Hector's Dolphin Eco-Tourism

Economic Impact Assessment

13 December 2018

m.e consulting

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Prepared for

Black Cat Cruises

Document reference: BCC001.18 EIA of Hectors Dolphin\EIA Hectors Dolphin Tourism.docx

Date of this version: 13 December 2018

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Executive Summary

The Hector's dolphin is an important species which New Zealanders as a community value. Over the last two decades the IUCN status of Hector's has changed from 'Vulnerable' to 'Endangered', which means the species is now considered very likely to become extinct. The main man-made threat to the Hector's population is ongoing bycatch in fisheries.

Early in 2018, five Hector's were accidentally killed in one fishing net off Banks Peninsula. As a result, the Fisheries Minister and Conservation Minister accelerated work to review the Threat Management Plan for the Hector's (and Māui) dolphins. There is a consultation process under way with the public and stakeholders, which will be completed in 2019. Officials will report to the Ministers in February 2019, at which time a decision will be made about the new TMP which may include some recommendations on additional protections.

In the past there have been studies conducted on the value of the Hector's to the wider community, which places the protection of the species at around $46 million per annum. There have also been studies of the lost fishing value that could be expected if protections are increased in the Hector's habitat. However, there have been no studies of the value of Hector's dolphin tourism, which is the focus of this Report.

This Report has found that Hector's dolphin tourism is an important part of the Banks Peninsula economy and the wider Christchurch region. The relatively high incidence of Hector's means that eco-tours afford almost guaranteed sightings on every trip. This high success is important in drawing many tourists to Banks Peninsula and Christchurch, and to New Zealand.

There are seven eco-tourism operators that rely on the presence of the Hector's dolphins to attract tourists. The tourist that undertake an eco-tour to see the Hector's also spend money on good and services on the day of the eco-tour.[1] In today's terms, it is estimated that eco-tourism (tour operators and tourist spend) generates economic impact equivalent of $19.5 million in value added which sustains the equivalent of 416 jobs in the Canterbury economy. Hector's eco-tourism also generates economic impact of $24.5 million in value added which sustains the equivalent of 476 jobs in the national economy.

Hector's Eco-Tourism	Canterbury	Rest of NZ	Total
Value Added ($m)	$19.5	$5.0	$24.5
Employment (EC)	416	60	476

Some of the tourist spend that occurs elsewhere in Christchurch and Canterbury region will also be related to the presence of the Hector's dolphin. This is because some tourists who have chosen to visit Christchurch purposely to undertake an eco-tour and see the Hector's dolphin will stay longer than the minimum time for a tour and spend on other goods and services, but that other spend accrues to Christchurch only because of the core choice to see Hector's.

[1] Christchurch residents are excluded from the assessment.

Based on the economic impact which can be attributed to Hector's, the wider value of Hector's eco-tourism (eco-tourism and wider tourism spend) is estimated at between $22.2 million and $24.9 million in annual value added which sustains the equivalent of between 473 to 530 jobs in the Canterbury economy. The wider value of Hector's eco-tourism is estimated as being between $27.9 million and $31.3 million in value added which sustains the equivalent of between 541 to 607 jobs in the national economy.

Wider Economic Impact	Canterbury	Rest of NZ	Total
Value Added ($m)	$22.2 - $24.9	$5.7 - $6.4	$27.9 - $31.3
Employment (EC)	473 - 530	69 - 77	541 - 607

Just as the presence of Hector's sustains a level of eco-tourism, so any reduction in that presence is likely to see a reduction in eco-tourism activity, and impact. If the Hector's population declines and there were less chance of sighting dolphins on an eco-tour, then that may also reduce the quality of the experience and result in fewer visitors undertaking tours. A more extreme outcome where Hector's became extinct would mean a corresponding loss of this eco-tourism activity in Banks Peninsula, Canterbury region and New Zealand which depends on Hector's.

1 Introduction

Black Cat Cruises (BCC) has commissioned this economic research to better understand the current quantum of tourism activity that is associated with Hector's dolphins and the associated economic activity that is generated. A number of tourism operators provide eco-tours to view Hector's, generating economic activity which benefits the local and national economies (i.e. creating jobs, incomes).

The Hector's dolphin has one of the most restricted distributions of any cetacean, with the majority of the population inhabiting the waters around the South Island of New Zealand. Importantly, the dolphin is most densely concentrated in the waters around Banks Peninsula, where much of the growing eco-tourism activity is based.

Hector's generally inhabit the inshore waters of the peninsula, where they can become entangled in set nets. Recently five Hector's dolphins were caught in a fisherman's single net, and that event has prompted Government to consider a total ban of set net fishing in the Banks Peninsula.[2] Since 2000, the dolphins have been listed as 'Endangered'[3], which means that the species faces a high risk of extinction in the near future.

BCC is supporting the government's review of the Threat Management Plan (TMP) and is actively participating in the Department of Conservation (DOC) consultation process.[4] To facilitate discussion, BCC has commissioned Market Economics (M.E) to establish the economic activity generated by the eco-tourism that is associated with the Hector's Dolphin.

This Report examines the economic impact of tourism associated with the Hector's. To start, it presents a summary of the background to this research, and a literature review of other economic-related studies of marine animals. The remainder of this section of the report briefly outlines the objectives and scope, approach and structure of this report.

1.1 Objective and Scope

The project objective is to provide new research that helps build wider understanding of the potential economic activity associated with Hector's. The scope of this research covers the tourism activity that is directly generated by the tourists that undertake an eco-tour to view Hector's and the flow on activity that is sustained in the rest of the economy.

In summary, the economic impact assessment covers and incorporates:

- The **current market** value of operational activities (by the tourism operators) and the subsequent change in the supply chain effects, and
- the **current market** value that is generated by tourism spend that is associated with Hector's, which includes spend by tourists on other goods and services beyond the tour ticket.

[2] Radio NZ (2018) Five Hector's dolphins killed in fisher's net – 20th March.

[3] International Union for Conservation of Nature (2018) Red List.

[4] Department of Conservation (2018) Hector's and Māui Threat Management Plan review.

It is important to note that the total economic value of Hector's is likely to be larger than is discussed in this report. The results in this report are likely to understate the value of Hector's because of the following three issues,

- First, the New Zealand tourism sector has been growing very quickly and is expected to keep growing over the coming decade.[5] It is accepted that a key reason why international tourists visit New Zealand is the natural environment and unique/rare animals which are on offer, which includes Hector's dolphins. Therefore, it is likely that the market value of Hector's will increase substantially in the coming years as more visitors purchase eco-tourism experiences.
- Second, the total economic value of Hector's will include non-market values which are likely to be significant. These values are important and should be assessed by the Government when establishing the value of additional protections for the dolphins. This report provides a review of international literature that outlines the economic assessments that could be applied to understand these non-market values. Also it is important to note that Treasury has recently adopted a Living Standards Framework which is intended to improve economic policy advice.[6] The principles of the framework are to adopt a more holistic approach to assessing Government policy, including non-market economic costs and benefits.
- Finally, this report has not assessed the potential implications of any protection policy options available to the government. Each policy option will have different costs and benefits, which extend beyond the tourism value generated by the Hector's Dolphin. This study has not presented a Cost-Benefit Analysis of the various policy options. An important implication of additional protection of Hector's will be the potential costs, which will mainly be associated with lost fishing activity. This impact is likely to be an important consideration, which is not covered in this report.

Within the project's time and budget constraints, this report has not been able to address these matters[7].

1.2 Approach

The approach applied in this research was to undertake the following four key steps,

- review of tourism operators as business entities,
- literature review of economic research of the value of eco-tourism marine species,
- survey of tourists that undertake Hector's tours and
- Identify the economic (market) value of tourism activity associated with Hector's.

[5] Ministry of Business Innovation & Employment (2018) Key Tourism Statistics.

[6] Treasury New Zealand (2018) Intergenerational Wellbeing: Weaving the Living Standards Framework into public policy.

[7] This research may be expanded at a later date if either the client or government agencies (DOC, MPI, MFE or NGO) considers there is need.

First, this research has reviewed the scale and nature of tourism operators as business entities. BCC and some other tourism operators have provided financial and passenger data which has been used to estimate the current quantum of the industry.

Second, a short literature review has been undertaken to provide an understanding of the economic methods applied to establish the value of marine animals. This literature review has covered both international and local research.

Third, a survey was developed to collect information about the behaviour and spending patterns of tourists that undertake tours to see Hector's (see Appendix A for the survey script). This survey covered tourists in BCC tours in October and November 2018, with a total of 209 responses.

Finally, the research identifies the economic impact of Hector's tourism. In summary, the modelling combines the results from the current level of activity (first step) and the survey (third step) to establish the **eco-tourism** impact and **wider** economic activity that is associated with Hector's tourism. The eco-tourism economic activity is defined as the market value generated by tourism operations as business entities, tourist spend on the day of the tour and associated activity that supports the operators. While the wider economic activity is defined as the additional tourist spend in the region which is associated with the visit to view the Hector's (accommodation, food and beverage etc.). This metric provides a total view of the proportion of the economy that is related in some way by the Hector's.

Once identified, the eco-tourism impact and wider economic activity was run through a Multi-Regional Input Output model (see Appendix B for details) which is similar to the commonly applied Economic Impact Assessment (EIA) method. This model allows the calculation of all flow-on effects associated with the direct activity – i.e. the indirect (suppliers) and induced (household incomes) impacts.

1.3 Report Structure

This report is structured into four subsequent sections, as follows:

- Section Two briefly provides background which covers the Hector's Dolphin, tourism operations that are reliant on the dolphins and the current protections measures.
- Section Three outlines a literature review of the economic methods that have been applied in New Zealand and internationally to assess the economic value of large marine creatures which are similar to the Hector's. These alternative methods could be utilised to assess the value of Hector's. However, given the limited budget it was not possible to apply these methods.
- Section Four focusses on the current level of Hector's tourism and the associated economic activity that is generated. The section presents results in terms of value added (GDP) and employment.
- Section Five provides a summary of the key points of the report and conclusions about the quantum of benefit that will accrue to Christchurch and the New Zealand economy as a result of the operation of Hector's tourism operations.

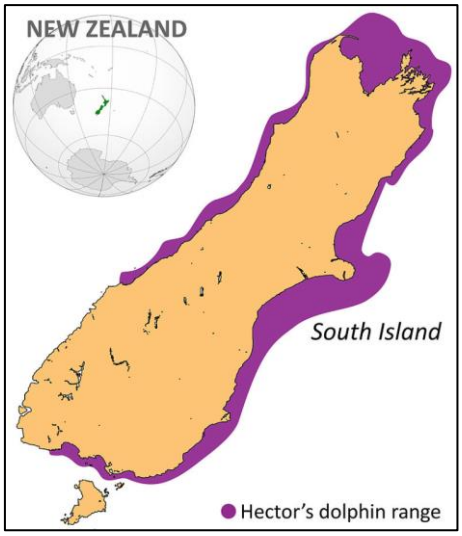
2 Background

This section briefly provides background which covers the Hector's Dolphin, tourism operations that are reliant on the dolphins and the current protections measures.

2.1 Hector's Dolphin

Hector's Dolphin is an endemic species, being only found in New Zealand waters, which makes it one of the most restricted distributions of any cetacean. Regular sightings of Hector's dolphins are made around most of the South Island (indicated in green in Figure 2.1) and occasionally can reach the North Island up to Bay of Plenty or Hawke's Bay. About 95% of the population occurs in South Island waters with the densest concentrations found in Banks Peninsula waters and in Te Wae Wae Bay. The Hector's dolphin is generally found inshore, rarely being observed in water with depth above 100 metres.

Figure 2.1: Range of Hector's Dolphin



Hector's population is estimated in the range from 10,000 to 15,000 dolphins.[8] Females reach sexual maturity at between seven to nine years of age and they produce just one calf every two to three years which makes population increase a very slow process.

Over the last two decades the IUCN status of Hector's has changed from 'Vulnerable' to 'Endangered' – i.e. which means the species is now considered very likely to become extinct. There has been an ongoing population decline of -74% over the past three generations, which is projected to continue (-50% over the coming three generations).

The main man-made threat to the Hector's population is ongoing bycatch in fisheries.[9] Entanglement of cetaceans in nets is the key cause of bycatch in the drift and set-gillnet fisheries. Inshore coastal fisheries

[8] Goetz K and Roberts J (2018) Hector's/Maui dolphin distribution – NIWA. TMP risk assessment workshop.

[9] There is debate about the scale of natural causes of death – old age, predation, stranding, toxoplasmosis etc.

probably have a greater impact than oceanic fisheries, because Hector's has a more restricted distribution than their oceanic relatives. According to the IUCN, sixty per cent of all dead Hector's dolphins, for which cause of death could be determined, had died as a result of gillnet entanglement.

2.2 Eco-Tourism Operators

The Hector's is a marquee species for New Zealand, which along with other marine creatures in the South Island attract tourists from all around the world. There are number of tourism operators that offer tours to view the Hector's dolphin around Bank Peninsula.

The majority of the operators are located in Akaroa harbour, where there are almost guaranteed sightings on each tour, with some operators claiming 98% success. Currently there are seven tourism operators in Akaroa harbour which provide tours to view Hector's dolphins.

Harbour cruise is the most common tour, which is scenic trip that includes sightings of Hector's dolphin and other marine life, along with the natural environment. There is also a substantial portion of the tours where tourists are given the opportunity to swim with Hector's dolphin. Some tourism operators also offer sailing and kayaking trips which are advertised as including Hector's sightings.

Outside of the Banks Peninsula area there are a number of other tourism operators in Kaikoura and other parts of the South Island which advertise sightings of Hector's (e.g. E-Ko tours in Marlborough Sounds and Dolphin Encounter Kaikoura around the Kaikoura Peninsula). However, these sightings are mostly incidental to other experiences offered by these operators, such as whale watching, seal encounters, other dolphin tours, penguin tours and other sea adventure tours (kayaking, sailing etc.).

Finally, Hector's are also regularly observed at some beaches. Most famously, there is a resident population that can be observed at Curio and Porpoise Bays in the Catlins. The presence of the Hector's attracts tourists to these remote areas, however there are no tourism operators that specifically offer tours related to the Hector's.

The focus of this report is on tours that are predominately reliant on the presence of Hector's dolphins. This includes all the tours operating from Banks Peninsula. However, the study excludes other associated tourism activity in other areas (Kaikoura, Marlborough Sounds etc) or Free-independent-tourist activity (visits to Curio and Porpoise Bays) that may also benefit from the presence of Hector's dolphins.

2.3 Legislative and Regulations

Historically there has been an intensive commercial net fishery and recreational netting within some parts of the Hector's habitat, which have both resulted in entanglement and death of Hector's (and Māui) dolphins. Over the last three decades a number of legislative and regulative protection have been introduced to reduce the chance of entanglement of these rare dolphins.

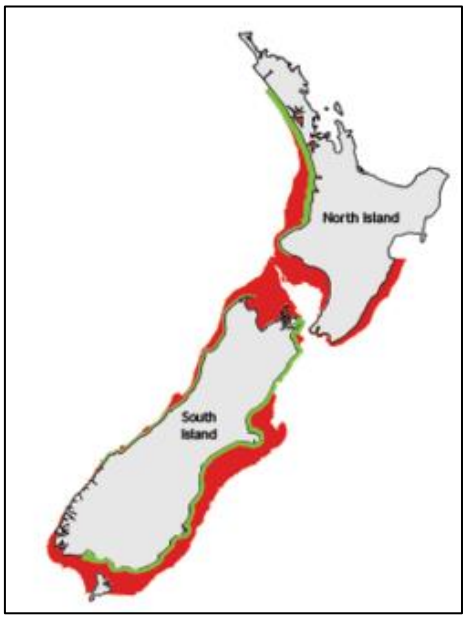
The implementation in 1986 of a fisheries management system based on individual transferable quotas (ITQs) resulted in restrictions on the allowable catch. ITQs implementation resulted in several fishers that used netting methods to leave the industry, and a shift of those remaining towards using other methods;

which reduced the incidental catch of Hector's. There are also legal reporting requirements that commercial fisherman must follow if a Hector's is caught or killed.

Other measures have been taken to protect the species, the Banks Peninsula Marine Mammal Sanctuary was established in 1988 under the Marine Mammals Protection Act to protect Hector's dolphins. The 1,170 km² sanctuary extends 70 nautical miles alongshore around the Banks Peninsula to the Rakaia River and out to 4 nautical miles offshore.

The Department of Conservation has also produced two Threat Management Plans (TMP) for the Hector's (and Māui) dolphins (2007 and 2012), which have resulted in additional protections being implemented to reduce incidental catch of the Hector's by commercial fishermen. Currently, there are marine protection areas that cover much of the of the South Island inner coastal areas (main habitat of Hector's) and the west coast of the North Island (main habitat of Māui). The green areas in Figure 2.2 shows the existing geography of the protections for the Hector's and Māui dolphins, these areas have full or partial bans on commercial net fishing. The red area shows the parts of the Hector's and Māui habitat that have no protections.

Figure 2.2: Existing Protections for Hectors and Māui Dolphin



Early in 2018, five Hector's were accidentally killed in one fishing net off Banks Peninsula. As a result, the Fisheries Minister and Conservation Minister accelerated work to review the TMP for the Hector's (and Māui) dolphins.

The joint press release by the Ministers identified a number of areas where more work needs to be done and have asked for advice on whether changes can be made to some fishing practices in the short-term. The range of options includes:

- prioritising the development of a new Threat Management Plan for Māui and Hector's dolphins
- reviewing the use of set nets in a bid to reduce or phase out their use

- considering extending the ban on set nets in the Banks Peninsula Marine Mammal Sanctuary further offshore
- encouraging voluntary closures of certain fisheries to set nets such as those recently adopted by commercial set netters to protect the hoihō/yellow eyed penguin off Southland.
- the role of observers and camera coverage on fishing boats.

DOC officials have been asked to prioritise the development of a new TMP. There is a consultation process under way with the public and stakeholders, which will be completed in 2019. Officials will report to the Ministers in February 2019, at which time a decision will be made about the new TMP which may include some recommendations on additional protections.

3 Literature Review

Marine environment and marine species provide a range of benefits to communities and societies. The importance of the benefits from marine environment and marine species is reflected in economic literature, where there is considerable amount of international and local economic research on the valuation of these benefits.

Most obviously the marine environment and marine species create value in terms of fish stocks which are harvested by commercial, recreational and cultural users. There is also considerable value generated via non-extractive eco-tourism, where visitors undertake fee or non-fee paying trips to observe the marine species and environment. These two 'direct use values' are the most commonly studied aspects of the marine environment and marine species as they can be readily quantified via market transactions.

There is also other economic literature that extends to measure non-market values that are generated by marine environment and marine species.[10] It is an accepted principle in economics that there are important non-market values, provided by the environment, that are important to society whether or not they are actually traded in markets. This approach is commonly referred to as 'Total Economic Valuation' (TEV) which measures both the direct use and non-use values.

In the TEV approach, the value of a marine environment and marine species equals the sum of,

- direct use value (benefits arise from the physical use of it as discussed in the previous paragraph),
- ecological function value (services produced by the species that are critical to the functioning of the earth),
- option value (benefit of maintaining the right to use the resource),
- quasi- option value (welfare obtained from the opportunity to get better information by delaying a decision that may result in irreversible environmental damage),
- vicarious use value (gained by people from the knowledge that others may be enjoying use of the natural resource),
- bequest value (maintenance of environmental attributes for the benefit of future generations), and
- existence value (the satisfaction that the community derives from simply knowing that the species exists).

The value of the non-use benefits has important implications for policy decisions (such as protection for Hector's) on biodiversity conservation. The TEV approach provides policy makers with a wider understanding of the potential outcomes for society at large and the trade-offs that are being made. The

[10]For example see Hassall & Associates Pty Ltd (2001).

Ministry for Environment study on the value of the Waitaki catchment provides a useful summary of how this method can be applied to policy making.[11]

While this study only focusses on one use value (Hector's Tourism), it is important to note that this value is likely to be relatively small compared to the non-use benefits described above. It is likely that DOC or an NGO may undertake research on these non-market values. Equally, the value of fishing that could be impacted by policy changes is not measured in this study. It is likely that MPI or Industry Association may undertake research on the values of commercial and recreational fishing.[12]

The following sections focus on economic studies that have assessed the economic value of marine eco-tourism that is associated with a marine species, the first part presents the studies conducted to New Zealand species and the second part covers studies from other countries.

3.1 New Zealand

Many tourists undertake tours to view marine species in New Zealand. Marine eco-tourism occurs in most regions of the country, with sightseeing trips to view whales, dolphins, seals, penguins and pelagic birds as well as scuba diving.

The literature review undertaken in this study has found few attempts to study the total economic value of particular marine species. Most of the studies that have been conducted estimates of the direct use value (i.e. harvest value and eco-tourism) or non-use values, with very few combining methods to establish the total value.

The literature search has found one previous study of the economic value of the Hector's and Māui dolphin, which focused on the non-use value. An international NGO (Whale and Dolphin Conservation) commissioned a study of the preferences of New Zealanders via a survey.[13] This study determined estimates of values of between $355,000 and $440,000 per dolphin, based on respondents' willingness to pay to (protect / maintain / avoid killing) the dolphins. This means that the estimated 130 dolphins killed every year in fishing nets represents an estimated $46 million NZD annual 'welfare' loss to the people of New Zealand.

Hoyt *et al* recommend that "further research should focus on the regional impacts….. of the marine tourism industry relevant to the NZ dolphin". However, there has not been any further study of the eco-tourism value of the Hector's dolphin. The literature review has found assessments of eco-tourism value for other rare marine species that live around the Kaikoura and Otago peninsulas.

Otago peninsula has two rare marine species, the royal albatross and the yellow-eyed penguin, which attract tourists from around the world. Tisdell (2007) applied an Economic Impact Analysis (EIA) to establish

[11] Ministry for the Environment (2005) Option and existence values for the Waitaki Catchment.

[12] Ministry of Primary Industry (2013) Maui Dolphin Threat Management Plan – Appendix 3 and 4.

[13] Hoyt, E., McGrath, G., Bossley, M., Knowles, T., 2014 Assessing New Zealanders' Willingness-to-pay to Protect the Endangered New Zealand Dolphin (Cephalorhynchus hectori): A benefit-cost analysis comparing three scenarios, Economists at Large, Melbourne, Australia and Critical Habitat Marine Protected Areas Programme, Whale and Dolphin Conservation, Chippenham, UK.

the contribution of these two species to the peninsula and Dunedin's regional economy.[14] The study found that the annual turnover of the tourism operators directly offering eco-tours was estimated to be of the order of $6.5 million and 70 full-time persons were employed in the industry. It was estimated that as a result of the eco-tourism associated with these species, approximately $100 million in GDP was generated in the Dunedin regional economy (directly or indirectly) and that 800-1000 full-time equivalent jobs were sustained.

Kaikoura is a major tourist destination for people who want to experience a close encounter with marine mammals like whales, dolphins and seals. Simmons & Fairweather (1998) analysed eco-tourism in Kaikoura and the economic impact of the industry on the peninsula. The study found that tourism increased significantly after the first whale watching[15] in 1988, which has had major impacts on the community (especially iwi), but the study did not provide a valuation of the economic activity. However, publicly available data indicates that Whale Watch Kaikoura Ltd employs around 80 staff year-round and has an annual turnover of more than $10m. Also an IFAW study of world Whale Watching tourism activity estimated that whale watching generated around $100 million in New Zealand in 1998 (of which most is related to Kaikoura).[16]

This literature review has been conducted under tight timeframes and cannot be considered to provide a complete coverage of the entire list of studies of marine eco-tourism in New Zealand context. There may be other local studies of other marine species and environments (one example would be the Leigh Marine Reserve[17]).

3.2 International

Internationally there is an extensive number of economic studies of the economic value of various marine species and environments. The most commonly applied method is to value the direct use of the marine species and environments (for tourism and/or harvest). However, there are many studies that have applied methods to value the non-use values of marine species and environments.

The following list provides examples of the direct use valuation studies that have been applied to major marine species,

- Sea turtles: Wilson & Tisdell (2003) outlined various direct and indirect economic benefits that can arise from Sea Turtles tourism in Australia, the research applied surveys to estimate the regional economic impact of visitor spending due to the presence of sea turtles in two regions of Australia.

[14] Tisdell, C. (2007). Valuing the Otago Peninsula: The Economic Benefits of Conservation. Queensland: The University of Queensland.

[15] "Whale-watching can be defined as 'any commercial enterprise which provides for the public to see cetaceans in their natural habitat' (International Whaling Commission, 1994). It is important to note that although the generic term 'whale-watching' is used, the term also encompasses the watching of other cetacean species such as dolphins and porpoises"(Parsons et al., 2003).

[16] Hoyt. E (2001) Whale Watching World Wide Expenditure and Expanding Socioeconomic benefits – International Fund for Animal Welfare.

[17] Hunt. L (2008) Economic Impact Analysis of the Cape Rodney Okakari Point (Leigh) Marine Reserve on the Rodney District.

- **Manta rays**: R. C. Anderson (2011) assessed the extent and economic value of manta ray watching in the Maldives. The study was based on surveys of tourist numbers at manta diving sites, and from interviews with experienced divers. Using the proportion of arrivals to the Maldives and the proportion of manta ray dives a rough direct revenue from manta ray watching dives was calculated. The researchers also compared the price a manta ray is worth in a fish market in Asia with the individual revenue a Manta Ray generates during her lifetime. The study showed a manta ray might generate around US$100,000 through a lifetime while only worth US$500 if caught and sold.

- **Sharks:** Vianna et al (2012) quantified the value of the tourism industry based on shark diving in Palau. The authors collected surveys addressed to people directly interested in, or affected by, the shark-diving industry, as well as government statistics. The economic benefit from shark diving to the economy of Palau was divided into the following components: direct (the amount spent by visitors on shark-diving activities), indirect (the amount spent by shark tourists on additional services and products), induced (the amount spent by shark-dive operators on inputs such as wages and fuel) and tax receipts. The results showed that shark diving is a major contributor to the economy of the Island. The authors note that one Grey Reef Shark may be worth 100 times more alive at a dive site than dead on a fishing boat.

- **Whales:** Parsons et al (2003) assessed the value of conserving whales in West Scotland, the research calculated the direct and related tourist's expenditure figures, and the employment provided by whale-watching in the region, the data was collected from surveys conducted to boat operators, visitor-centre managers, tourists on whale-watching tours, general tourists to West Scotland and residents.

These studies all applied the same method, estimate the amount of tourist activity associated with the eco-tourism via a survey of tourists and financial data collected from the tour operators. The value of this direct use is then applied in an economic model to establish the wider value that is supported by the eco-tourism.

There are also other studies that have applied methods to establish the non-use value of the marine species and environments. The economic literature establishes a shadow prices which is a constructed/proxy value which is defined using available market prices in other related markets or stated preferences. Shadow prices can be calculated by using two methods:

- **abatement cost method** which is calculated as the cost of the most expensive policy option required to meet government targets. This is equal to the Pigouvian charge that would have to be paid to achieve the set targets, or

- **damage cost method** which is the estimated damage occurring as a result of outcome and other changes in natural capital. The damage cost method proceeds from people's willingness to pay to not damage the environment and is commonly used by economists for assigning a value to externalities (Bruyn, Korteland, Davidson, & Bles, 2010).

In theory, the abatement cost method generally reports a lower value than the damage cost method. The following list of studies are examples of the different methods being applied to quantify the non-use values including,

- Haraden et al. (2004) provides an example of the abatement costs method being applied to the dolphins. The authors developed a shadow price based on the value of tuna harvested against reported dolphin mortality (by-catch). The study established a dolphin mortality limit that maximizes the net benefits to society from the consumption (by-catch) and non-consumption of dolphins as public good. This shadow price can then be equated to a user fee on tuna fisherman (Pigouvian tax) that could then be implemented to correct for the market failure.

- Loomis & Larson (1994) provides an example of damage cost method. The study tested the consistency of an individual's willingness to pay (WTP) in response for increases in the quantity of gray whale population. The researcher carried surveys directed to tourists and households with questions regarding the total value for two increases in gray whale population (50% and 100%). The study assessed whether Contingent Valuation Method-derived estimates of an individual's incremental total economic value for increases in wildlife populations are significantly different from zero, and whether they are consistent with expectations based on economic theory.

4 Hector's Eco-Tourism

This section presents the quantification of the activity that occurs in the economy that is related to Hector's dolphin eco-tourism in Bank Peninsula. As discussed above in the methodology section, the study has collected financial data from eco-tourism operators and a survey of passengers. The following section presents two impacts, the eco-tourism impact and the wider economic impact.

The economic impacts are classified in the following main categories:

- Eco-tourism Impact: is defined as the operational expenditure by the eco-tourism operators and tourists on the day of the eco-tour in the regional economy and the flow on economic activity generated in other businesses that supply the eco-tourism operators or staff.
- Wider Economic Impact: is defined as the eco-tourism impact and wider value of expenditure by tourists pre and post the day of the eco-tour and the flow on economic activity generated in other businesses that supply the eco-tourism operators, staff and other tourist activity.

The results in this section are presented in terms of value added (GDP) and employment.

4.1 Eco-Tourism Economic Impact

The eco-tourism economic impact includes the activity of the eco-tourism operators as business operations, tourist spend on the day of the eco-tour and the additional flow on impacts in the economy.

The seven eco-tourism operators currently operate eight vessels (excluding kayaks) and employ some 40 to 60 staff, of which around 80% are permanent positions. Some of the eco-tourism operators also offer retail goods at their sales office and food/beverage on board the vessels. These activities have been included in the eco-tourism economic impacts.

In this study financial data provided by the eco-tourism operators has been used to estimate the proportion of each business that is associated with eco-tours that primarily focus on viewing Hector's dolphins. As the data that has been collected is commercially sensitive, this study presents high level information which gives a broad understanding of the scale of the industry, without revealing the potential scale of each of the businesses in the industry. In total the industry has a total turnover in the order of $6 to $8 million per annum.

The eco-tourism operators carry in the order of 60,000 to 75,000 passengers per annum on tours to view the Hector's dolphin. The majority of the passengers are tourists from outside of Canterbury, both international and domestic.[18] On the day of the eco-tour these passengers spend money on other goods and services. Given the length of the eco-tours (about 1.5hrs) and travel to/from Akaroa (about 1.5 hrs each way), there is little opportunity to undertake other major tourist activities on the day of the eco-tour. Therefore, the spend on the day of the tour is likely to be closely related to the passengers' decisions to

[18] Christchurch residents are excluded from the following assessment.

undertake the eco-tour, and to make the associated expenditure on transport, food, accommodation and so on in order to so they participate in the eco-tourism experience.

As noted in the approach section, the tourism spend by passengers have been estimated using survey data from BCC customers. The survey collected 209 responses which covered 437 passengers, of whom approximately 80% undertook a harbour cruise and 20% undertook the swim with the dolphin tour.[19]

The sighting success rate was very high, with most passengers seeing a Hector's dolphins on the tour (93%). As would be expected, the passengers undertaking swims with the dolphin tours showed a strong preference for viewing the Hector's dolphin, with almost 90% of respondents on these tours rating the sightings as "very important" to their decision to undertake the tour, while the harbour cruise passengers indicated that sightings was "very important" to 46% respondents.

Finally the survey shows that the average passenger spent approximately $215 per person on the day of the tour (excluding tour ticket price).[20] This study has estimated tourist spend by passengers on the day of the eco-tour by combining the average spend from the survey data with the total passenger data from the eco-tourism operators. In total the tourists that undertaking an eco-tour to view Hector's dolphins spent approximately $12.2 million on the day of the tour.

The eco-tourism businesses and tourists purchase goods and services from other local businesses, which generates additional economic activity which is commonly referred to as indirect value. Also the staff of the eco-tourism businesses will receive wages and salaries which they spend on goods and services, which generates additional economic activity which is commonly referred to as induced value. These additional flow on values have been established by inputting the direct activity of the eco-tourism (both eco-tourism operators as business operations and tourist spend on the day of the eco-tour) into Market Economics MRIO model.

Table 4.1 shows the eco-tourism economic impact of Hector's in the Canterbury regional economy and the national economy, which includes the direct activity of the eco-tourism operators (operating) and tourist spend on the day of the eco-tour, along with flow on indirect and induced impacts.

In today's terms, Hector's eco-tourism, and economic impact is estimated as being the equivalent of $19.5 million in value added which sustains the equivalent of 416 jobs in the Canterbury economy. The national value of Hector's eco-tourism is estimated as being the equivalent of $24.5 million in value added which sustains the equivalent of 476 jobs in the national economy.

Table 4.1: Hector's Eco-Tourism Economic Impact - Value Added and Employment

Hector's Eco-Tourism	Canterbury	Rest of NZ	Total
Value Added ($m)	$19.5	$5.0	$24.5
Employment (EC)	416	60	476

[19] The sample split of passengers on each tour type is consistent with the total market data that was supplied by the tourism operators.

[20] Average spend reported for the survey have been calculated by weighting the responses by the passenger origin (BCC data) and the distribution of tours (all tour operators data). These values exclude Christchurch residents.

4.2 Wider Economic Impact

The wider economic impact extends the eco-tourism economic impact to include associated tourist spend on the days pre and post the tour and the additional flow on impacts in the economy.

The survey showed that passengers spent an average of 3 nights in Christchurch and spent in total $600 per person (approx. $200 per night). The level of spend reported in the survey is consistent with the official estimates of average daily spend in New Zealand ($190 per night[21]). In total the passengers spent an additional $22 million in the Christchurch economy.

Some of this tourist spend will also be related to the presence of the Hector's dolphin. Specifically, some tourists will have chosen visit Christchurch purposely to undertake an eco-tour to see the Hector's dolphin and/or some tourists may decide to stay additional days to undertake an eco-tour to see the Hector's dolphin.

However, the survey showed that a significant proportion of respondents consider that the eco-tour was crucial to their decision to visit to Christchurch (31% rate the tour as "very important" and a further 33% rate it as important) and to New Zealand (25% rate as "very important" and a further 20% rate as important).

It is not possible to directly attribute specific shares of passengers' other expenditure to the Hector's tours, because tourists travel for a number of reasons, and other attractions and experiences will all account for some of the expenditure. Nevertheless, these estimates relate only to those who did undertake a tour (thereby establishing the tour as a tangibly important reason for the whole trip), and two-thirds of those cited the tour as a very important or important reason for visiting Christchurch, while nearly half (45%) cited it as a very important or important reason for visiting New Zealand. Recognising this and the importance of other attractions, we consider it reasonable to attribute 15 to 20% of the additional tourism spend in Christchurch on the days either side of the tour to Hector's eco-tourism.[22] This wider tourism value is estimated to be within the range of $3 and $6 million per annum.

Again, the tourist purchase goods and services from other local businesses, and this generates additional economic activity which is commonly referred to as indirect value. Also the staff of the local businesses will receive wages and salaries which they spend on goods and services, which generates additional economic activity which is commonly referred to as induced value. These additional flow on values have been established by inputting the direct activity of the eco-tourism operators as business operations into Market Economics MRIO model.

Table 4.2 shows the Wider Economic Impact of Hector's eco-tourism in the Canterbury regional economy and the national economy, which includes the direct activity of the eco-tourism operators (operating) and tourist expenditure, along with flow on indirect and induced impacts.

[21] MBIE (2018) New Zealand Tourism Forecasts 2018-2024.

[22] Specifically, this study attributes 15 to 20% of the total remaining spend in the region by tourists (that undertake a Hector's eco-tour) to the presence of the Hector's around Banks Peninsula. It could be argued that a greater percentage of the spend in the region and some of the spend in the rest of New Zealand could be lost if Hector's eco-tours could not be offered.

In today's terms, Hector's eco-tourism, and wider economic impact is estimated to range between $22.2 million and $24.9 million in value added which sustains the equivalent of between 473 to 530 jobs in the Canterbury economy. The national value of Hector's eco-tourism is estimated as being between $27.9 million and $31.3 million in value added which sustains the equivalent of between 541 to 607 jobs in the national economy.

Table 4.2: Hector's Eco-Tourism Wider Economic Impact - Value Added and Employment

Wider Economic Impact	Canterbury	Rest of NZ	Total
Value Added ($m)	$22.2 - $24.9	$5.7 - $6.4	$27.9 - $31.3
Employment (EC)	473 - 530	69 - 77	541 - 607

5 Conclusion

The Hector's dolphin is an important species which New Zealanders as a community value. In the past there have been studies conducted on the value of the Hector's to the wider community, which places the protection of the species at around $46 million per annum. There have also been studies of the lost fishing value that could be expected if protections are increased in the Hector's habitat. However, there have been no studies of the value of Hector's dolphin tourism, which is the focus of this Report.

This study has found that Hector's dolphin tourism is an important part of the Banks Peninsula economy and the wider Christchurch region. The relatively high incidence of Hector's means that eco-tours afford almost guaranteed sightings on every trip. This high success is important in drawing many tourists to Banks Peninsula and Christchurch, and to New Zealand.

There are seven eco-tourism operators that rely on the presence of the Hector's dolphins to attract tourists. The tourist that undertake an eco-tour to see the Hector's also spend money on good and services on the day of the eco-tour. In today's terms, it is estimated that eco-tourism (tour operators and tourist spend) generates economic impact equivalent of $19.5 million in value added which sustains the equivalent of 416 jobs in the Canterbury economy. Hector's eco-tourism also generates economic impact of $24.5 million in value added which sustains the equivalent of 476 jobs in the national economy.

Some of the tourist spend that occurs elsewhere in Christchurch and Canterbury region will also be related to the presence of the Hector's dolphin. This is because some tourists who have chosen to visit Christchurch purposely to undertake an eco-tour and see the Hector's dolphin will stay longer than the minimum time for a tour and spend on other goods and services, but that other spend accrues to Christchurch only because of the core choice to see Hector's.

Based on the economic impact which can be attributed to Hector's, the wider value of Hector's eco-tourism (eco-tourism and wider tourism spend) is estimated at between $22.2 million and $24.9 million in annual value added which sustains the equivalent of between 473 to 530 jobs in the Canterbury economy. The wider value of Hector's eco-tourism is estimated as being between $27.9 million and $31.3 million in value added which sustains the equivalent of between 541 to 607 jobs in the national economy.

Just as the presence of Hector's sustains a level of eco-tourism, so any reduction in that presence is likely to see a reduction in eco-tourism activity, and impact. If the Hector's population declines and there were less chance of sighting dolphins on an eco-tour, then that may also reduce the quality of the experience and result in fewer visitors undertaking tours. A more extreme outcome where Hector's became extinct would mean a corresponding loss of this eco-tourism activity in Banks Peninsula, Canterbury region and New Zealand which depends on Hector's.

Appendix A: Survey Script

Hector's Dolphin Tourism Survey

Purpose of this survey

The Hector's dolphin population is declining and is now classified as an endangered species by the International Union for Conservation of Nature. Black Cat Cruises has commissioned this survey to measure the tourism activity related to this unique species. Information collected from this survey will be used by Market Economics to assess the tourism related economic value of Hector's dolphins.

Thank you for participating in our survey, it will take less than 5 minutes to complete.

Experience

You recently undertook a cruise with Black Cat Cruises which entered the primary habitat of the Hector's dolphin. The following questions collect information about your experience on the tour.

1. Which of the following Black Cat Cruises tours did you undertake?
   - ◯ Akaroa Harbour Nature Cruises
   - ◯ Swimming with Dolphins
2. During this tour did you see Hector's dolphins?
   - ◯ Yes
   - ◯ No
3. On a scale of 1 to 5, how important was seeing the Hector's dolphins to your decision to undertake this cruise with Black Cat Cruises?

Not Important			Very Important	
1	2	3	4	5

4. On a scale of 1 to 5, how important was this tour to your decision to visit Christchurch? Skip this question if you live in Christchurch.

Not Important			Very Important	
1	2	3	4	5

5. On a scale of 1 to 5, how important was having this experience in your decision to visit New Zealand? Skip this question if you live in New Zealand.

Not Important			Very Important	
1	2	3	4	5

Tourism Activity and Spend

This section collects information about your stay and spending in the local economy, some of which would be related to the presence of Hector's dolphins.

6. How much did you spend on **the day of the tour** with Black Cat Cruises? **Excluding** the cruise tickets.

Accommodation	$
Food/ Bars/ Restaurants	$
Shopping	$
Tourist Activities	$
Other	$

7. Did you stay an additional day in Akaroa/Christchurch so that you could undertake this trip with Black Cat Cruises? Skip this question if you live in Christchurch.

- ◯ Yes
- ◯ No

8. How much have you spent during your visit to Akaroa and Christchurch? **Excluding** the cruise tickets Skip this question if you live in Christchurch..

Accommodation	$
Food/ Bars/ Restaurants	$
Shopping	$
Tourist Activities	$
Other	$

9. How many days have you stayed in Akaroa/Christchurch? Skip this question if you live in Christchurch.

10. How many people does this spend relate to? i.e number of people travelling with you

About you

11. Where do you usually live?

- ◯ Christchurch
- ◯ Rest of New Zealand (domestic tourist)
- ◯ Australia
- ◯ Europe
- ◯ North America
- ◯ Asia/Japan
- ◯ Other

Thank you for your time. Your responses will help protect Hector's dolphins!

Appendix B: Multi Regional Input Output

Prior to describing the specifics of the methodology, it is helpful to provide a brief introduction to the IO framework,[23] particularly for those not familiar with input-output analysis.

At the core of any IO analysis is a set of data that measures, for a given year, the flows of money or goods among various sectors or industrial groups within an economy. These flows are recorded in a matrix or 'IO table' by arrays that summarize the purchases made by each industry (its inputs) and the sales of each industry (its outputs) from and to all other industries. By using the information contained within such a matrix, IO practitioners are able to calculate mathematical relationships for the economy in question.

These relationships describe the interactions between industries, specifically, the way in which each industry's production requirements depend on the supply of goods and services from other industries. With this information it is then possible to calculate, given a proposed alteration to a selected industry (a scenario), all of the necessary changes in production that are likely to occur throughout supporting industries within the wider economy.

As with all modelling approaches, IO analysis relies on certain assumptions for its operation. Among the most important is the assumption that the input structures of industries (i.e. technical relationships) are fixed. In the real world, however, technical relationships will of course change over time as a result of new technologies, relative price shifts causing substitutions, and the introduction of new industries. For this reason IO analysis is generally regarded as most suitable for short-run analysis, where economic systems are unlikely to change greatly from the initial snapshot of data used to generate the base IO tables.

With reference the IO modelling in general, a key assumption is that input structures of all industries (i.e. technical relationships) are fixed. In the real world, however, technical relationships will change over time. These changes are driven by new technologies, relative price shifts, product substitutions and the emergence of new industries. For this reason, IO analysis is generally regarded as suitable for short-run analysis, where economic systems are unlikely to change greatly from the initial snapshot of data used to generate the base IO tables.

In addition to the 'fixed structure' assumption, other important assumptions (and limitations) of IO models are:

- Constant return to scale: This means that the same quantity of inputs is needed per unit of output, regardless of the level of production. In other words, if output increases by 10 per cent, input requirements will also increase by 10 per cent.
- No supply constraints: IO assumes there are no restrictions to inputs requirements and assumes there is enough to produce an unlimited product.
- The model is static: No price changes are built in meaning that dynamic feedbacks between price and quantity (e.g. substitution between labour and capital) are not captured.

[23] Those who wish to learn more about input-output analysis can refer to authors such as Miller, R. E., & Blair, P. D. (2009). *Input-output analysis: foundations and extensions*. Cambridge University Press.

The following indicators are used to measure economic impact:

- **Value added** measures all payments to factors of production (land, labour and capital), and excludes all purchases of intermediate inputs. It broadly equates with **gross domestic product (GDP)** as a measure of economic activity on the national level, and gross regional product on the regional level. Components of value added include compensation of employees (salary and wages), operating surplus (company profits), consumption of fixed capital (depreciation), and subsidies.
- **Employment** is measured in Modified Employee Count years (MECs). This is the number of full-time and part-time employees as well as working proprietors on an annual basis. This provides a measure of the labour demand associated with the estimate level of economic activity. Note that additional MEC-years do not necessarily require that additional persons be actually employed. It may mean existing employees or proprietors work longer hours to complete the additional work.

Key steps

Several steps were required to estimate Hector's Tourism economic impact. Firstly, the spending associated with Hector's Tourism, as a business, was mapped to specific economic sectors (106 industries) and geographies.

The spending was then included into the Christchurch Multi-Regional Input-Output model to estimate the flow-on effects associated with the spending. The flows are traced through the local (Canterbury Region) and national (Rest of NZ) economies.

Using MRIO modelling, the following is estimated:

- The economic impact caused by the spending, covering:
    - Direct impacts, which are generated by direct spending that occurs, sustaining a certain quantity of direct employment to meet these needs,
    - Indirect impacts occur when suppliers to the directly impacted businesses must increase their production to meet the increase in demand for goods and services. This requires the further purchase of other goods and services from their suppliers, along with additional labour.
    - Induced impacts, cover the additional wages, salaries and profits paid into the economy, thereby inducing additional expenditure, such as spend on retail or services. Businesses either directly or indirectly impacted, are assumed to be operating at maximum capacity and therefore additional demand causes them to either hire additional workers or pay overtime. This means more money is available to households in the economy. The induced effect covers how this money then flows through the system as households increase their spending.
- The size of the impacts in terms of:
    - GDP ($), and
    - Employment,
- The distribution of the impacts:
    - Spatial (regional) breakdown of impacts, i.e. the results show what share of impacts are felt in Canterbury Region and what share is felt in the rest of NZ.
    - Sectoral breakdown of impacts (e.g. professional services, health services, retailing).

Bibliography

Anderson, R., & Ahmed, H. (1993). The Shark Fisheries of the Maldives. *MOFA Malé and FAO Rome 73pp*, (September), 84. https://doi.org/10.1080/00358539708454343

Anderson, R. C., Adam, M. S., Kitchen-Wheeler, A.-M., & Stevens, G. (2011). Extent and Economic Value of Manta Ray Watching in Maldives. *Tourism in Marine Environments*, *7*(1), 15–27. https://doi.org/10.3727/154427310X12826772784793

Bruyn, S. De, Korteland, M., Davidson, M., & Bles, M. (2010). Shadow Prices Handbook Valuation and weighting of emissions and environmental impacts, (March), 1–140. Retrieved from http://www.ce.nl/?go=home.downloadPub&id=1032&file=7788_defMainReportMaKMV_1271765427.pdf

Curtin, S. (2010). *Whale-Watching in Kaikoura: Sustainable Destination Development?* Journal of Ecotourism. doi:10.1080/14724040308668143Dawson, S. M., & Slooten, E. (1993). Conservation of Hector's dolphins: The case and process which led to establishment of the Banks Peninsula Marine Mammal Sanctuary, *3*(August 1992), 207–221.

Department of Conservation (2018). Hector's and Māui Threat Management Plan review.

Duffus, D. A., Dearden, P., Baird, R. W., Abrams, P. A., Dill, L. M., Brookshire, D. S., … Watkins, W. A. (1993). Recreational use, valuation, and management, of killer whales (Orcinus orca) on Canada's Pacific Coast. *Environmental Conservation*, *20*(2), 149. https://doi.org/10.1017/S0376892900037656

Gallagher, A. J., & Hammerschlag, N. (2011). Global shark currency: The distribution frequency and economic value of shark ecotourism. *Current Issues in Tourism*, *14*(8), 797–812. https://doi.org/10.1080/13683500.2011.585227

Goetz, K., & Roberts, J. (2018). Hector's/Maui dolphin distribution – NIWA. TMP risk assessment workshop.

Haraden, J., Herrick, S. F., Squires, D., & Tisdell, C. A. (2004). Economic benefits of dolphins in the United States eastern tropical Pacific purse-seine tuna industry. *Environmental and Resource Economics*, *28*(4), 451–468. https://doi.org/10.1023/B:EARE.0000036773.77566.3d

Hassall & Associates Pty Ltd. (2001). *Non-market Economic Values & the south-East Marine Region*. Sydney.

Hoyt. E (2001) Whale Watching World Wide Expenditure and Expanding Socioeconomic benefits – International Fund for Animal Welfare.

Hoyt, E., McGrath, G., Bossley, M., Knowles, T., 2014 Assessing New Zealanders' Willingness-to-pay to Protect the Endangered New Zealand Dolphin (Cephalorhynchus hectori): A benefit-cost analysis comparing three scenarios, Economists at Large, Melbourne, Australia and Critical Habitat Marine Protected Areas Programme, Whale and Dolphin Conservation, Chippenham, UK.

Loomis, J. B., & Larson, M. (1994). Total Economic Values of Increasing Gray Whale Population: Results from a Contingent Caluation Survey of Visitors and Households, *275*, 275–286.

Ministry for the Environment (2005) Option and existence values for the Waitaki Catchment

Ministry of Business Innovation & Employment (2018). Key Tourism Statistics.

Ministry of Primary Industry (2013) Maui Dolphin Threat Management Plan – Appendix 3 and 4.

Nomura, N., & Akai, M. (2004). Willingness to pay for green electricity in Japan as estimated through

contingent valuation method. *Applied Energy*, *78*(4), 453–463. https://doi.org/10.1016/j.apenergy.2003.10.001

Parsons, E. C. M., Warburton, C. A., Woods-Ballard, A., Hughes, A., & Johnston, P. (2003). The value of conserving whales: The impacts of cetacean-related tourism on the economy of rural West Scotland. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *13*(5), 397–415. https://doi.org/10.1002/aqc.582

Radio NZ. (2018). Five Hector's dolphins killed in fisher's net – 20th March.

Simmons, D. G., & Fairweather, J. R. (1998). *Towards a Tourism Plan for Kaikoura.* Christchurch: Lincoln University.

Treasury New Zealand (2018) Intergenerational Wellbeing: Weaving the Living Standards Framework into public policy.

Tisdell, C. (2007). *Valuing the Otago Peninsula: The Economic Benefits of Conservation.* Queensland: The University of Queensland.

Vianna, G. M. S., Meekan, M. G., Pannell, D. J., Marsh, S. P., & Meeuwig, J. J. (2012). Socio-economic value and community benefits from shark-diving tourism in Palau: A sustainable use of reef shark populations. *Biological Conservation*, *145*(1), 267–277. https://doi.org/10.1016/j.biocon.2011.11.022

Wilson, C., & Tisdell, C. (2003). Conservation and economic benefits of wildlife-based marine tourism: Sea turtles and whales as case studies. *Human Dimensions of Wildlife*, *8*(1), 49–58. https://doi.org/10.1080/10871200390180145