Commercial fisheries of the Bay of Islands and adjacent waters in relation to possible marine protected areas

John Booth

Summary

Both the Marine Reserves Act 1971 and the Marine Protected Areas policy of the New Zealand Biodiversity Strategy are concerned that, when establishing marine protected areas (MPAs), existing usage by—among others—commercial fishers is not unduly affected. Accordingly, people interested in setting aside unfished areas in the Bay of Islands need to know the nature and extent of commercial harvesting, especially in relation to the potential candidate no-take marine reserve areas around Okahu and Waewaetorea Islands and in and around Maunganui Bay, and the scientific reserve area in the Tangatapu Estuary.

Most of the commercial fisheries of New Zealand are managed under the Quota Management System which gives quota holders access to a certain tonnage each year to be harvested within a certain area (Quota Management Area or QMA). 'Existing users' has been held to include anyone holding quota for a QMA, irrespective of where in that QMA their fishing has actually been taking place. Most inshore fishers estimate their catches on Catch, Effort, and Landing Returns, the finest scale for most fisheries being at the inshore statistical area level. The Bay of Islands is within Statistical Area 003, which extends about 200 km, from near Taupo Bay to Waipu Cove. The main restrictions to commercial fishing in the Bay of Islands are 1) trawling and Danish seining is permitted only in outer parts; 2) purse seining is banned from southeastern parts, including around the islands of Ipipiri; 3) harvesting of beach-cast seaweed is not allowed anywhere; and 4) all other commercial fishing (apart from rock lobster potting) is banned from around the islands of Ipipiri from late spring to late autumn. The distribution and intensity of some recent fishing events involving lines, nets and trawls, made available by the Ministry for Primary Industries by 1-nautical mile grid cells, reflect these restrictions.

The tonnage and \$-value of the fish and invertebrate species (or species-groups) taken within the Bay of Islands itself—as opposed to Statistical Area 003 as a whole—are poorly known. Few commercial fishers regularly and routinely fish the waters of the Bay of Islands, although several visit now and then from elsewhere. The main finfish species routinely landed by local fishers, using set nets and beach seines, are flounder, garfish, grey mullet, kahawai, pilchard, snapper and trevally. However, from time to time, visitor lining, netting and trawling for such fish as snapper, trevally, flatfish and grey mullet, and purse seining of pelagic species like skipjack tuna, pilchards and mackerels near the mouth of the bay, can be important. The main invertebrates taken within the Bay of Islands are potted or dived for: rock lobsters and kina, and possibly paddle crabs.

There is no known reason to expect current harvesting methods, species, or areas to change markedly over the next five years.

The fishing of only one locally based Bay of Islands fisher—a pot fisherman—is likely to be seriously affected by closure of any of the three possible MPAs. However, it is easy to underrate the significance to their fishing of the periodic visits by non-resident fishers, who may work close to, or even within, the candidate sites. In any case, we can expect the commercial industry to vigorously oppose any closures in the Bay of Islands because of the loss—potential or actual—of fishing opportunity.

1. INTRODUCTION

Both the Marine Reserves Act 1971 and the Marine Protected Areas policy of the New Zealand Biodiversity Strategy¹ are concerned that, when establishing marine protected areas (MPAs), any adverse impacts on existing users of the marine environment are minimised. Furthermore, 'existing users' has been held to include anyone holding quota for a Quota Management Area (QMA), irrespective of where in the QMA their fishing has actually been taking place.² People interested in establishing marine reserves (MRs) and other MPAs must, therefore, come to terms with the nature and extent of present—and potential future—commercial fishing. This paper reports on commercial fishing in and near the Bay of Islands, and examines the potential impact on fishers of possible no-take MRs around Okahu and Waewaetorea Islands and in and around Maunganui Bay, and a scientific reserve in the Tangatapu Estuary.

Most commercial fisheries in New Zealand waters are managed under the Quota Management System (QMS; the exceptions relevant here are albacore and skipjack tuna, and the seaweeds). The QMAs are largely based around ten Fisheries Management Areas (FMAs) (Figure 1), each typically with several hundred kilometres of coastline. For most inshore fisheries, 48 statistical areas apply around mainland New Zealand (Figure 1) for the reporting of catch and effort. For each fishing event, fishers must estimate the weight of their five most abundant (by weight) species by statistical area. Bay of Islands is within Statistical Area 003 (Karangi, near the west end of Taupo Bay, to Waipu Cove), which encompasses about 200 km of coast (excluding harbours and islands). The fishing year for most fisheries is 1 October to 30 September.



Figure 1. Fishery Management Areas (left), and inshore statistical areas for mainland New Zealand (right).

The objectives of this paper are to

- 1. Use existing information to summarise the recent (past 5 years), and potential near-future (next five years), commercial fisheries of the Bay of Islands
- 2. Identify and contact current commercial fishers using the Bay of Islands to characterise their fishing patterns and to determine the extent to which the possible MPAs will affect their fishing.

2. COMMERCIAL FISHING ALLOWED WITHIN THE BAY OF ISLANDS

Restrictions applying to commercial fishing within the Bay of Islands—the methods allowed and the times of year—are summarised in Figure 2 (for finfish) and Figure 3 (invertebrates).³ Commercial harvesting of beachcast seaweed is prohibited within the Bay of Islands,⁴ but it is unknown what other (if any) area or season restrictions apply to other seaweed harvesting—although it is presumably prohibited in the Ipipiri area from 1 October to 31 May, because all commercial fishing, except that for rock lobsters, is banned there.





Figure 2. Areas and times of the year that various fishing methods for finfish can be used commercially in the Bay of Islands³. Red, prohibited altogether (circles have 1-nautical mile radius and are for set netting at Cape Wiwiki, Whale Rock and Twins Rock; and any netting at Nine Pin, Cape Brett and Bird Rock); orange, permitted 1 May to 30 September (but set nets must be <1 km long); blue, permitted all year for set nets <1 km long; green, permitted year-round. Insets illustrate the less well-known fishing methods.



Figure 3. Areas and times of the year that various fishing methods for invertebrates can be used commercially in the Bay of Islands.³ Orange, permitted 1 May to 30 September; green, permitted year-round. Rock lobsters can be fished anywhere at any time; commercial scallop fishing is banned altogether. (Maps for bottom pair trawl, bottom trawl, Danish seine, and set net used to catch squid were given in Figure 2.)

3. DATA SOURCES

3.1 Statistical Area 003 catches and value

Overviews of the Ministry for Primary Industries (MPI) commercial fishing data at the statistical-area level for most of the species of interest are available on the National Aquatic Biodiversity Index System (NABIS) website.⁵ Catch-by-method data for the period October 2008 to March 2013 from the Catch, Effort, and Landing Returns (CELRs) for the mainly small inshore fishing vessels, and the Tuna Longlining Catch Effort Returns (TLCERs) for tuna longline vessels, for Statistical Area 003 were examined on 20 March 2013. No finer geographic subdivision of effort or harvests are routinely available apart from the subset referred to in Section 3.2). Eel Catch Landing Returns were not investigated because discussion with experts⁶ indicated that no—or virtually no—eels are commercially harvested below MHWS. Also, the logbook records of rock lobster fishers were ignored because their data focus more on lobster size and maturity than detailed catch locations. No seaweed harvest data associated with Statistical Area 003 could be located.

For the CELRs, finfish fishers should estimate and record for each fishing event the weights of their top five species. In practice, usually fewer of the main species are reported, so less-abundant species tend to be under-reported. Fishers of most other species—such as most of the invertebrates, and the seaweeds—also use CELRs and the inshore statistical areas. Rock lobster fishers, however, report on CELRs with different statistical areas, and the TLCERs have much more precise position data, but both returns have been summarised in NABIS according to the standard inshore statistical areas.

The *scale* of value of the Statistical Area 003 fishery, 2008–2013, for each species can be gleaned from the port price, in turn based on recent levy rates.⁷ Port prices reflect what fishers are paid for their catch, but the actual value of a fishery to the community can be much higher when onshore processing and export value are taken into account.

3.2 Statistical Area 003 catch and effort by method

Fishing catch and effort based on 1-nautical mile grid cells for some or most line, net and trawl events available from the MPI website for the 2007/08 to 2009/10 fishing years⁸ allow a more detailed spatial overview of fishing patterns, probably of visiting vessels.

3.3 Interviews of Bay of Islands commercial fishers

Commercial fishers working within the Bay of Islands were interviewed and their fishing activities characterised.

4. RECENT COMMERCIAL FISHERIES IN STATISTICAL AREA 003

The commercial fisheries for finfish, invertebrates and seaweeds in Statistical Area 003 (which takes in Bay of Islands) for the 2008/09 to 2012/13 fishing years are considered separately and conclusions are drawn concerning the main methods used and species caught within the Bay of Islands itself.

4.1 Finfish

Thirty finfish species/taxa managed under the QMS, and two tunas, have been harvested to a significant extent (usually >10 t total) in Statistical Area 003 over the past five years (Table 1). These were taken using 12 methods. The species with greatest catches were, in order, blue mackerel, skipjack tuna, snapper and jack mackerel. The methods resulting in highest tonnages were purse seining, bottom trawling and Danish seining.

Table 1. Combined reported estimated catches (t greenweight) of the main finfish species caught in Statistical Area 003 by fishing method for the 2008/09 to 2012/13 fishing years. BLL, bottom long-line;

BPT, bottom pair trawl; BS, beach seine/drag net; BT, bottom trawl; CP, cod pot; DL, dahn line; DS, Danish seine; HL, handline; PS, purse seine; SLL, surface/midwater longline; SN, set net; T, troll; dw, data withheld, usually to protect the identity of the few vessels fishing the area. Note that the Total column often exceeds the sum of the previous columns, mainly because of withheld data.⁹ Note too that the values will be under-counts because 1) we are still only part way through the 2012/13 fishing year, and it can take up to 3 months or more for data to be validated and errors corrected; and 2) the estimated weight of only the five most abundant species need be recorded by fishers—and often even fewer than five are recorded. The term 'Flatfish' takes in several species, so the reported estimated catches of yellow belly flounder are not inclusive. Catches >100 t are highlighted.

	BLL	BPT	BS	BT	СР	DL	DS	HL	PS	SLL	SN	Т	Total
Albacore						dw				2.6		2.7	5.3
Barracouta	0.6	dw		53.3			1.2	dw	0.9		0.2		57.8
Blue cod	2.3			dw	dw								3.3
Blue mackerel									8823.2				8825.1
Blue shark	0.1									24.2			24.4
Bluenose	51.3					0.8							53.4
Flatfish							0.9				36.8		37.9
Frostfish	0.1	dw		9.1			0.9						11.1
Garfish			4.4								12.4		17.0
Gemfish	3.4			2.2		dw	dw						8.3
Grev mullet											110.1		113.3
Hapuku & bass	51.7			0.3		2.4		0.9					55.4
Jack mackerel				12.6					2074.6				2099.5
John dorv		dw		123.9			24.3				0.7		154.3
Kahawai	4.7	dw	dw	0.6				0.1	dw		19.2		57.8
Kingfish	12.9	dw		4.9			0.5	4.0	5.8		2.1		31.4
Leatheriacket		dw		56.6			2.9				dw		63.6
Parore			1.6								55.4		57.4
Pilchard									1647.4				1647.8
Porae	7.5	dw		3.7			0.1	0.1			6.9		18.6
Red gurnard	76.3	dw		53.5			118.6	0.1			2.0		254.6
Red snapper	10.2			0.6									11.4
Rig	4.2	dw		1.9				dw			37.0		44.4
Rough skate	1.5	dw		10.7									12.5
School shark	66.1	dw		31.5		0.2					10.7		109.7
Skipjack tuna									5813.6				5813.9
Snapper	929.1	dw	0.3	630.6		dw	498.3	6.6			11.1		2118.0
Swordfish								dw		46.3			47.1
Tarakihi	38.5	dw		200.2		dw	28.6	0.2			1.3		271.5
Trevally	8.9	dw	2.4	74.1			1.5	0.1	200.1		10.4		301.4
Yellow belly flounder											69.5		69.5
Yellow-eved mullet			dw								14.7		15.6
TOTAL													22412.3

Catches in Statistical Area 003, compared with those in adjacent statistical areas, are shown in Figure 4. The scale of \$ value of each of these species/taxa is indicated in Table 2.





Figure 4. Reported estimated finfish commercial catches (t greenweight) for Statistical Area 003 for the fishing years 2008/09 to 2012/13 based on Catch, Effort, and Landing Returns and Tuna Longlining Catch Effort Returns from Table 1, at 20 March 2013. The intensity of colour is clue to the scale of catches in adjacent statistical areas (range breaks are calculated on an 'Equal Count' basis, where each catch range has approximately the same number of statistical areas). See note in Table 1 concerning values being underestimates.

Table 2. *Scale* of estimated \$ value of finfish species/taxa taken in Statistical Area 003 based on annual catch and the port price which had been used to establish levy rates for 2011–12 for the finfish species in Table 1.⁷ FMA, Fisheries Management Area. YBF 1 was ascribed the same value as FLA 1. na, not applicable. Species with an annual value >\$200 000 are highlighted.

Common name	FMA	Port price (\$/t)	Rounded port price (\$/t)	5-year Catch (t)	Mean catch (nearest t)	Mean annual value (\$1000)
Albacore	na	2196.667	2200	5.3	1	2
Barracouta	BAR 1	290	300	57.8	12	4
Blue cod	BCO 1	4446.667	4400	3.3	1	4
Blue mackerel	EMA 1	380	400	8825.1	1765	706
Blue shark	BWS 1	456.6667	500	24.4	5	3
Bluenose	BNS 1	5010	5000	53.4	11	55
Flatfish	FLA 1	3203.333	3200	37.9	8	26
Frostfish	FRO 1	493.3333	500	11.1	2	1
Garfish	GAR 1	6696.667	6700	17.0	3	20
Gemfish	SKI 1	1890	1900	8.3	2	4
Grev mullet	GMU 1	3270	3300	113.3	23	76
Hapuku & bass	HPB 1	5116.667	5100	55.4	11	56
Jack mackerel	JMA 1	200	200	2099.5	420	84
John dorv	JDO 1	6636.667	6600	154.3	31	205
Kahawai	KAH 1	413.3333	400	57.8	12	5
Kingfish	KIN 1	5613.333	5600	31.4	6	34
Leatherjacket	LEA 1	563.3333	600	63.6	13	8

Parore	PAR 1	1836.667	1800	57.4	11	20
Pilchard	PIL 1	746.6667	700	1647.8	330	231
Porae	POR 1	2210	2200	18.6	4	9
Red gurnard	GUR 1	2153.333	2200	254.6	51	112
Red snapper	RSN 1	7973.333	8000	11.4	2	16
Rig	SPO 1	4420	4400	44.4	9	40
Rough skate	RSK 1	490	500	12.5	3	2
School shark	SCH 1	1956.667	2000	109.7	22	44
Skipjack tuna	na	630	600	5813.9	1163	698
Snapper	SNA 1	5350	5400	2118.0	424	2 290
Swordfish	SWO 1	6096.667	6100	47.1	9	55
Tarakihi	TAR 1	3290	3300	271.5	54	178
Trevally	TRE 1	1753.333	1800	301.4	60	108
Yellow belly flounder	YBF 1	3203.333	3200	69.5	14	45
Yellow-eyed mullet	YEM 1	2530	2500	15.6	3	8
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General spatial overviews of fishing catch and effort in Statistical Area 003, and in the Bay of Islands itself (waters inshore of a line from Tikitiki to Motukokako), at a fine scale for some of the lining (surface, bottom and trot lines) and netting (set and drift) vessels, and essentially all trawlers (bottom, midwater, single and pair), for some recent years are shown in Figures 5-7. Fishing shown within the Bay of Islands is almost certainly that of visiting—rather than locally based—vessels. The lines and nets will have taken essentially only finfish, whereas trawls may have also taken significant quantities of such invertebrates as arrow squid.

The main finfish species by both weight and value taken within the Bay of Islands by both local and visiting line, net, trawl and beach-seine vessels are likely to have included flatfish, grey mullet, John dory, red gurnard, snapper, tarakihi and trevally. Visiting purse seiners will have taken pelagic species such as skipjack tuna, pilchards and mackerels near the mouth of the Bay of Islands from time to time.



Figure 5. Spatial pattern of about 70% of the commercial line (surface, bottom and trot) events (upper), and their catches (kg, lower), in Statistical Area 003 (left), and the Bay of Islands in particular (right).¹⁰ The annual number of fishing events is shown for the position where each event started, averaged for all events starting in each 1-nautical mile grid cell during the 2007/08 to 2009/10 fishing years.



Figure 6. Spatial pattern of about 33% of the commercial net (set and drift) events (upper), and their catches (kg, lower), in Statistical Area 003 (left), and the Bay of Islands in particular (right).¹⁰ The annual number of fishing events is shown for the position where each event started, averaged for all events starting in each 1-nautical mile grid cell during the 2007/08 to 2009/10 fishing years.



Figure 7. Spatial pattern of essentially all commercial trawl events (bottom, midwater, single and pair, upper), and their catches (kg, lower), in Statistical Area 003 (left), and the Bay of Islands in particular

(right).¹⁰ The annual number of fishing events is shown for the position where each event started, averaged for all events starting in each 1-nautical mile grid cell during the 2007/08-2009/10 fishing years.

4.2 Invertebrates

Five invertebrates are known to have been fished to a significant extent in Statistical Area 003 over the past 5 years (Table 3), their catches here and in adjoining statistical areas being shown in Figure 8. All but arrow squid (and possibly paddle crabs) are likely to have been significant within the Bay of Islands itself; potting and diving were the main methods. The scale of value of each species is given in Table 4. Note, though, that the estimated catches of several QMS invertebrate species—particularly recently admitted ones including sea cucumber, octopus, horse mussel, knobbed whelk, Cook's turban, and various volutes—are not on the NABIS database. It is possible that one or more of these species are fished commercially in Statistical Area 003, but probably at a very low level (although they could still be important to individual fishers).

Table 3. Reported estimated catches (t greenweight) of invertebrate species by fishing method for the 2008/09 to 2012/13 fishing years for Statistical Area 003. BPT, bottom pair trawl; BT, bottom trawl; CRP, crab pot; DI, diving; DS, Danish seine; RLP, rock lobster pot; SJ, squid jig; SN, set net; dw, data withheld. Note that the Total column often exceeds the sum of the previous columns, mainly because of withheld data.⁹ Note too that the values will be under-counts because 1) we are still only part through the 2012/13 fishing year, and it can take up to 3 months or more for data to be validated and errors corrected. Arrow squid would be from the more open waters; it is unknown how important—if at all—paddle crabs are within the Bay of Islands itself.



Figure 8. Combined reported estimated invertebrate commercial catches (t greenweight) for Statistical Area 003 for the fishing years 2008/09 to 2012/13 based on Catch, Effort, and Landing Returns (CELRs), as at 20 March 2013.⁹ The tonnage given is for Statistical Area 003; the intensity of colour is a clue as to the scale of the catch in adjacent statistical areas (range breaks are calculated on an 'Equal Count' basis, where each catch range has approximately the same number of statistical areas).

Table 4. *Scale* of estimated \$ value of invertebrate species taken in Statistical Area 003 based on annual catch and the port price which had been used to establish levy rates for 2011–12.⁷ FMA, Fisheries Management Area. Species with an annual value >\$200 000 are highlighted.

Common name			Rounded port	5-year	Mean catch	Mean annual
	FMA	Port price (\$/t)	price (\$/t)	Catch (t)	(nearest t)	value (\$1000)
Arrow squid	SQU1 T	896.6667	900	10.3	2	2
Kina	SUR1 A	1450	1500	159.5	32	48
Packhorse rock lobster	PHC 1	36063.33	36100	17.9	4	144
Paddle crab	PAD 1	4580	4600	74.1	15	69

Red spiny lobster	CRA 1	46686.67	46700	54.0	11	514
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4.3 Seaweeds

Although seaweeds are managed under the non-QMS framework, harvests are reported on CELRs by inshore statistical area.¹¹ Only fishers authorised to harvest commercial species before 1992 can continue to do so in the case of Schedule 4C species (which are essentially all the commercial species), although anyone can take beach-cast red seaweed species without a fishing permit. Having said that, commercial harvesting of beachcast seaweed is prohibited within the Bay of Islands itself,⁴ and—with no data on the NABIS database—the status of any other seaweed harvesting in the bay and nearby is unclear. The New Zealand Seaweeds Fisheries Plan shows that between two and eight permit holders reported seaweed 'catches' in FMA 1 each year between 2001/02 and 2005/06¹¹—which may or may not have included harvesters in the Bay of Islands. The harvests in FMA 1 for those years were of SEO (beachcast seaweed: 55.5 t in 2003/04) and non-SEO (4.4 t in 2002/03 and 9.0 t in 2003/04). The main species likely to be of value in northeast New Zealand are *Ecklonia radiata, Lessonia* spp., and *Pterocladia* spp.—all Schedule 4C species.

5. POTENTIAL FUTURE COMMERCIAL FISHERIES IN STATISTICAL AREA 003

It is not envisaged that any further finfish species than those currently fished will be sought commercially in Statistical Area 003 in the foreseeable future (5-year horizon). The story may, however, be different for the invertebrates and seaweeds. Invertebrate species recently admitted into the QMS—including sea cucumber, octopus, horse mussel, knobbed whelk, Cook's turban, and various volutes—may become of greater interest. Seaweed harvesting remains an unknown both now and into the future—but is unlikely to be significant over the next five years.

6. INTERVIEWS WITH COMMERCIAL FISHERS

Few commercial fishers regularly fish the waters of the Bay of Islands. However, several vessels visit now and then from outside (in particular from further north, from the west coast, and from Whangarei and Leigh), but it has not been possible to nail down their activities. What follows are the results of interviews undertaken with the three regular locals, together with another who is likely to take up again shortly. (A set-netter who used to work the shallow bays and estuaries in the southeast of the Bay of Islands has apparently retired from fishing, according to MPI.) 'Anticipated impact of proposed closures' refers to the fisher's impression concerning the impact on their fishing operations should no-take reserves at Okahu/Waewaetorea and Maunganui, and a scientific reserve at Tangatapu Estuary, be established.

6.1 Fisher 1

Where: Te Puna (Mangonui) Inlet, Kerikeri Inlet, eastern Bay of Islands For: flounder (yellow belly & sand flounder), garfish (= piper), grey mullet, kahawai, pilchard, snapper, trevally Methods: beach seine (garfish) and set net (all others)

Anticipated impact of proposed closures: little or none

6.2 Fisher 2

Where: Te Puna (Mangonui) Inlet, Kerikeri Inlet For: flounder (yellow belly & sand flounder), grey mullet Methods: set net Anticipated impact of proposed closures: none

6.3 Fisher 3

Where: exposed shores of the Bay of Islands, and outside the Bay For: red and packhorse rock lobsters Methods: pots Anticipated impact of proposed closures: significant, particularly Maunganui Bay

6.4 Fisher 4

Where: proposes to fish mostly in outer parts of the Bay and beyond For: snapper, mainly Methods: longline Anticipated impact of proposed closures: little or none

6.5 Summary of commercial fishing, and impacts of candidate-site closures

The fisher-interviews point to low intensity of regular, locally based commercial fishing currently taking place in the Bay of Islands. The main finfish species routinely landed by local fishers are flounder, garfish, grey mullet, kahawai, pilchard, snapper and trevally, using set nets and beach seines. (This is a far cry from the early 1980s, in the lead up to the introduction of the QMS, when there were around 170 commercial boats based in the Bay of Islands, landing around 600 t of wetfish—mostly from set netting and lining—and shellfish each year.¹²) Potting for rock lobsters is the other significant, locally based fishery. Only one fisher—the pot fisherman—thought their fishing would be seriously affected by closure of the candidate sites.

However, the full nature and extent of the periodic visits by non-resident fishers remain unknown, and it is easy to underrate the significance of their fishing, including near, and even within, the candidate sites for marine protection. None of the resident Bay of Islands fishers have been recently using either lines or trawls, and yet Figures 5 and 7 show that significant levels of lining in particular, and trawling, have been undertaken within the Bay of Islands in recent years. Furthermore, purse-seining is allowed throughout (apart from the southeast), and it is not difficult to imagine that some of the large purse-seine catches shown in Table 1 could have been taken by visiting vessels, not only within the Bay of Islands, but in fact close to Maunganui Bay.

We can expect the commercial industry to vigorously oppose any closed areas in the Bay of Islands. All fishers holding quota in FMA 1, and its various iterations according to species, have a property right that is challenged wherever areas are closed off to fishing.

7. REFERENCES

¹Department of Conservation (2005). Marine protected areas: policy and implementation plan.

²Subantarctic Marine Protection Planning Forum (2009). Implementation of the marine protected areas policy in the territorial seas of the Subantarctic Biogeographic Region of New Zealand.

³Froude, V.A. (2004). Area-based restrictions in the New Zealand environment. Department of Conservation. ⁴http://www.fish.govt.nz/NR/rdonlyres/0830DFBF-42B0-4239-B012-

A9E654DC4C01/0/Beachcast seaweed FMA 1 2 factsheet updated.pdf

⁵http://www2.nabis.govt.nz

⁶Dr Don Jellyman, NIWA Christchurch, pers. comm.

⁷www.seafoodnewzealand.co.nz/.../102576_Gazetted_levy_rates_-_2011- 2012.xlsx at 23 March 2013

⁸http://www.mpi.govt.nz/ ⁹http://www2.nabis.govt.nz/CommercialCatch.aspx ¹⁰http://www.fish.govt.nz/en-nz/Commercial/About+the+Fishing+Industry/Maps+of+Commercial+Inshore+Fishing+Activity/defaul <u>t.htm</u>

¹¹http://fs.fish.govt.nz/Page.aspx?pk=113&dk=16407 and associated files—an undated document which incorporates data up to 2006).

¹²King, M.R. (1985). Fish and shellfish landings by domestic fishermen, 1974-82. Fisheries Research Division Occasional Publication: Data Series No. 20.