Appendices

Appendix 1: Initial Position Paper (attached as separate document)

Appendix 2: Copy of submissions (attached as separate document)

Appendix 3: DOC incident database mortality records for Hector's and Maui's dolphin mortalities reported between 1921 and 2010[1].

Description of incident	Incidents	Specifics	
Known entanglement - animal was known (from incident report) to have been entangled and died.	115	Commercial set net Recreational set net Unknown Trawl Cray Known set net bycatch	45 21 24 19 3 3
Not assessed - carcass was not necropsied or recovered, or the cause of death was not assessed (typical of historical mortalities)	91		
Not determinable - carcass too decomposed for necropsy	85		
Possible entanglement - net marks on the body and a mention of the net marks in the incident report; or the pathology report lists probable entanglement as cause of death	54		
Unknown - cause of death unexplained or not definitive (eg, "open" diagnosis in pathology report)	40		
Natural - cause of death deemed to be from natural causes	27		
Probable entanglement - net marks on the body and one other definite indication of capture such as mutilation; or the pathology report lists probable entanglement as cause of death	21		
Not available - necropsy or incident report not available	19		
Possible human interaction - no signs of net entanglement but indications of other types of human interaction such as marks that resemble knife wounds	10		
Trauma - unknown cause	11		
Human interaction - no sign of net entanglement but definite signs of other types of human interaction such as high degree of mutilation	9		
Harpooned	4		
To be confirmed	3		
Boat strike	1		
Possible maternal separation	1		
Probable septicaemia	1		
Reported by-catch but necropsy records saltwater drowning	1		
Euthanased	1		
No details available	1		
Sum	**495**		

[1] This summary does not include 9 reported incidents of entanglement but where the dolphin was released and 2 releases following strandings as survival after these incidents is unknown. 4 recent additional incidents have been recorded that do not appear in the table above.

Appendix 4: Reported WCNI Maui's mortalities between 1921 and 2010. Source is the DOC Hector's and Maui's Dolphin Incident database

Description of Incident	Incidents
Known entanglement - animal was known (from incident report) to have been entangled and died.	2
Probable entanglement - net marks on the body and one other definite indication of capture such as mutilation; or the pathology report lists probable entanglement as cause of death.	1
Possible entanglement - net marks on the body and a mention of the net marks in the incident report; or the pathology report lists probable entanglement as cause of death.	2
Not assessed - carcass was not necropsied or recovered, or the cause of death was not assessed (typical of historical mortalities).	23
Not determinable - carcass too decomposed for necropsy.	7
Unknown - cause of death unexplained or not definitive (eg, "open" diagnosis in pathology report).	1
Natural - cause of death deemed to be from natural causes.	3
Human interaction - no sign of net entanglement but definite signs of other types of human interaction such as high degree of mutilation.	1
Possible human interaction - no signs of net entanglement but indications of other types of human interaction such as marks that resemble knife wounds	1
To be confirmed - Incident or necropsy report pending	0
Total	**41**

Appendix 5: Reported ECSI Hector's dolphin mortalities between 1948 and 2010. Source is the DOC incident database.

Description of Incident	Mortalities	Specifics	
Known entanglement - animal was known (from incident report) to have been entangled and died.	89	Commercial set net Recreational set net Trawl Cray pot Unknown set net	44 12 15 3 15
Not assessed - carcass was not necropsied or recovered, or the cause of death was not assessed (typical of historical mortalities).	39		
Possible entanglement - net marks on the body and a mention of the net marks in the incident report; or the pathology report lists probable entanglement as cause of death.	34		
Not determinable - carcass too decomposed for necropsy.	37		
Unknown - cause of death unexplained or not definitive (e.g., "open" diagnosis in pathology report).	20		
Natural - cause of death deemed to be from natural causes.	12		
Probable entanglement - net marks on the body and one other definite indication of capture such as mutilation; or the pathology report lists probable entanglement as cause of death.	11		
Human interaction - no sign of net entanglement but definite signs of other types of human interaction such as high degree of mutilation.	8		
Not available - necropsy or incident report not available.	7		
Possible human interaction - no signs of net entanglement but indications of other types of human interaction such as marks that resemble knife wounds.	6		
Trauma unknown cause - as read from pathology report - trauma, with an unknown cause (ie, could be natural or human induced).	6		
Boat strike	1		
Harpooned	1		
Possible maternal separation	1		
Probable septicaemia	1		
To be confirmed - incident or necropsy report pending.	2		
Total	**275**		

Appendix 6: The Ministry synthesis of management options cost impacts

Overview of methodology

1 To provide estimates of the economic impacts of the current interim relief areas, the Ministry used the same methodology as it did for the original Threat Management Plan (TMP) Final Advice. The same methodology was used in each of the areas (4nm to 7nm on the WCNI and the butterfish areas in the Marlborough Sounds). This section first explains the methodology and then reports the results for each area.

2 The Ministry first estimated the direct revenue loss likely to be incurred by the harvesting sector. These direct revenue losses to the harvesting sector were then used to estimate income lost in the harvesting sector, the processing sector, and more widely to the economy. Finally, the annual income losses were used to estimate the approximate present value of losses to the harvesting section, the processing sector, and the rest of the economy. The loss in quota value was estimated separately. Income losses were adjusted to avoid the double-counting of quota value and ACE value.

Total revenue loss estimates: Appropriate estimate of price of fish

3 To estimate the direct revenue losses, two sets of information are required: estimates of landed prices and estimates of the reduction in landings that would be caused by removing the interim relief. The process by which the Ministry derived its best estimates of prices is explained next. The process of estimating the reductions in landings was specific to each area, and is explained in separate sections below.

4 The Ministry has compared port price and export price to various recent data on landed fish prices. The Ministry agrees that port price appears to be substantially below recent landed prices. However, there are also problems with export price as a measure of the price paid to harvesters. For some species, exports are a small percent of landings and may not reflect the broader market. Export price includes the value of services that occur after harvesting, such as unloading fees, auction commissions, expenses for processing and freezing, and transportation. Rather than choosing either port price or export price, the Ministry combined information on port price and export price with its best judgment to produce its price estimates for this final advice.

5 Table 1 presents the 2010-11 port price and the 2009 export-derived price for the 3 species that are most significant in analyzing the impact of the removing the interim relief on the fishing industry. The last column presents the price estimates which the Ministry has used in this analysis.

Table 1: Estimates of Fish Prices

Species	Port Price (2010/2011 fishing year)	Export-derived price (2009 calendar year)	The Ministry estimate
Butterfish	$4.97/kg	N/A	$4.97/kg
Rig	$3.49/kg	$6.31/kg	$5.60/kg
School shark	$1.78/kg	$4.47/kg	$3.50/kg

Estimates of income impacts

6 The revenue losses by sector and area were used to estimate income effects. This section explains how income effects were estimated.

7 The Ministry has developed estimates of lost income using value added estimates from an input-output model of the economy. Value added is the difference between the value of output and cost of goods and services purchased from other sectors. Note that value added includes income earned by labour (as wages and salaries) and by capital (as profits). While value added in an input-output model varies slightly from other definitions of income, it is an adequate estimate of income for present purposes. Those estimates were derived in a research project by Market Economics under a contract with the Ministry (The Ministry Contract SEC 2006-10). This study is an update of methodology in McDermott Fairgray Group (2000) "Economic Impact Assessment for New Zealand Regions" prepared for New Zealand Seafood Industry Council. The methodology in the two reports is identical; only the time-frame of the estimates is different. The Ministry used the estimates from the current research, rather than the estimates from the 2000 report, because the underlying economic model has been updated by ten years and better reflects current economic conditions.

8 Input-output models enable estimation of how a change in output of one industry will affect value added in that industry and more broadly in the economy. Using the Market Economics estimates, the Ministry estimated lost value added into four categories:

a. Value added lost in the harvesting sector (direct harvesting income);
b. Value added lost in the processing sector (direct processing income);
c. Value added lost in sectors that supply harvesting and processing (indirect income); and
d. Value added lost in the broader economy as the three types of income above are spent and generate income for suppliers of a wide array of goods (induced income).

9 Table 2 presents the ratios derived from Market Economics model to estimate each of the value added components above. These ratios represent separate impacts; double-counting that would occur because of economic interrelationships has been removed.

Table 2: Estimates of value added impacts from Market Economics model

	Ratio of value added to harvesting sector total output
Direct harvesting value added	.25
Processing value added	.46
Indirect value added	.56
Induced value added	.41

10 Table 2 can be interpreted as follows. A $1 million reduction in landings would reduce annual value added in harvesting by $250,000, in processing by $460,000, in industries that supply harvesting and processing by $560,000, and in the broader economy through flow-on effects by $410,000.

11 Note that the methodology estimates all income earned by the harvesting sector and the processing sector under national income accounting definitions of value added. Because harvesters and processors own a substantial majority of the quota, the national accounts definition of value added would include income from quota holdings by processors and harvesters. The value added from quota could include either ACE sales or the increased income earned by a harvester who does not have to purchase ACE.

Impact on quota values

12 Estimates of quota value were also computed by the Ministry. This section explains the methodology used to estimate quota values.

13 The Ministry concludes that the costs of adjustment will be shared between harvesters and quota owners. There is a market for ACE for each QMA. The restrictions will decrease the demand for ACE in the restricted areas, because the costs of fishing in those areas will increase. On the other hand, the demand for ACE for QMAs not directly affected by the TMP may increase as some vessels change their fishing patterns. The relative sharing of the costs of adjustment between harvesters and quota owners will depend upon the relative changes in supply and demand for ACE, both in the markets directly affected by the interim relief and in some ACE markets indirectly affected by the interim relief. The Ministry lacks information to make reliable predictions about how individual ACE markets will be impacted.

14 The Ministry assumes that the loss in quota value is proportional to the reduction in landings.

15 A double-counting error occurs if both ACE and quota value are used to determine losses to society. Quota has value because it generates ACE. The value of quota is the present value of the expected future ACE generated by the quota.

16 As noted above in paragraph 11, the methodology of applying national income account income multipliers to total revenues implicitly includes any ACE value generated by firms in the sectors that own quota. Where quota value loss is accounted for directly in losses, the income generated from ACE (either explicitly by sale or implicitly through use by the quota owner) must be deducted from income estimates to avoid the double counting error (above).

17 The Ministry believes it is useful to separate the likely impact on quota value (which is equivalent to the impact on the present value of future ACE income) from other income losses. This information can help assess the likely distributional impacts of restrictions on quota owners as compared to harvesters.

Estimates of overall impacts

18 The methodology described above estimates the first-year impacts of options. The first-year impacts present an incomplete estimate of losses, because some of those losses will recur.

19 For the purposes of approximating the present value of economic losses, the Ministry examined each category of loss and used its best judgment on how best to approximate the relation of the first-year loss to the present value of all future losses. The Ministry capitalised first-year income losses into permanent losses by making the following assumptions.

a. **Quota value.** If the restrictions are permanent, the loss of quota value is permanent. Therefore quota value lost is a permanent loss. Because quota value captures the present value of ACE, ACE value should not be included in income to avoid double-counting.

b. **Removing ACE value from income.** To avoid double-counting ACE price, the value of ACE earned by fishing, processing and fishing supply sectors must be deducted from income in sectors that own ACE. Absent information on how ACE value is reflected in the national accounts (upon which the input-output model is based), the Ministry assumed that 30% of ACE value flows to the harvesting sector, 50% to the processing sector, and 20% to other supply sectors.

c. **Direct income in harvesting.** If the capital and labour in the harvesting sector cannot be easily transferred to other harvesting uses, losses equal to several years of income will be incurred as resources are unemployed or underemployed. Both the capital and labour in harvesting are relatively specialized, so the adjustment period of several years might be expected. The Aranovus research[2] (from the original TMP) confirms the general observation that the average age of those employed in fishing is relatively high, so retirement is possible for some set net harvesters, in particular. Likewise, because New Zealand's fisheries do not have significant unexploited fishery resources, some displaced harvesting capital is likely to be retired. To approximate the losses through the adjustment period, a loss of 5 times the initial displaced annual income is used in calculations.

d. **Direct income in processing.** The capital and labour in processing is less specialized to particular species, so the likely adjustment period will not be as long for processing. A loss of 2.5 times the initial annual displaced income is used in calculations.

e. **Indirect income in supply sectors.** The sectors supplying the fishing and processing sectors also supply very similar products to the broader boating and food processing industries. There may be one-time inventory losses if highly specialized inventories, such as set nets, become obsolete because of the restrictions. A loss of 1.5 times the initial displaced income in supply industries is used in calculations.

f. **Induced income in broader economy.** When income is lost in harvesting, processing, and fishing supply sectors, the broader economy will see reduced economic activity because of reduced consumption by those who earn income in the directly affected sectors. However, the broader economy will adjust to these changes by shifting resources towards other uses. How easy it will be for the economy to adjust depends upon (a) the relative magnitude of the impact and (b) the demand for other outputs by the economy. In the present context, the total changes are small in relation to the overall New Zealand economy and the New Zealand economy is currently operating at high levels

[2] Research Project SEC2007-01 , A Socio-economic Impact Assessment of Fishers: Proposed Options to Mitigate Fishing Threats to Hector's and Maui's Dolphins by Aranovus Limited

of employment and capacity use. For these reasons, the Ministry believes that the broader adjustments by the economy will be rapid and that all of the adjustment costs will be incurred within one year. Therefore, the Ministry suggests that one year of induced income losses are an appropriate estimate of total losses.

20 The Ministry emphasizes that the estimated multiples in the preceding paragraph are informed judgments. They are inherently imprecise. And because they multiply the annual impacts, they are the single most important driver of the final estimates of the present value of impacts. The Ministry believes that they are appropriate for the purpose of thinking about how changes are likely to unfold in the future. They are especially useful in understanding qualitatively which restrictions are associated with the largest costs, and which restrictions are less important in terms of overall cost impacts. But it is inappropriate to read high precision into the present value of losses that are computed from these income multiples.

New Zealand Treasury's Present Value methodology

21 SeaFIC, in its submission, proposed to address the issue of recurring losses by assuming that all losses are permanent. SeaFIC proposed that the Ministry uses the Present Value methodology outlined in New Zealand's Treasury's Cost Benefit Analysis Primer[3]. Using this approach SeaFIC capitalized those losses using a discounting factor of slightly over 6% over a maximum time period of 20 years.

22 The Ministry does not believe that all the income losses are permanent, so an assumption that all losses are permanent is inappropriate. The Ministry believes that some of the capital and labour that is displaced will find employment elsewhere in the economy. These movements to other employment will not immediate, so there can be significant transition costs. A useful way to think of these transition costs is to ask how long labour and capital are likely to take to find similar employment elsewhere.

23 However, the Ministry has decided to provide the Minister with the estimated overall impacts using Treasury's Present Value methodology so the Minister can see the estimates cost impact using both methodologies. The Ministry has used the Treasury default discount rate of 10% instead of the 6% discount rate proposed by SeaFIC.

24 The assumption around quota value and induced income in the broader economy (described above) are still appropriate when using Treasury's Present Value methodology.

Estimated impacts on West Coast North Island (WCNI)

25 This section reports the estimated economic impacts on the set net fishers on the WCNI.

26 To estimate the impact of Option 1 (Allow set net fishing between 4-7nm from shore) and Option 1A (Allow set net fishing between 4-7nm and introduce monitoring), Option 2 (Interim relief measures) and Option 3 (Retain closure of area between 4-7nm), ACE and quota prices for the species allowed to targeted under the interim relief are required for these calculations. Table 3 presents the ACE price (2008/09 fishing year) and the average quota price (since 2001) for school shark and rig. This data will be used in the calculations of quota value lost and to remove the double-counting of ACE income from income estimates.

[3] http://www.treasury.govt.nz/publications/guidance/planning/costbenefitanalysis/primer

Table 3: ACE and Quota prices for WCNI

Species	2008/09 ACE price ($/tonnes)	Average quota price since 2001 ($/tonnes)
School shark	$1,272.50	$17,118.90
Rig	$488.90	$5,376.32

27 To estimate the economic impact on the commercial set net fleet, the Ministry first estimated the percentage of catch in the interim relief area. These estimates used data from submissions and from the Ministry data on set net activity.

28 For the one-year period October 2008 to September 2009, the Ministry has collected latitude/longitude coordinates for all sets by set net fishers from vessels over 6meters while the interim relief has been in place. Using this data, the Ministry was able to obtain the number of set net events that occurred in the 4nm to 7nm interim relief area where fishers where targeting either school shark or rig. This data was then used to calculate what percentage of set net events targeting school shark and rig within the interim relief area represented compared to all set net events targeting school shark and rig in statistical areas 041, 042, 043, 044, 045 and 046.

29 The resulting percentages are presented in Table 4.

Table 4: Percentage of catch in the Interim Relief area, WCNI

Species	Set net effort
School shark	3.56%
Rig	34.08%

Options 1 & 1A

30 Option 1 (Allow set net fishing between 4-7nm from shore) and Option 1A (Allow set net fishing between 4-7nm and introduce monitoring) will provide set net fishers addition utilisation opportunities that they currently do not have under the interim relief. Set net fishers will be able to target species besides school shark and rig. Set fishers will also be able to fish year round instead of just between 1 September and 24 December.

31 SeaFIC submits that these changes will add an additional 10% in catch revenue to the figure used in the IPP. The Ministry agrees that this is an appropriate figure.

32 In their submission, SeaFIC also argues that the associated by-catch from targeting school shark and rig should be considered in the impact on revenue. SeaFIC submit that on average, the additional revenue from the by-catch of snapper, kingfish, gurnard and trevally is equal to 25% of the combined revenue for school shark and rig.

33 The Ministry believes that while it is likely that the associated by-catch from targeting school shark and rig within the interim relief area could be caught by other fishers using

different methods, there will be an impact on the revenue of the individual fishers who target school shark and rig inside the interim relief area. A 25% adjustment has been made and will be used in the calculations below.

34 Table 5 present the Ministry estimates of landed revenues for set nets. This table uses impacts from Table 4, landings data for 2008/09, and the price estimates from Table 1.

35 The set net catch on WCNI if it was allowed between 4 to 7nm is estimated to be worth just over $0.2 million.

Table 5: Estimates of the Economic Impact of allowing set netting between 4 to 7 nm, WCNI

Species	2008/09 Fishing Year Catch (tonnes)	Total Revenue from Catch + 10% (additional catch)	Additional 25% (for bycatch)	Revenue from allowing set netting
School shark	195.08	$751,069.55	$938,836.94	$33,422.59
Rig	65.16	$401,391.76	$501,739.70	$170,992.89
TOTAL	**260.24**	**$1,152,461.31**	**$1,440,576.64**	**$204,415.48**

36 Table 6 applies the ratios in Table 2 to revenue estimates in Table 5 to derive the estimated annual value added changes for set net harvesters on the WCNI.

37 Table 6 also present the Ministry estimates of the present value of allowing set netting between 4 to 7nm. Table 6 is computed by applying the factors from paragraph 19 to the annual income data in the Table and using the ACE and quota values in Table 3.

Table 6: Estimated annual income effects and Present Value of allowing set netting between 4 to 7 nm, WCNI – The Ministry's Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$51,103.87	$225,977.77	$277,081.64
Processing income lost	$94,031.12	$210,459.82	$304,490.94
Indirect income lost	$114,472.67	$165,800.69	$280,273.36
Induced income lost	$83,810.35	$0.00	$83,810.35
Quota value	$0.00	$238,281.22	$238,281.22
TOTAL	**$343,418.01**	**$840,519.49**	**$1,183,937.51**

38 The estimated annual value added changes of the interim relief is $0.34 million and the estimated present values of the interim relief is $0.84 million. The total estimated

economic impact is just under $1.2 million.

39 Table 7 shows the estimates of the present value of allowing set netting between 4 to 7nm using Treasury's Present Value methodology.

Table 7: Estimated annual income effects and Present Value of allowing set netting between 4 to 7 nm, WCNI – Treasury's Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$51,103.87	$486,179.93	$537,283.81
Processing income lost	$94,031.12	$894,571.08	$988,602.20
Indirect income lost	$114,472.67	$1,089,043.05	$1,203,515.73
Induced income lost	$83,810.35	$0.00	$83,810.35
Quota value	$0.00	$238,281.22	$238,281.22
TOTAL	**$343,418.01**	**$2,708,075.29**	**$3,051,493.30**

40 The estimated annual value added changes of the interim relief is still $0.34 million but the estimated present values of the interim relief is just over $2.7 million. The total estimated economic impact is just over $3.0 million.

41 Option 1 would allow set netters to continue to contribute between an estimated $1.2 and $3.0 million to the wider New Zealand economy. Option 1A would allow set netters to make the same contribution to the economy but they would incur some costs associated with the additional monitoring being proposed.

42 It is clear that the assumed length of time that it takes capital and labour displaced from the fishing industry to be put use by the broader economy affects the present value of allowing set netting between 4 to 7nm. As stated earlier, the Ministry does not believe that some of the labour and capital will be retired permanently and that discounting over 20 years is not appropriate in this case.

43 However, given the issues outlined in paragraph 20, the Ministry has provided the estimated annual income effects and present value of the interim relief using both the Ministry's methodology and Treasury methodology as the impact is likely to be somewhere in this range.

Options 2 & 3

44 The Ministry notes that the 25% adjustment proposed by SeaFIC (see paragraphs 32 and 33 above) has been used in the calculations below.

45 Table 8 present the Ministry estimates of landed revenues for set nets. This table uses impacts from Table 4, landings data for 2008/09, and the price estimates from Table 1.

46 The set net catch on WCNI under the current interim relief is estimated to be worth

$0.186million.

Table 8: Estimates of the Economic Impact of the Interim Relief, WCNI

Species	2008/09 Fishing Year Catch (tonnes)	Total Revenue from Catch	Total Revenue from Catch + 25% (bycatch)	Revenue from the Interim Relief
School shark	195.08	$682,790.50	$853,488.13	$30,384.18
Rig	65.16	$364,901.60	$456,127.00	$155,448.08
TOTAL	**260.24**	**$1,047,692.10**	**$1,309,615.13**	**$185,832.26**

47 Table 9 applies the ratios in Table 2 to revenue estimates in Table 8 to derive the estimated annual value added changes for set net harvesters on the WCNI.

48 Table 9 also present the Ministry estimates of the present value the interim relief for set nets. Table 6 is computed by applying the factors from paragraph 19 to the annual income data in the Table and using the ACE and quota values in Table 3.

Table 9: Estimated annual income effects and Present Value of the Interim Relief, WCNI – The Ministry's Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$46,458.06	$202,748.73	$249,206.80
Processing income lost	$85,482.84	$189,089.11	$274,571.95
Indirect income lost	$104,066.06	$150,190.78	$254,256.84
Induced income lost	$76,191.23	$0.00	$76,191.23
Quota value	$0.00	$238,281.22	$238,281.22
TOTAL	**$312,198.19**	**$780,309.84**	**$1,092,508.03**

49 The estimated annual value added changes of the interim relief is $0.31 million and the estimated present values of the interim relief is $0.78 million. The total estimated economic impact is just under $1.1 million.

50 Table 10 shows the estimates of the present value of the interim relief for set net using Treasury's Present Value methodology.

Table 10: Estimated annual income effects and Present Value of the Interim Relief, WCNI – Treasury's Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$46,458.06	$441,981.76	$488,439.82
Processing income lost	$85,482.84	$813,246.44	$898,729.28
Indirect income lost	$104,066.06	$990,039.14	$1,094,105.20
Induced income lost	$76,191.23	$0.00	$76,191.23
Quota value	$0.00	$238,281.22	$238,281.22
TOTAL	**$312,198.19**	**$2,483,548.56**	**$2,795,746.75**

51 The estimated annual value added changes of the interim relief is still $0.31 million but the estimated present values of the interim relief is just under $2.5 million. The total estimated economic impact is just under $2.8 million.

52 Option 2 would allow set netters to continue to contribute between an estimated $1.1 and $2.8 million to the wider New Zealand economy. Option 3 would cost the New Zealand economy an estimated $1.1 to $2.8 million.

53 It is clear that the assumed length of time that it takes capital and labour displaced from the fishing industry to be put use by the broader economy affects the present value of the interim relief. As stated earlier, the Ministry does not believe that some of the labour and capital will be retired permanently and that discounting over 20 years is not appropriate in this case.

54 However, given the issues outlined in paragraph 20, the Ministry has provided the estimated annual income effects and present value of the interim relief using both the Ministry's methodology and Treasury methodology as the impact is likely to be somewhere in this range.

Ability of WCNI set net fishers to adjust

55 Option 1 and 1A will provide more utilisation opportunities to the fishing industry and set net fishers. The current interim relief restricts set net effort within 4 to 7nm to targeting school shark and rig between 1 September and 24 December. By removing these restrictions, set net fishers will be able to fish the whole year and target additional species within the 4 to 7nm area. However, set net fishers will incur some costs if they are required to pay for any additional monitoring required under Option 1A.

56 Option 2 will require no adjustment as this is the situation set net fishers are currently operating in.

57 The Ministry believes that the options for adjustment by set netters to the options in this final advice are limited under Option 3. Most of these vessels will not be able to caught rig economically outside 7nm. The Ministry does not see any evidence that hook-and-line fishing is likely to be economically viable for the primary species targeted either. The only possible adjustment would be for vessels operators to move away from the WCNI to fish in some location, such as the east coast. The Ministry does not find it reasonable to assume that set net fishers on the WCNI will move elsewhere. Moreover, most fishing resources in New Zealand are fully utilized, so the opportunities to expand output elsewhere are limited. Because the options for adjustment are limited for set nets, the Ministry believes that the mitigating effects of any adjustments will be small for set net fishers.

Estimated impacts on the East Coast South Island (ECSI)

58 This section reports the estimated impacts on butterfish set netters at the top of the ECSI from the interim relief.

59 Table 11 presents average ACE for 2008/09 and the average quota price since 2001 to that are used to estimate quota value changes and total impact estimates for butterfish set netting.

Table 11: ACE and Quota prices for Butterfish

Species	2008/09 ACE price ($/tonnes)	Average quota price since 2001 ($/tonnes)
Butterfish	$896.30	$18,241.00

Impact on commercial set net fleet, ECSI

60 To estimate the reduction of harvests by the butterfish set net harvesters at the top of the ECSI if interim relief was removed, the Ministry used information from the **SeaFIC** submission and from the Ministry data on set net harvests.

61 For the one-year period October 2008 to September 2009, the Ministry has collected all Catch Effort Landing Return (CELR) data that shows set netters targeting butterfish in statistical areas 017 and 018. By mapping the GPS co-ordinates in the CELR data, the Ministry calculated that 24.2% of the total catch of butterfish in statistical areas 017 and 018 occurred within the interim relief area. However, vessels under 6meters in length do not have to report GPS co-ordinates in their CELR data and a large amount of the catch was unable to be plotted to determine if it was within the interim relief area or not.

62 SeaFIC submits that the all the catch that could not be plotted is taken from the interim relief area. SeaFIC submits that the percentage of butterfish caught in statistical areas 017 and 018 that is in the interim relief areas is 87% not 24.2%.

63 In assessing the impact of Options 1, 2 and 3, the Ministry will use the 87% figure proposed by SeaFIC.

64 Table 12 presents the Ministry estimates of landed revenues. This table uses the impact figure of 87%, landings data for 2008/09, and the price estimates from Table 11.

65 The set net catch on ECSI under the current interim relief is estimated $0.088 million.

Table 12: Estimates of the Economic Impact of the Interim Relief, ECSI

Species	2008/09 Fishing Year Catch (tonnes)	Total Revenue from Catch	Revenue from the Interim Relief
Butterfish	20.46	$101,706.08	$88,484.29
TOTAL	**20.46**	**$101,706.08**	**$88,484.29**

66 Table 13 applies the value added proportions and multipliers from Table 2 to the estimated revenue in Table 12 to derive the estimated annual income changes for set net harvesters on the ECSI.

67 Table 13 also present the Ministry estimates of the present value the interim relief for set nets. Table 13 is computed by applying the factors from paragraph 19 to the annual income data in the Table and using the ACE and quota values in Table 3.

Table 13: Estimated annual income effects and Present Value of the Interim Relief, ECSI – MFish Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$22,121.07	$86,669.20	$108,790.28
Processing income lost	$40,702.77	$81,810.14	$122,512.91
Indirect income lost	$49,551.20	$69,539.57	$119,090.77
Induced income lost	$36,278.56	$0.00	$36,278.56
Quota value	$0.00	$324,756.93	$324,756.93
TOTAL	**$148,653.61**	**$562,775.84**	**$711,429.44**

68 The estimated annual value added changes of the interim relief is just under $0.15 million and the estimated present values of the interim relief is $0.56million. The total estimated economic impact is just over $0.71 million.

69 Table 14 shows the estimates of the present value of the interim relief for set netting using Treasury's Present Value methodology.

Table 14: Estimated annual income effects and Present Value of the Interim Relief, ECNI – Treasury's Methodology

	Annual Value	Capitalised Future Value	Total
Direct harvesting income lost	$22,121.07	$210,450.23	$232,571.30
Processing income lost	$40,702.77	$387,228.43	$427,931.20
Indirect income lost	$49,551.20	$471,408.52	$520,959.72
Induced income lost	$36,278.56	$0.00	$36,278.56
Quota value	$0.00	$324,756.93	$324,756.93
TOTAL	**$148,653.61**	**$1,393,844.10**	**$1,542,497.71**

70 The estimated annual value added changes of the interim relief is still just under $0.15 million but the estimated present values of the interim relief is just under $1.4 million. The total estimated economic impact is just under $1.55 million.

71 Option 1 would allow set netters to continue to contribute between an estimated $0.71 and $1.55 million to the wider New Zealand economy. Option 2 would allow set netters to continue contribute between an estimated $0.71 and $1.55 million to the wider New Zealand economy but there would be some additional costs to the fishing industry associated with the required monitoring. Option 3 would cost the New Zealand economy an estimated $0.71 to $1.55 million.

72 It is clear that the assumed length of time that it takes capital and labour displaced from the fishing industry to be put use by the broader economy affects the present value of the interim relief. As stated earlier, the Ministry does not believe that some of the labour and capital will be retired permanently and that discounting over 20 years is not appropriate in this case.

73 However, given the issues outlined in paragraph 20, the Ministry has provided the estimated annual income effects and present value of the interim relief using both the Ministry's methodology and Treasury methodology as the impact is likely to be somewhere in this range.

Ability of ECSI set net fishers to adjust

74 Option 1 will require no adjustment as this is the situation set net fishers are currently operating in.

75 Option 2 will require no adjustment to fishing activity as this is the situation set net fishers are currently operating in. However, set net fishers will incur some costs if they are required to pay for any additional monitoring required under Option 2. This additional cost may make set netting for butterfish uneconomically for some or all of set net fishers who operate in this area.

76 The Ministry believes that the options for adjustment by set netters to the options in this final advice are limited under Option 3. Most of these vessels are less than 6meters in length and will not be able to be operated safely in more exposed waters. The only possible adjustment would be for vessels operators to move away from the ECSI to fish in some other location. The Ministry does not find it reasonable to assume that set net fishers on the ECSI will move elsewhere. Moreover, most fishing resources in New Zealand are fully utilized, so the opportunities to expand output elsewhere are limited. Because the options for adjustment are limited for set nets, the Ministry believes that the mitigating effects of any adjustments will be small for set net fishers.

Appendix seven: Plots of set net fishing effort for WCNI, for summer and winter in 2007-08 and 2008/09

Appendix 8: Potential Biological Removal (PBR)

1. The Potential Biological Removal (PBR) level is the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (Wade 1998). The PBR is calculated by the following formula:

   $PBR = N_{MIN}½R_{MAX}F_R$

   Where: N_{MIN} = the minimum population estimate of the stock;

   i. $½R_{MAX}$ = one-half the maximum theoretical or estimated net productivity rate of the stock at a small population size; and

   ii. F_R = a recovery factor between 0.1 and 1.0

2. The term Optimum Sustainable Population means, with respect to any population stock, the number of animals that will result in the maximum productivity (Maximum Net Productivity Level – MNPL) of the species, population, subpopulation or stock in question, keeping in mind the carrying capacity of the habitat and the health of the ecosystem of which they form a constituent part. For marine mammals, this level is thought to be between 50% and 85% of carrying capacity (K) and is more likely to be at the lower end of that range (Taylor & DeMaster 1993).

3. The minimum population estimate of the stock (N_{MIN}) is defined as the 20th percentile of a log-normal distribution based on an estimate of the number of animals in the stock. This is equivalent to the lower limit of a 60% 2-tailed confidence interval (Barlow *et al.* 1995).

4. The default maximum theoretical productivity rate is 0.04 for cetaceans. This value is used as a default in the absence of species specific information. When data are available on the productivity rate, they should be used.

5. The recovery factor is intended to compensate for uncertainty and possible unknown estimation errors. A recovery factor of 0.1 often is the default used for endangered stocks of marine mammals. A recovery factor of 0.5 has been suggested for stocks of indeterminate status (Wade & Angliss 1997).

6. The MNPL goal of the PBR approach was developed to achieve the goals given in the US Marine Mammal Protection Act, i.e., to maintain the population above its maximum net productivity level. This level will be at 50% – 85% of carrying capacity.

7. The Recovery-Rate goal allows a population known to be at a low level relative to its pre-exploitation level to recover at a rate close to its maximum as possible. In this case, a recovery factor (F_R) of 0.15 will achieve the goal of not delaying the time to recovery by more than 10% with 95% probability.

8. Earlier studies suggested an R_{MAX} of about 1.8. The Hector's dolphin Technical Working Group meeting of 31 August 2006 suggested that an R_{MAX} of 3.4% is appropriate based on the modelling work of Davies and Gilbert (2003).

9. As applied here, values calculated by the PBR approach should be seen as indicative only and should not be taken as absolute values of maximum allowable Hector's dolphin human caused mortality.

Appendix 9: Various ECSI butterfish fishery areas proposed for exemption

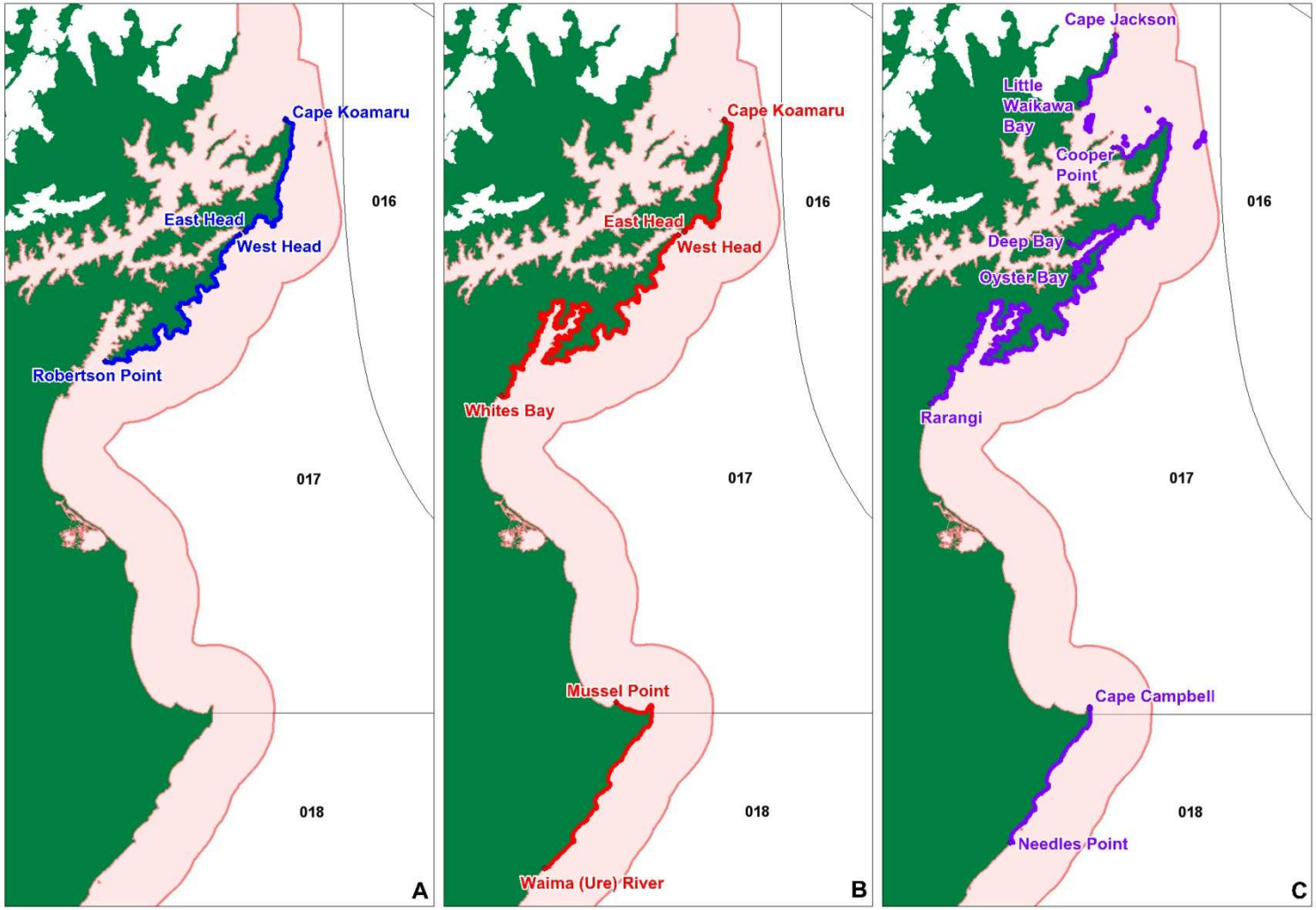


Figure 4. Various ECSI butterfish fishery areas proposed for exemption: (A) by the 2007 IPP and the July 2008 proposal from Federation of Commercial Fisheries; (B) by the 2008 FAP; and (C) the interim relief that applied from 2008 .

Appendix 10: Estimating costs of observer programmes

Set net fishing and Maui's dolphins – west coast, North Island

Calculating fishing effort and observer coverage cost for option one (a)

1. During 2006/07 and 2007/08 the total number of days of set-net fishing activity reported to have occurred within the defined area was 47 days and 63 days, respectively. The total number of days of set-net fishing activity reported within the defined area in 2008/09 was 41 days. In 2009/10 it is believed that poor weather restricted the fishing effort and the total number of days of set-net fishing activity reported was 18 days.

2. This is likely to be an underestimate of the actual fishing effort taking place within the area as fishing effort as these estimates only represent the activity of vessels that are longer than 6m, as vessels smaller than this are not required to report GPS coordinates of their fishing events. SeaFIC submitted that they expect the total number of days of set-set fishing activity, when vessels smaller than 6m are also included, would be around 80 days in 2008/09 and less than this due to the poor weather conditions in 2009/10.

3. All fishing vessels, including those less than 6m long, have to report fishing activity to the level of statistical area. For the four statistical areas that overlap the defined area, the total number of days of set-net fishing activity of all vessels in 2006/0, 2007/08, 2008/09 and 2009/10 was 1748, 1884, 2221 and 1841 days respectively. This provides the maximum possible fishing effort that may have occurred in the defined area, but is likely to be a significant over-estimate.

4. Fishing activity in both 2008/09 and 2009/10 has been subject to interim relief which only allowed set-nets fishing to target rig and school shark between 1 September and 24 December. If the parameters of the restrictions on fishing changed, the level of fishing effort may also vary accordingly.

5. The cost per observer day is likely to range between $1000 and $1200. Based on the estimated fishing effort data available for the last four years, the number of days of fishing effort is expected be in the range of between 18 and 2221 days, but likely to fall at around 80 days.

6. Based on this data, the total cost for 100% observer coverage for 2011/12 is expected to cost between $80,000 and $2,665,200 per year, but is likely to fall around 96,000. The cost of observer services may be reduced in the future with effort being made to increase the cost-efficiency of observer services.

Impact of the cost on fishers

7. The cost of the observer programme will be recovered from quota owners of the fish stocks that are caught most frequently by set-nets within the statistical areas that overlap with the defined area. The cost of the observer would be divided between quota owners of each stock based on the percentage that each species contributes to the total catch with the statistical areas.

8. The table below outlines the landing revenue of each stock and number of quota owners. The actual cost to each quota owner would be dependent on the proportion of the quota they owned.

Table 2. The most frequently caught species stocks by set net fishing within statistical area 41,42,45 and 46.

Stock Species	% of total catch	Number of quota owners	Landed Revenue 2009/10 ($)
SCH1	48	100	307,739
WAR1	21	147	171,748
SPO1	14	109	181,916
TRE1	6	98	49,869
SNA1	4	22	72,805
SPD1	3	76	7,379
KAH1	3	148	7,098
GUR1	3	138	15,979

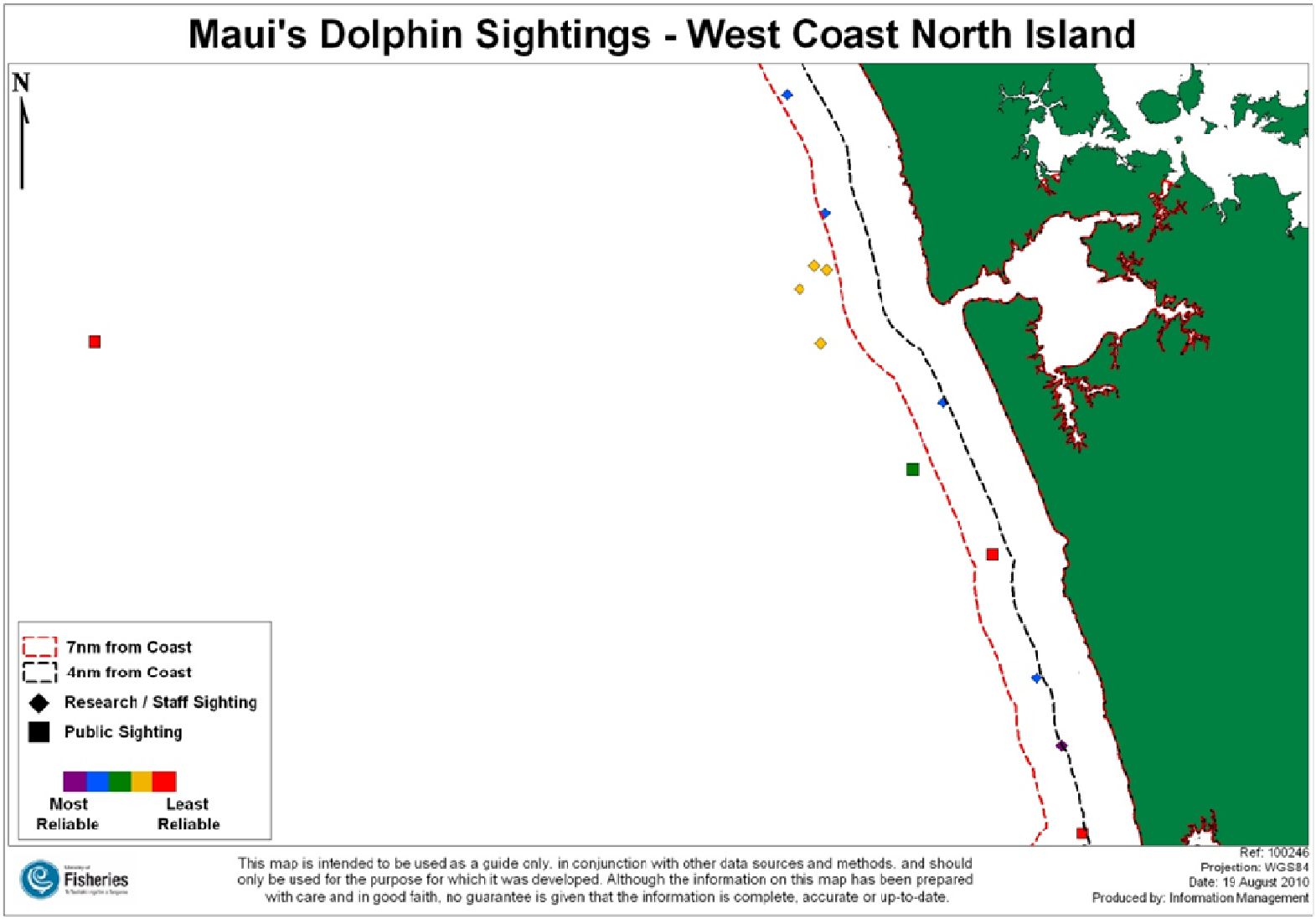
Hector's dolphins: East Coast of the South Island – commercial butterfish fishery

Calculating fishing effort and observer coverage cost for option two,

9. The total number of days of set-net fishing activity between 2007/08 and 2008/09 is estimated at 210 days in statistical area 017 and 45 days in statistical area 018. Using SeaFIC's estimate that 87.7% of butterfish caught in statistical areas 017 and 018 is caught in the defined area, we can estimate that 224 days of observer coverage would be needed to monitor set net activity in the defined area.

10. The cost per observer day is likely to range between $1000 and $1200. Based on the estimated fishing effort observed for the last two years, the total cost for 100% observer coverage for 2011/12 is likely to cost between $224,000 and $268,800. Total revenue from butterfish catch in the 2008/09 fishing year was estimated to be $101,706.

Appendix 11: Map plotting Sightings of Maui's dolphins further than 4nm from shore between Pariokariwa Point to Maunganui Bluff on the WCNI. The colour of the marker represents the positioning of the sighting(s) along the reliability scale.



In-C

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