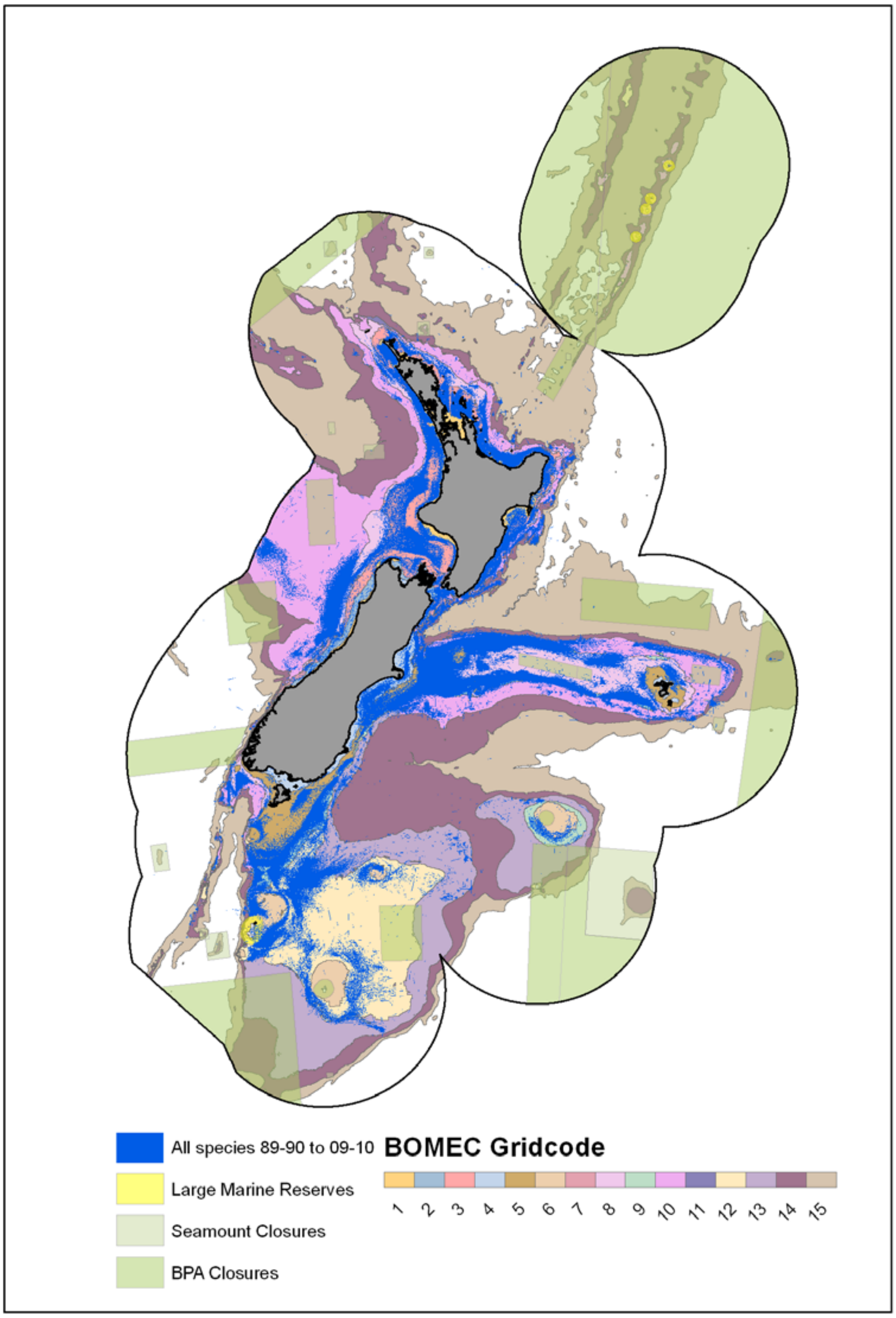
TCEPR data and benthic habitats

Tables and plots showing the estimated swept areas for the each species overlain on the BOMEC areas are in Appendix 3 (tables are in files <species id>_footprint_stats.pdf and <species id>_footprint_stats.xls, e.g., barracouta data are in BAR_footprint_stats.pdf and BAR_footprint_stats.xls; plots are in files <species id>_BOMEC_fig_part<number>.pdf, e.g. BAR_BOMEC_fig_part1.pdf. See file README.doc for more information). Results are provided for each species for each fishing year and for the period 1989/90 to 2009/10.

In total, the 15 BOMEC classification areas cover 2 627 073 km², approximately 64% of the EEZ and TS. The total swept area within the BOMEC for all species for the period 1989/90 to 2009/10 is estimated to be 384 376 km², about 15% of the total BOMEC classification area (Figure 29). The swept area for all species for the 2009/10 fishing year is 49 695 km², covering about 1.9% of all BOMEC zones.

Analysis of the estimated swept area within individual BOMEC zones could be used as an indication of the scale of potential benthic effects by trawling. This analysis shows that, for the period 1989/90 to 2009/10, more than 60% of BOMEC classes 3 and 9 are estimated to have been contacted by bottom trawling; more than 40% of BOMEC classes 1, 5, 7 and 8 are estimated to have been contacted by bottom trawling; less than 10% of BOMEC classes 11, 13, 14 and 15 are estimated to have been contacted by bottom trawling.



BOMEC code	Area (km^2)	Swept Area (km^2)	Swept Area (%)
1	27 557	12 400	45%
2	12 420	3 324	27%
3	89 710	57 840	64%
4	27 268	9 592	35%
5	60 990	26 612	44%
6	38 609	6 691	17%
7	6 342	3 043	48%

8	138 551	68 389	49%
9	52 224	38 238	73%
10	311 361	71 594	23%
11	1 289	14	1.1%
12	198 577	54 337	27%
13	233 825	18 503	8%
14	493 034	11 369	2%
15	935 315	2 431	0.3%
TOTAL	2 627 073	384 376	15%

Figure 29: The BOMEC classification and trawl footprint for all species, 1989/90 to 2009/10 (top) and associated area and swept area (km^2) statistics (bottom).

BOMEC 10 has the largest swept area, followed by BOMEC 8 (Figure 30). However, in terms of the percentage of the BOMEC zone that has been swept, BOMEC 9 is the highest at over 70%, followed by BOMEC 3 at 63%. The remaining BOMEC zones have less than 50% swept area, including those with the largest swept area (BOMEC 8 and 10).

The fishing effort in the BOMEC areas has varied with time (Figure 31). For example, the swept area in BOMEC 9 (light green line in Figure 32) was maximal in 1999/2000 at 37% and has decreased in recent years and in 2009/10 it was less than 20%.

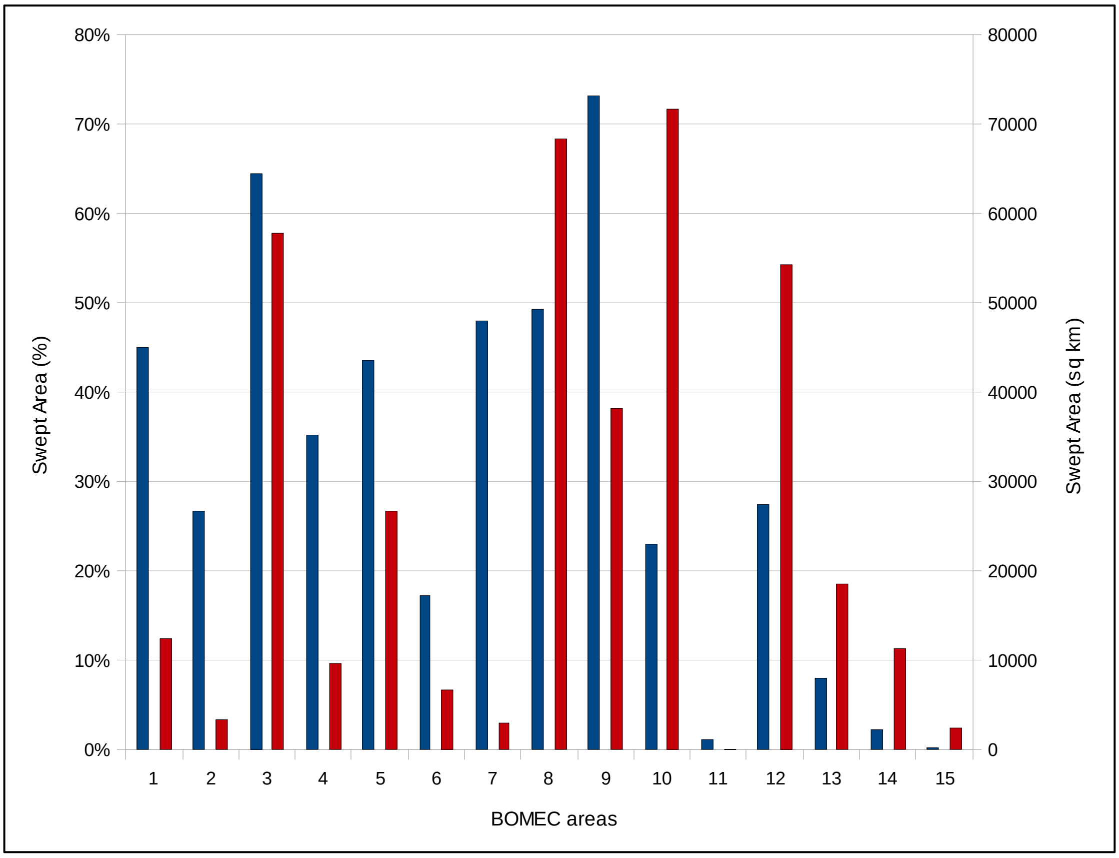


Figure 30: Swept area in each BOMEC zone as a percentage (blue), and in square kilometres (red).

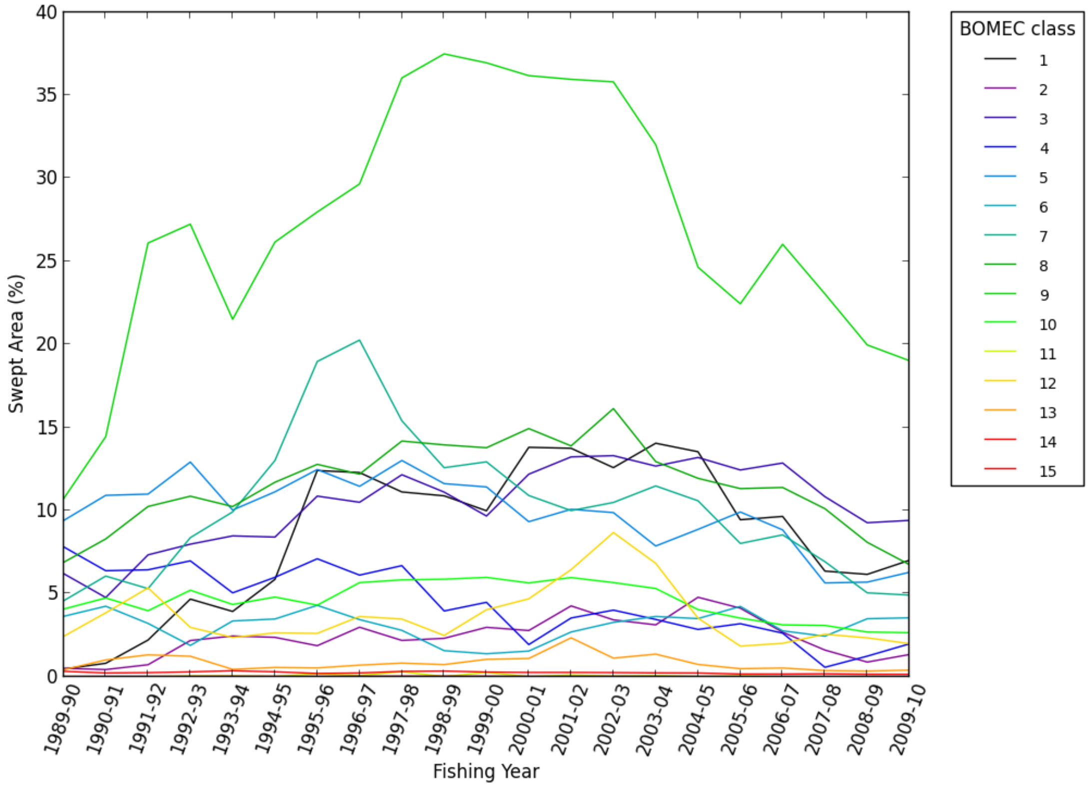


Figure 31: Swept area for all species (as a percentage of the BOMEC zone) as a function of time.

The results for individual fish species highlight the variability of their preferred habitats. Figure 32 shows that both total swept area and diversity of fishing effort varies considerably among the BOMEC areas, most likely influenced by the habitat preferences of the different target species, which is driven mainly by depth but also by latitude. The areas generally less than 250 m depth (i.e. classes 1–6) are dominated by minor species, BAR, JMA and SQU; classes 7–10 and 12–13 range from 250–1200 m depth and are dominated by HOK, and class 14, deeper than 1000 m, is dominated by ORH.

It is possible to monitor changes in fishing effort for a species across BOMEC classes. For example, the results for silver warehou show that the total swept area has fluctuated over the last five years, and the trends are not the same in all BOMEC areas (Figure 33). The results show large increases in the swept area in BOMEC class 8 in 2006/07 and 2007/08, and closer examination of the data indicates that this was likely to have been due to a very slight shift in the distribution of trawling off Banks Peninsula during these two years, rather than a response to a change in their abundance.

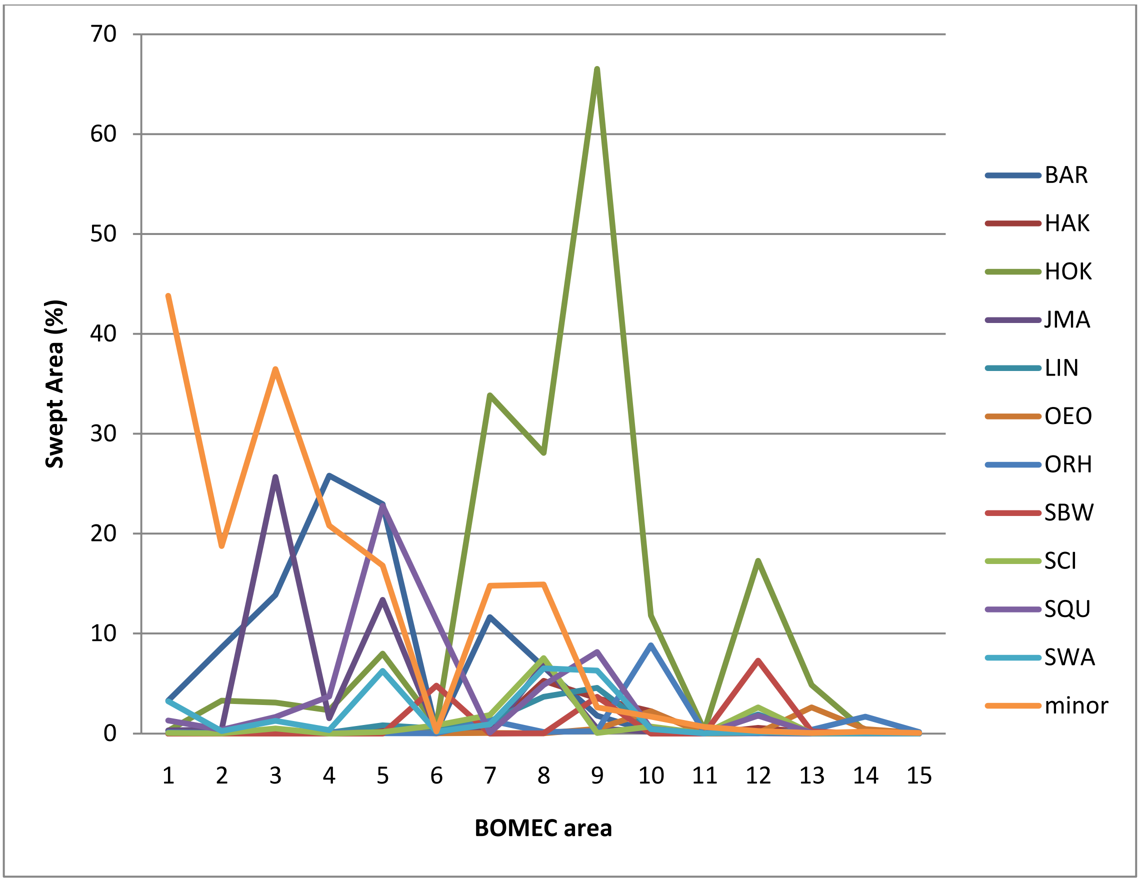


Figure 32: Percentage of BOMEC areas swept by trawls for each of the 11 major species considered by this report for fishing years 1989/90 to 2009/10.

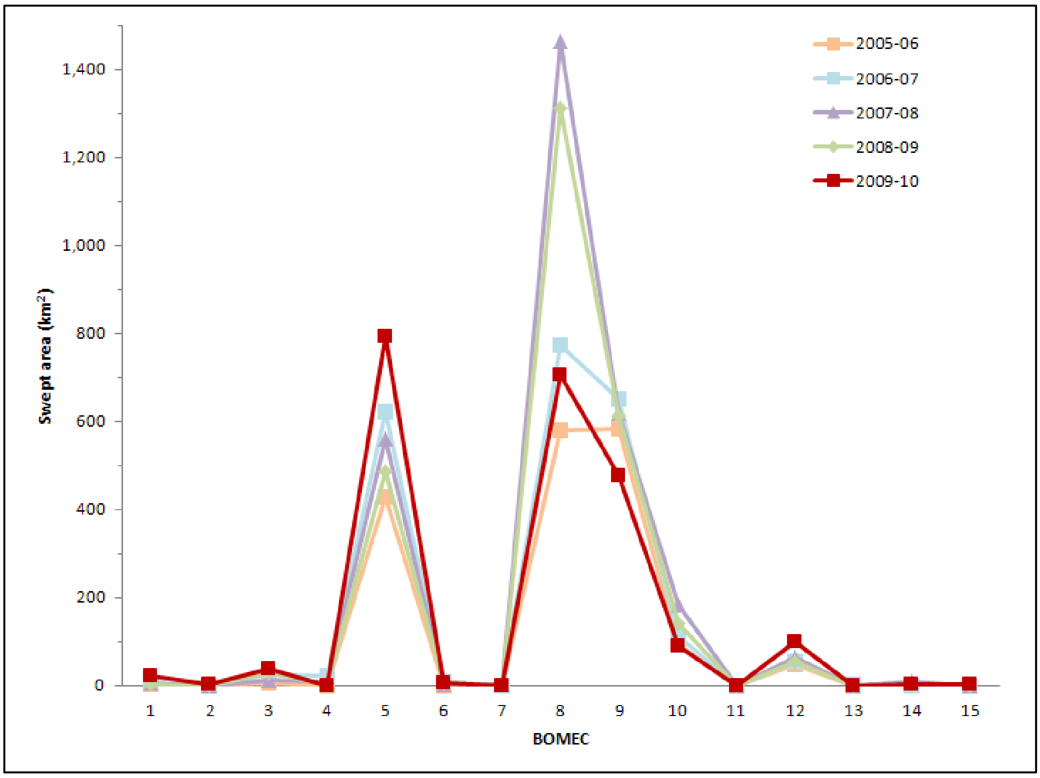


Figure 33: Swept area in the 15 BOMEC classes for silver warehou over the last five fishing years.

Trawl Footprint Analysis - Trends

The edited database can be used to estimate the area of sea floor trawled annually (Figure 34). The estimated area of sea floor trawled each year varies from about 50 000 km^2 to about 105 000 km^2, with an average of about 76 000 km^2. The area generally increased until the 2002/03 fishing year, and then declined by about 50% by 2009/10.

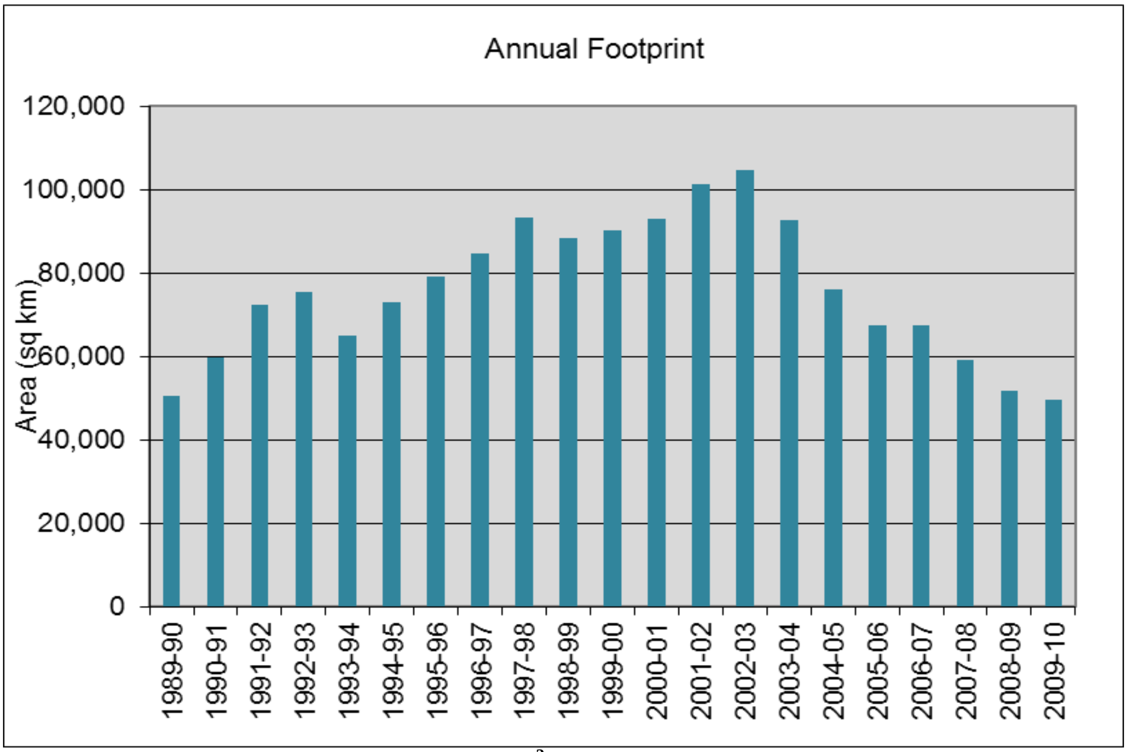


Figure 34: Estimated annual area of sea floor (km^2) contacted by trawling each year.

The database can also be used to examine what proportion of the cumulative trawl footprint had previously been trawled (Figure 35). This shows that there has been a gradual decrease in the area of seafloor trawled that had not previously been trawled. By 2009/10 only 3 208 km^2 of seafloor was trawled that had previously been untouched,

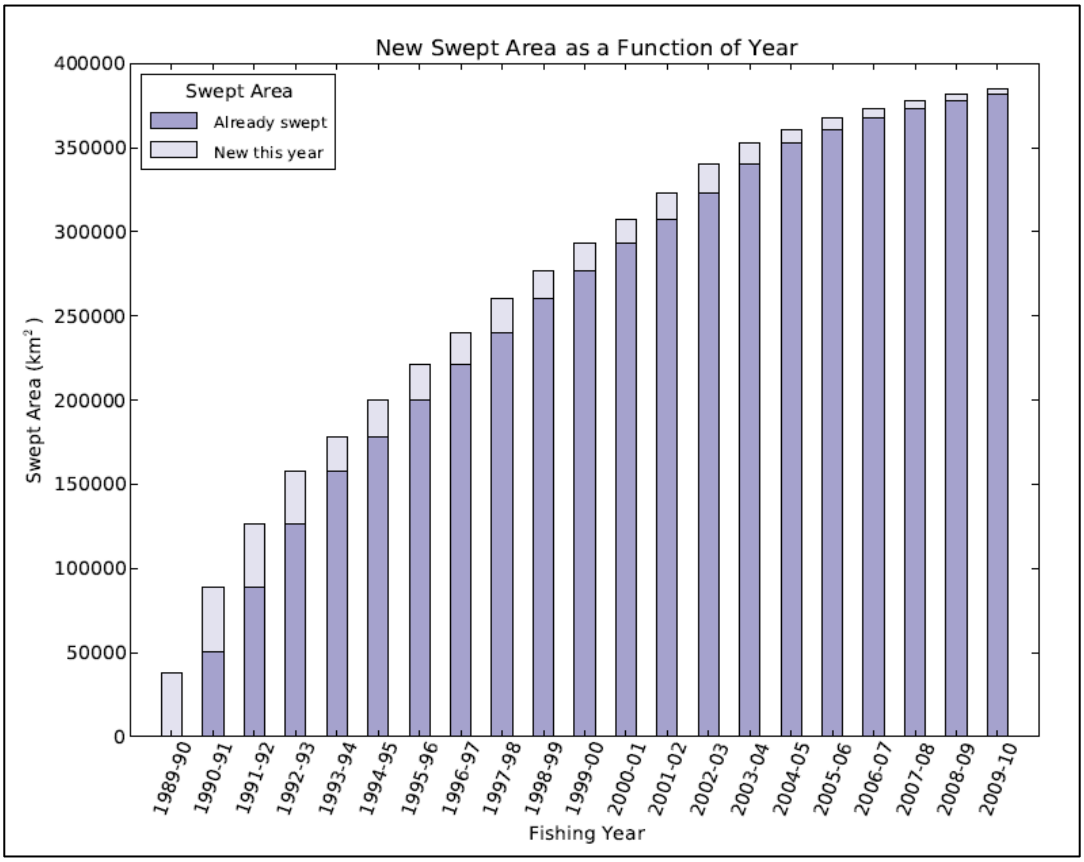


Figure 35: Cumulative trawl footprint, showing the area that had previously been trawled, and the area that had not been trawled until that year.

The results for individual fish species can be more variable. Figure 36 shows the estimated area of sea floor contacted by hoki trawling (the fishery with the most bottom-contact). Data indicates an increasing trend in annual area until the 2002/03 fishing year, followed by a decline. For 2009/10, the seafloor contacted was less than one third of that in 2002/03. Similarly for orange roughy (Figure 37), the 2009/10 footprint was approximately a third of that during the peak in 1998/99.

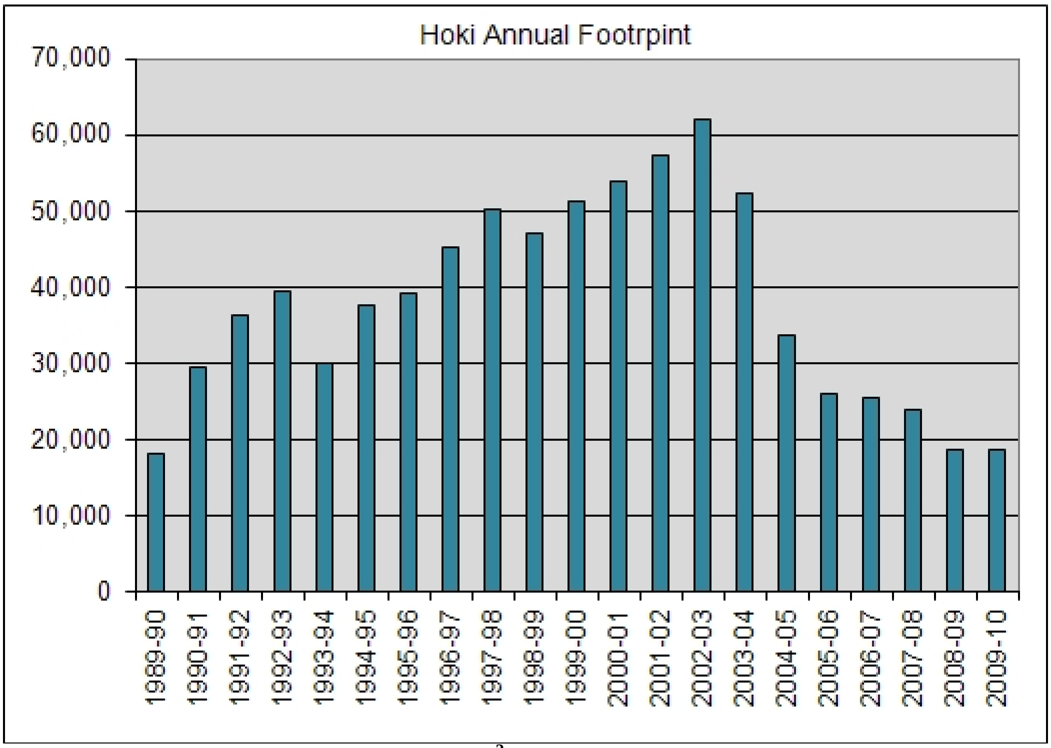


Figure 36: Estimated annual area of sea floor (km^2) contacted by trawling for hoki.

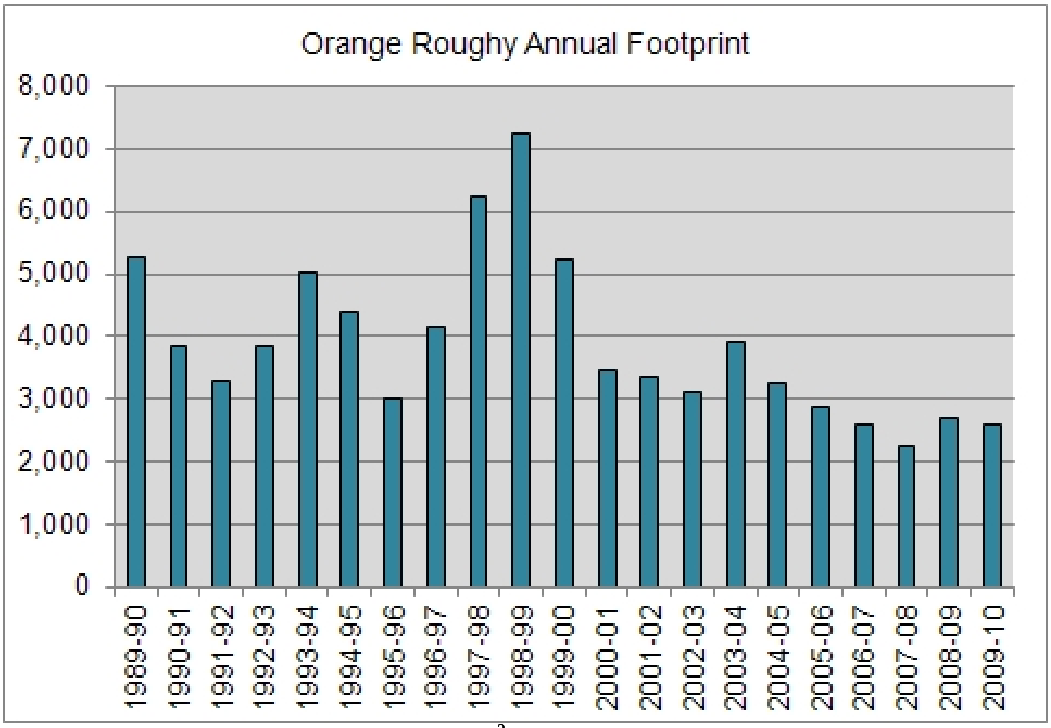


Figure 37: Estimated annual area of sea floor (km^2) contacted by trawling for orange roughy.

DISCUSSION

The aggregate swept area and extent of the trawl footprint and frequency of trawl effort by year and by depth zone, based on analysis of TCEPR data, have previously been reported by Baird et al. (2011) for the 16-year period from 1989/90 to 2004/05, as well as in relation to the BOMEC areas (Baird & Wood 2009). The Baird et al. (2011) analyses were by species group (eight groups, covering a total of 31 species) and vessel category (four size categories) and also provided descriptive effort distribution by Statistical Area for catches reported on CELRs (e.g. inshore trawl catches and scallop and oyster dredging). The present study has had a slightly different approach, with emphasis on analysing the aggregate swept area and trawl footprint for 11 key middle-depth and deepwater species/species aggregates, and for the aggregate of all other species (a total of 89 minor species), reported as target species on TCEPRs. TCEPR records for the 11 key species made up 77% of all TCEPR records in the database and were represented as follows: HOK 30%; SQU 14%; ORH 9%; SCI 8%; JMA; BAR and OEO 4%; HAK, SBW; SWA & LIN 1%.

Individual trawl footprint analyses for key inshore species would be useful as some of these are well represented in the TCEPR database, including: snapper 7% of all TCEPRs; tarakihi 4%; trevally 3%; red cod 2%; gurnard 2%; john dory and gemfish 1%.

A summary of trawl tows reported on TCEPRs, CELRs and TCERs indicates that for the 11 key species during the period between 2005/06 and 2010/11, the proportions of tows recorded on TCEPRs was: SCI and SBW 100%; HAK 99%; ORH 98%; OEO and SWA 97%; SQU 95%; HOK 93%, BAR 84%; JMA 78%; LIN 61% (Appendix 2). This high proportion of trawl tows reported using TCEPRs for these key species provides a level of comfort that the trawl footprint estimated through this study is representative of the overall trawl footprint in the EEZ, although somewhat less so in the Territorial Sea where smaller vessels have a higher incidence of reporting using CELRs and, more recently, TCERs.

Baird et al. (2011) estimated an overall trawl footprint for the 16-year period, based on 960 420 tows, to be 328 360 km^2 in a total of 36 792 fished cells. For the same time period, (i.e. 1989/90 to 2004/05), this study estimated the total trawl footprint to be slightly greater, at 360 929 km^2, based on a total of 913 883 tows (i.e. a 9% greater footprint from 5% fewer tows). These differences will have been influenced by the following:

- The current study rejected tows for which start and end co-ordinates were the same (approx. 30 000 tows), whereas Baird et al. (2011) calculated swept areas for these based on tow duration and average tow speed;
- Baird et al (2011) did not identify vessels towing twin-trawl rigs, which will have led to a slight under-estimate of the trawl footprint;
- Baird et al (2011) assigned door spread values on the basis of vessel size and target species while the current study assumes a standard door spread based on target species only, regardless of vessel size, leading to a slight over-estimate of the footprint;
- The current study includes a random offset ‘jitter’ of between -0.5 and +0.5 minutes to start and end co-ordinates, which effects a slight footprint increase.

The full 21-year study period, from 1989/90 to 2009/10, was based on 1 109 924 tows and provided an aggregate trawl footprint estimate of 385 032 km^2, 56 672 km^2 greater than the estimate for the 1989/90 to 2004/05 period. However, this increased swept area has not been accompanied by increases in annual trawl footprint area. In fact, the annual trawl footprint has declined by 33%, from 75 000 km^2 in 2004/05 to around 50 000 km^2 in 2009/10.

It is evident that the change in annual trawl footprint has been strongly affected by changes in the hoki TACC, as reflected by the similar trend in the total footprint for all species combined (Figure 34) and in the hoki footprint (Figure 35), both of which peaked in 2002/03 and then declined steadily through to 2008/09 before stabilising in 2009/10.

It is interesting to note that while the hoki TACC was reduced by 50 000 t (20%) from 1 October 2001, the hoki footprint continued to increase for a further two years, peaking in 2002/03. This may have been a reflection of the increased use of twin-rig trawl gear during this period when stock biomass was at an all-time low (MPI, 2012). The implication here is that swept area may be more sensitive to changes in CPUE than to changes in TACC.

Number and frequency of cells traversed:

The analysis by frequency of trawling within 5 × 5 km cells during the 21-year period 1989/90 to 2009/10 demonstrated that the total number of cells trawled was 3198 greater than for the 16-year period 1989/90 to 2004/05 (i.e. an increase from 36 792 to 39 990 cells). This indicates that new areas have continued to be explored, despite a substantial overall decline in the annual trawl footprint. Figure 38 illustrate that the extent of 'new area' subjected to trawling in each successive year has continued to decline throughout the time series and in 2009/10 amounted to 3208 km^2, which is 4% of the 2009/10 trawl footprint of 79 512 km^2 and less than 1% of the cumulative swept area for the period 1989/90 to 2009/10 of 385 032 km^2.

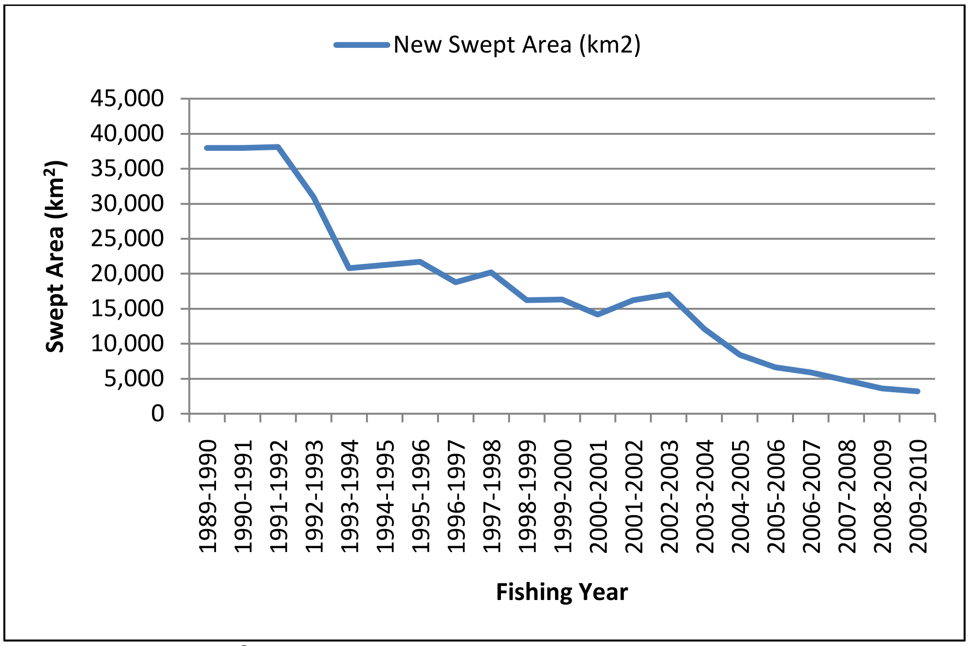


Figure 38: New swept area (km^2) in each successive year during the period 1989/90 to 2009/10.

In the most recent five-year period, the mean frequency with which 5 × 5 km fished cells have been contacted by trawling in the 0–400 m and 400–800 m depth zones has been similar and has ranged from 16 to 21 times per annum (Figure 16). The 400–800 m depth zone is heavily dominated by hoki trawling, while in the 0–400 m depth zone trawling targeted at the group of minor species dominates, followed in order by trawling for barracouta, jack mackerel, hoki and squid (Figure 22).

The most heavily fished cells in the 0–400 m depth range have been contacted between 449 and 941 times per annum during the most recent five-year period, while for the 400–800 m depth range the highest tow frequencies in cells have ranged between 302 and 564 times per annum, indicating that a small proportion of cells are fished at a much higher level than the average for all fished cells. The frequency of tows in the most heavily fished cells in the 800–1200 m and deeper than 1200 m depth zones ranged between 105–210 and 43–154 times per annum, respectively, during this period, indicative of a considerably lower rate of contact in these deeper zones (Figure 39).

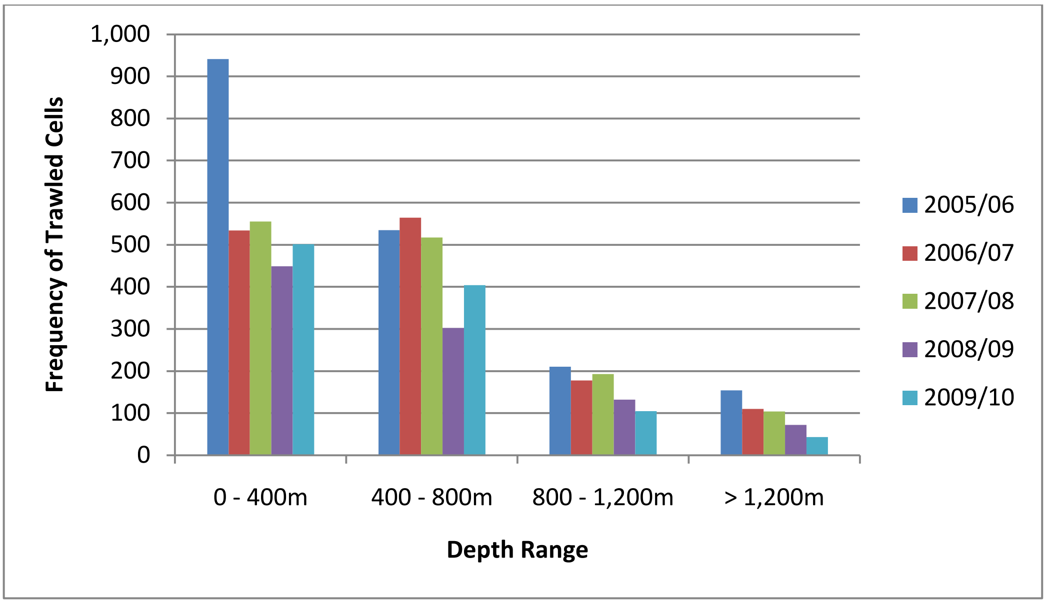


Figure 39: Maximum tow frequencies within 5 × 5 km cells by depth zone during the period 2005/06 to 2009/10.

BOMEC classes:

Class 9 has the highest proportional swept area, of 73%, for all years combined. However, from 2005/06 to 2009/10 this has been much reduced compared to previous years and has ranged between 26% and 19%. This is one of the smaller BOMEC areas, which overlaps with fishing grounds mainly on the western and southern edges of the Chatham Rise, south-east of Stewart Island along the Stewart-Snares shelf and on the Bounty Plateau. Of these three areas, the Bounty Plateau area appears least affected, while the Chatham Rise area appears to be the most affected by trawling. Further analyses could be undertaken to reveal whether the swept areas within Class 9 in recent years fall within or outside of the previous footprint.

Class 3 had the second largest proportional footprint over all years, of 64%. Over the most recent five year period it has ranged between 13% and 9%. As this class falls in water generally shallower than 250 m and includes northern areas (FMAs 1 and 9) where small vessels operate and which report using CELRs and TCERs, the footprint will be an under-estimate (Baird & Wood 2009).

The BOMEC classes with the largest swept areas are 10 and 8 (71 594 km^2 and 68 389 km^2, respectively). These are both large classes which occur in fishable depths in the productive waters of Chatham Rise and around North Island, and also off the West Coast and Challenger Plateau. By proportion, their swept areas are small, ranging between 11% and 7% for class 8 and at 3% for class 10 over the last five years.

MANAGEMENT IMPLICATIONS

The database of the trawl footprint by year, depth zone, BOMEC class and by trawl frequencies within the 5 × 5 km cell grid, provides a powerful tool for application in any future work designed to assess the scale and effects of trawling on the benthic environment. Assessment of the footprint in the shallower coastal waters is under-estimated and will not be improved unless provision is made for reporting of tow start and end co-ordinates on the reporting forms used by vessels fishing in these areas. The coastal and shelf grounds (i.e. shallower than 200 m depth) are probably the most intensely fished of all New Zealand waters and warrant greater scrutiny. This is supported by an earlier study by Leathwick et al. (2006), who demonstrated that for the period 1989/90 to 2007/08, based on TCEPR tows only, the cumulative areas trawled in Coastal and Shelf demersal fish community classes (e.g. Northern Coastal and Northern Shelf) were as high or higher than for areas typically fished by deepwater trawlers (e.g. Challenger Plateau, Campbell Plateau and Chatham Rise). Considering that the number of trawl tows reported using CELR and TCER forms (not used to estimate swept area), amounted to between 46% and 64% of the total number of tows reported, the swept area in the inshore areas, where these form types are most used, will have been under-estimated to a greater extent.

The BOMEC system was developed as a tool for use in the management of the spatial effects of fishing in the EEZ and TS (Baird & Wood 2009). However, ground-truthing the model-based BOMEC zones using direct sampling methods has indicated that they are broadly representative at spatial scales greater than about 100 km, and may therefore have application for regional-scale assessments of benthic habitat distributions, but are less representative at the smaller scales characterised by several BOMEC classes (Bowden et al. 2011).

The two BOMEC classes with historically high rates of contact by trawl gear are class 3 (64.5% swept over entire study period), (shelf zone) and class 9 (73.2% swept over entire study period), (shallow upper slope zone). For the most recent five year period between 2005/06 and 2009/10 the swept areas in class 3 and class 9 are much lower, averaging 11% and 22% respectively.

There have been no studies investigating whether current trawling frequencies, as determined for the 5 × 5 km cell grid, have had adverse effects on the structure and function of benthic communities, or on the productivity of the associated fisheries. In the orange roughy fishery on the Chatham Rise, which is prosecuted primarily in the 800–1200 m depth zone, there is evidence that fishing effort has shifted geographically over time in response to changes in catch rates on individual hills (MPI 2012). However, the extent to which this might be linked to impaired benthic ecosystem functioning has yet to be determined.

Several studies have looked at the effects of bottom trawling on soft and hard sediments in New Zealand waters (MAF 2012). While these have revealed changes in biodiversity patterns, less is known about their effects on ecological processes or on the rates of recovery following contact by trawl fishing gear (Bowden et al. 2011).

ACKNOWLEDGMENTS

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APPENDIX 1 - MINOR TARGET SPECIES INCLUDED IN THE ANALYSIS

Count	Reporting Code	Common Name	Target Tows	Percentage of Total Target Tows
1	SNA	Snapper	72 393	6.53%
2	TAR	Tarakihi	47 804	4.31%
3	TRE	Trevally	36 312	3.27%
4	RCO	Red cod	17 422	1.57%
5	GUR	Gurnard	17 416	1.57%
6	JDO	John dory	15 202	1.37%
7	SKI	Gemfish	13 120	1.18%
8	BYX	Alfonsino	12 122	1.09%
9	CDL	Black cardinal fish	10 972	0.99%
10	WAR	Blue warehou	3 512	0.32%
11	WWA	White warehou	2 796	0.25%
12	BNS	Bluenose	1 936	0.17%
13	STA	Stargazer	1 677	0.15%
14	RBY	Ruby fish	1 223	0.11%
15	SPE	Sea perch	974	0.09%
16	SPD	Spiny dogfish	909	0.08%
17	FLA	Flatfish	895	0.08%
18	FRO	Frostfish	328	0.03%
19	LEA	Leatherjacket	220	0.02%
20	ELE	Elephant fish	218	0.02%
21	SCH	School shark	194	0.02%
22	EMA	Blue mackerel	169	0.02%
23	GSH	Ghost shark, dark	143	0.01%
24	SPI	Spider crab	142	0.01%
25	MOK	Blue moki	97	0.01%
26	SSK	Smooth skate	95	0.01%
27	CAR	Carpet shark	55	<0.01%
28	BCO	Blue cod	54	<0.01%
29	RBT	Red bait	49	<0.01%
30	RSK	Rough skate	43	<0.01%
31	LDO	Lookdown dory	41	<0.01%
32	MDO	Mirror dory	39	<0.01%
33	SQX	Squid	37	<0.01%
34	PRA	Prawn	35	<0.01%
35	TRU	Trumpeter	32	<0.01%
36	SBO	Southern boarfish	31	<0.01%
37	SKA	Skate	31	<0.01%
38	PTO	Patagonian toothfish	30	<0.01%
39	SPO	Rig	22	<0.01%
40	SDO	Silver dory	20	<0.01%
41	OPE	Orange perch	19	<0.01%
42	SCO	Swollenhead conger	18	<0.01%
43	HPB	Hapuku and bass	17	<0.01%

Count	Reporting Code	Common Name	Target Tows	Percentage of Total Target Tows
44	MIX	Mixed fish	17	<0.01%
45	HOR	Horse mussel	15	<0.01%
46	RIB	Ribaldo	15	<0.01%
47	THR	Thresher shark	14	<0.01%
48	RSN	Red snapper	9	<0.01%
49	BOA	Sowfish	8	<0.01%
50	KAH	Kahawai	7	<0.01%
51	OFH	Oilfish	7	<0.01%
52	ASP	Tam 'O Shanter urchin	5	<0.01%
53	HAP	Hapuku	5	<0.01%
54	JAV	Javelin fish	5	<0.01%
55	RAT	Rattail	5	<0.01%
56	RBM	Rays bream	5	<0.01%
57	SSP	Scallop spat	5	<0.01%
58	TRA	Roughies	5	<0.01%
59	BWS	Blue shark	4	<0.01%
60	ESO	New Zealand sole	4	<0.01%
61	BAS	Bass groper	3	<0.01%
62	BAT	Large headed slickhead	3	<0.01%
63	GFL	Greenback flounder	3	<0.01%
64	LSO	Lemon sole	3	<0.01%
65	PRK	Prawn killer	3	<0.01%
66	SND	Shovelnose spiny dogfish	3	<0.01%
67	BRA	Short-tailed black ray	2	<0.01%
68	MAK	Mako shark	2	<0.01%
69	ROC	Rock cod	2	<0.01%
70	SAU	Saury	2	<0.01%
71	SKJ	Skipjack	2	<0.01%
72	SNS	Sunset	2	<0.01%
73	SSI	Silverside	2	<0.01%
74	HOL	Tubeshoulder	1	<0.01%
75	JGU	Japanese gurnard	1	<0.01%
76	MTP	Myctophum spp.	1	<0.01%
77	OSD	Smooth dog shark	1	<0.01%
78	SCA	Scallop	1	<0.01%
79	SCC	Sea cucumber	1	<0.01%
80	SCL	Scales	1	<0.01%
81	SPF	Scarlet wrasse	1	<0.01%
82	SQI	Squirrelfish	1	<0.01%
83	SWO	Swordfish	1	<0.01%
84	TRG	Triggerfish	1	<0.01%
85	YEM	Yellow-eyed mullet	1	<0.01%
		Total "minor" target trawls	259 105	23.36%
		Total all target trawls	1 109 383	100.00%

APPENDIX 2 – Catch by reporting form type as provided by Dave Foster (MPI)

PROPORTION OF ESTIMATED CATCH OF TIER 1 SPECIES (PLUS SWA AND BAR) BY RETURN TYPE

Table 1. Types of return

Return abbreviation	**Description**	**Completed by**
TCEPR	Trawl catch, effort, and processing returns	Trawlers >28m in overall length or trawlers that the chief executive has advised to complete this return
TCER	Trawl catch effort return	Trawlers 6-28m in overall length or trawlers that the chief executive has advised to complete this return
CELR	Catch, effort, and landing returns	Vessels using methods not covered by other returns
LCER	Lining catch effort return	Bottom longliners >28m in overall length or longliners that the chief executive has advised to complete this return
LTCER	Lining trip catch effort return	Bottom longliners 6-28m in overall length or longliners that the chief executive has advised to complete this return
NCER	Netting catch effort returns	Set netters >6m in overall length.

Hoki

Table 1A Estimated catch of hoki (tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	**TCEPR**	**TCER**	**CELR**	**Others**	**Total**
2010/11	107,443	8,351	14	14	*115,822*
2009/10	97,905	7,253	8	19	*105,185*
2008/09	81,247	6,317	16	17	*87,598*
2007/08	80,083	7,376	1	15	*87,475*
2006/07	90,452	-	7,328	10	*97,790*
2005/06	96,431	-	5,553	0	*101,984*
Total	*553,561*	*29,297*	*12,920*	*76*	*595,854*

Table 1B. Proportion of estimated catch of hoki by form type for the period 2005/06 – 2010/11

Fishing year	**TCEPR**	**TCER**	**CELR**	**Others**
2010/11	93%	7%	<0.1%	<0.1%
2009/10	93%	7%	<0.1%	<0.1%
2008/09	93%	7%	<0.1%	<0.1%
2007/08	92%	8%	<0.1%	<0.1%
2006/07	92%	-	7%	<0.1%
2005/06	95%	-	5%	<0.1%

Total	*93%*	*5%*	*2%*	*<0.1%*

Hake

Table 2A. Estimated catch of hake (tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	TCER	Others	Total
2010/11	4,892	46	38	*4,977*
2009/10	3,885	32	29	*3,946*
2008/09	9,134	19	21	*9,175*
2007/08	5,129	18	20	*5,166*
2006/07	9,697	-	32	*9,730*
2005/06	8,887	-	29	*8,916*
Total	*41,625*	*115*	*170*	*41,910*

Table 2B. Proportion of estimated catch of hake by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	TCER	Others
2010/11	98%	1%	1%
2009/10	98%	1%	1%
2008/09	100%	<1%	<1%
2007/08	99%	<1%	<1%
2006/07	100%	-	<1%
2005/06	100%	-	<1%
Total	*99%*	*<1%*	*<1%*

Ling

Table 3A. Estimated catch of ling (tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	LCER	LTCER	CELR	TCER	NCER	Total
2010/11	6,047	1,877	2,088	75	917	82	*11,095*
2009/10	6,055	2,857	1,745	131	699	109	*11,595*
2008/09	6,728	2,593	1,462	188	563	101	*11,636*
2007/08	9,614	2,857	2,045	206	510	99	*15,331*
2006/07	10,153	2,566	-	1,818	-	133	*14,670*
2005/06	8,605	2,512	-	1,701	-	-	*12,819*
Total	*47,202*	*15,272*	*7,340*	*4,119*	*2,688*	*524*	*77,146*

Table 3B. Proportion of estimated catch of ling by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	LCER	LTCER	CELR	TCER	NCER
2010/11	55%	17%	19%	1%	8%	1%
2009/10	52%	25%	15%	1%	6%	1%
2008/09	58%	22%	13%	2%	5%	1%
2007/08	63%	19%	13%	1%	3%	1%
2006/07	69%	17%	-	12%	-	1%
2005/06	67%	20%	-	13%	-	-
Total	*61%*	*20%*	*10%*	*5%*	*3%*	*1%*

Southern blue whiting

All estimated catch information for the last six years is reported on TCEPRs.

Jack mackerel (all stocks)

Table 4A Estimated catch of jack mackerel (tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	CELR	TCER	Others	Total
2010/11	29,825	8,296	159	4	*38,285*
2009/10	31,860	9,030	153	4	*41,048*
2008/09	28,921	9,781	129	6	*38,837*
2007/08	34,933	11,368	103	3	*46,407*
2006/07	32,519	5,168	-	6	*37,693*
2005/06	31,520	9,641	-	-	*41,161*
Total	*189,580*	*53,282*	*544*	*23*	*243,430*

Table 4B Proportion of estimated catch of jack mackerel by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	CELR	TCER	Others
2010/11	78%	22%	<1%	<0.1%
2009/10	78%	22%	<1%	<0.1%
2008/09	74%	25%	<1%	<0.1%
2007/08	75%	24%	<1%	<0.1%
2006/07	86%	14%	-	<0.1%
2005/06	77%	23%	-	-
Total	*78%*	*22%*	<1%	<0.1%

Orange roughy

Table 5A Estimated catch of orange roughy (tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	TCER	CELR	Total
2010/11	5,931	15	-	*5,946*
2009/10	8,735	66	-	*8,802*
2008/09	10,576	86	-	*10,661*
2007/08	12,077	27	-	*12,105*
2006/07	12,777	-	312	*13,089*
2005/06	14,152	-	497	*14,649*
Total	*64,249*	*195*	*808*	*65,252*

Table 5B Proportion of estimated catch of orange roughy by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	TCER	CELR
2010/11	100%	<1%	-
2009/10	99%	1%	-
2008/09	99%	1%	-
2007/08	100%	<1%	-
2006/07	98%	-	2%
2005/06	97%	-	3%
Total	*98%*	*0*	*1%*

Oreos

Table 6A Estimated catch of oreos (all species, tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	TCER	CELR	Others	Total
2010/11	13,737	2	1	<1	*13,740*
2009/10	16,418	50	<0.1	<0.1	*16,468*
2008/09	14,622	649	-	<0.1	*15,271*
2007/08	15,217	525	134	<1	*15,875*
2006/07	15,129	-	704	-	*15,833*
2005/06	15,253	-	972	<0.1	*16,225*
Total	90,376	1,225	1,810	*<1*	*93,411*

Table 6B Proportion of estimated catch of oreos (all species, tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	TCER	CELR	Others
2010/11	100%	<0.1%	<0.1%	<0.1%
2009/10	100%	<0.1%	<0.1%	<0.1%
2008/09	96%	4%	-	<0.1%
2007/08	96%	3%	1%	<0.1%
2006/07	96%	-	4%	<0.1%
2005/06	94%	-	6%	<0.1%
Total	*97%*	*1%*	*2%*	<0.1%

Scampi

All estimated catch information for the last six years is reported on TCEPRs.

Squid

Table 7A Estimated catch of squid (tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	SJCER[3]	TCER	CELR	Others	Total
2010/11	33,703	1,414	226	1	<0.1	*35,344*
2009/10	29,574	891	367	2	<0.1	*30,834*
2008/09	43,489	1,032	189	2	<0.1	*44,712*
2007/08	51,922	1,371	736	<1	<0.1	*54,028*
2006/07	63,261	2,278	-	1,221	-	*66,760*
2005/06	62,915	5,844	-	918	-	*69,677*
Total	284,863	12,830	1,518	*2,145*		*301,356*

Table 7B Proportion of estimated catch of squid by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	SJCER	TCER	CELR	Others
2010/11	95%	4%	1%	<0.1%	<0.1%
2009/10	96%	3%	1%	<0.1%	<0.1%
2008/09	97%	2%	<1%	<0.1%	<0.1%
2007/08	96%	3%	1%	<0.1%	<0.1%
2006/07	95%	3%	-	2%	-
2005/06	90%	8%	-	1%	-
Total	*95%*	*4%*	*1%*	*1%*	<0.1%

[3] Squid jig catch, effort return

Barracouta

Table 8A Estimated catch of barracouta (tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	TCER	CELR	Others	Total
2010/11	20,576	4,206	57	3	*24,841*
2009/10	22,452	3,801	100	1	*26,354*
2008/09	20,094	4,381	202	2	*24,679*
2007/08	21,512	4,234	63	6	*25,815*
2006/07	24,424	-	3,045	3	*27,472*
2005/06	21,771	-	3,998	-	*25,769*
Total	130,829	16,621	7,464	*16*	*154,929*

Table 8B Proportion of estimated catch of barracouta (tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	TCER	CELR	Others
2010/11	83%	17%	<1%	<0.1%
2009/10	85%	14%	<1%	<0.1%
2008/09	81%	18%	1%	<0.1%
2007/08	83%	16%	<1%	<0.1%
2006/07	89%	-	11%	-
2005/06	84%	-	16%	-
Total	*84%*	*11%*	*5%*	<0.1%

Silver warehou

Table 9A Estimated catch of silver warehou (tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	TCER	CELR	Others	Total
2010/11	6,828	258	1	2	*7,090*
2009/10	6,140	333	2	2	*6,478*
2008/09	7,635	303	4	2	*7,945*
2007/08	7,079	221	<1	3	*7,303*
2006/07	13,037	-	107	1	*13,144*
2005/06	9,902	-	130	-	*10,031*
Total	50,621	1,116	243	*11*	*51,991*

Table 9B Proportion of estimated catch of silver warehou (tonnes) by form type for the period 2005/06 – 2010/11

Fishing year	TCEPR	TCER	CELR	Others
2010/11	96%	4%	<0.1%	<0.1%
2009/10	95%	5%	<0.1%	<0.1%
2008/09	96%	4%	<0.1%	<0.1%
2007/08	97%	3%	<0.1%	<0.1%
2006/07	99%	-	1%	<0.1%
2005/06	99%	-	1%	-
Total	*97%*	*2%*	*<1%*	<0.1%

APPENDIX 3

COMPILATION OF SPREADSHEETS AND FIGURES –

Disk available upon request from Science Officer, Ministry for Primary Industries (Science.Officer@mpi.govt.nz).