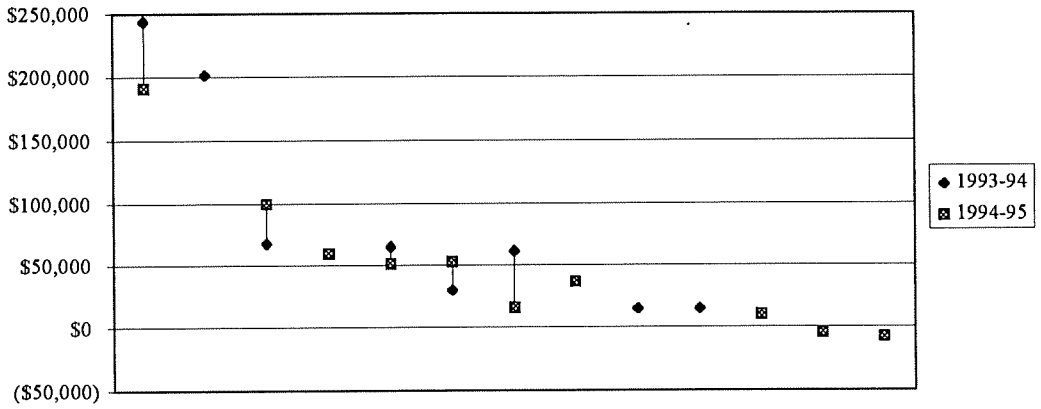
	Mean for sample eastern zone	Mean for sample western zone
Number of pots	36	62
Value of lobster licence	$86,300	$385,800
Value of other fishing assets	$103,420	$262,236
1993/94		
Pot lifts per pot	103	170
Kg per pot lift	0.33	0.76
Receipts from fishing	$73,834	$217,620
Profit	+$7,325	+$78,274
% return on assets	3.2%	11.3%
1994/95		
Pot lifts per pot	128	173
Kg per pot lift	0.26	0.62
Receipts from fishing	$38,740	$184,156
Profit	minus $9,179	+$49,154
% return on assets	-4.8%	7.9%

Western zone financial performance

The mean level of profit for the western zone sample was $78,274 for 1993/94 and $49,154 for 1994/95. By "profit", we mean the return to owner's equity capital remaining after paying the owner an allowance of $36,000 for their own labour and after paying interest on loans and after setting aside an amount to cover depreciation. Profit, as a percentage return on total assets, averaged 11.3 and 7.9 per cent in 1993/94 and 1994/95 respectively.

Performance varied considerably between fishermen, and the chart below presents the actual level of boat profit for some of the fishermen in the western zone sample. At one extreme there are fishermen earning a profit of $200,000 or more per year, while at the other extreme there are a few fishermen who make a small loss.

PROFIT FOR THE SAMPLE OF WESTERN ZONE LICENCE
(after paying $36,000 allowance plus depreciation and debt

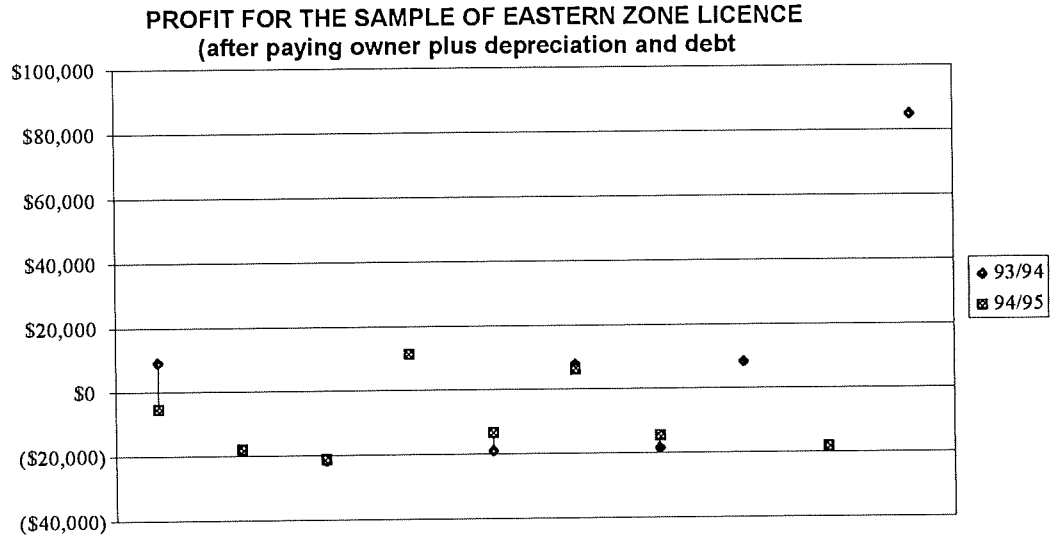


The financial performance of enterprises was extremely sensitive to two variables; namely, the price received for lobsters and the level of catch per pot lift. While the rate of return on assets for a "typical" fisherman in the western zone was 10 per cent with a catch rate of 0.65 kg per pot lift and a lobster price of $30 per kg, that fisherman's rate of return would be extremely sensitive to the price received for lobsters and to the catch rate. For example, prices for the opening of the 1995/96 season, at about $24 per kg, have been markedly lower than the previous season. If lobster prices of $24 were sustained for an entire season instead of $30 per kg, then the rate of return on assets would decline from 10 per cent to 4 per cent if nothing else changed. Similarly if the price remained at $30 per kg, but his catch rate increased to 0.75 kg per lift, then his rate of return would rise to 14.5%.

Eastern zone financial performance

The mean level of boat profit for the eastern zone sample was much lower that for the western zone. The mean profit for 1993/94 was $7,325 while for 1994/95 there was a mean **loss** of $9,178. The corresponding rates of return on total assets were 3.2 and -4.8 per cent.

Performance varies between fishermen, but not by the same extent as was observed for the western zone. While the performance in the western zone ranged across a continuum from very good to poor, the vast majority of fishermen in the eastern zone achieved poor performance relative to fishermen in the western zone in that they made small losses or small profits. The chart below presents the actual level of boat profit for the fishermen in the eastern zone sample. This demonstrates that at one extreme there was one fisherman earning a profit of about $80,000, while the remainder made mainly losses of around $10,000 to $20,000 per year or profits of around $10,000.



Participation in the rock lobster fishery in the eastern zone has the reputation of being much more to do with "lifestyle" compared to the much more business-oriented attitudes in the western zone. This is expressed in a number of ways, such as a higher levels of equity, fishermen with several sources of income, including other small fishing activities, fishermen who have retired from other work, and a willingness to work for lower returns to labour than the *pro rata* equivalent of average weekly earnings. Furthermore, from the assessment of "latent effort" in the two zones, it appears that some fishermen in the eastern zone would rather use their pots sparingly than dispose of them. These observations suggest that a good number of fishermen in the eastern zone receive significant non-monetary income from fishing for rock lobsters.

The need for a change in management

The two zones constitute separately managed fisheries in which the main management instruments are licence and pot limitations, size limits, closed seasons and gear restrictions. Even so, it is generally accepted that high levels of fishing effort for rock lobster have depleted the resource and that the current level of fishing is putting the long term future of the industry at risk. The continued long-term decline in the catch per pot lift is evidence that the levels of commercial and recreational catches are possibly beyond the maximum sustainable yield. There has been a 40 per cent increase in effort since 1988 and recreational fishing has also increased, yet catch rates (i.e. catch per unit effort or CPUE) have declined.

Change is needed to achieve a restructure of the industry such that the basic productivity of the stock is protected and harvest is economically efficient. In considering proposals for change there will always be tension between these objectives and the effects of the proposals on the welfare of the current generation of fishermen. The latter brings the issues of equity and fairness into the debate. All parties involved with the fishery need to be conscious that these differing viewpoints must be considered.

Proposals for change

Two broad types of changes to management have been proposed to attempt to rectify the problem of too much effort in the fishery. The first type of proposal is to tighten the existing input controls, either by reducing the number of pots in each zone (by government purchase of pot entitlements or by cancellation of pot entitlements) or by increasing the length of the closed season. The second type of proposal is to restrict the output from the fishery by imposing a total allowable catch and allocating this amongst fishermen in the form of individual transferable quotas.

As far as the financial data from the survey and the biological data on the fishery allow, these options have been assessed both qualitatively and quantitatively from the viewpoint of economic efficiency and the viewpoint of individual fishermen.

Input controls

Three types of schemes to reduce fishing effort have been considered: buy-back; pot reduction; and closed seasons.

Buy-back

The consultants have evaluated the buy-back proposal for the western zone in much more detail than the other proposals because the administrative detail of how effort would be reduced in the first instance is much clearer. DCNR officers believe that a 25 per cent reduction in effort would lead to a relatively rapid recovery of the western zone fishery to at least present levels of total catch if it (1) involved the removal of active pots, (2) that the pots removed were widely distributed across all ports in the fishery and (3) that the remaining fishermen did not increase their effort.

Similarly, DCNR officers believe that a 50 per cent reduction in effort would lead to a relatively rapid recovery of the eastern zone fishery to at least present levels of total catch.

However, economic theory and the practice of fisheries management in many countries, including many fisheries in Australia, have established that managing a fishery by controlling inputs causes inefficiencies in the production of fishing effort. The greater the ease in substituting uncontrolled inputs for controlled inputs, the greater the opportunity for substitution to occur and for the effective effort to increase. This means that, at any time, there must be a suite of controls on different inputs. When there is a technological advance in the use of one input the whole suite may need revision. Further controls on effort are required to offset fishermens' ingenuity at input substitution and the process will be repeated.

This "spiral" has been evident in the Victorian rock lobster fishery where the emphasis in management has been on controlling effort by tightening control over pot numbers. In the last 13 years there has been a once-off pot reduction of 17 per cent and an ongoing forfeiture (still in place) on the transfer of pot entitlements and whole licences. Yet, effort is now at record levels (some 40 per cent higher than when effort was first judged to be too high) and the fishery is poised for the next round of the spiral if reliance on effort reduction by input control is to continue.

The evidence is mounting that pot reduction schemes and pot buy-back schemes are not an economically desirable means of achieving **sustained** reductions in fishing effort. Indeed, the need for further reductions is a direct result of attempting to rely on input controls to overcome waste. If one proceeds down the path of pot reduction or buy-back, the inevitable question which must be asked is: "How long until the next round"?

Nevertheless, to attempt to gauge the effects as if they were successful, we have analysed the impacts of a 20 per cent buy-back for the western zone and a 45 per buy-back for the eastern zone.

The consultants stress that they have not chosen the 20 and 45 per cent reductions in effort based on any particular proposal by DCNR or fishermen. We just wanted a hypothetical level of reduction for each zone with which to compare a number of management changes on a consistent basis. Since we analyse buy-backs, pot reductions and closed seasons, we wanted to compare these management measures on a consistent basis for each zone. Accordingly, we have analysed for the western zone, a buy-back, a pot reduction, and an increased lose season each designed to reduce effort by 20 per cent; and for the eastern zone, a buy-back and a pot reduction, each designed to reduce effort by 45 per cent

In the first instance, we modelled the schemes as if they would lead to a recovery of total catch for each zone which would be the same as the present level of catch and that it would take five years for this new equilibrium to be achieved. The majority of fishermen in the western zone would be better off by $160,000 to $500,000 in accumulated funds at the end of ten years from the buy-back as modelled. Even the "below average" fishermen in the western zone would be better off by about $140,000 in accumulated funds at the end of ten years.

These results for the western zone refer to a scenario involving catch rates for the **remaining pots** increasing by 25 per cent[29] over five years (i.e. total catch for the western zone being restored to its present levels). Because the consultants cannot be at all certain about the actual level of benefits associated with the buy-back, the level of increase on catch rate that would be required for fishermen to break-even has been calculated. This sensitivity analysis has suggested that all remaining fishermen would need to experience an increase in catch rate of only about 4 to 13 per cent in order to justify the payment of the levy of $261 per pot providing that average lobster prices remain in the range of $20 to $40 per kg (in 1995 dollar values).

The hypothetical buy-back of 45 per cent of pots in the eastern zone has also been shown to be a good investment for fishermen. Whereas a recovery to present levels of total catch for the eastern zone would require an increase in catch per pot lift of about 82 per cent for the remaining fishermen in the eastern zone, we estimated the break-even rates of increase in catch rate for the remaining fishermen would need to be in the range of 9 to 28 per cent at a lobster price of $33 per kg.

The consultants emphasise that a number of other important conditions would need to be met in order that any increase in catch could be achieved. The extent of increase in catch for the remaining fishermen would largely depend on how many active pots were withdrawn (as distinct from latent effort being withdrawn). **The chances of a recovery in the fishery to present levels of catch would fall to the extent that latent effort was withdrawn. Similarly the chances of the fishery recovering to its present level of catch would depend greatly on the remaining fishermen not increasing their fishing effort.**

The apparent attractiveness of the buy-back options arise because it ensures that both the number of boats and number of pots were reduced simultaneously. This leads to immediate benefits from both the viewpoint of fishermen and the viewpoint of the wider economy. Fishermen would experience the benefit differently to the wider economy:

- the remaining fishermen would experience the benefit in terms of less pots competing for space with their own pots, but importantly
- the wider economy experiences the benefit in terms of less resources (boats) being used in the fishery.

It would appear from our financial analyses that using a buy-back to reduce effort would represent a good investment of funds for the fishermen who remained after the buy-back. The consultants believe that the 20 per cent buy-back proposal for the western zone, and the 45 per cent buy-back proposal for the eastern zone, have been shown to be good investments primarily because boats would be withdrawn from the fishery.

---

29 With 20% less pots in the fishery, this would represent a 25% increase in yield for the remaining pots. At first glance this may seem odd and the reader can be forgiven for thinking that a buy back of 20% of pots and a recovery to present level of total catch for the zone would lead to a 20% increase in yield for the remaining pots. However, it should be thought of as a 20% increase for 80% of the pots (and of course 20% as a fraction of 80% is 25%). Similarly, in the eastern zone, with 45% less pots in the fishery, a recovery to present level of total catch would require an 82% increase in yield for the remaining pots.

Pot reductions and closed seasons

In the first instance, across-the-board reductions in effort (pot reductions or extended closed seasons for all fishermen) would not achieve the same benefits as a buy-back, primarily because they would reduce fishing effort immediately, but not reduce the number of boats nor compensate the losers immediately. However, rational fishermen could then proceed subsequently to take the necessary steps themselves to ensure that the number of boats were reduced and that the losers were compensated. This would be achieved by fishermen trading licences amongst themselves to amalgamate of licences.

All fishermen would be worse off financially over the first years after an across-the-board reduction and this would provide the impetus for many fishermen to organise rapidly other adjustments to their own enterprises following the introduction of the schemes. A rational response to across-the-board effort reduction schemes would be for fishermen to mimic exactly the first round effects that are imposed by a buy-back; namely:

1. to amalgamate licences and as such have one group of fishermen buying out the licences of other fishermen (just as the Government would buy out the licences of one group with the "buy-back" scheme); and

2. to arrange finance to cover the costs of that purchase of licences (repayment of privately arranged loans would be equivalent to the buy-back levy).

If such a rational result did follow, then these other options to reduce effort are similar to the buy-back proposal from both the viewpoint of fishermen and the viewpoint of the wider economy, assuming the same costs of finance. Those who bought pot entitlements, however, would do so from a lower base than if the pot reductions had not occurred. This is a further inefficiency imposed by such a scheme.

To re-iterate, all proposals to reduce effort would be beneficial to the industry if it is expected that present levels of catch would at least be maintained, and possibly increased, if effort is reduced. The inevitable drawback is that all forms of input controls (buy-back, pot reductions or extended closed seasons) would be assured of only reducing effort in the short term as they achieve only a once-off reduction in effort.

Output control

Direct control over the quantity of catch by setting a TAC and the distribution of that TAC to fishermen in the form of ITQs is emerging in many countries and for many fisheries as the preferred method of fisheries management. In contrast to input controls, management using ITQs does not distort the production of effort and fishermen are free to choose their least-cost combination of how, when and with what gear they will fish. The freedom that ITQs give to fishermen about when to fish allows them to have safer and more "normal" lifestyles. The trading of ITQs permits the autonomous adjustment of fishing fleets and experience in ITQ-managed fisheries has been that this adjustment is rapid.

An output control, if properly managed, will allow many of the present input controls to be lifted, assisting the fleet to become more efficient.

Fishermen are likely to be concerned about what might be perceived as an unequal distribution of effects between fishermen. Allocating the same fraction of the TAC per pot to each fishermen would be seen as inequitable by fishermen with an above-average catch history in that it provides the seemingly perverse result of penalising the above-average performing fishermen and rewarding the below-average performing fishermen. The alternative of allocating TACs to each fishermen based on their own past performance would be viewed as inequitable by fishermen who had a below-average catch history. Those fishermen might argue that it was the fishermen with an above-average catch history who had contributed most to the depletion of stocks and that those fishermen should bear the burden of the reduction in effort.

The effects of allocating the initial ITQs according to: pot entitlement; catch history; and various ways of combining pot entitlements and catch history have been analysed by imperfect means. It has not been possible to simulate the implications of such methods across the whole fishery because of the requirement for confidentiality of the catch and effort records held by DCNR. Nevertheless, the demonstration of the various methods show that there is considerable flexibility to attempt to reach a compromise position. The choice to manage the fishery by ITQs or other means is one for both government and industry. If quota-based management is selected, the choice of the method for allocating initial ITQs to fishermen is best left to industry alone.

Discussion

A new management structure is needed to achieve a restructure of the industry such that the productivity of the stock is protected and harvesting is conducted in an economically efficient manner, in both the short and long term future. As is so often the case, it would be much easier to redress the present level of decline in catch rates and stocks if the longer term did not have to be considered. It is much easier to introduce a quick fix than to provide for a lasting solution.

Buy-back schemes certainly have considerable appeal because they achieve **almost immediately** the potential gains from restructure. Buy-backs would achieve the goals of restructure in the short term, but it would be likely that further restructuring would be required in the future. Buy-back schemes are particularly appealing because of their apparent fairness.

As with other fisheries, the equity of each scheme is a major consideration to fishermen. The short-term goals of restructure can be achieved equitably, certainly with a buy-back and possibly with an across-the-board reduction.

Only the immediate imposition of output controls could lead to a **sustained** reduction in total catch, but the initial implementation of output controls would create both winners and losers.

The consultants believe that the important question that must be addressed by fishermen is:

> How many rounds of adjustment do fishermen want to endure in order to meet the objectives of re-structure?

If the goal is to set the scene now for the achievement of **long-term** sustainability and profitability for the fishery, then:

- output controls could achieve this with two rounds of adjustments; firstly the introduction of quotas and secondly fishermen would amalgamate licences;
- a buy-back could also achieve this with two rounds of adjustments; namely, have a buy-back then subsequently introduce output controls with no further need for amalgamation of licences after introduction of output controls; and
- schemes to reduce effort across-the-board (pot reductions or closed seasons) could achieve this with three rounds of adjustments; namely, introduce the across-the-board reduction, then fishermen would amalgamate licences and then subsequently it would still be necessary to introduce output controls.

REFERENCES

Anderson L.G. (1986), *The Economics of Fisheries Management*, The Johns Hopkins University Press, Baltimore and London.

Bowen B.K. (1994), *Long Term Management Strategies for the Western Rock Lobster Fishery, Volume 1, Evaluation of Management Options*, Fisheries Management Paper No.67, Fisheries Department of Western Australia (October).

Campbell D. and Haynes J. (1990), *Resource Rent in Fisheries*, Australian Bureau of Agricultural and Resource Economics, Discussion Paper 90-10, Canberra.

Crutchfield J.A. (1982), "Keynote Address", pp.9-22 in Sturgess N.H. and Meany T.F. (eds), *Policy and Practice in Fisheries Management*, Australian Government Publishing Service, Canberra.

Commonwealth of Australia (1989), *New Directions For Commonwealth Fisheries Management in the 1990s*, Australian Government Publishing Service, Canberra.

Department of Conservation and Natural Resources (1993), *Management of the Victorian Southern Rock Lobster Fishery*, Discussion Paper, Rock Lobster Management Team, July.

Department of Conservation and Natural Resources (1994), *The Victorian Rock Lobster Fishery: Options for Future Management*, August.

Department of Conservation and Natural Resources Fisheries (1995), *Economic Evaluation of Effort Reduction Schemes for the Victorian Southern Rock Lobster Fishery*, (August).

Geen G., Nielander W. and Meany T.F. (1993), "Australian Experience with Individual Transferable Quota Systems", pp.73-94 in OECD Document, *The Use of Individual Quotas in Fisheries Management*, OECD Publications Service, Paris.

Hannesson R. (1993), *Bioeconomic Analysis of Fisheries*, published by arrangement with the Food and Agricultural Organisation of the United Nations by Fishing News Books, Oxford.

Hobday D. and Smith D.C. (eds) (1995), *Rock Lobster 1995*, Victorian Fisheries Assessment Report. Complied by Rock Lobster Assessment Group. Victorian Fisheries Research Institute (Queenscliff).

Industries Assistance Commission (1984), *Southern Bluefin Tuna*, Report No. 349 (28 June), Australian Government Publishing Service, Canberra.

KPMG Peat Marwick Hungerfords (1988), *Review of the Administrative Arrangements for the Management and Development of Australian Fisheries Subject to Commonwealth Jurisdiction*, a report to the Department of Primary Industries and Energy (16 November), Canberra.

Lindner B. (1994), *Long Term Management Strategies for the Western Rock Lobster Fishery, Volume 2, Economic Efficiency of Alternative Input and Output Based Management Systems in the Western Rock Lobster Fishery*, Fisheries Management Paper No.68, Fisheries Department of Western Australia (October).

McLaughlan N. (1994), *Long Term Management Strategies for the Western Rock Lobster Fishery, Volume 4, Law Enforcement Considerations*, Fisheries Management Paper No.70, Fisheries Department of Western Australia (October).

Morrow R. (1992), *An Economic Analysis of the Tasmanian Rock Lobster Fishery 1990/91*, a report to the Rock Lobster Working Group (September).

Northern Zone Rock Lobster Fishery Management Committee (1995), *A Management Proposal for the Northern Zone Rock Lobster Fishery's 1995/96 Season and an Assessment of the Effort Reduction Package Implemented During the 1994/95 Season*, South Australian Fisheries Management Series, Paper No.10, Primary Industries South Australia (November).

Presser J. (1994), "Distributive Justice in Allocating Individual Catch Quota in a Fishery", paper presented to the 38th Annual Conference of the Australian Agricultural Economics Society, Victoria University, Wellington, New Zealand.

Rock Lobster Industry advisory Committee (WA) (1995), "Long Term Management Strategy" *Background Papers to Coastal Tour 1995.*

Scott A. D. (1989), "Conceptual Origins of Rights Based Fishing", Chapter 1 in Neher P.A., Arnason R. and Mollett N. *Rights Based Fishing*, Kluwer Academic Publishers in cooperation with NATO Scientific Affairs Division, London.

Staniford A. (1988), "The Effects of the Pot Reduction in the South Australian Southern Zone Rock Lobster Fishery", *Marine Resource Economics*, Vol 4(4), pp.271-288.

Staniford A. (1993), "An Economic Evaluation of the 1987 Buy-back Scheme in the Southern Zone Rock Lobster Fishery", unpublished report (June), Report funded by the Fishing Industry Research and Development Corporation.

SA Northern Zone rock Lobster Fishermen's Association Incorporated (1995), *Discussion Paper, Version 1*, (June).

Southern Zone Rock Lobster Fishery Management Committee (1995), *A Review of the Management of the South Australian Southern Zone Rock Lobster Fishery*, South Australian Fisheries Management Series, Paper No.5, Primary Industries South Australia (September).

APPENDIX 1

COPY OF QUESTIONNAIRE USED FOR SURVEY OF LOBSTER FISHERMEN

HOME PORT----------

PERSON INTERVIEWED:----------

TELEPHONE NO.:----------

ADDRESS: ----------

PREVIOUS OCCUPATION (if any):----------

EDUCATION LEVEL ATTAINED:----------

TRADE OR PROFESSIONAL QUALIFICATIONS:----------

NAME OF BOAT OWNER:----------

TELEPHONE NO.:----------

ADDRESS: ----------

NAME OF LICENCE OWNER:----------

TELEPHONE NO.:----------

ADDRESS: ----------

BOAT AND LICENCE DETAILS

AGE: ----------

LENGTH: ----------

YEAR PURCHASED: ----------

NO. POTS: 1993/94:----------1994/95:----------

PURCHASE PRICE OF BOAT:----------

CURRENT VALUE
OF BOAT (WITHOUT LICENCES):----------

HOW WAS LICENCE OBTAINED----------
(e.g. original allocation, inherited, purchased)

PRICE PAID IF LOBSTER LICENCE PURCHASED:----------

CURRENT VALUE
OF LOBSTER LICENCE: ----------

CURRENT VALUE OF OTHER LICENCES,
ENTITLEMENTS OR QUOTAS:

(i)----------
(ii)----------
(iii)----------

OWNERSHIP OF ENTERPRISE (BOAT AND LICENCE)
(consider boat and licence separately if necessary)

1. Sole owner
2. Family partnership
3. Non-family partnership
4. Registered private company:
   - Family
   - Processor
   - Other
5. Public company
6. Trust
7. Other

BOAT SKIPPERED BY:

1. Sole owner
2. Part owner
3. Employee
4. Lessee
5. Other

Method of payment to skipper:----------

CREW

Number normally employed:
Number of family members:
Number of non-family: (i) permanent: (i) casual:
Method of payment to crew (what are rates or shares for each member)

CAPITAL EQUIPMENT

ITEM	TYPE	AGE	EST. LIFE**	YEARS OWNED	PRICE PAID	EST. VALUE NOW	EST. REPL. COST
BOAT + ENGINES	Type of hull: timber plywood steel fibreglass aluminium ferrocement						
ECHO SOUNDER							
RADIO							
RADAR							
AUTO PILOT							
NAVIG. EQUIP.							
MOBILE PHONE							
DINGHY							
O'BOARD MOTORS							

**** Given average repairs and maintenance, and without major alterations or overhauls, what is your estimate of the working life of various capital items, assuming you bought them new.**

ITEM	TYPE	AGE	EST. LIFE	YEARS OWNED	PRICE PAID	EST. VALUE NOW	EST. REPL. COST
NETS AND GEAR FOR OTHER FISHERIES							
OTHER ON-BOAT ASSETS							
HUTS, SHEDS							
FREEZER							
MOTOR VEHICLE 1							
MOTOR VEHICLE 2							
OTHER SHORE-BASED ASSETS							

GENERAL INFORMATION

What type of lobster pot do you use?

What is the expected life of a pot?

What is the cost of a pot?

What was your rate of gear loss (pots, lines,etc.) in the two previous seasons?

1993-94:

1994-95:

What types and how much bait do you use per fishing day?

Do you catch your own bait?

What do you do in the off-season?

Do you earn an income from:

- the sale of other fish?
- the charter of your boat?
- sources outside fishing?

Catch and effort for rock lobster:

(Separate into Victoria and South Australia if dual licence holder)

	1993-94	**1994-95**
Catch (kg) Victoria South Australia		
Effort (pot lifts) Victoria South Australia		

INCOME AND EXPENDITURE

1. INCOME

ITEM	1993-94	1994-95
Value of lobsters sold		
Value other fish sold		
Shark		
Scalefish		
Scallops		
Other		
Income from other uses of boat		
Other income assoc. with fishing (coop. dividends, etc)		
Non-fishing income		
Gross income		

2. *EXPENDITURE*

(a) Fixed Costs

ITEM	1993-94	1994-95
Licence fees		
Rock Lobster		
Total of other licence fees		
Harbour and mooring fees		
Vehicle registration costs		
Office costs telephone bank charges stationery and postage accountancy fees rent rates electricity and gas Memberships and subscriptions Survey Travel Other admin. costs		
Insurance boat gear shed/office vehicles		
Other		
Total		

(b) Variable Trip Costs

ITEM	1993-94	1994-95
Fuel and oil (boat only)		
Bait		
Ice		
Cost of gear replacement		
Food and provisions for crew		
Wet weather clothing		
Other		
Total		

(c) Labour

ITEM	1993-94	1994-95
Payment to skipper		
Payment to crew		
WorkCare		
Superannuation		
Other labour costs		
Total		

(d) Selling Costs

ITEM	1993-94	1994-95
Packing		
Freight		
Commission		
Other selling costs		
Total		

(e) Repairs and maintenance and shore-based running costs

ITEM	1993-94	1994-95
Boat R&M		
Engines R&M		
Gear and equipment R&M		
Vehicles R&M ***		
Vehicle and other fuel and oil ***		
Other shore-based assets R&M		
Total		

*** **If family vehicle is used for business, obtain estimate of percentage of total use**

(f) Interest Costs

ITEM	1993-94	1994-95
Total Interest Paid		

(g) Licence Lease payments

ITEM	1993-94	1994-95
Rock Lobster		
Others (specify)		
Total		

(h) Liabilities

Item (list)	**Term (years remaining)**	**Balance Outstanding**	**Interest Rate**	**Annual Payment**
Overdraft				
Other				

APPENDIX 2

FURTHER RESULTS OF FINANCIAL MODELLING

APPENDIX TABLE 2.1

MODEL 1
20% BUY-BACK WITH TOTAL CATCH FOR THE ZONE BEING RESTORED PROGRESSIVELY OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.7875	0.825	0.8625	0.9	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375
Kg p.a.	11,610	12,191	12,771	13,352	13,932	14,513	14,513	14,513	14,513	14,513	14,513
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$348,300	$384,001	$422,401	$463,681	$508,033	$555,661	$583,444	$612,616	$643,247	$675,410	$709,180
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446
Total	$148,360	$177,324	$184,168	$191,354	$198,899	$206,822	$215,141	$223,876	$233,047	$242,677	$252,789
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$61,549	$63,583	$73,553	$84,329	$95,967	$108,525	$114,598	$120,975	$127,671	$134,702	$142,084
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$94,791	$97,314	$116,611	$137,525	$160,171	$184,669	$195,277	$206,416	$218,112	$230,393	$243,288
ACCUMULATED FUNDS	N.A.	$97,314	$213,924	$351,450	$511,621	$696,289	$891,566	$1,097,982	$1,316,095	$1,546,488	**$1,789,775**

APPENDIX TABLE 2.2

MODEL 2

20% BUY-BACK WITH TOTAL CATCH FOR THE ZONE BEING RESTORED PROGRESSIVELY OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.6825	0.715	0.7475	0.78	0.8125	0.8125	0.8125	0.8125	0.8125	0.8125
Kg p.a.	6,435	6,757	7,079	7,400	7,722	8,044	8,044	8,044	8,044	8,044	8,044
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$193,050	$212,838	$234,121	$257,001	$281,584	$307,983	$323,382	$339,551	$356,528	$374,355	$393,073
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$106,205	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$32,240	$32,678	$38,123	$44,010	$50,371	$57,237	$60,505	$63,936	$67,538	$71,321	$75,292
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$32,510	$31,640	$41,321	$51,847	$63,280	$75,683	$80,329	$85,207	$90,330	$95,708	$101,356
ACCUMULATED FUNDS	N.A.	$31,640	$72,961	$124,807	$188,087	$263,770	$344,099	$429,306	$519,636	$615,345	**$716,701**

APPENDIX TABLE 2.3

MODEL 3
20% BUY-BACK WITH TOTAL CATCH FOR THE ZONE BEING RESTORED PROGRESSIVELY OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.4725	0.495	0.5175	0.54	0.5625	0.5625	0.5625	0.5625	0.5625	0.5625
Kg p.a.	4,050	4,253	4,455	4,658	4,860	5,063	5,063	5,063	5,063	5,063	5,063
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$121,500	$133,954	$147,349	$161,749	$177,221	$193,835	$203,527	$213,703	$224,389	$235,608	$247,388
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745
Total	$85,000	$100,245	$103,920	$107,779	$111,830	$116,085	$120,552	$125,242	$130,167	$135,338	$140,768
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$11,008	$10,081	$13,156	$16,493	$20,108	$24,023	$25,652	$27,362	$29,158	$31,044	$33,024
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($12,608)	($16,377)	($11,733)	($6,628)	($1,029)	$5,102	$6,266	$7,489	$8,773	$10,120	$11,536
ACCUMULATED FUNDS	N.A.	($16,377)	($28,110)	($34,738)	($35,766)	($30,665)	($24,398)	($16,910)	($8,137)	$1,983	**$13,519**

APPENDIX TABLE 2.4

MODEL 1

20% BUY-BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 5.9%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.75878855	0.76757711	0.77636566	0.78515421	0.79394277	0.79394277	0.79394277	0.79394277	0.79394277	0.793942766
Kg p.a.	11,610	11,746	11,882	12,018	12,154	12,290	12,290	12,290	12,290	12,290	12,290
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$348,300	$370,000	$393,000	$417,375	$443,205	$470,574	$494,103	$518,808	$544,748	$571,986	$600,585
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446
Total	$148,360	$177,324	$184,168	$191,354	$198,899	$206,822	$215,141	$223,876	$233,047	$242,677	$252,789
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$61,549	$59,103	$64,145	$69,511	$75,222	$81,297	$86,009	$90,956	$96,151	$101,606	$107,333
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$94,791	$87,794	$96,618	$106,037	$116,088	$126,809	$134,525	$142,626	$151,133	$160,065	$169,443
ACCUMULATED FUNDS	N.A.	$87,794	$184,412	$290,449	$406,537	$533,346	$667,871	$810,497	$961,630	$1,121,695	**$1,291,138**

APPENDIX TABLE 2.5

MODEL 2
20% BUY-BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 6.8%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.65878853	0.66757706	0.67636559	0.68515413	0.69394266	0.69394266	0.69394266	0.69394266	0.69394266	0.693942657
Kg p.a.	6,435	6,522	6,609	6,696	6,783	6,870	6,870	6,870	6,870	6,870	6,870
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$193,050	$205,443	$218,593	$232,544	$247,344	$263,043	$276,195	$290,005	$304,505	$319,730	$335,717
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$106,205	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$32,240	$30,311	$33,154	$36,184	$39,414	$42,856	$45,405	$48,081	$50,891	$53,841	$56,938
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$32,510	$26,612	$30,761	$35,216	$39,996	$45,124	$48,242	$51,516	$54,954	$58,564	$62,354
ACCUMULATED FUNDS	N.A.	$26,612	$57,373	$92,589	$132,586	$177,709	$225,951	$277,467	$332,421	$390,985	**$453,339**

APPENDIX TABLE 2.6

MODEL 3
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 8.8%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.45790971	0.46581941	0.47372912	0.48163883	0.48954853	0.48954853	0.48954853	0.48954853	0.48954853	0.489548533
Kg p.a.	4,050	4,121	4,192	4,264	4,335	4,406	4,406	4,406	4,406	4,406	4,406
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$121,500	$129,817	$138,663	$148,068	$158,067	$168,696	$177,131	$185,988	$195,287	$205,052	$215,304
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745
Total	$85,000	$100,245	$103,920	$107,779	$111,830	$116,085	$120,552	$125,242	$130,167	$135,338	$140,768
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$11,008	$8,758	$10,377	$12,115	$13,979	$15,978	$17,205	$18,493	$19,846	$21,266	$22,757
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($12,608)	($19,190)	($17,639)	($15,931)	($14,053)	($11,993)	($11,683)	($11,358)	($11,016)	($10,658)	($10,281)
ACCUMULATED FUNDS	N.A.	($19,190)	($36,829)	($52,760)	($66,813)	($78,806)	($90,489)	($101,846)	($112,863)	($123,521)	**($133,802)**

APPENDIX TABLE 2.7

MODEL 2 BUT WITH PRESENT CATCH RATE OF 0.60 KG PER POT LIFT
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.60	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Kg p.a.	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940	5,940
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$178,200	$187,110	$196,466	$206,289	$216,603	$227,433	$238,805	$250,745	$263,283	$276,447	$290,269
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$88,000	$91,850	$95,893	$100,137	$104,594	$109,274	$114,187	$119,347	$124,764	$130,452	$136,425
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$27,488	$29,038	$30,666	$32,376	$34,170	$36,055	$38,034	$40,111	$42,293	$44,584	$46,989
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$22,412	$23,907	$25,476	$27,124	$28,854	$30,671	$32,578	$34,581	$36,684	$38,892	$41,211
ACCUMULATED FUNDS	N.A.	$23,907	$49,383	$76,506	$105,360	$136,031	$168,609	$203,190	$239,874	$278,766	**$319,977**

APPENDIX TABLE 2.8

MODEL 2 BUT WITH PRESENT CATCH RATE OF 0.60 KG PER POT LIFT
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS -7.3%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.60	0.60878854	0.61757709	0.62636563	0.63515418	0.64394272	0.64394272	0.64394272	0.64394272	0.64394272	0.643942719
Kg p.a.	5,940	6,027	6,114	6,201	6,288	6,375	6,375	6,375	6,375	6,375	6,375
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$178,200	$189,851	$202,221	$215,354	$229,294	$244,090	$256,295	$269,109	$282,565	$296,693	$311,528
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$106,205	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$27,488	$25,322	$27,914	$30,683	$33,638	$36,791	$39,037	$41,394	$43,870	$46,469	$49,198
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$22,412	$16,009	$19,628	$23,526	$27,722	$32,236	$34,710	$37,307	$40,035	$42,898	$45,905
ACCUMULATED FUNDS	N.A.	$16,009	$35,637	$59,164	$86,886	$119,122	$153,831	$191,139	$231,173	$274,072	**$319,977**

APPENDIX TABLE 2.9

MODEL 2 BUT WITH PRESENT CATCH RATE OF 0.55 KG PER POT LIFT
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Kg p.a.	5,445	5,445	5,445	5,445	5,445	5,445	5,445	5,445	5,445	5,445	5,445
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$163,350	$171,518	$180,093	$189,098	$198,553	$208,481	$218,905	$229,850	$241,342	$253,409	$266,080
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$88,000	$91,850	$95,893	$100,137	$104,594	$109,274	$114,187	$119,347	$124,764	$130,452	$136,425
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$22,736	$24,049	$25,427	$26,875	$28,394	$29,990	$31,666	$33,425	$35,272	$37,212	$39,248
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$12,314	$13,304	$14,343	$15,434	$16,580	$17,783	$19,046	$20,372	$21,765	$23,227	$24,762
ACCUMULATED FUNDS	N.A.	$13,304	$27,647	$43,081	$59,660	$77,443	$96,489	$116,861	$138,626	$161,853	**$186,615**

APPENDIX TABLE 2.10

MODEL 2 BUT WITH PRESENT CATCH RATE OF 0.55 KG PER POT LIFT
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS -8.0%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.55	0.55878856	0.56757711	0.57636567	0.58515422	0.59394278	0.59394278	0.59394278	0.59394278	0.59394278	0.59394278
Kg p.a.	5,445	5,532	5,619	5,706	5,793	5,880	5,880	5,880	5,880	5,880	5,880
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$163,350	$174,258	$185,849	$198,163	$211,244	$225,137	$236,394	$248,214	$260,625	$273,656	$287,339
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$106,205	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$22,736	$20,332	$22,675	$25,182	$27,862	$30,727	$32,669	$34,708	$36,849	$39,097	$41,457
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$12,314	$5,406	$8,495	$11,837	$15,448	$19,348	$21,177	$23,098	$25,115	$27,233	$29,457
ACCUMULATED FUNDS	N.A.	$5,406	$13,901	$25,738	$41,186	$60,534	$81,711	$104,810	$129,925	$157,158	**$186,615**

APPENDIX TABLE 2.11

MODEL 2 BUT WITH PRESENT CATCH RATE OF 0.50 KG PER POT LIFT
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.50	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Kg p.a.	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$148,500	$155,925	$163,721	$171,907	$180,503	$189,528	$199,004	$208,954	$219,402	$230,372	$241,891
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$88,000	$91,850	$95,893	$100,137	$104,594	$109,274	$114,187	$119,347	$124,764	$130,452	$136,425
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$17,984	$19,059	$20,188	$21,374	$22,618	$23,925	$25,297	$26,738	$28,251	$29,840	$31,508
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$2,216	$2,701	$3,210	$3,744	$4,306	$4,895	$5,514	$6,163	$6,845	$7,562	$8,314
ACCUMULATED FUNDS	N.A.	$2,701	$5,911	$9,655	$13,961	$18,855	$24,369	$30,532	$37,378	$44,939	**$53,253**

APPENDIX TABLE 2.12

MODEL 2 BUT WITH PRESENT CATCH RATE OF 0.50 KG PER POT LIFT
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS -8.8%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.50	0.50878858	0.51757716	0.52636573	0.53515431	0.54394289	0.54394289	0.54394289	0.54394289	0.54394289	0.54394289
Kg p.a.	4,950	5,037	5,124	5,211	5,298	5,385	5,385	5,385	5,385	5,385	5,385
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$148,500	$158,666	$169,477	$180,972	$193,194	$206,185	$216,494	$227,319	$238,684	$250,619	$263,150
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$106,205	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$17,984	$15,343	$17,436	$19,681	$22,086	$24,662	$26,301	$28,021	$29,828	$31,725	$33,717
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$2,216	($5,197)	($2,638)	$147	$3,174	$6,460	$7,645	$8,889	$10,196	$11,568	$13,008
ACCUMULATED FUNDS	N.A.	($5,197)	($7,835)	($7,688)	($4,514)	$1,946	$9,591	$18,481	$28,677	$40,245	**$53,253**

APPENDIX TABLE 2.13

MODEL 1 BUT WITH LOBSTER PRICE OF $20 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Kg p.a.	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610
RECEIPTS											
Average price	$20.00	$21.00	$22.05	$23.15	$24.31	$25.53	$26.80	$28.14	$29.55	$31.03	$32.58
Gross receipts p.a.	$232,200	$243,810	$256,001	$268,801	$282,241	$296,353	$311,170	$326,729	$343,065	$360,218	$378,229
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$148,360	$154,878	$161,722	$168,908	$176,453	$184,376	$192,695	$201,430	$210,601	$220,231	$230,343
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$24,397	$25,905	$27,488	$29,150	$30,896	$32,729	$34,653	$36,674	$38,795	$41,023	$43,362
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$15,843	$17,247	$18,722	$20,270	$21,895	$23,602	$25,394	$27,276	$29,252	$31,326	$33,505
ACCUMULATED FUNDS	N.A.	$17,247	$35,969	$56,239	$78,134	$101,736	$127,130	$154,406	$183,658	$214,984	**$248,489**

APPENDIX TABLE 2.14

MODEL 1 BUT WITH LOBSTER PRICE OF $20 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 8.8%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.76318287	0.77636573	0.7895486	0.80273147	0.81591434	0.81591434	0.81591434	0.81591434	0.81591434	0.815914336
Kg p.a.	11,610	11,814	12,018	12,222	12,426	12,630	12,630	12,630	12,630	12,630	12,630
RECEIPTS											
Average price	$20.00	$21.00	$22.05	$23.15	$24.31	$25.53	$26.80	$28.14	$29.55	$31.03	$32.58
Gross receipts p.a.	$232,200	$248,095	$265,000	$282,975	$302,084	$322,398	$338,518	$355,444	$373,216	$391,876	$411,470
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446
Total	$148,360	$177,324	$184,168	$191,354	$198,899	$206,822	$215,141	$223,876	$233,047	$242,677	$252,789
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$24,397	$20,093	$23,185	$26,503	$30,063	$33,880	$36,221	$38,680	$41,261	$43,971	$46,817
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$15,843	$4,898	$9,578	$14,645	$20,126	$26,050	$28,727	$31,539	$34,491	$37,590	$40,845
ACCUMULATED FUNDS	N.A.	$4,898	$14,476	$29,121	$49,247	$75,297	$104,024	$135,563	$170,053	$207,644	**$248,489**

APPENDIX TABLE 2.15

MODEL 2 BUT WITH LOBSTER PRICE OF $20 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Kg p.a.	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435
RECEIPTS											
Average price	$20.00	$21.00	$22.05	$23.15	$24.31	$25.53	$26.80	$28.14	$29.55	$31.03	$32.58
Gross receipts p.a.	$128,700	$135,135	$141,892	$148,986	$156,436	$164,257	$172,470	$181,094	$190,149	$199,656	$209,639
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$88,000	$91,850	$95,893	$100,137	$104,594	$109,274	$114,187	$119,347	$124,764	$130,452	$136,425
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$11,648	$12,406	$13,203	$14,039	$14,917	$15,839	$16,807	$17,823	$18,890	$20,011	$21,187
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($11,248)	($11,436)	($11,634)	($11,842)	($12,060)	($12,289)	($12,529)	($12,782)	($13,047)	($13,325)	($13,618)
ACCUMULATED FUNDS	N.A.	($11,436)	($23,071)	($34,913)	($46,973)	($59,262)	($71,791)	($84,573)	($97,620)	($110,945)	**($124,563)**

APPENDIX TABLE 2.16

MODEL 2 BUT WITH LOBSTER PRICE OF $20 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 10.1%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.66318288	0.67636575	0.68954863	0.70273151	0.71591439	0.71591439	0.71591439	0.71591439	0.71591439	0.715914386
Kg p.a.	6,435	6,566	6,696	6,827	6,957	7,088	7,088	7,088	7,088	7,088	7,088
RECEIPTS											
Average price	$20.00	$21.00	$22.05	$23.15	$24.31	$25.53	$26.80	$28.14	$29.55	$31.03	$32.58
Gross receipts p.a.	$128,700	$137,876	$147,647	$158,051	$169,127	$180,914	$189,960	$199,458	$209,431	$219,902	$230,898
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$106,205	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$11,648	$8,690	$10,451	$12,346	$14,384	$16,575	$17,810	$19,106	$20,467	$21,896	$23,396
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($11,248)	($19,334)	($17,482)	($15,439)	($13,192)	($10,724)	($10,398)	($10,056)	($9,696)	($9,319)	($8,923)
ACCUMULATED FUNDS	N.A.	($19,334)	($36,816)	($52,255)	($65,447)	($76,171)	($86,568)	($96,624)	($106,321)	($115,640)	**($124,563)**

APPENDIX TABLE 2.17

MODEL 3 BUT WITH LOBSTER PRICE OF $20 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Kg p.a.	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050
RECEIPTS											
Average price	$20.00	$21.00	$22.05	$23.15	$24.31	$25.53	$26.80	$28.14	$29.55	$31.03	$32.58
Gross receipts p.a.	$81,000	$85,050	$89,303	$93,768	$98,456	$103,379	$108,548	$113,975	$119,674	$125,658	$131,940
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$85,000	$88,500	$92,175	$96,034	$100,085	$104,340	$108,807	$113,497	$118,422	$123,593	$129,023
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	($1,952)	($1,810)	($1,660)	($1,503)	($1,338)	($1,165)	($983)	($793)	($592)	($382)	($161)
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($40,148)	($41,645)	($43,218)	($44,869)	($46,602)	($48,422)	($50,333)	($52,340)	($54,447)	($56,659)	($58,982)
ACCUMULATED FUNDS	N.A.	($41,645)	($84,863)	($129,732)	($176,334)	($224,756)	($275,089)	($327,429)	($381,876)	($438,535)	**($497,517)**

APPENDIX TABLE 2.18

MODEL 3 BUT WITH LOBSTER PRICE OF $20 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 13.2%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.46186455	0.4737291	0.48559364	0.49745819	0.50932274	0.50932274	0.50932274	0.50932274	0.50932274	0.509322739
Kg p.a.	4,050	4,157	4,264	4,370	4,477	4,584	4,584	4,584	4,584	4,584	4,584
RECEIPTS											
Average price	$20.00	$21.00	$22.05	$23.15	$24.31	$25.53	$26.80	$28.14	$29.55	$31.03	$32.58
Gross receipts p.a.	$81,000	$87,292	$94,012	$101,184	$108,839	$117,007	$122,857	$129,000	$135,450	$142,223	$149,334
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745
Total	$85,000	$100,245	$103,920	$107,779	$111,830	$116,085	$120,552	$125,242	$130,167	$135,338	$140,768
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	($1,952)	($4,850)	($3,912)	($2,888)	($1,774)	($563)	($163)	$257	$698	$1,161	$1,647
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($40,148)	($48,107)	($48,002)	($47,812)	($47,528)	($47,141)	($48,589)	($50,109)	($51,705)	($53,381)	($55,141)
ACCUMULATED FUNDS	N.A.	($48,107)	($96,109)	($143,921)	($191,449)	($238,590)	($287,180)	($337,289)	($388,994)	($442,376)	**($497,517)**

APPENDIX TABLE 2.19

MODEL 1 BUT WITH LOBSTER PRICE OF $25 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Kg p.a.	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610
RECEIPTS											
Average price	$25.00	$26.25	$27.56	$28.94	$30.39	$31.91	$33.50	$35.18	$36.94	$38.78	$40.72
Gross receipts p.a.	$290,250	$304,763	$320,001	$336,001	$352,801	$370,441	$388,963	$408,411	$428,831	$450,273	$472,787
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$148,360	$154,878	$161,722	$168,908	$176,453	$184,376	$192,695	$201,430	$210,601	$220,231	$230,343
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$42,973	$45,409	$47,968	$50,654	$53,475	$56,437	$59,547	$62,812	$66,241	$69,841	$73,621
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$55,317	$58,695	$62,242	$65,966	$69,876	$73,982	$78,293	$82,820	$87,573	$92,563	$97,804
ACCUMULATED FUNDS	N.A.	$58,695	$120,937	$186,903	$256,779	$330,761	$409,054	$491,874	$579,447	$672,010	**$769,814**

APPENDIX TABLE 2.20

MODEL 1 BUT WITH LOBSTER PRICE OF $25 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 7.0%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.76054631	0.77109263	0.78163894	0.79218525	0.80273157	0.80273157	0.80273157	0.80273157	0.80273157	0.802731566
Kg p.a.	11,610	11,773	11,937	12,100	12,263	12,426	12,426	12,426	12,426	12,426	12,426
RECEIPTS											
Average price	$25.00	$26.25	$27.56	$28.94	$30.39	$31.91	$33.50	$35.18	$36.94	$38.78	$40.72
Gross receipts p.a.	$290,250	$309,048	$329,000	$350,175	$372,645	$396,486	$416,310	$437,126	$458,982	$481,931	$506,028
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446
Total	$148,360	$177,324	$184,168	$191,354	$198,899	$206,822	$215,141	$223,876	$233,047	$242,677	$252,789
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$42,973	$39,598	$43,665	$48,007	$52,642	$57,589	$61,115	$64,818	$68,706	$72,788	$77,075
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$55,317	$46,346	$53,098	$60,341	$68,107	$76,429	$81,626	$87,083	$92,812	$98,828	$105,144
ACCUMULATED FUNDS	N.A.	$46,346	$99,444	$159,785	$227,892	$304,322	$385,948	$473,030	$565,842	$664,670	**$769,814**

APPENDIX TABLE 2.21

MODEL 2 BUT WITH LOBSTER PRICE OF $25 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Kg p.a.	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435
RECEIPTS											
Average price	$25.00	$26.25	$27.56	$28.94	$30.39	$31.91	$33.50	$35.18	$36.94	$38.78	$40.72
Gross receipts p.a.	$160,875	$168,919	$177,365	$186,233	$195,545	$205,322	$215,588	$226,367	$237,686	$249,570	$262,048
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$88,000	$91,850	$95,893	$100,137	$104,594	$109,274	$114,187	$119,347	$124,764	$130,452	$136,425
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$21,944	$23,217	$24,554	$25,958	$27,432	$28,979	$30,604	$32,310	$34,102	$35,983	$37,958
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$10,631	$11,537	$12,487	$13,486	$14,534	$15,635	$16,790	$18,004	$19,278	$20,616	$22,021
ACCUMULATED FUNDS	N.A.	$11,537	$24,024	$37,510	$52,044	$67,678	$84,469	$102,473	$121,751	$142,367	**$164,388**

APPENDIX TABLE 2.22

MODEL 2 BUT WITH LOBSTER PRICE OF $25 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 8.1%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.66054627	0.67109254	0.68163881	0.69218508	0.70273135	0.70273135	0.70273135	0.70273135	0.70273135	0.702731349
Kg p.a.	6,435	6,539	6,644	6,748	6,853	6,957	6,957	6,957	6,957	6,957	6,957
RECEIPTS											
Average price	$25.00	$26.25	$27.56	$28.94	$30.39	$31.91	$33.50	$35.18	$36.94	$38.78	$40.72
Gross receipts p.a.	$160,875	$171,659	$183,120	$195,298	$208,235	$221,979	$233,077	$244,731	$256,968	$269,816	$283,307
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$106,205	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$21,944	$19,501	$21,802	$24,265	$26,899	$29,716	$31,607	$33,593	$35,679	$37,868	$40,167
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$10,631	$3,639	$6,640	$9,888	$13,402	$17,200	$18,922	$20,730	$22,629	$24,622	$26,715
ACCUMULATED FUNDS	N.A.	$3,639	$10,279	$20,167	$33,569	$50,769	$69,691	$90,422	$113,050	$137,673	**$164,388**

APPENDIX TABLE 2.23

MODEL 2 BUT WITH LOBSTER PRICE OF $25 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 8.1%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.66054627	0.67109254	0.68163881	0.69218508	0.70273135	0.70273135	0.70273135	0.70273135	0.70273135	0.702731349
Kg p.a.	6,435	6,539	6,644	6,748	6,853	6,957	6,957	6,957	6,957	6,957	6,957
RECEIPTS											
Average price	$25.00	$26.25	$27.56	$28.94	$30.39	$31.91	$33.50	$35.18	$36.94	$38.78	$40.72
Gross receipts p.a.	$160,875	$171,659	$183,120	$195,298	$208,235	$221,979	$233,077	$244,731	$256,968	$269,816	$283,307
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$106,205	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$21,944	$19,501	$21,802	$24,265	$26,899	$29,716	$31,607	$33,593	$35,679	$37,868	$40,167
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$10,631	$3,639	$6,640	$9,888	$13,402	$17,200	$18,922	$20,730	$22,629	$24,622	$26,715
ACCUMULATED FUNDS	N.A.	$3,639	$10,279	$20,167	$33,569	$50,769	$69,691	$90,422	$113,050	$137,673	**$164,388**

APPENDIX TABLE 2.24

MODEL 3 BUT WITH LOBSTER PRICE OF $25 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Kg p.a.	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050
RECEIPTS											
Average price	$25.00	$26.25	$27.56	$28.94	$30.39	$31.91	$33.50	$35.18	$36.94	$38.78	$40.72
Gross receipts p.a.	$101,250	$106,313	$111,628	$117,210	$123,070	$129,224	$135,685	$142,469	$149,592	$157,072	$164,926
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$85,000	$88,500	$92,175	$96,034	$100,085	$104,340	$108,807	$113,497	$118,422	$123,593	$129,023
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$4,528	$4,994	$5,484	$5,998	$6,538	$7,105	$7,700	$8,325	$8,982	$9,671	$10,394
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($26,378)	($27,187)	($28,036)	($28,928)	($29,864)	($30,848)	($31,880)	($32,964)	($34,102)	($35,297)	($36,552)
ACCUMULATED FUNDS	N.A.	($27,187)	($55,223)	($84,151)	($114,016)	($144,863)	($176,743)	($209,707)	($243,810)	($279,107)	**($315,659)**

APPENDIX TABLE 2.25

MODEL 3 BUT WITH LOBSTER PRICE OF $25 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 10.6%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.4594917	0.46898341	0.47847511	0.48796681	0.49745851	0.49745851	0.49745851	0.49745851	0.49745851	0.497458513
Kg p.a.	4,050	4,135	4,221	4,306	4,392	4,477	4,477	4,477	4,477	4,477	4,477
RECEIPTS											
Average price	$25.00	$26.25	$27.56	$28.94	$30.39	$31.91	$33.50	$35.18	$36.94	$38.78	$40.72
Gross receipts p.a.	$101,250	$108,555	$116,337	$124,626	$133,454	$142,852	$149,994	$157,494	$165,369	$173,637	$182,319
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745
Total	$85,000	$100,245	$103,920	$107,779	$111,830	$116,085	$120,552	$125,242	$130,167	$135,338	$140,768
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$4,528	$1,954	$3,233	$4,613	$6,103	$7,708	$8,521	$9,375	$10,272	$11,213	$12,202
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($26,378)	($33,649)	($32,821)	($31,871)	($30,790)	($29,567)	($30,136)	($30,733)	($31,361)	($32,020)	($32,711)
ACCUMULATED FUNDS	N.A.	($33,649)	($66,469)	($98,341)	($129,131)	($158,698)	($188,834)	($219,567)	($250,928)	($282,948)	**($315,659)**

APPENDIX TABLE 2.26

MODEL 1 BUT WITH LOBSTER PRICE OF $35 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Kg p.a.	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610
RECEIPTS											
Average price	$35.00	$36.75	$38.59	$40.52	$42.54	$44.67	$46.90	$49.25	$51.71	$54.30	$57.01
Gross receipts p.a.	$406,350	$426,668	$448,001	$470,401	$493,921	$518,617	$544,548	$571,775	$600,364	$630,382	$661,901
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$148,360	$154,878	$161,722	$168,908	$176,453	$184,376	$192,695	$201,430	$210,601	$220,231	$230,343
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$80,125	$84,419	$88,928	$93,662	$98,634	$103,853	$109,334	$115,089	$121,131	$127,476	$134,137
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$134,265	$141,590	$149,282	$157,358	$165,838	$174,742	$184,091	$193,908	$204,215	$215,038	$226,402
ACCUMULATED FUNDS	N.A.	$141,590	$290,872	$448,231	$614,069	$788,810	$972,901	$1,166,809	$1,371,024	$1,586,061	**$1,812,463**

APPENDIX TABLE 2.27

MODEL 1 BUT WITH LOBSTER PRICE OF $35 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 5.0%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.75753306	0.76506612	0.77259918	0.78013224	0.7876653	0.7876653	0.7876653	0.7876653	0.7876653	0.787665298
Kg p.a.	11,610	11,727	11,843	11,960	12,076	12,193	12,193	12,193	12,193	12,193	12,193
RECEIPTS											
Average price	$35.00	$36.75	$38.59	$40.52	$42.54	$44.67	$46.90	$49.25	$51.71	$54.30	$57.01
Gross receipts p.a.	$406,350	$430,953	$457,000	$484,575	$513,765	$544,662	$571,895	$600,490	$630,515	$662,040	$695,142
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446
Total	$148,360	$177,324	$184,168	$191,354	$198,899	$206,822	$215,141	$223,876	$233,047	$242,677	$252,789
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$80,125	$78,608	$84,625	$91,015	$97,801	$105,005	$110,902	$117,095	$123,596	$130,423	$137,592
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$134,265	$129,241	$140,138	$151,733	$164,069	$177,189	$187,424	$198,170	$209,454	$221,302	$233,742
ACCUMULATED FUNDS	N.A.	$129,241	$269,380	$421,113	$585,182	$762,371	$949,795	$1,147,965	$1,357,419	$1,578,721	**$1,812,463**

APPENDIX TABLE 2.28

MODEL 2 BUT WITH LOBSTER PRICE OF $35 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Kg p.a.	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435
RECEIPTS											
Average price	$35.00	$36.75	$38.59	$40.52	$42.54	$44.67	$46.90	$49.25	$51.71	$54.30	$57.01
Gross receipts p.a.	$225,225	$236,486	$248,311	$260,726	$273,762	$287,451	$301,823	$316,914	$332,760	$349,398	$366,868
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$88,000	$91,850	$95,893	$100,137	$104,594	$109,274	$114,187	$119,347	$124,764	$130,452	$136,425
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$42,536	$44,839	$47,257	$49,796	$52,461	$55,260	$58,199	$61,285	$64,526	$67,928	$71,500
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$54,389	$57,482	$60,731	$64,141	$67,722	$71,482	$75,430	$79,576	$83,929	$88,499	$93,298
ACCUMULATED FUNDS	N.A.	$57,482	$118,213	$182,354	$250,076	$321,559	$396,989	$476,565	$560,494	$648,993	**$742,291**

APPENDIX TABLE 2.29

MODEL 2 BUT WITH LOBSTER PRICE OF $35 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 5.8%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.65752536	0.66505073	0.67257609	0.68010146	0.68762682	0.68762682	0.68762682	0.68762682	0.68762682	0.68762682
Kg p.a.	6,435	6,510	6,584	6,659	6,733	6,808	6,808	6,808	6,808	6,808	6,808
RECEIPTS											
Average price	$35.00	$36.75	$38.59	$40.52	$42.54	$44.67	$46.90	$49.25	$51.71	$54.30	$57.01
Gross receipts p.a.	$225,225	$239,224	$254,060	$269,782	$286,440	$304,090	$319,295	$335,260	$352,023	$369,624	$388,105
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$106,205	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$42,536	$41,121	$44,503	$48,100	$51,925	$55,992	$59,197	$62,562	$66,096	$69,807	$73,703
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$54,389	$49,583	$54,879	$60,538	$66,582	$73,036	$77,550	$82,289	$87,266	$92,491	$97,978
ACCUMULATED FUNDS	N.A.	$49,583	$104,462	$164,999	$231,581	$304,617	$382,167	$464,456	$551,722	$644,213	**$742,191**

APPENDIX TABLE 2.30

MODEL 3 BUT WITH LOBSTER PRICE OF $35 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Kg p.a.	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050
RECEIPTS											
Average price	$35.00	$36.75	$38.59	$40.52	$42.54	$44.67	$46.90	$49.25	$51.71	$54.30	$57.01
Gross receipts p.a.	$141,750	$148,838	$156,279	$164,093	$172,298	$180,913	$189,959	$199,456	$209,429	$219,901	$230,896
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$85,000	$88,500	$92,175	$96,034	$100,085	$104,340	$108,807	$113,497	$118,422	$123,593	$129,023
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$17,488	$18,602	$19,773	$21,001	$22,291	$23,646	$25,068	$26,561	$28,130	$29,776	$31,505
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$1,162	$1,730	$2,327	$2,953	$3,611	$4,301	$5,026	$5,787	$6,587	$7,426	$8,308
ACCUMULATED FUNDS	N.A.	$1,730	$4,057	$7,010	$10,620	$14,921	$19,948	$25,735	$32,322	$39,748	**$48,056**

APPENDIX TABLE 2.31

MODEL 3 BUT WITH LOBSTER PRICE OF $35 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 7.5%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.45677979	0.46355959	0.47033938	0.47711918	0.48389897	0.48389897	0.48389897	0.48389897	0.48389897	0.483898972
Kg p.a.	4,050	4,111	4,172	4,233	4,294	4,355	4,355	4,355	4,355	4,355	4,355
RECEIPTS											
Average price	$35.00	$36.75	$38.59	$40.52	$42.54	$44.67	$46.90	$49.25	$51.71	$54.30	$57.01
Gross receipts p.a.	$141,750	$151,080	$160,988	$171,510	$182,682	$194,541	$204,268	$214,482	$225,206	$236,466	$248,289
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745
Total	$85,000	$100,245	$103,920	$107,779	$111,830	$116,085	$120,552	$125,242	$130,167	$135,338	$140,768
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$17,488	$15,562	$17,521	$19,616	$21,856	$24,248	$25,889	$27,611	$29,420	$31,319	$33,312
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$1,162	($4,732)	($2,458)	$10	$2,685	$5,582	$6,770	$8,018	$9,328	$10,704	$12,149
ACCUMULATED FUNDS	N.A.	($4,732)	($7,189)	($7,180)	($4,495)	$1,087	$7,857	$15,875	$25,203	$35,907	**$48,056**

APPENDIX TABLE 2.32

MODEL 1 BUT WITH LOBSTER PRICE OF $40 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Kg p.a.	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610	11,610
RECEIPTS											
Average price	$40.00	$42.00	$44.10	$46.31	$48.62	$51.05	$53.60	$56.28	$59.10	$62.05	$65.16
Gross receipts p.a.	$464,400	$487,620	$512,001	$537,601	$564,481	$592,705	$622,340	$653,457	$686,130	$720,437	$756,459
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$148,360	$154,878	$161,722	$168,908	$176,453	$184,376	$192,695	$201,430	$210,601	$220,231	$230,343
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$98,701	$103,924	$109,408	$115,166	$121,213	$127,561	$134,227	$141,227	$148,576	$156,293	$164,396
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$173,739	$183,038	$192,802	$203,054	$213,819	$225,122	$236,990	$249,451	$262,536	$276,275	$290,701
ACCUMULATED FUNDS	N.A.	$183,038	$375,840	$578,894	$792,713	$1,017,835	$1,254,825	$1,504,276	$1,766,812	$2,043,087	**$2,333,788**

APPENDIX TABLE 2.33

MODEL 1 BUT WITH LOBSTER PRICE OF $40 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 4.4%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	86	86	86	86	86	86	86	86	86	86
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480	15,480
Kg per pot lift	0.75	0.75659144	0.76318288	0.76977432	0.77636576	0.7829572	0.7829572	0.7829572	0.7829572	0.7829572	0.782957197
Kg p.a.	11,610	11,712	11,814	11,916	12,018	12,120	12,120	12,120	12,120	12,120	12,120
RECEIPTS											
Average price	$40.00	$42.00	$44.10	$46.31	$48.62	$51.05	$53.60	$56.28	$59.10	$62.05	$65.16
Gross receipts p.a.	$464,400	$491,905	$521,001	$551,775	$584,325	$618,750	$649,688	$682,172	$716,281	$752,095	$789,700
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$40,635	$42,667	$44,800	$47,040	$49,392	$51,862	$54,455	$57,178	$60,036	$63,038
Hired labour costs	$58,480	$61,404	$64,474	$67,698	$71,083	$74,637	$78,369	$82,287	$86,402	$90,722	$95,258
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446	$22,446
Total	$148,360	$177,324	$184,168	$191,354	$198,899	$206,822	$215,141	$223,876	$233,047	$242,677	$252,789
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$98,701	$98,112	$105,105	$112,519	$120,380	$128,713	$135,796	$143,233	$151,042	$159,241	$167,850
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$173,739	$170,689	$183,658	$197,429	$212,049	$227,569	$240,323	$253,714	$267,775	$282,539	$298,041
ACCUMULATED FUNDS	N.A.	$170,689	$354,347	$551,777	$763,826	$991,396	$1,231,719	$1,485,433	$1,753,208	$2,035,747	**$2,333,788**

APPENDIX TABLE 2.34

MODEL 2 BUT WITH LOBSTER PRICE OF $40 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Kg p.a.	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435	6,435
RECEIPTS											
Average price	$40.00	$42.00	$44.10	$46.31	$48.62	$51.05	$53.60	$56.28	$59.10	$62.05	$65.16
Gross receipts p.a.	$257,400	$270,270	$283,784	$297,973	$312,871	$328,515	$344,941	$362,188	$380,297	$399,312	$419,277
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$88,000	$91,850	$95,893	$100,137	$104,594	$109,274	$114,187	$119,347	$124,764	$130,452	$136,425
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$52,832	$55,650	$58,608	$61,714	$64,976	$68,401	$71,997	$75,773	$79,738	$83,900	$88,271
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$76,268	$80,455	$84,852	$89,469	$94,316	$99,406	$104,750	$110,362	$116,254	$122,441	$128,937
ACCUMULATED FUNDS	N.A.	$80,455	$165,308	$254,776	$349,093	$448,499	$553,249	$663,611	$779,865	$902,305	**$1,031,242**

APPENDIX TABLE 2.35

MODEL 2 BUT WITH LOBSTER PRICE OF $40 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 5.1%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	55	55	55	55	55	55	55	55	55	55
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900	9,900
Kg per pot lift	0.65	0.65659143	0.66318285	0.66977428	0.6763657	0.68295713	0.68295713	0.68295713	0.68295713	0.68295713	0.682957131
Kg p.a.	6,435	6,500	6,566	6,631	6,696	6,761	6,761	6,761	6,761	6,761	6,761
RECEIPTS											
Average price	$40.00	$42.00	$44.10	$46.31	$48.62	$51.05	$53.60	$56.28	$59.10	$62.05	$65.16
Gross receipts p.a.	$257,400	$273,011	$289,539	$307,038	$325,562	$345,172	$362,430	$380,552	$399,579	$419,558	$440,536
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$26,250	$27,563	$28,941	$30,388	$31,907	$33,502	$35,178	$36,936	$38,783	$40,722
Hired labour costs	$33,000	$34,650	$36,383	$38,202	$40,112	$42,117	$44,223	$46,434	$48,756	$51,194	$53,754
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355	$14,355
Total	$88,000	$106,205	$110,248	$114,492	$118,949	$123,629	$128,542	$133,702	$139,119	$144,807	$150,780
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$52,832	$51,933	$55,856	$60,022	$64,444	$69,138	$73,000	$77,056	$81,314	$85,786	$90,481
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$76,268	$72,558	$79,005	$85,872	$93,185	$100,971	$106,882	$113,088	$119,605	$126,447	$133,631
ACCUMULATED FUNDS	N.A.	$72,558	$151,562	$237,434	$330,618	$431,590	$538,471	$651,559	$771,164	$897,611	**$1,031,242**

APPENDIX TABLE 2.36

MODEL 3 BUT WITH LOBSTER PRICE OF $40 IN 1995 DOLLAR VALUES
PRESENT SITUATION

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Kg p.a.	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050
RECEIPTS											
Average price	$40.00	$42.00	$44.10	$46.31	$48.62	$51.05	$53.60	$56.28	$59.10	$62.05	$65.16
Gross receipts p.a.	$162,000	$170,100	$178,605	$187,535	$196,912	$206,758	$217,095	$227,950	$239,348	$251,315	$263,881
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$85,000	$88,500	$92,175	$96,034	$100,085	$104,340	$108,807	$113,497	$118,422	$123,593	$129,023
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$23,968	$25,406	$26,917	$28,503	$30,168	$31,916	$33,752	$35,679	$37,703	$39,829	$42,060
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$14,932	$16,189	$17,508	$18,893	$20,348	$21,876	$23,479	$25,163	$26,931	$28,788	$30,737
ACCUMULATED FUNDS	N.A.	$16,189	$33,697	$52,590	$72,938	$94,814	$118,293	$143,456	$170,388	$199,176	**$229,913**

APPENDIX TABLE 2.37

MODEL 3 BUT WITH LOBSTER PRICE OF $40 IN 1995 DOLLAR VALUES
20% BUY BACK WITH LEVEL OF INCREASE IN TOTAL CATCH TO ACHIEVE BREAK-EVEN FOR REMAINING FISHERS - 6.6%

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	45	45	45	45	45	45	45	45	45	45
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Kg per pot lift	0.45	0.45593229	0.46186457	0.46779686	0.47372914	0.47966143	0.47966143	0.47966143	0.47966143	0.47966143	0.47966143
Kg p.a.	4,050	4,103	4,157	4,210	4,264	4,317	4,317	4,317	4,317	4,317	4,317
RECEIPTS											
Average price	$40.00	$42.00	$44.10	$46.31	$48.62	$51.05	$53.60	$56.28	$59.10	$62.05	$65.16
Gross receipts p.a.	$162,000	$172,342	$183,314	$194,952	$207,295	$220,386	$231,405	$242,975	$255,124	$267,880	$281,274
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$24,150	$25,358	$26,625	$27,957	$29,354	$30,822	$32,363	$33,981	$35,681	$37,465
Hired labour costs	$24,000	$25,200	$26,460	$27,783	$29,172	$30,631	$32,162	$33,770	$35,459	$37,232	$39,093
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745	$11,745
Total	$85,000	$100,245	$103,920	$107,779	$111,830	$116,085	$120,552	$125,242	$130,167	$135,338	$140,768
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$23,968	$22,366	$24,665	$27,118	$29,732	$32,519	$34,573	$36,729	$38,993	$41,371	$43,868
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$14,932	$9,727	$12,724	$15,950	$19,422	$23,156	$25,223	$27,394	$29,673	$32,066	$34,578
ACCUMULATED FUNDS	N.A.	$9,727	$22,450	$38,401	$57,823	$80,979	$106,202	$133,596	$163,269	$195,335	**$229,913**

APPENDIX TABLE 2.38

MODEL 1
20% POT REDUCTION WITH TOTAL CATCH FOR THE ZONE BEING RESTORED PROGRESSIVELY OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	86	69	69	69	69	69	69	69	69	69	69
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	15,480	12,384	12,384	12,384	12,384	12,384	12,384	12,384	12,384	12,384	12,384
Kg per pot lift	0.75	0.7875	0.825	0.8625	0.9	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375
Kg p.a.	11,610	9,752	10,217	10,681	11,146	11,610	11,610	11,610	11,610	11,610	11,610
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$348,300	$307,201	$337,921	$370,945	$406,426	$444,529	$466,755	$490,093	$514,598	$540,328	$567,344
CASH COSTS p.a.											
Fixed costs	$22,000	$23,100	$24,255	$25,468	$26,741	$28,078	$29,482	$30,956	$32,504	$34,129	$35,836
Trip costs	$38,700	$32,508	$34,133	$35,840	$37,632	$39,514	$41,489	$43,564	$45,742	$48,029	$50,431
Hired labour costs	$58,480	$49,123	$51,579	$54,158	$56,866	$59,710	$62,695	$65,830	$69,121	$72,577	$76,206
Repairs & maintenance	$11,180	$11,739	$12,326	$12,942	$13,589	$14,269	$14,982	$15,731	$16,518	$17,344	$18,211
Interest & loan costs	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000	$18,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$148,360	$134,470	$140,294	$146,408	$152,829	$159,570	$166,649	$174,081	$181,885	$190,080	$198,684
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$7,600	$7,980	$8,379	$8,798	$9,238	$9,700	$10,185	$10,694	$11,229	$11,790	$12,380
Tax	$61,549	$52,720	$60,559	$69,036	$78,195	$88,083	$92,775	$97,702	$102,875	$108,307	$114,010
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$94,791	$74,230	$88,999	$105,028	$122,406	$141,230	$148,903	$156,961	$165,421	$174,304	$183,631
ACCUMULATED FUNDS	N.A.	$74,230	$163,229	$268,256	$390,663	$531,893	$680,796	$837,757	$1,003,177	$1,177,481	**$1,361,112**

APPENDIX TABLE 2.39

MODEL 2
20% POT REDUCTION WITH TOTAL CATCH FOR THE ZONE BEING RESTORED PROGRESSIVELY OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	55	44	44	44	44	44	44	44	44	44	44
Lifts per pot	180	180	180	180	180	180	180	180	180	180	180
Pot lifts p.a.	9,900	7,920	7,920	7,920	7,920	7,920	7,920	7,920	7,920	7,920	7,920
Kg per pot lift	0.65	0.6825	0.715	0.7475	0.78	0.8125	0.8125	0.8125	0.8125	0.8125	0.8125
Kg p.a.	6,435	5,405	5,663	5,920	6,178	6,435	6,435	6,435	6,435	6,435	6,435
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$193,050	$170,270	$187,297	$205,601	$225,267	$246,386	$258,705	$271,641	$285,223	$299,484	$314,458
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$25,000	$21,000	$22,050	$23,153	$24,310	$25,526	$26,802	$28,142	$29,549	$31,027	$32,578
Hired labour costs	$33,000	$27,720	$29,106	$30,561	$32,089	$33,694	$35,379	$37,147	$39,005	$40,955	$43,003
Repairs & maintenance	$8,000	$8,400	$8,820	$9,261	$9,724	$10,210	$10,721	$11,257	$11,820	$12,411	$13,031
Interest & loan costs	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$88,000	$79,670	$83,104	$86,709	$90,494	$94,469	$98,642	$103,024	$107,626	$112,457	$117,530
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$4,300	$4,515	$4,741	$4,978	$5,227	$5,488	$5,762	$6,051	$6,353	$6,671	$7,004
Tax	$32,240	$27,547	$31,825	$36,453	$41,455	$46,857	$49,376	$52,021	$54,798	$57,714	$60,776
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	$32,510	$20,738	$27,938	$35,787	$44,333	$53,626	$56,681	$59,889	$63,258	$66,794	$70,508
ACCUMULATED FUNDS	N.A.	$20,738	$48,676	$84,463	$128,797	$182,423	$239,104	$298,993	$362,250	$429,045	**$499,553**

APPENDIX TABLE 2.40

MODEL 3
20% POT REDUCTION WITH TOTAL CATCH FOR THE ZONE BEING RESTORED PROGRESSIVELY OVER 5 YEARS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CATCH AND EFFORT											
Pots	45	36	36	36	36	36	36	36	36	36	36
Lifts per pot	200	200	200	200	200	200	200	200	200	200	200
Pot lifts p.a.	9,000	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200
Kg per pot lift	0.45	0.4725	0.495	0.5175	0.54	0.5625	0.5625	0.5625	0.5625	0.5625	0.5625
Kg p.a.	4,050	3,402	3,564	3,726	3,888	4,050	4,050	4,050	4,050	4,050	4,050
RECEIPTS											
Average price	$30.00	$31.50	$33.08	$34.73	$36.47	$38.29	$40.20	$42.21	$44.32	$46.54	$48.87
Gross receipts p.a.	$121,500	$107,163	$117,879	$129,399	$141,777	$155,068	$162,822	$170,963	$179,511	$188,486	$197,911
CASH COSTS p.a.											
Fixed costs	$11,000	$11,550	$12,128	$12,734	$13,371	$14,039	$14,741	$15,478	$16,252	$17,065	$17,918
Trip costs	$23,000	$19,320	$20,286	$21,300	$22,365	$23,484	$24,658	$25,891	$27,185	$28,544	$29,972
Hired labour costs	$24,000	$20,160	$21,168	$22,226	$23,338	$24,505	$25,730	$27,016	$28,367	$29,786	$31,275
Repairs & maintenance	$12,000	$12,600	$13,230	$13,892	$14,586	$15,315	$16,081	$16,885	$17,729	$18,616	$19,547
Interest & loan costs	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Buy back levy	N.A.	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$85,000	$78,630	$81,812	$85,152	$88,660	$92,343	$96,210	$100,270	$104,534	$109,010	$113,711
IMPUTED COSTS p.a.											
Living expenses	$36,000	$37,800	$39,690	$41,675	$43,758	$45,946	$48,243	$50,656	$53,188	$55,848	$58,640
Depreciation	$2,100	$2,205	$2,315	$2,431	$2,553	$2,680	$2,814	$2,955	$3,103	$3,258	$3,421
Tax	$11,008	$8,425	$10,801	$13,381	$16,181	$19,215	$20,415	$21,676	$23,000	$24,390	$25,849
FUNDS FOR INVESTMENT AFTER TAX AND LIVING EXPENSES	($12,608)	($19,897)	($16,738)	($13,239)	($9,374)	($5,115)	($4,861)	($4,594)	($4,314)	($4,020)	($3,710)
ACCUMULATED FUNDS	N.A.	($19,897)	($36,635)	($49,875)	($59,249)	($64,364)	($69,225)	($73,820)	($78,133)	($82,153)	**($85,863)**

APPENDIX 3 STAFF EMPLOYED FOR THE STUDY

Mike Read, Read Sturgess and Associates

Neil Sturgess, Read Sturgess and Associates

David Honybun, Read Sturgess and Associates

APPENDIX 4 COST OF STUDY

Research Organisation:	FRDC Project Number	Title of Project
Read Sturgess and Associates	**95/115**	**Economic Study of the Victorian Rock Lobster Fishery**

Study commenced and finalised in 1995/96

Original budget: $37,600

Details Financial Year to 30 June 1996

Funds Available

Balance brought forward from previous year		Nil
Total funds received from FRDC during 1995/96		$37,600
Funds Available for FY 1995/96		**$37,600**
Less Expenditure		
Salaries	Nil	
Travel	$2,100	
Operating	$35,500	
Capital	Nil	$37,600
Balance as at 30 June		**NIL**

APPENDIX 5 DISTRIBUTION OF REPORT

Copies of the Summary and Conclusions were sent to each lobster fishermen in Victoria.

Copies of the entire report sent to:

Victorian Fishing Industry Federation

Fisheries Branch, Department of Conservation and Natural Resources, Victoria