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The Value of Recreational Inshore Marine Fishing

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Summary

The relative values of New Zealand commercial and recreational marine fishing are unknown. Value transfer is applied to assess the likely value of inshore marine recreational fishing. The few relevant studies available report widely differing estimates of value. However, there is sufficient evidence to indicate that the value of recreational fishing is of the same order of magnitude as commercial fishing.

Keywords: Value transfer, recreational fishing

Introduction

Marine fisheries contribute to welfare in many different ways. The most obvious are commercial fishing and supporting industries as well as recreational fishing and cultural harvests. Fisheries also have existence and bequest values, and changes in fisheries can have important social and cultural implications (Kirk, undated). Conflict between some of these values and externalities associated with unconstrained use typically invoke management intervention in order to ensure sustainability and to enhance benefits from resource use.

Under New Zealand's Quota Management System (QMS), annual Total Allowable Commercial Catch (TACC) is set by deducting an allowance for recreational (and cultural, and illegal) harvest from Total Allowable Catch (TAC). Total recreational catch is not directly constrained by the QMS. However there are size, location, method and daily bag restrictions on recreational fishing.

One prominent area of conflict arises between commercial and recreational fishers who are competing for the same resource. There is a dual externality. The more fish caught by recreational fishers, the fewer are available for commercial fishers. On the other hand, an increase in TAC can result in higher TACC, decreasing fish abundance and possibly size, affecting the quality and quantity of recreational fishing. This situation raises the question of whether competing sector interests should be accounted for in making fishery management decisions. Adopting a total benefit maximisation perspective, one would equate the marginal net benefit of fish across the sectors. Understanding the change in total value by sector under alternative management regimes would permit assessment of potential policy changes in a cost-benefit framework. In the New Zealand context, where one sector is managed and the other is not, this leads to a complicated management problem for determining economically optimal TACC (ERA, 2010). Economic benefits from recreational fishing are not explicitly accounted for in contemporary New Zealand fishery management, which is a point of contention for recreational fishers. A coarse measure of value, indicating what is at stake in each sector, but not allowing optimisation at the margin, is the nett value of the different fishery sectors.

The purpose of this paper is to assess the order of magnitude of nett recreational fishery values, and to assess their significance against the nett value of the commercial fishery.

Theoretical background

The annual value of marine recreational fishing can be estimated by several approaches:

1. Number of fishers * Value/fisher/year, or
2. Number of fishers * Number of days/fisher/year * Value/fisher/day fished, or
3. Number of fishers * Number of trips/fisher/year * Value/fisher/trip, or
4. Number of fishers * Number of fish caught/year * Value/fish

Approach 4 (e.g. Wheeler & Damania, 2001) has limited validity because it assumes that the only purpose of recreational fishing is to catch fish. Where other motivators are at play approach 4 is invalid. However, both the number of days/trips taken and the average value a fisher obtains from their fishing year (or day or trip) is likely to be influenced by the number and characteristics of fish caught. In other words, an outward shift in the recreational fishing demand curve caused by improved attributes of recreational fishing will influence both the quantity consumed and the average benefit. The alternative valuation approaches are illustrated with reference to Figure 1.

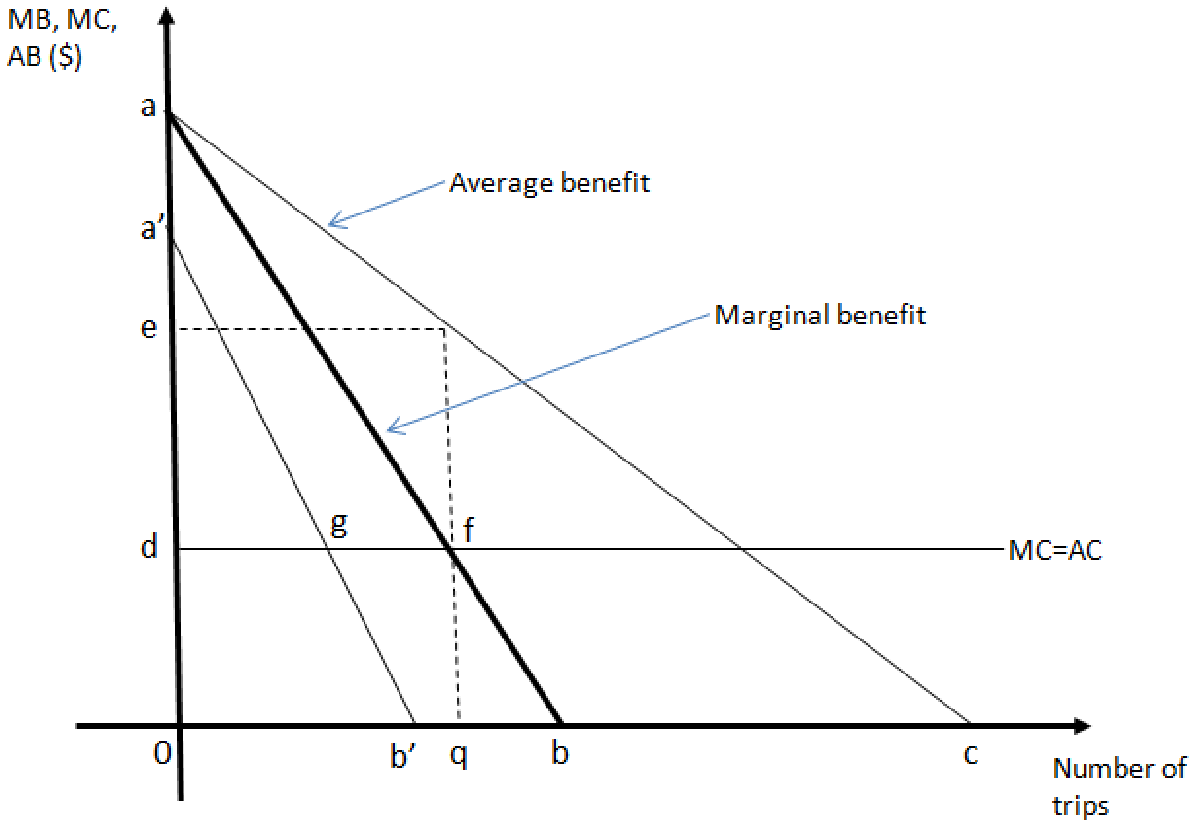

Figure 1: Recreational fishing demand

Ideally, fishery managers would have full information on the aggregate recreational fishing demand function (ab), and how it responds to changes in fishery characteristics such as fish size, species mix and recreational catch rates. Annual fishing benefits are measured by consumers’ surplus (area daf). Approach 1 measures annual consumers’ surplus directly. Approaches 2 and 3 multiply the level of activity (0q) and average nett benefit per unit of activity (ed) in order to estimate area adf. Any attempt to directly measure consumers’ surplus using these approaches (e.g. via open-ended contingent valuation) provides no information on the demand curve, except for the location of point f in circumstances where the cost of fishing (0d) and the quantity of fishing (0q) are both known. However, some valuation approaches (e.g. travel cost methods) identify the demand curve, estimating consumers’ surplus indirectly.

Changes in commercial fishing activities affect benefits from the recreational fishery by shifting the recreational fishing demand curve. Suppose an increase in TAC reduces recreational catch rates, then the recreational fishing demand curve is expected to move towards the origin (say to a’b’ in Figure 1). If this new demand curve is everywhere below the original demand curve then both average benefits and quantity of fishing decline, reducing aggregate recreational fisher welfare to area da'g (the loss of welfare in this case is area fga'a).

Whilst identification of demand curves conditioned on fishery attributes can be achieved using a range of non-market valuation methods, this has not been undertaken in New Zealand to date. In common with other recreation sectors, many recreational fishing non-market valuation studies have sought simply to estimate current consumers' surplus (the magnitude of area daf) and have not identified the demand curve *per se*, or how fishery attributes affect the demand curve. The purpose of this paper is to apply value estimates from existing studies, value transfer, to assess the value of New Zealand's marine recreational fishery and to evaluate its significance relative to the commercial fishery.

Method

Orders of magnitude of the component parts for Approaches 1-3, necessary for approximation of the order of magnitude of the value of marine recreational fishing, are available from existing sources. New Zealand information on marine recreational fishery participation has been identified through literature review. A review of recreational marine fishing non-market valuation studies, in New Zealand and elsewhere, was undertaken to provide value estimates.

Study identification entailed discovery of as many existing marine fishing valuation studies as possible. Several approaches were adopted for this task, including:

- A thorough investigation of the EVRI database (www.evri.ca), which is an international repository of environmental non-market valuation studies funded by six governments, including New Zealand.
- Consultation with academics who regularly undertake non-market valuation.
- Electronic literature searches using databases available at the Lincoln University Library, as well as publicly accessible databases, such as *Google Scholar*.
- Scrutiny of references cited in fishing valuation studies.

In order to make the data commensurable all values have been adjusted to third quarter (Q3) 2010 New Zealand dollars. This was a two stage process. Firstly, consumer price indices for each of the countries were used to adjust to Q3 2010 values in the currency concerned. Official government statistics were used for this adjustment (Australian Bureau of Statistics 2011, Statistics NZ 2011, US Bureau of Labour and Statistics 2011). The second stage entailed currency conversion using consumer purchasing power parity rates (OECD 2011). New Zealand denominated value estimates are evaluated before combining relevant components to provide a value transfer assessment of annual consumers' surplus.

Results

Table 1 underlines the diversity of participation estimates. Several studies indicate that over a million New Zealanders fish in the sea each year. However, SPARC (2009), in a large scale national level study specifically addressing sport and recreation, indicates somewhat lower participation. The scant evidence available suggests that fishers make about 9 trips per year.

Table 1: Fishing participation

Source	Participation rate	Number of fishers ♣	Days per fisher	Trips per fisher
Bell & Associates (1996 NMRFS) ♦	9.7% Kearney (2002) argues this is an under estimate.			
Sylvester et al. (1994) ♦	17.3%			
National Research Bureau (1991) ♦	38%			
AC Nielsen (2000) – recruitment for 1999 NMRFS ♦	39% Kearney (2002) argues this is an over estimate.			
AC Nielsen National Readership and Finance surveys (2000) ♦	31%			
AC Nielsen's "Interests & Activities" 10 year average ♦	19.5%			
Hughey et al. (2002) ◊	33.4% of the adult population	970,000 adults ♣		
NIWA (2007)	>25%	>1 million		
Hughey et al. (2008) ◊	33.8% of the adult population (SE=1.7%)	1,080,000 adults ♣	8.04	
SPARC (2009)	16.6% of the adult population (95% confidence interval = 15.0% ~ 18.3%) ‡	539,446 adults ♣ (487,000~ 595,000)		
Heatley (2010)	"nearly a third of us have gone fishing or have gathered shellfish in the last 12 months", "recreational fishers go fishing an average of nine times a year"	>1 million		9
Davey et al. (2006) [West Coast, SI]				8.6
Schischka & Marsh (2008)				9.3

♦ Source: Kearney (2002).

‡ In "New Zealand Fisheries at a Glance" www.fish.govt.nz the Ministry of Fisheries reports that 19.5% of the total NZ population fishes. According to SPARC (2009a) this represents both fresh and saltwater fishing.

◊ The Hughey et al. participation rate estimates for other activities are acknowledged by the authors to be implausibly high, these estimates may be similarly biased.

♣ NZ population 18 years and older: 2002=2.9m, 2008=3.2m, 2010=3.3m. NZ total population 2008=4.27m (www.stats.govt.nz)

Indicators of the monetary value of consumers' surplus from New Zealand studies are reported in Table 2. Only two studies have addressed marine recreational fishing.

Kerr et al. (2003), in an omnibus national survey of perceptions about the New Zealand environment undertook a contingent behaviour analysis of willingness to purchase a marine recreational fishing license. Given debate at the time about the desirability of such a license, it is expected that there would have been significant protest response and the value derived is likely to be an under-estimate of what people would actually pay. Schischka and Marsh (2008) used contingent valuation in Whangamata to estimate WTP for the last fishing trip. Because of diminishing marginal utility, this approach, which values the marginal trip, is expected to under-estimate average trip value. Kerr (2009) used benefit transfer to assess mean WTP of high value freshwater fisheries, which appear to be about twice the value of outdoor recreation in general. Because some fishing trips last longer than a day, differences between the recent estimates by Kerr (2009) and Schischka and Marsh (2008) are not inconsistent. The value transfer study undertaken by Kerr (2004) is a compilation of values from sixteen New Zealand diverse outdoor recreation studies, ranging from mountaineering to road end camping.

Table 2: Value estimates (2010 NZ$)

Source	Type of study	Value /day	Value /trip	Value /year
Kerr et al. (2003)	Contingent behaviour: WTP for a national marine fishing license			$137 ($106~$249)
Kerr (2004)	Value transfer: 16 NZ outdoor recreation studies	$26		
Schischka & Marsh (2008)	Contingent valuation: WTP for the last trip, Whangamata		$52~$65	
Kerr (2009)	Value transfer: High value NZ freshwater fisheries	$49		

Whilst there is a very large international literature on fishery valuation, much of it was not relevant to this study. While many early studies addressed the value of the fishery, or the value of a fishing-day, more recently the focus has been on attribute–based methods that typically report on the value of attribute changes, but do not commonly report the welfare implications of fishery closure. Other studies addressed the value of fish *per se* (e.g. Johnston et al. 2006). Several studies are vague on the location of the fishery studies, are freshwater-based, or concurrently estimate values for both freshwater and saltwater fishing. Such studies were excluded.

We identified only six studies that reported value per fishing day. Values covered an extremely broad range, from $0.30 (Q3 2010 NZ$) per fishing day for access to the Georgia, USA coastline (Whitehead and Haab 1999), to a range of $378 to $616 for fishing access to the coast of Southern California (Haab et al. 2006). Two studies assessed the value of marine fishing in Florida; Bell’s (1997) estimate for the east coast ($177) is an order of magnitude larger than Whitehead and Haab’s (1999) estimate ($6) for the same area.

Fifteen studies reported values per marine recreational fishing trip. Again, there is great diversity of value estimates, ranging from less than a dollar for a trip to Augusta in West Australia (Zhang et al. 2003) to $600 for Texas (Cameron 1992). Ten studies allowed derivation of annual values. Again, value estimates are diverse, ranging from $25 for the Gulf of Mexico Red Snapper fishery (Gillig et al. 2003), several thousand dollars for access to Queensland’s Capricorn Coast (Prayaga et al.

2010) and the United States eastern seaboard (McConnell et al. 1994), up to $10,000 for Texas (Cameron (1992). The large potential differences in value from alternative valuation methods are amply demonstrated by Gillig et al. (2003), who applied three valuation methods and found contingent valuation estimates an order of magnitude larger than estimates from the other methods.

The role of substitutes

Availability of substitutes is an important determinant of site value. Two effects are anticipated. First, the loss of small sites is expected to be of less importance than the loss of access to broad areas because the former affords more opportunity for substitution of alternative fishing destinations. Second, the value of sites should decrease with distance from the site, partly because of travel costs consuming consumers' surplus, but also because of the broader range of site substitution possibilities, a result confirmed by Morey et al. (1991).

Scale differences are apparent in day and trip value estimates. For example, Haab et al. (2000) assessed trip values for three areas of Florida; the Gulf Coast ($100), the South Atlantic Coast ($26), and all of Florida ($439). Fishers who would have used one of these locations could transfer their effort to the other location should one site close (e.g. if the Atlantic Coast closed they could fish on the Gulf Coast). They do not have that opportunity when both coasts close, resulting in a much higher value for loss of access to all of Florida. Estimates of value loss for large coastal areas (All the Gulf Coast, $178; All the Atlantic Coast, $237) are considerably larger than for loss of access to individual states (Haab et al. 2007). Two West Australian studies (Raguragavan et al. 2010, Zhang et al. 2003) used the same dataset, which addressed a large number of small sites. The loss of any individual site in this context is not important because fishers can transfer to another site. Consequently, the small West Australian sites are lowly valued ($0.20 to $20 per trip).

Value of the New Zealand Fishery

In order to value the New Zealand marine recreational fishery it is essential to establish a counterfactual. Loss of small areas may simply mean effort is transferred to other locations. The value of the fishery is established when all recreational fishing is extinguished, i.e. national closure. The implications of scale effects mean that only a limited number of value studies have relevance for this task – essentially, studies that evaluate welfare changes over substantial spatial dimensions for loss of access to all species. Studies fitting that profile are reported in Table 3. Values per trip (Haab et al. 2000, Hausman et al. 1995) are much larger than Schischka and Marsh's (2008) New Zealand estimate. The Scandinavian study annual values (Toivonen et al. 2004) are similar to the New Zealand estimate (Kerr et al. 2003). However, USA (McConnell et al. 1994) and Australian (Prayaga et al. 2010) values are an order of magnitude larger. Both New Zealand studies are expected to be downward biased, for reasons mentioned earlier.

Previous value transfer studies have found similarly broad ranges of values (Freeman 1995, Downing & Ozuna 1996, Pendleton & Rooke 2007). The diversity of values observed across studies, coupled with cautions throughout the literature about the validity of transferring values (Boyle et al. 2009, Downing & Ozuna 1996, Kristofersson & Navrud 2005, Plummer 2009, Rosenberger & Loomis 2003, Vandenberg et al. 2001), suggest that little can be learned about the value of the New Zealand fishery from international value transfer. We therefore proceed with caution to draw some tentative conclusions.

Table 3: Large site value estimates (2010 NZ$)

Study	**Item valued**	**Valuing population**	**Value**
Hausman et al. (1995)	Access to Alaska	Alaska	$313 ~ $414/trip
Haab et al. (2000)	Access to Florida	South Eastern	$439/trip
	Access to Gulf Coast	USA	$178/trip
	Access to South Atlantic		$237/trip
McConnell et al. (1944)	Access to the whole Mid & south Atlantic coast, USA	Mid-Atlantic	$2,006/year
		Chesapeake	$1,893/year
		South Atlantic	$1,890/year
Toivonen et al. (2004)	Access to whole country fisheries. Scandinavia	Denmark	$148/year
		Finland	$152/year
		Iceland	$291/year
		Norway	$171/year
		Sweden	$116/year
Prayaga et al. (2010)	Access to Capricorn Coast, Australia		$2,430/year

To gain an understanding of the potential dimension of value for the New Zealand marine recreational fishery we create some illustrative scenarios in Table 4. The New Zealand studies (Kerr et al. 2003, Schischka & Marsh 2008) are expected to be conservative. The other studies are presented as alternatives, without implying superiority. Clearly, marine recreational fishing generates considerable benefits. We wish to compare those estimates with the value of the commercial fishery.

Table 4: Value scenarios

Value basis	Indicative Value ($NZ)	Frequency	Annual value 500,000 Participants	Annual value 1,000,000 Participants
Schischka & Marsh (2008)	$55/person/trip	9 trips/year	$247 million	$495 million
Haab et al. (2000), Hausman et al. (1995)	$200/person/trip	9 trips/year	$900 million	$1,800 million
Kerr et al. (2003)	$130/person/year		$65 million	$130 million
Toivonen et al. (2004)	$150/person/year		$75 million	$150 million
McConnell et al. (1994), Prayaga et al. (2010)	$2,000/person/year		$1,000 million	$2,000 million

Value of the commercial fishery

Schischka and Marsh (2008) identify two methods for estimating the value of the commercial fishery.

1. Market value of quota, as estimated in the Fish Monetary Stock Accounts (Statistics NZ, 2007), capitalised at 9%.

The latest monetary stock accounts report aggregate fishery value at $4b (Statistics NZ, 2010). However, some commercially fished species are not harvested by recreational fishers. The commercial value for recreationally harvested species is in the order of $2b (Appendix A). Applying a 9% discount rate yields annual value of about $180m, which is of similar magnitude to the value of recreational fishing.

2. Sales receipts less operating costs (operating surplus). Schischka and Marsh (2008) report data from the Statistics NZ annual enterprise surveys for the period 1999-2003: Income $1,133m/annum, Expenditure $1,017m/annum, Net income $116m/annum. This implies net worth is about 10% of revenue. Note that this figure includes deepwater and other non-recreational species.

Discussion

The values estimated here are extremely exploratory. However, they do indicate that direct nett benefits obtained by recreational fishers and commercial fishers from species that are targeted by both are of broadly similar orders of magnitude.

Both recreational and commercial fishing have broader economic implications. Expenditures by saltwater anglers will produce upstream effects. For example, Crosson (2010) found that North Carolina recreational saltwater anglers spent about US$139 per trip, taking 26.8 trips per year for a total spend of US$3,727 per annum, underscoring the potential magnitude of flow-on effects. McDermott Fairgray (2000) used input output analysis to identify the economy-wide impacts of commercial marine fisheries. Direct value-added from fishing was $244 million, expanding to $594 million after including indirect and induced effects. The inclusion of value-added from processing (Direct $302m, Total $1,140m) results in industry-wide direct value-added of $546m and total value-added of $1,734m.

Values relevant for decision making are the magnitudes of value changes for the different sectors induced by policy changes, which we have not addressed. Transferring allowable catch from the recreational sector to the commercial sector (for example) could be socially beneficial if the value of fish at the margin for commercial fishers exceeded the value of fish at the margin for recreational fishers. Changes in TACC, minimum and maximum fish sizes, permitted fishing methods, temporal and spatial closures, and so forth can affect recreational catch rates, fish size, congestion, and gear conflicts. These effects have the potential to affect the value of the recreational fishery. Understandably, recreational fishers want these impacts recognised and accounted for when fishery management decisions are made. The magnitude of the value indicators we have derived reinforce their case for adequate consideration in that process.

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Appendix A: QMS Fishery asset value

Source: Statistics NZ (2011)

Table 1 *(continued)*

New Zealand's Commercial Fish Resource

Year ended September, 1996–2009

Species	Year ended September							Only commercial	Commercial	Mixed
	2003	2004	2005	2006	2007	2008	2009			
	NZ$ million									
Hoki	815	695	541	627	693	730	815	1	815	0
Rock lobster	689	644	585	570	621	634	771		0	771
Paua	328	355	379	366	390	361	304		0	304
Orange roughy	225	324	300	277	250	319	282	1	282	0
Snapper	298	282	258	226	252	280	262		0	262
Ling	172	196	219	197	231	235	246	1	246	0
Hake	141	147	123	188	141	156	135	1	135	0
Scampi(1)	…	…	116	128	119	131	132	1	132	0
Arrow squid	103	240	138	298	170	109	117	1	117	0
Silver warehou	55	71	71	63	83	83	83		0	83
Tarakihi	63	65	62	94	79	86	75		0	75
Oreo	59	68	68	72	85	87	74		0	74
Southern blue whiting(2)	57	52	59	62	53	64	74	1	74	0
Jack mackerel	17	99	58	27	26	28	54	1	54	0
Bluenose	73	43	50	43	58	54	43	1	43	0
Barracouta	33	37	43	41	38	42	40		0	40
Stargazer	24	29	26	25	24	28	39		0	39
Blue cod	33	39	45	57	46	41	39		0	39
Dredge oysters(3)	20	30	29	24	23	26	37		0	37
School shark	37	42	50	45	45	40	35		0	35
All other species	371	406	512	369	398	408	360		0	360
Total	3,614	3,866	3,730	3,796	3,825	3,939	4,017		1898	2119

(1) Scampi was introduced to the Quota Management System (QMS) on 1 October 2004.

(2) Southern blue whiting was introduced to the QMS on 1 November 1999.

(3) Dredge oysters (OYS7) was introduced to the QMS on 1 October 1996, followed by OYU5 on 1 October 1998.
An additional 10 QMAs were introduced to the QMS on 1 October 2005.

Symbol: … not applicable