

New Zealanders' perceptions of the state of marine fisheries and their management

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Abstract.

Management of New Zealand marine fisheries is widely regarded as innovative and effective. However a nationwide survey in 2000 revealed that New Zealanders judge the state of New Zealand's marine fisheries to be adequate to good, and management of the marine fisheries is only adequate. On those two criteria marine fisheries obtained the lowest ratings amongst thirteen areas of the natural environment. In this paper we report results from a 2002 nationwide survey which repeats the 2000 questions and probes further to determine which features of marine fisheries and their management lead to their comparatively low scores. Findings are consistent between the two surveys. There are clear differences in perception on the basis of ethnicity and this has a range of policy implications for fisheries and other policy managers.

Keywords: Environmental reporting, marine fisheries, perceptions, Pressure-State-Response model, New Zealand

1. INTRODUCTION

The first State of the Environment Reporting (SER) exercise based on a survey of New Zealanders' perceptions of the environment was undertaken in 2000 (Hughey et al. 2001). Most SER is based on biophysical indicators of environmental performance. However, relying on trends among biophysical indicators for SER alone may be problematic. People's perceptions of the state of environmental parameters are also important because there is frequently a dissonance between technical and perceptual measures of risk. Our survey was based on the Pressure-State-Response (PSR) model. OECD (1996) and MfE (1997) explain this model, which is used internationally as the basis for environmental reporting. The Hughey et al. (2001) survey was designed to be undertaken biennially. Results from the first survey in 2000 identified that respondents gave some of the lowest ratings (albeit with ratings of good to adequate) to matters associated with marine fisheries and their management, including consideration of marine reserves. In this paper we report on the 2002 survey which repeated most of the 2000 survey questions and further explored some marine fisheries management related questions.

2. SURVEY METHOD

A postal questionnaire based on the PSR model and the survey administered in 2000 was used to gather information on New Zealanders' perceptions of the environment and environmental management.

2.1 The questionnaire

The PSR framework guided the development of survey questions. Three sets of questions assessed perceptions of the state of the environment and three sets of questions assessed perceptions of the response by management. For all of these measures a 'don't know' option was provided for respondents. Perceived pressures were assessed by one set of questions.

Further questions supplemented the PSR framework. These included measurement of the main perceived causes of damage to the environment. One question set examined preferred allocation of government expenditure on environmental management and government services. Further perceptions of aspects of marine resource management were measured separately. Eight questions sought demographic information. We included questions on ethnic origin to further our analysis here. Not all questions covered in the study are reported in this paper.

The state of the marine environment

To measure perceptions about the state of the environment three sets of questions were asked about quality, the availability or amount, and change of state over the previous five years. The first set was preceded by the instruction: *Please indicate what you think the state of each of the following is.* Followed by: *The quality or condition of New Zealand's...* The eleven aspects were then presented with a five-point scale provided for measurement of each which was anchored by *very good* and *very bad*.

The second set of questions regarding the state of the environment measured perceptions of the amount or availability of nine natural resources. These were measured by asking: *We would like your opinion on the availability or amount of some of our natural resources.* The set of nine natural resources was then preceded by: *In New Zealand the....* The set was presented with five-point scales provided for measurement anchored by *very high* and *very low*.

The third measurement was of perceptions of change in the state of the environment over the last five years. These were taken with the invitation: *Now that you have told us what you think about the state of New Zealand's environment, we would like you to tell us how you think the environment has changed over the last 5 years.* The set of aspects was preceded by: *Compared to five years ago...,* followed by thirteen aspects of the New Zealand environment. These aspects were presented with a five-point measurement scale anchored by *much better* and *much worse*. An additional question sought views on how recreational marine catch rates within the respondent's region had changed over the last five years.

Adequacy of marine environmental management

A set of questions measured perceptions about current management of the environment. Thirteen items were preceded by: *Currently in New Zealand how well or poorly managed is...* These items were presented with a five-point measurement scale of each anchored by *very well managed* and *extremely poorly managed*.

A further set of management questions established perceptions about change in management quality over the previous five years. The question presented the same set of items as the prior set with the instruction: *Compared to five years ago, management of New Zealand's...* These items were presented with a five-point scale provided for measurement anchored by *much better* and *much worse*.

Finally, respondents were asked *who should manage* the New Zealand coastline. Ten alternatives were given, although respondents could tick any number of boxes.

Pressures on the marine environment

The PSR framework includes pressures on the environment. Pressures were measured by presenting a table containing ten aspects of the New Zealand environment with fifteen potential causes of adverse environmental effect. Respondents were instructed to select up to three causes for each aspect. This approach was designed to assist respondents by removing the necessity to select the single most important item from the fifteen presented. Respondents were invited to respond with the invitation: *Tell us what you think are the main causes of damage to parts of the New Zealand environment by ticking up to three items on each line.* Fishing was subdivided into commercial and recreational components. Respondents were asked how their *catch rates, for recreational fishing, had changed over the last five years.*

Allocation of government funds

Design of the 2002 survey differed from the 2000 survey in terms of how respondents were asked to consider expenditure preferences. The 2000 survey mixed the major overall areas of government expenditure with some specific conservation and environment expenditure items. While these results were interesting, it was decided to improve the question in 2002 by separating the general areas of government expenditure from specific areas in environment and conservation. Despite these changes we do make an effort to compare findings between surveys, although these comparisons need to be made with care.

To enable comparison between preferences for the allocation of government spending on conservation and the environment within the existing budget, respondents were asked whether they considered more or less should be spent on eleven items. The question began by stating: *Now we would like to know how you would*

reallocate the Government's expenditure on Conservation and the Environment. Total spending on Conservation and the Environment would not change. Please tick one box for each spending category to show how you would change the allocation of government spending if total spending is the same as now. Measurement was then taken on five- point scales anchored by *we should spend far more* and *we should spend far less*.

Demographic information

Information was obtained on gender, age, country of birth, ethnicity, education, current situation, paid employment, the industry the person worked or had last worked in, and personal income. Numbering of each survey allowed derivation of respondents' residential locations, which were subsequently categorised into three regions (South Island, central, being the North Island south of Auckland, and northern which was Auckland and north).

Some preliminary work has been carried out to determine the representativeness of survey respondents compared to the New Zealand population. Both gender ($\chi^2=4.86$; DoF=1; $p=0.028$) and age ($\chi^2=13.46$; DoF=5; $p=0.019$) were significantly different to comparative population data. Females and older age groups were over-represented.

2.2. Distribution and response

Two thousand questionnaires were distributed to randomly selected individuals drawn from the New Zealand electoral roll. The questionnaire and the letter of introduction were posted with a freepost return envelope. The questionnaires were posted on 9 March 2002. In addition, a follow-up postcard on 28 March 2002 and a second questionnaire posting to non-respondents was sent on 18 April 2002. The survey received an effective response rate of 45% (N= 836) (2000 survey response rate of 48 per cent; N = 894). Both surveys had maximum margins of error of 3% at the 95% confidence level.

3. RESULTS

3.1. The state of the environment

a) Quality of the New Zealand environment

Table 1 shows that perceptions of the state of the marine environment were generally *adequate to good*. In 2000 and 2002 marine fisheries were considered to be in the worst condition of all environmental sectors addressed, although the mean was still within the *adequate to good* range. Marine fisheries received the largest number of 'don't know' responses (with more than 10%) in both years. There were highly significant differences between ethnic groups ($\chi^2=25.4$; DoF=4; $p<0.0001$; Figure 1): Whereas NZ Europeans judged the state of the resource more favourably than Maori, their views were not as favourable as people of other ethnic origin. About 65% of 'others' thought the condition of marine fisheries was good or better.

Table 1: Perceived state of New Zealand's environment.

Perceived quality of ...	N	Very good	Good	Adequate	Bad	Very bad	Don't know	Mean (1-5)	Std. Dev
		(1)	(2)	(3)	(4)	(5)			
%									
marine fisheries:									
2000	875	6.2	30.2	32.9	15.4	2.7	12.6	2.75	.93
2002	801	6.2	33.5	36.0	10.2	2.5	11.6	2.65	.88
New Zealand's natural environment compared to other developed countries:									
2000	879	34.6	42.3	14.7	1.6	0.2	6.6	1.83	.77
2002	821	38.7	41.2	12.7	1.3	0.4	5.7	1.76	.76

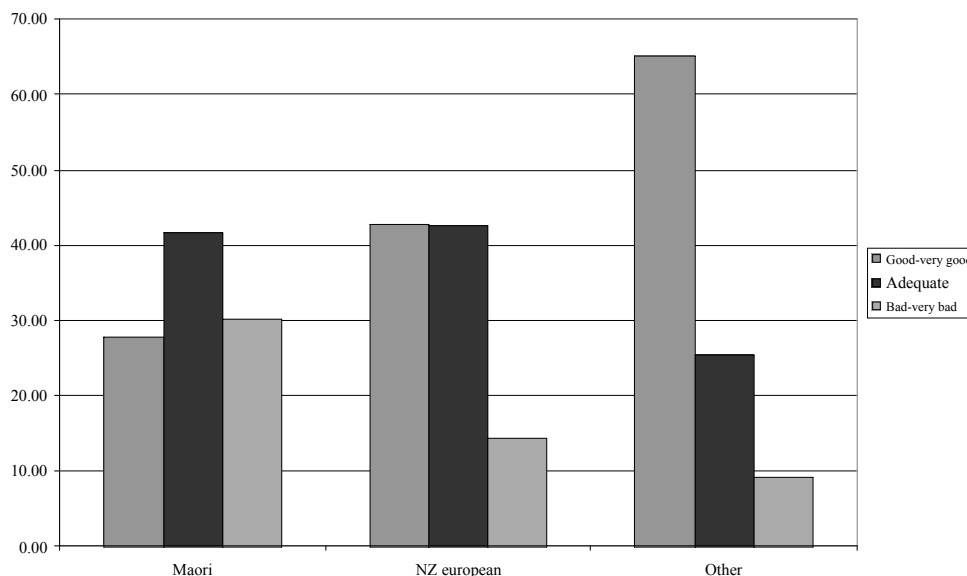


Figure 1: Condition of marine fisheries by ethnicity (percent).

b) Availability of natural resources

Respondents considered there to be a moderate to high quantity of marine fish stocks (Table 2), but a moderate to low availability of marine reserves. There are significant differences in ethnic perspectives on the area of marine reserves ($\chi^2=20.7$; DoF=4; $p<0.001$; Figure 2) with 'others' evaluating the area most highly, while Maori and NZ Europeans both considered it to be in the moderate-very low range.

Table 2. Perceived availability of natural resources.

Perceptions of ...	N	Very high (1)	High (2)	Moderate (3)	Low (4)	Very low (5)	Don't know	Mean (1-5)	Std. Dev
		%							
quantity of marine fisheries:									
2000	846	3.8	25.2	38.3	16.2	1.5	15.0	2.84	.84
2002	808	3.7	22.0	42.9	12.0	2.4	17.0	2.85	.92
area of marine reserves:									
2000	849	2.5	13.8	37.9	24.5	4.9	16.4	3.19	.88
2002	808	3.7	16.7	36.1	21.8	4.6	17.1	3.08	.93

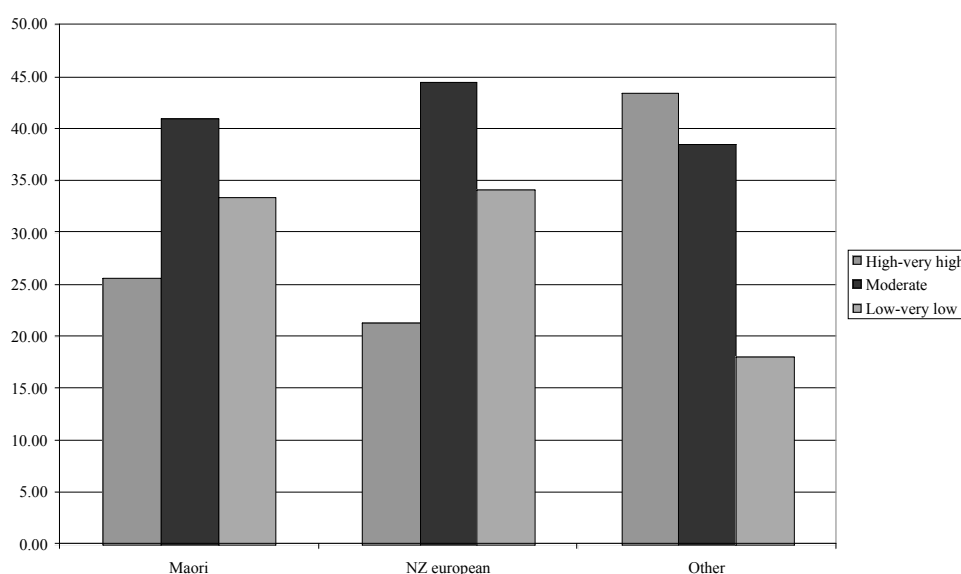


Figure 2: Area of marine reserves by ethnicity (percent).

The state of recreational fisheries is perceived as poor (Table 3) with a mean Likert score of 3.43.

Table 3: Perceived fish abundance and effort required by region.

Perceptions of fish abundance and effort required	N	There are plenty of fish, very little effort is required	Good fish numbers, little effort is required	Moderate fish numbers, moderate effort required	Low fish numbers, lots of effort required	Very low fish numbers, very high effort required	Don't know	Mean (1-5)	Std. Dev	
		(1)	(2)	(3)	(4)	(5)				
		%								
	804	0.5	5.6	32.5	24.1	5.8	31.5	3.43	0.79	

c) Change in the state of the environment

Perceived changes in the state of New Zealand's environment over the last five years are shown in Table 4. Respondents considered the state of marine fisheries had either not changed or had got worse over the last five years, in both surveys, whereas, marine reserves were thought to have stayed the same or got better. There were large numbers of *don't know* responses for marine fisheries and marine reserves.

Table 4. The perceived state of the environment compared to five years ago.

Perceived change over the last five years of ...	N	Much better	Better	No change	Worse	Much worse	Don't know	Mean (1-5)	Std. Dev	
		(1)	(2)	(3)	(4)	(5)				
		%								
marine fisheries:										
2000	850	1.6	10.6	28.8	32.1	3.6	23.2	3.33	.85	
2002	807	1.6	12.3	28.6	27.1	4.6	25.8	3.28	.89	
marine reserves:										
2000	845	2.6	23.7	33.3	14.1	1.3	25.1	2.84	.83	
2002	802	2.5	27.2	30.4	12.7	1.6	25.6	2.78	.84	
NZ's natural environment compared to other developed countries:										
2000	857	13.5	45.3	24.4	5.1	0.6	11.1	2.26	.81	
2002	817	15.7	43.5	21.7	4.7	0.4	14.2	2.19	.81	

Most people thought it was more difficult to catch fish now than it was five years ago (Table 5).

Table 5: Perceived change in regional recreational catch rates over the last five years.

Perceptions of how regional recreational fish catch rates have changed over the last five years	N	It is much easier to catch fish	It is easier to catch fish	It takes about the same effort to catch fish	It is more difficult to catch fish	It is much more difficult to catch fish	Don't know	Mean (1-5)	Std. Dev	
		(1)	(2)	(3)	(4)	(5)				
		%								
	807	0.9	1.9	17.0	30.6	9.5	40.1	3.77	0.80	

3.2. Management of the environment

a) Current management of the environment

Perceptions of quality of management are shown in Table 6. While marine fisheries were considered to be poorly to adequately managed, marine reserves were considered adequately to well managed. An analysis of

perceived management quality by ethnicity showed that while 36% of 'others' thought fisheries are well managed, only 29% of Maori and 18% of NZ Europeans thought so ($\chi^2=17.2$; DoF=4; $p<0.002$). Thirteen percent of 'others' and 16% of NZ Europeans believed that marine reserves were poorly managed, while for 29% of Maori considered marine reserves were poorly managed ($\chi^2=8.6$; DoF=4; $p<0.1$).

Table 6. Perceptions of current management of the environment.

Perceived quality of management of ...	N	Very well managed (1)	Well managed (2)	Adequately managed (3)	Poorly managed (4)	Very poorly managed (5)	Don't know	Mean (1-5)	Std. Dev
		%							
marine fisheries:									
2000	848	2.2	13.2	33.3	24.5	4.4	22.4	3.20	.89
2002	809	1.2	14.8	37.6	20.4	3.7	22.2	3.14	.83
marine reserves:									
2000	853	2.6	20.3	40.3	10.9	2.2	23.7	2.87	.80
2002	802	2.6	21.7	41.4	11.1	2.0	21.2	2.85	.79
New Zealand's natural environment compared to other developed countries:									
2000	852	11.6	39.9	33.1	4.3	0.7	12.3	2.35	.80
2002	815	13.6	36.3	32.1	3.2	1.0	13.7	2.32	.82

b) Management of the environment compared to five years ago

Perceptions of changes in quality of management over the previous five years are shown in Table 7. Change in management quality differs between surveys for marine fisheries, having improved between surveys, but is consistent for marine reserves.

Table 7. Quality of management compared to five years ago.

Perceived change in management compared to 5 years ago of ...	N	Much better (1)	Better (2)	The same (3)	Worse (4)	Much worse (5)	Don't know (N)	Mean (1-5)	Std. Dev
		%							
marine fisheries:									
2000	843	2.6	15.9	35.7	19.0	3.2	23.6	3.06	.87
2002	805	2.6	19.4	35.9	16.4	2.0	23.7	2.94	.84
marine reserves:									
2000	842	2.5	24.0	35.7	10.6	1.8	25.4	2.80	.81
2002	811	3.7	27.6	36.0	8.6	1.4	22.7	2.69	.80
New Zealand's natural environment compared to other developed countries:									
2000	843	13.2	35.5	29.9	3.9	1.1	16.5	2.33	.84
2002	808	14.1	35.8	28.8	3.3	0.6	17.3	2.28	.82

3.3. Main causes of damage to the environment

Respondents' judgements of the main causes of damage to marine fisheries and marine reserves are reported in Table 8 and in Figures 3 and 4. An example serves to illustrate how Table 8 should be interpreted. The top left cell in column two indicates that 1.56% of respondents in 2002 believed that motor vehicles were one of the three main causes of damage to marine fisheries.

While there were only two years between the surveys, there are significant differences in responses to the two surveys. Differences for marine fisheries and marine reserves are summarised as:

- **Marine fisheries:** More people in 2002 identified farming as a main cause of damage (but only from 2-3%). Recreational fishing was increasingly perceived as a cause of damage to marine fisheries, jumping from 15% to 19% of respondents, while hazardous chemicals declined from 22% to 15%.

- **Marine Reserves:** Recreational fishing was recorded as a cause of damage by 17% in 2000, increasing to 21% in 2002. Farming increased to 3% in 2002, whereas only 1% of respondents listed it in 2000. Forestry declined from 1% to 0% and hazardous chemicals from 19% to 14% between 2000 and 2002.

Table 8: Main causes of damage to marine resources.

Resource:	Marine fisheries		Significance of difference	Marine reserves		Significance of difference
	2002	2000		2002	2000	
Main causes of damage:	% of all survey respondents who gave this response			% of all survey respondents who gave this response		
Motor vehicles and transport	1.5	0.8		1.2	2.3	*
Household waste and emissions	5.3	5.1		5.4	5.2	
Industrial activities	12.9	13.9		8.7	10.5	
Pests and weeds	4.1	3.6		7.5	7.1	
Farming	3.3	1.5	**	3.4	1.2	***
Forestry	0.6	0.5		0.0	0.7	**
Urban development	1.9	2.3		5.0	4.6	
Mining	0.8	1.1		1.3	1.9	
Sewage and storm water	31.9	32.3		28.7	29.3	
Tourism	5.1	5.0		12.2	12.1	
Commercial fishing	60.4	60.1		32.3	30.3	
Recreational fishing	18.5	15.4	*	21.4	17.3	**
Dumping of solid waste	12.5	14.9		12.1	13.7	
Hazardous chemicals	15.0	22.2	***	14.2	18.8	**
Other	2.7	1.8		2.2	2.8	

Note: Percentages add to more than 100 because respondents could nominate up to 3 causes.

Key: Z score significance levels: * = $p < 0.1$; ** = $p < 0.05$; *** = $p < 0.01$

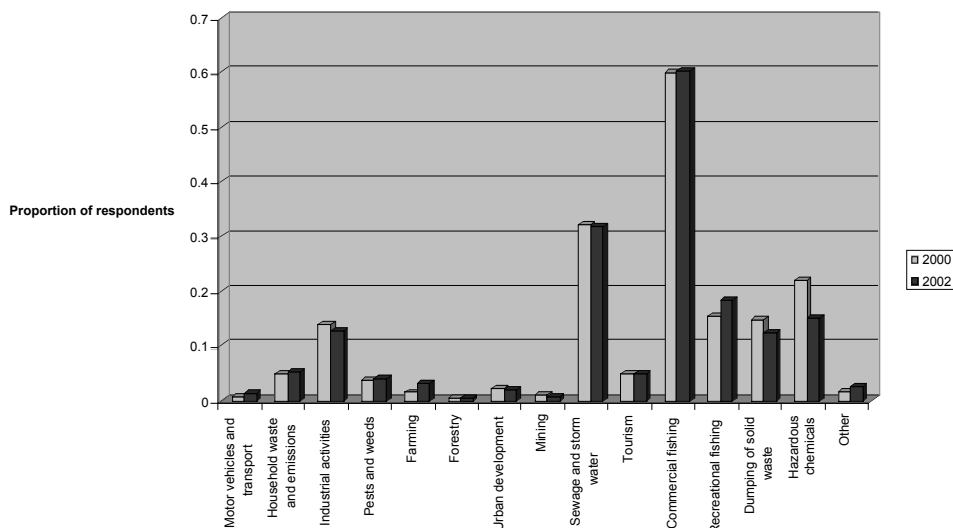


Figure 3: Main causes of damage to marine fisheries

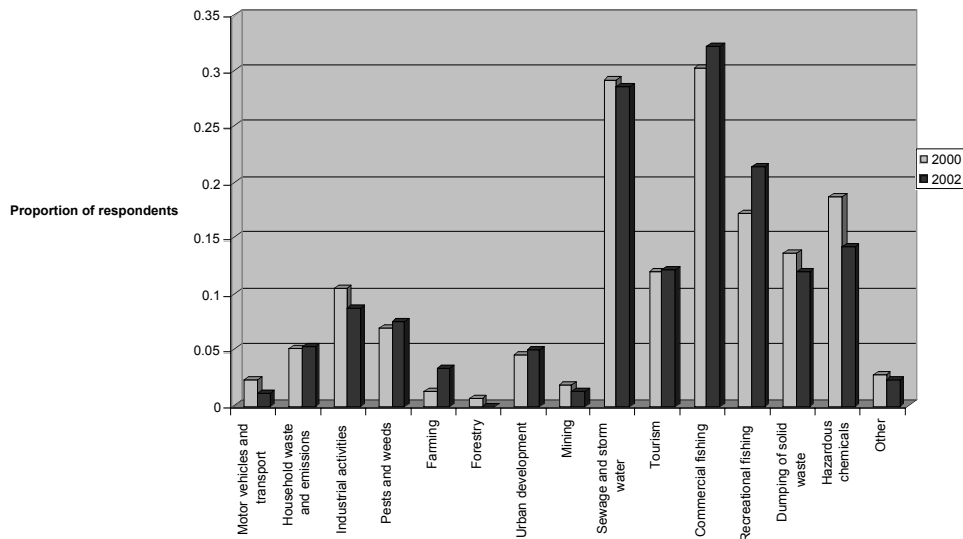


Figure 4: Main causes of damage to marine reserves.

3.4. Allocation of government spending

Preferences for changes in expenditure on eleven environmental items were tested (Table 9). Total spending on the environment was required to remain the same. In 2002 people wanted more expenditure on marine fisheries than they did in 2000. There are significant differences in ethnic perspectives on expenditure on marine fisheries ($\chi^2=19.1$; DoF=2; $p<0.0001$; Figure 5), with most Maori wanting more spent while most NZ Europeans and 'others' did not support additional spending on marine fisheries.

Table 9: Preferences for allocation of government spending.

Preferences for spending on ...	N	Spend far more	Spend more	No change	Spend less	Spend far less	Mean (1-5)	Std. Dev
		(1)	(2)	(3)	(4)	(5)		
%								
marine fisheries:								
2002	684	8.2	30.6	51.3	8.8	1.2	3.06	1.34
2000	853	4.7	29.1	61.0	4.3	0.9	2.68	.68
marine reserves:								
2002	686	8.2	32.8	50.3	7.1	1.6	3.03	1.34
2000	856	5.8	33.2	57.1	3.3	0.6	2.60	.68

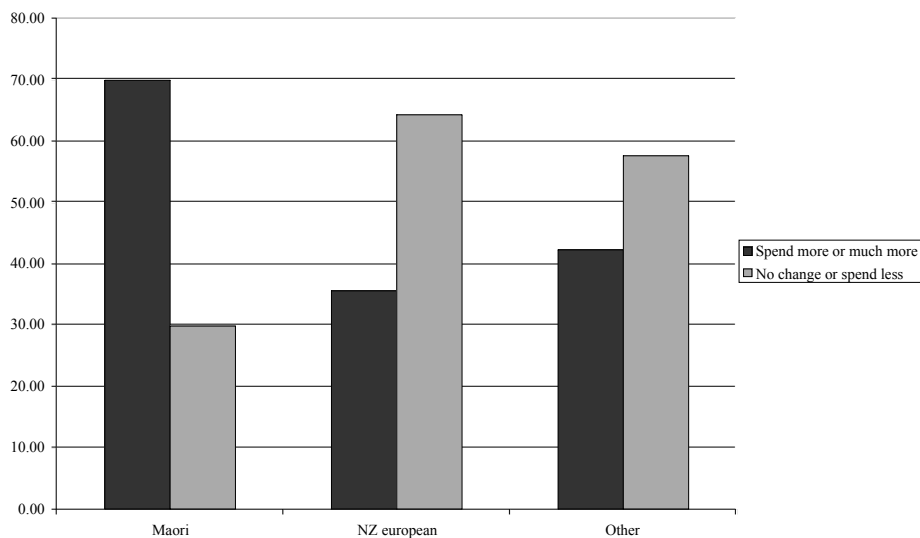


Figure 5: Desired change in fisheries expenditure by ethnicity (percent in each ethnic category).

4. DISCUSSION

Hughey et al. (2001) note that '[the 2000 survey] has systematically identified perceptions of the state of the environment using the framework of the Pressure-State-Response model (and) that the results of the survey ... along with the large sample size, the high response rate, and small margin of error, provide the most accurate representation yet of New Zealanders' perceptions of the environment'. These same conclusions apply to the 2002 survey. Additionally, there is, apart from age, a high degree of similarity between the demographics of respondents in 2002 and 2000, indicating that comparison of responses to the two surveys provides a valid indicator of changes in community perceptions (Hughey et al. 2002b).

4.1. Key findings related to marine fisheries

Both surveys show that marine fisheries are rated as the poorest performing environmental sector for all of the pressure, state and response criteria (Hughey et al. in prep.). It is not surprising then that there is a call for extra expenditure on marine fisheries and marine reserves. This finding is tempered by recognition that, even though marine fisheries rate the poorest, they and their management are generally rated in the adequate to good range. The exception is recreational fisheries where responses mostly lie in the moderate to low categories.

There are, however, worrying trends for fisheries managers. There are many 'don't know' responses which might indicate a lack of publicly available, reliable and easily understood knowledge about the state of fisheries and the marine environment in general. There is also a perception that the state of, and management of, marine reserves (in effect management for *conservation* purposes) is superior to management of marine fisheries (that is management largely for *use* purposes). There might be more 'trust' and reliability in management for conservation rather than use and this is an issue for policy managers to consider. For recreational fisheries there appears to be little positive news, i.e., both the current state of the resource and change over time are rated extremely poorly. The main causes of damage to both marine fisheries and, somewhat surprisingly, marine reserves are perceived to come from commercial and recreational fishing.

4.2. Ethnicity and responses

Responses to many questions vary significantly with the ethnicity of respondents. As with a similar analysis of water (Hughey et al. 2002a), we found 'others' to almost always have a more positive view about marine fisheries than did either NZ Europeans or Maori. 'Other' ethnicity people include Pacific Islanders and those of Asian origins. There is some evidence that Asian people have differing attitudes toward environmental management than do New Zealand Europeans and Maori (MfE, 1997: 2.9). This difference has been manifested in reef and other near-shore fisheries where problems have occurred with some Asians taking almost all the marine life they can harvest. For example, Ministry of Fisheries inspectors have reported that immigrant groups from Asia and (sic) contribute disproportionately to the over-harvesting of shellfish in the Auckland and Wellington areas (Weatherly 1996). It also appears likely their frame of reference, which may have developed in the context of depleted resources in their home country, would lead them to have relatively positive views about the situation in New Zealand.

Conversely, Maori responses were often very mixed or highly negative. Maori judge marine fisheries and their management to be poorer than do New Zealand Europeans and 'other ethnicity' respondents. This may happen because Maori have particular affinities with marine fisheries because of a history of traditional use and because of recent Treaty of Waitangi recognition.

There are clear policy implications here, particularly from the Maori perspective. Ongoing efforts to involve Maori in policy and day-to-day fisheries management need to be further enhanced. Furthermore, these ongoing efforts need to be communicated clearly to all Maori.

4.3. Concluding comments

Public perceptions of the state of marine fisheries in New Zealand are relatively poor compared with the full set of other resources examined in the 2002 survey (Hughey et al. in prep; 2002a,b). This is despite the commonly held view amongst many environmental professionals and fishing industry participants that New

Zealand fisheries management is leading the world. Should decision makers be concerned about the findings presented here? The answer is probably yes. Survey results signal the need for better communication of the positive results being achieved under the existing policy regime. Nevertheless, there are problems with existing fisheries management, particularly in terms of recreational fishing and in terms of the environmental externalities caused by fishing (see Hughey et al. 2001) and these clearly need to be addressed. The potential downside of not addressing these issues is a move, via the political process, to a previously failed policy regime because of the perception that the current regime is not working.

Perception about pressures, management, and the state of the fishery, are likely to be important drivers of policy. They may also provide early warning of impending fishery management issues. For example, regional 'hotspots' can sometimes be identified and differences in perceptions between social groups can be revealed. The surveys show concerns about the state of marine fisheries to be most important in the central-lower North Island and the relatively positive perception of non-New Zealanders to be potentially problematic, especially given the propensity for some of the latter to over harvest certain marine resources. Forewarning, and ongoing concern if expressed in repeat surveys, about these matters can identify intervention that can be undertaken to target these concerns.

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