

Determining the recreational share of New Zealand's marine harvest

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Introduction

New Zealand is endowed with a diverse marine fishery resource, a coastline of 15 000 km, reputedly equivalent in length to that of the USA, and a population of only 3.5 million. Nevertheless, competition for access to the resource has become one of the major issues facing recreational, commercial and Maori participants in the fishery.

Approximately 0.5 million or 15% of all New Zealanders spend time marine recreational fishing, something which is regarded by many as an unalienable right and an integral part of our way of life. About 40 inshore species are of prime interest to the recreational fishing sector. Species mentioned in this paper are listed in Table 1.

New Zealand's Exclusive Economic Zone (EEZ) is the fourth largest in the world. Last year, this area yielded a harvest of 600 000 tonnes to the commercial fishing sector and export earnings of \$1.2 billion, moving fishing into fourth place as an export earner. It is the stated intention of the fishing industry to increase this figure to \$2 billion by the year 2000.

Maori claims to the fishery were recently addressed by the passing of the Treaty of Waitangi Settlement Act which has seen

Maori become the largest quota owner in New Zealand. Nearly 40% of all quota is now owned by Maori. The Settlement Act also supplemented existing customary fishing rights with provisions for local tribes to assume responsibility for managing fisheries within coastal areas of traditional significance.

Overall responsibility for the research, management and enforcement of marine fisheries is currently vested with the Ministry of Agriculture and Fisheries (MAF) and funded by the Crown. Deepwater fisheries are managed centrally from Wellington whereas inshore fisheries are more the focus of the three regional centres of Auckland, Nelson and Dunedin (Figure 1). However, the current review of the Fisheries legislation, the introduction of user charges for the fishing industry in October 1994 and the restructuring of MAF including the transfer of all research functions to a Crown Research Institute, will see a considerable change to current arrangements.

Through what are exceptionally dynamic times for all those involved in marine fisheries in New Zealand, it is clear that both commercial and Maori rights to the fishery are being strengthened and defined more clearly. In contrast, I believe that the recre-

ational fishing sector is in an increasingly vulnerable position compared with the other user groups. To date, there is little evidence that recreational fishers are prepared to contribute the necessary funding to get organised, and without such funding, representative groups cannot effectively advocate for their rights to the fishery.

As far as research is concerned, the Government currently allocates approximately \$17 million to MAF for what is termed stock assessment research. This represents about 2% of the landed value of our fish. In comparison, the USA invests 6.6% of the landed value of its fish in equivalent research. It is only over the past six or seven years that funds have been allocated specifically to recreational fisheries research and then the allocation has amounted to about 2–3% of available research funds, which has placed considerable constraints on what can be carried out. To make the most effective use of available funds, the Recreational Fisheries Research Working Group was established in 1990 comprising researchers and representatives from all user groups including the recreational and commercial fishing sectors, tangata whenua (Maori) and environmental interest groups. Each year the group considers research directions and priorities, and reviews progress, an approach which is suited to a small country with limited resources, and one which has seen considerable progress recently.

Research priorities for New Zealand's marine recreational fishers

Top priority goes to *quantifying the recreational harvest by species and area.*

Firstly, this information is fundamental to determining *sustainable harvesting levels.*

Commercial overfishing of inshore fish stocks saw the introduction of the Quota Management System (QMS) in 1986 and the replacement of many input controls with controls on the amounts of fish that could be harvested. To determine the Total Allowable Catch (TAC) and set Total Allowable Commercial Catches (TACCs) for almost thirty species which are currently in the QMS, data on both the commercial and recreational catches are required for stock assessments. Clearly, if the recreational harvest is a significant or increasing component of the catch, and this is not taken into account, the harvest may not be sustained.

Quantifying the recreational harvest is also required to enable meaningful negotiations between the recreational and commercial sectors, and Government over *allocation of the resource.* Each year the Minister of Fisheries has to take into account the recreational harvest before setting commercial catches. Furthermore, if the combined harvest has to be reduced an equitable way to apportion the cuts must be found which is acceptable to the various user groups.

A third major issue for which recreational harvest data are required is that of *allocating the harvest fairly among the many thousands of recreational fishers.* The main management mechanism in recreational fisheries is the daily bag limit. To determine bag limits which are an effective management tool, the relationship between the total recreational harvest of each species and individual daily catches needs to be established.

Research strategy

Very few studies of marine recreational fishing were conducted prior to 1990 and those that were did not address the question of recreational catch estimates. What was needed was an approach to quantify the recreational harvest that could be implemented nationwide within the constraints of available resources.

Our approach combines a telephone survey component to identify a random sample of marine recreational fishers (there is no licensing system for marine recreational fishers in New Zealand), and a diary scheme whereby the sample of fishers identified are invited to keep detailed records of their fishing activities for one year. Diarists return their records every three months and those who fail to do so are followed up by telephone. To encourage a high response rate, all returns, including no fishing returns, are entered into a draw for prizes of fishing equipment. A newsletter summarising results is also sent to all diarists.

This approach was successfully implemented in the South region during 1991/92 and has since been extended into the Central and North regions in 1992/93 and 1993/94 respectively.

To provide a check on certain critical aspects of the diary scheme, the results of boat fishing diarists have been compared with those from an intercept survey of selected boat ramps in the Central region. In the North region, a check on harvest estimates for boat fishing in the Hauraki Gulf is currently being derived from a combined aerial survey and boat ramp interview approach. Results from these complementary studies will enable us to refine our approach and improve the accuracy of the

harvest estimates, a high priority given the stake the commercial sector has in the fishery and their keen interest in the results.

Implementing the survey in the three regions over the past three years has involved randomly selecting and telephoning over 35 000 households, or 3% of all households in New Zealand. Of these, 16% contained marine recreational fishers, 4 579 of whom qualified according to certain criteria and agreed to keep diaries, representing 1.2% of the estimated 389 000 fishers 15 years of age and over who go marine recreational fishing around the New Zealand coastline.

Results from South region survey

In the South region, where results are now available, 860 fishers agreed to keep diaries and a response rate of 90% or better was achieved in each of the four quarters between September 1991 and 1992. Over 30% of respondents did not go fishing and 50% made fewer than 10 trips during the year (Figure 2). Fishing opportunities in the South region are constrained by the exposed nature of the coastline which is subject to regular cold southerly fronts straight from the Antarctic.

The geographic distribution of fishing trips generally reflects the distribution of the population, especially around the centres of Christchurch, Dunedin and Invercargill (Figure 3). However, the small coastal fishing town of Kaikoura attracted many fishers from Christchurch, and Stewart Island, which offers an exceptional fishing experience, attracted fishers from throughout the region.

Different fishing methods are used to target fish species which are typical of distinctly

different coastal habitats. For instance, shore fishers target salmon, kahawai and red cod (Table 1) from sweeping gravel beaches and river mouths, while boat fishers harvest blue cod, which are widely distributed in reef habitat both inshore and farther off the coast. Whereas divers focus on reef habitat to collect rock lobster, paua, and reef fish, set nets are also used to catch reef species. Both set nets and drag nets are used to harvest flatfish from the heads of harbours and bays and hand gathering of shellfish species is popular on sandy beaches and reefs.

The success of recreational fishers in harvesting their targeted species was highly variable (Figure 4). Blue cod was by far the most sought after fish, accounting for 22% of the 4 461 trips recorded by diarists and making up the largest proportion of the catch. On the other hand, although the salmon/red cod/kahawai combination was much sought after, fishers were considerably less successful at catching these species. Of note are the species such as Jock Stewart (sea perch), spiky dogfish and the wrasses, which were not sought but caught in considerable numbers. In total, almost 18 000 finfish and more than 5000 rock lobster and paua were recorded by the diarists.

To calculate harvest estimates, the number of each species caught was multiplied by the average weight of a fish to give the weight of fish harvested by the sample of fishers. To derive a total harvest estimate, the sample harvest was adjusted by a factor to account for the various response categories and then a further scaling factor was used to convert the sample harvest to the total population of recreational fishers.

At 440 tonnes, the blue cod harvest was four times that of paua, rock lobster and red

cod, the next most harvested species (Figure 5). Spiky dogfish, with an estimated harvest of 122 t, is a species which recreational fishers do not appreciate and yet one which makes a significant contribution to the recreational harvest.

Application of results to management

Sustainable harvesting levels

In 1993, the recreational harvest estimates were incorporated into stock assessment determinations and published in the relevant documents, thus meeting our first major objective of contributing data to the process of ensuring stock sustainability.

Allocation between the commercial and recreational sectors

Before an appropriate allocation between the commercial and recreational sectors can be determined the combined harvest must be calculated and the recreational harvest expressed as a percentage of that. Percentages of the harvest attributable to recreational fishers ranged from a high of 65% for blue cod to less than 1% for red cod. The significance of the recreational contribution is obviously related to the size of the commercial harvest. For instance, although recreational fishers harvested an estimated 100 t of red cod, this was an insignificant amount when compared with a TACC of 12 300 tonnes.

Blue cod and paua provide useful examples to illustrate the way in which the recreational contribution to the total harvest, and the geographic distribution of the recreational catch can be used to help resolve allocation issues (Figures 6, 7 and 8).

For instance, an estimated blue cod harvest of 250 t in QMA 3 (BCO 3), puts the recreational blue cod harvest at 65% of the total harvest (Figure 6). Given the importance of this species to recreational fishers in the South region, a suggestion that the TACC be increased, currently being promoted by the commercial sector, is unlikely to occur unless adequate consultation takes place and agreement is reached with the recreational sector.

Farther south in BCO 5, the situation is quite different. Both recreational and commercial sectors are concerned about local depletion of blue cod stocks in Foveaux Straits which separate the South Island from Stewart Island. Although the recreational harvest made up only 18% of the total harvest in 1991/92, the major part of the estimated 190 t recreational harvest came from the Foveaux Straits area (Figure 7a). However, examining the distribution of the commercial harvest revealed that the bulk of the almost 900 t commercial catch also came from the Foveaux Straits area. Together, these pieces of information indicate that management attention needs to be focussed initially on the commercial fishery and fishing practices to address the issue.

A similar situation exists for paua in QMA 5 (PAU 5), where the commercial and recreational sectors, and Maori, began expressing serious concerns about a depletion of the paua resource in the early 1990s. A Paua 5 Management Working Group, was formed to address the issue and is comprised of representatives of all user and interest groups and facilitated by MAF Fisheries. On the basis that the estimated recreational paua harvest represented only 12% of the total 1991/92 harvest, the

Working Group decided to focus on improving the management of the commercial paua fishery rather than suggesting daily bag limit reductions. Attention turned to the problem of managing a sedentary, clumped species over a very extensive QMA.

Data on the distribution of the recreational and commercial harvests showed that some parts of PAU 5 were harvested almost exclusively by the commercial sector whereas other areas supported both commercial and recreational paua harvesters (Figure 7b). On the basis of this and other information, the Working Group decided that the PAU 5 should be sub-divided so that management could be tailored to the requirements of smaller areas with distinct stock characteristics and fishing patterns. To achieve this, provisions enabling subdivision have been drafted into the new fisheries legislation.

Both the paua and blue cod examples show the value of recreational harvest estimates and catch distribution data for clearly identifying fisheries issues and selecting the most appropriate approach to resolving these. Such information is fundamental to the equitable allocation of access to the fisheries resource and the success of a growing user group involvement to fisheries management in New Zealand.

Allocating within the recreational sector

Turning now to the third major objective of the survey, allocating the resource within the recreational sector, the survey data have been used to revise daily bag limits. A series of bag limits were adopted on the basis of daily catches, the size of fish, state of the stocks and the nature of the

commercial fishery. Bag limits of 30, 15, 5, 2 and 1 now characterise our finfish stocks.

We aimed to place the bag limit at the point where current catches would not be unduly constrained but where lowering the bag limit would reduce the total harvest. Blue cod and flatfish daily catches show the classic distribution for finfish species where most trips result in a few fish and a few trips result in the bag limit (Figure 8a and b). Raising the bag limit is unlikely to increase the catch significantly but lowering the bag limit will certainly reduce the catch. A similar distribution characterises butterfish, kahawai and blue moki but daily catches are lower and a lower bag limit was therefore warranted (Figure 8c, d and e).

In contrast, more accessible, sedentary species such as rock lobster and paua are more easily targeted and produce a catch distribution which is constrained by the bag limit (Figure 9a and b). Raising the bag limit would definitely increase the catch and lowering the bag limit would reduce the catch.

To determine the potential impact of lowering bag limits on the recreational harvest, blue cod can be used as an example. It should be noted that two years ago, there was a serious proposal to lower bag limits to 20 nationwide, and this exercise provides some insight into the impact this could have had on our blue cod fishers in the South region.

Distribution of the blue cod harvest shows 350 trips during which fishers caught from one to five fish, accounting for a total of 900 fish. At the other extreme, only 35 trips during which fishers caught 26 to 30 fish, accounted for an equivalent harvest. Converting fish numbers to weights shows

that approximately 30% of the harvest was accounted for by those catching between 20–30 blue cod per trip (Figure 10). It is this portion of the harvest which would have been impacted by reducing the bag limit to 20. All the trips resulting in 21–30 fish would instead catch 20, translating into a saving of 450 fish. Converting this to a tonnage for all recreational fishers in the South region equates to a reduction of 25 t or 21 700 blue cod (Figure 11). Note that the shifting of 95 tonnes to the 16–20 per day category (i.e. catches of fishers who previously caught 21 to 30 fish), converts the characteristic finfish catch distribution into one which is now constrained by the bag limit. So for blue cod our position that the bag limit should not be lowered was supported by the survey data. Given that blue cod stocks in the South region appear to be generally healthy, the views of the recreational fishers who argued that a cut to the bag limit for no real reason would adversely affect a substantial number of blue cod fishers were vindicated.

Similar exercises have been conducted for other key recreational fish species such as paua and rock lobster in response to suggestions that bag limits should be lowered where there are concerns about the state of the stocks. Such an approach allows the effectiveness of various bag limit reductions to be evaluated, and associated issues such as non-compliance to be identified.

Conclusion

The approach we have adopted has shed light on three major objectives; stock sustainability, ensuring recreational fishing access to the resource and allocating that share fairly among recreational fishers. The survey information is proving invaluable,

and the results are being applied to many more fisheries issues than have been covered here.

It is accepted that every approach to investigating recreational fisheries has limitations and that the key to a successful application is to recognise these and attempt to minimise or compensate for them. Throughout the development of our approach, considerable effort has been, and continues to be, made to validate critical aspects of the survey method we have adopted.

Currently, the Recreational Fisheries Research Working Group is considering

proposing that the survey be conducted nationally in 1995/96 so that the variability in the recreational harvest from year to year can begin to be monitored. Specific recreational fisheries issues in particular areas will continue to be addressed using intercept methods.

Finally, I believe that our approach to recreational fisheries research in New Zealand is beginning to allow recreational fishing rights to be defined. Given the power of the other stakeholders in the resource and the implications of the current institutional reform, this is indeed timely.

Table 1. Fish species referred to in the text which are caught by recreational fishers.

Common Name	Specific name
Barracouta	<i>Thyrsites atun</i>
Blue cod	<i>Parapercis colias</i>
Blue moki	<i>Latridopsis ciliaris</i>
Butterfish	<i>Odax pullus</i>
Flatfish	<i>Rhombosolea plebeia</i>
	<i>Rhombosolea leporina</i>
	<i>Rhombosolea retiaria</i>
	<i>Rhombosolea tapirina</i>
	<i>Peltorhamphus novaezeelandiae</i>
	<i>Colistium guntheri</i>
	<i>Colistium nudipinnis</i>
	<i>Pelotretis flavilatus</i>
Groper	<i>Polyprion oxygeneios</i>
Kahawai	<i>Arripis trutta</i>
Common paua	<i>Haliotis iris</i>
Red cod	<i>Pseudophycis bachus</i>
Rig	<i>Mustelus lenticulatus</i>
Spiny rock lobster	<i>Jasus edwardsii</i>
Chinook salmon	<i>Onchorynchus tshawaschta</i>
School shark	<i>Galeorhinus galeus</i>
Sea perch	<i>Helicolenus papillosus</i>
Spiky dogfish	<i>Squalus acanthias</i>
Wrasses	<i>Pseudolabrus spp.</i>

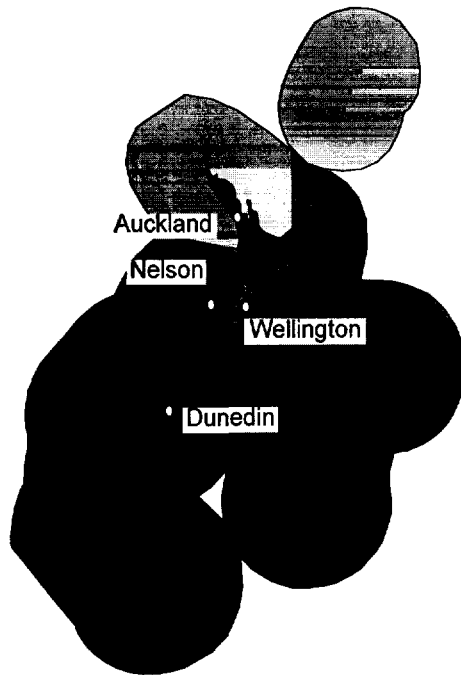


Figure 1. New Zealand EEZ showing MAF Fisheries regions.

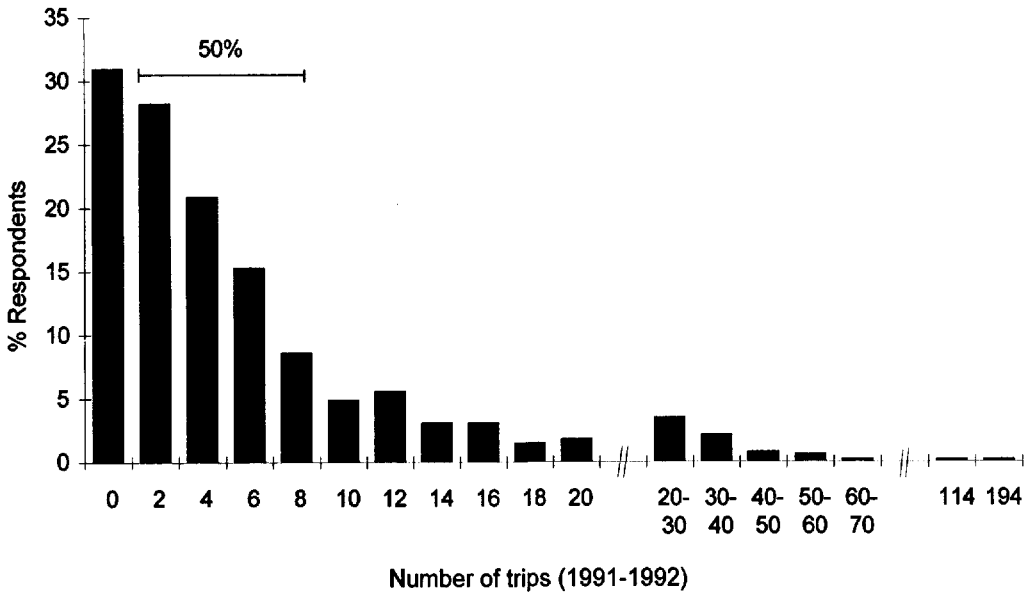


Figure 2. Distribution of fishing effort among respondents.

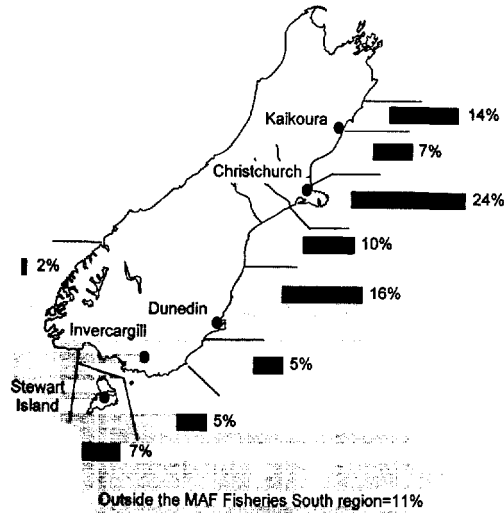
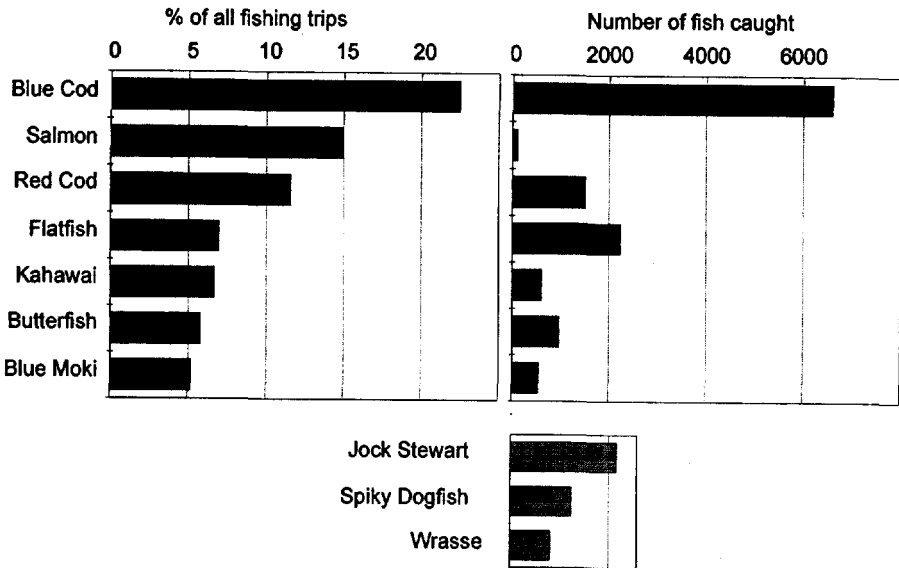


Figure 3. Geographic distribution of fishing trips.

Finfish



Shellfish

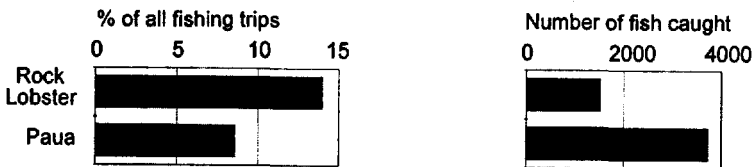


Figure 4. Species sought and species caught.

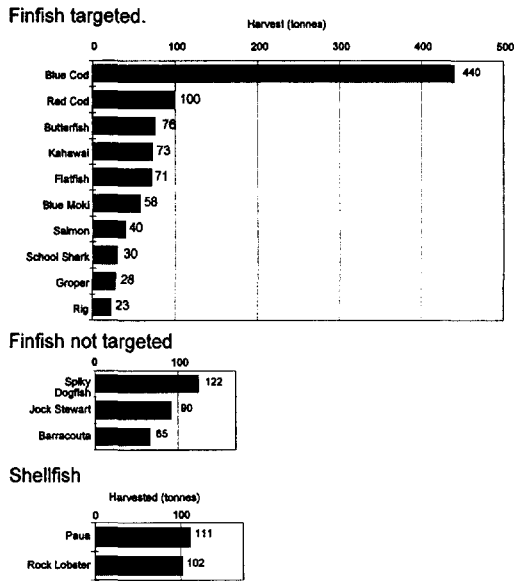


Figure 5. Recreational harvest estimates for MAF Fisheries South region fishers.

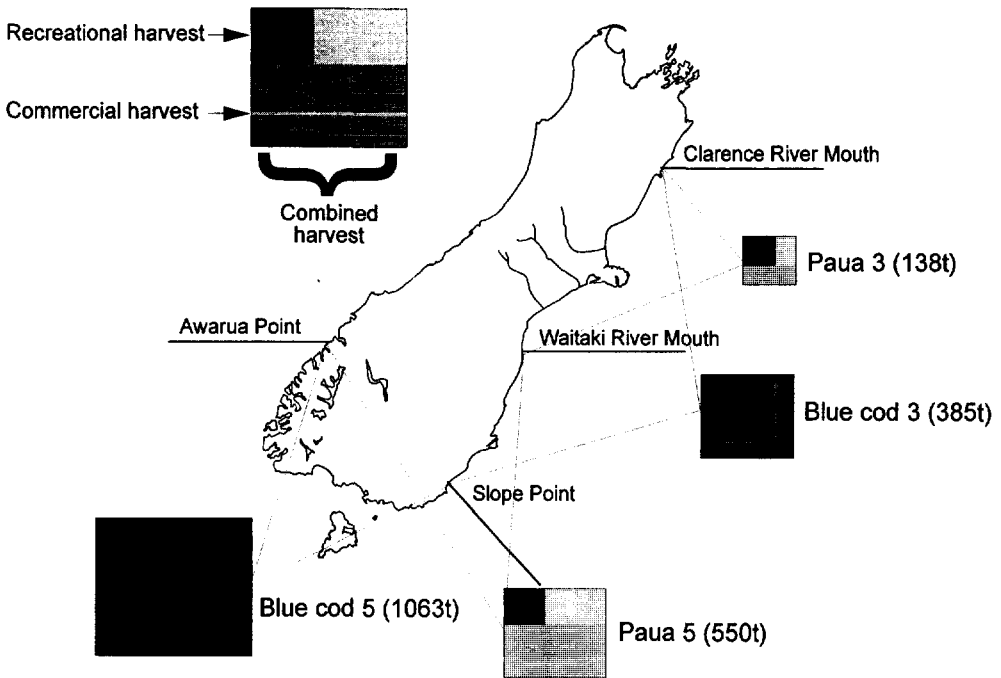


Figure 6. Relative contribution of recreational and commercial catches to combined catches for blue cod and paua.

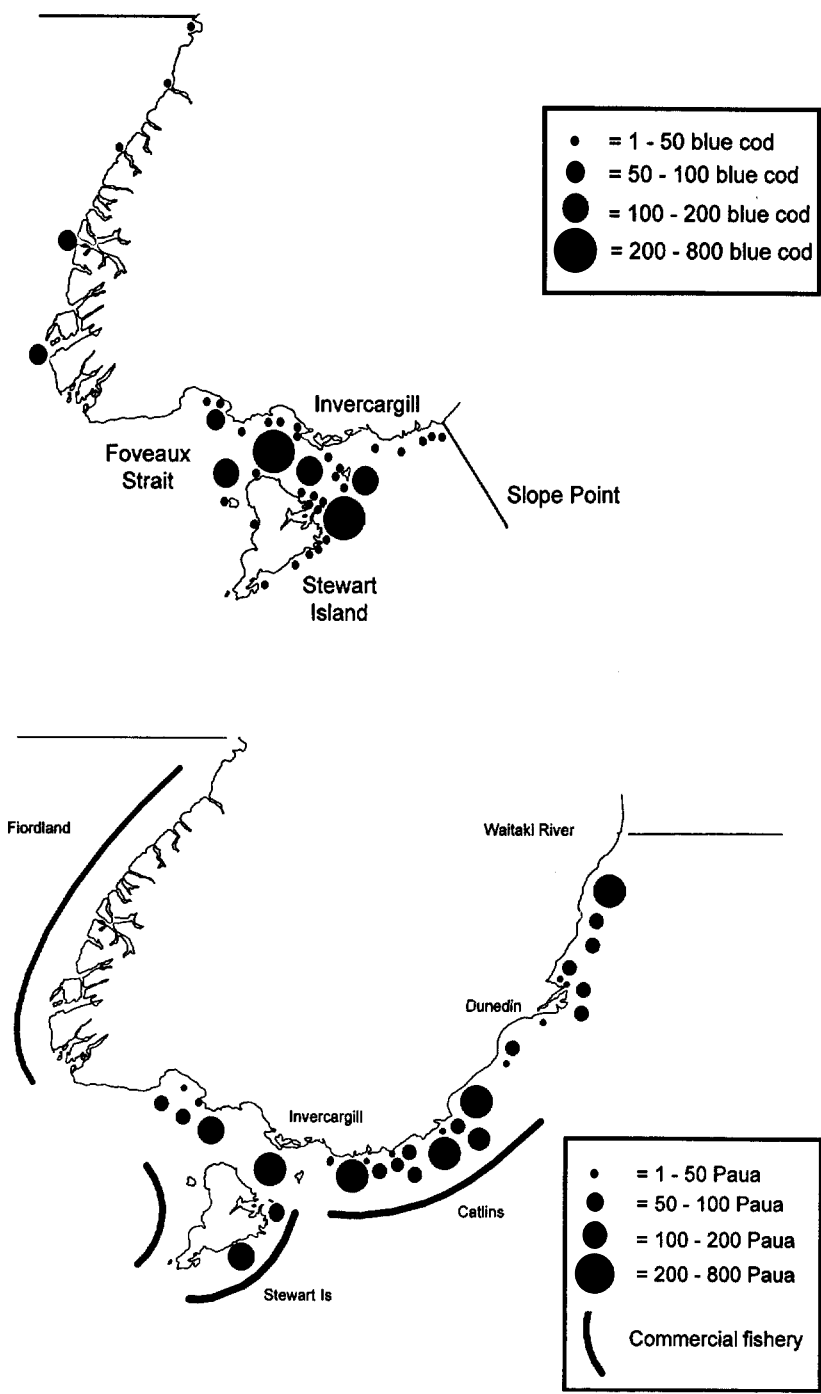


Figure 7. Distribution of the recreational harvest of (a) blue cod in BCO 5 and (b) paua in PAU 5.

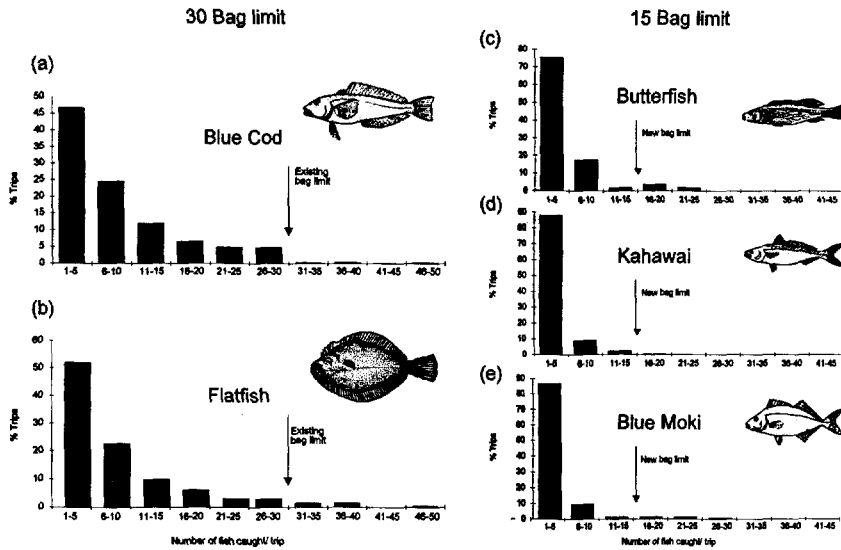


Figure 8. Relationships between daily bag limits for selected finfish species and the distribution of daily catches: (a) blue cod, (b) flatfish, (c) butterfish, (d) kahawai and (e) blue moki.

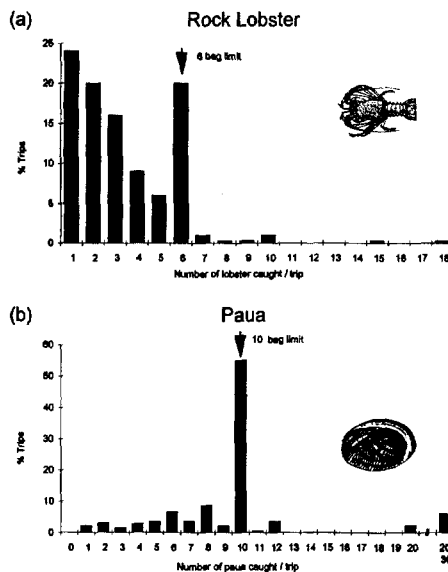


Figure 9. Relationships between daily bag limits and the distribution of daily catches for (a) rock lobster and (b) paua.

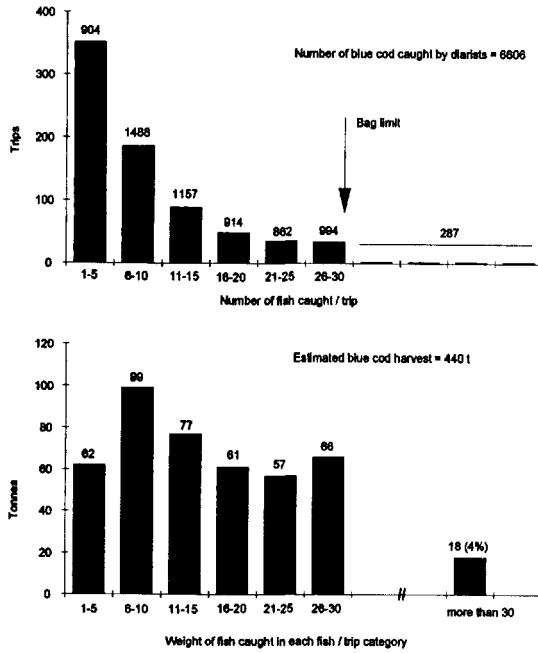


Figure 10. Relationship between daily catches and the weight of blue cod harvested.

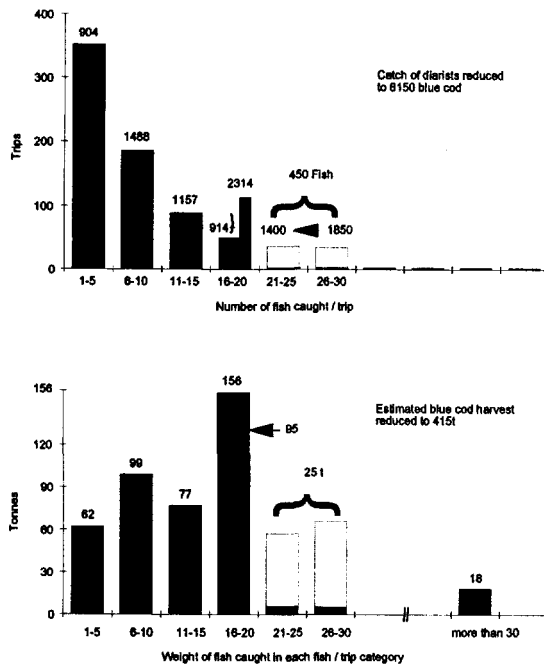


Figure 11. Potential impact of reducing the blue cod bag limit on the harvest.