



Marine and Tropical Sciences Research Facility Annual Report, June 2008

Program 8: Sustainable Use and Management of Marine Resources of the Great Barrier Reef

Project 4.8.6: Analysis of recreational and tourism use and impact on the Great Barrier Reef for managing sustainable tourism [Objectives (a) and (c)]

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1. Project Objectives

An overview of Project 4.8.6 is available from the Marine and Tropical Sciences Research Facility (MTRSF) website: http://www.rirc.org.au/mtrsf/theme_4/project_4_8_6.html

Objective (a): Identify relative social and economic values of key marine species, including large fish around tourist facilities; and

Objective (c): Identify impacts of tourism and visitation to key reef sites and sustainable levels of visitation to these sites (this component deferred pending additional MTRSF funding and/or co-investment).

2. Project / Task Methodology

Objective (a): Identify relative social and economic values of key marine species, including large fish around tourist facilities

Surveys of tourists visiting the Great Barrier Reef (GBR) and interacting with iconic marine wildlife species (e.g. minke whales, sharks and rays, turtles and large fishes such as Maori wrasse, Potato cod and Queensland grouper), combined with a business expenditure survey of GBR tourism operators providing these experiences, will provide the first in-depth assessment of some of the relative social and economic values of these iconic marine species and their impact on the local and regional economy.

Field assessments of the quality of key wildlife attractions, impacts and their management will be conducted and will require the continued in-kind support of industry. Assessment of social values requires an understanding of visitor expectations, satisfaction and perceptions of iconic wildlife species. An understanding of these social and economic values of these key species is required for a Triple Bottom Line (or Quadruple Bottom Line) evaluation of the sustainability of tourism utilising these important resources.

MTSRF funding allocated to Project 4.8.6 Objective (a): \$28,000 per annum for four (4) years (financial years 2006/2007 – 2009/2010).

Objective (c): Identify impacts of tourism and visitation to key reef sites and sustainable levels of visitation to these sites (this component deferred pending additional MTSRF funding and/or co-investment).

Data collected through the visitor survey, focus groups and operator survey will establish the importance of specific attractors in the reef experience, the importance of specific sites as triggers to attract visitors and key elements of the experience that determine satisfaction levels. Combining this knowledge with environmental sustainability levels will assist in determining the level of visitor sustainability if there are restrictions placed on visitor numbers or visitor usage of specific sites. A number of management tools will be identified and a sustainable level of visitation framework developed as a new assessment and management tool to assist GBR managers mitigate impacts of loss of sustainability through overuse.

No specific MTSRF funds were allocated to Project 4.8.6 Objective (c): Task deferred pending project scoping, additional MTSRF funding and/or co-investment. A sum of \$4,000 was offered by the Project 4.8.6 Leader (Professor Bruce Prideaux, James Cook University) in January 2008 to conduct a substantial scoping workshop on this topic (involving all key stakeholder groups including the tourism industry, reef managers and researchers), however the funding was received too late in the financial year for the task, which was originally planned for late 2007. Such a workshop will require a significant lead time (and additional skilled assistance) to develop and Issues paper which would provide core material for participants to discuss – based on the successful model developed during the Department of the Environment and Heritage funded project *Towards Sustainable Dugong and Turtle Tourism, Phase I and II* (Birtles *et al.* 2004a, 2004b; Birtles *et al.* 2005). It will also require somewhat more financial support than was available.

3. Research plan and key milestones

A research plan / summary with associated key milestones (reports to the Reef and Rainforest Research Centre Ltd and manuscripts for peer-reviewed publication) is presented in Table 1.

Table 1: Project 4.8.6 Objective (a) research plan / summary and key milestones for 2007-2010.

Species	Surveys	Planned output - Milestones	
		Report	Peer Reviewed
Multi-species (including sharks, turtles, large fishes, minke whales)	<ul style="list-style-type: none"> • 2006 and 2007 far northern GBR survey; • 2007 GBR (Minke Whale) passenger survey; • 2007-2008 GBR and Coral Sea Reefs (e.g. Osprey) Marine Wildlife survey (until May 2008). 	June 2008 Preliminary report on social and relative economic values of marine wildlife species (including sharks, rays, large fish and minke whales)	Dec 2008 Relative economic values of marine wildlife species
Dwarf minke whales	<ul style="list-style-type: none"> • 2007/2008 GBR (Minke Whale) passenger survey. 	July 2009 Report on social and economic values of dwarf minke whales	Dec 2009 Social and economic values of dwarf minke whales
Marine turtles	<ul style="list-style-type: none"> • 2006, 2007 and 2008 (and potential 2009) far northern GBR survey. 	March 2010 Report on social and economic values of marine turtles	July 2010 Focus TBA
Key Marine Species (all of the above)	<ul style="list-style-type: none"> • 2006, 2007 and 2008 (and potential 2009) far northern GBR survey; • 2007 and 2008 GBR (Minke Whale) passenger survey; • 2007-2009 GBR and Coral Sea Reefs (e.g. Osprey) Marine Wildlife survey; • 2008-2009 S.S. Yongala Wreck Marine Wildlife survey. 	June 2010 Final report on the social and economic values of key marine species	Dec 2010 Focus TBA

In Section 4 of this report we provide an overview of progress towards these milestones, including details of data collected, data entry/analysis undertaken, research team communications and consultation with industry and management agency stakeholders. In Section **Error! Reference source not found.** we provide more detail about the methodological approaches taken, and present some preliminary findings from the data analyses that have been undertaken thus far.

4. Brief overview of progress towards milestones – Project 4.8.6 Objective (a)

All current milestones towards the objective have been met or exceeded. Research activities in the financial year 2007 include:

4.1 Data collection

1. **2007 Far Northern GBR marine species passenger survey** (two live-aboard operations in 'Far Northern' Section of GBR); conducted October to December 2007; N=90.
2. **2007 GBR (Minke Whale) social and economic survey** (minke whale permit holders); conducted June to July 2007; N=575.
3. **2007-2008 GBR and Coral Sea Reefs (e.g. Osprey) Marine Wildlife survey** (five live-aboard operations in 'Cairns/Cooktown' Section of GBR), conducted November 2007 to May 2008; N=391.
4. **2008 GBR (Minke Whale) social and economic survey** (minke whale permit holders); sampling in progress June to July 2008.
5. **2008 S.S. Yongala Wreck Marine Wildlife survey** (two day boat operations from Townsville and Ayr); commenced June 2008.
6. **2007-2008 GBR Cairns/Port Douglas Operator Business Expenditure Survey**; conducted December 2007 to mid May 2008; sampling in progress.
7. **GBR tourism operator Key Informant Interview questionnaire** conducted 2007; N=10.

4.2 Data entry / analyses

- **2007 Far Northern GBR marine species passenger survey** (two live-aboard operations in 'Far Northern' Section of GBR); sample of n=90; preliminary results presented below.
- **2007 GBR (Minke Whale) social and economic survey** (four minke whale live-aboard permit holders); sample of n=575; preliminary results presented below.
- **2007-2008 GBR and Coral Sea Reefs (e.g. Osprey) marine wildlife survey** (five live-aboard operations in 'Cairns/Cooktown' Section of GBR); sample n=350*; preliminary results presented below. (*Total number received 391 (current as per end May 2008); preliminary analyses based on n=350, questionnaires received by mid-May 2008). Further analyses are continuing for planned publication in December 2008.)

4.3 Team meetings and consultation / workshops with tourism industry and management agency stakeholders in the financial year 2007/2008

Team members

Dr Alastair Birtles (AB); Associate Professor Peter Valentine (PV); Dr Natalie Stoeckl (NS); Arnold Mangott (AM); Marina Farr (MF); Matt Curnock (MC) and Lauren Hill (LH).

Team meetings

- Full research team meeting 9 October 2007 (PV, AB, NS, MC, AM);
- Full research team meeting 21 November 2007 (PV, AB, NS, MC, AM, LH);
- Full research team meeting 26 February 2008 (PV, AB, NS, MC, LH, MF);
- Regular fortnightly sub-group meetings (AB, AM, MC);
- Regular email contact / updates between team members.

Workshops / Seminars and GBRMPA Meetings

- Dwarf Minke Whale Tourism Monitoring Programme 2007 Post-Season Industry Workshop, 16 November 2007 – MTSRF Project 4.8.6 Objective (a) update by Alastair Birtles (including six of nine GBRMPA permitted swim-with-minke whale operators, GBRMPA and QPWS staff, WDCS and JCU Minke Whale Project researchers);
- Informal meeting with Ingrid van Putten (Project Manager, Social and Economic Research Group, GBRMPA), 13 March 2008 – regarding potential collaboration with TRC; Birtles update for van Putten on MTSRF project;
- Dwarf Minke Whale Tourism Monitoring Programme 2008 Workshop on Code of Practice and Sustainability Objectives, 18 April 2008; Birtles update to Industry participants on MTSRF project;
- Dwarf minke whale and MTSRF social and economic values of GBR key marine species research update to GBRMPA Conservation Reef Advisory Committee, 17 April 2008;
- Dwarf Minke Whale Tourism Monitoring Programme 2008 GBRMPA seminar, 6 May 2008; Birtles update to GBRMPA on MTSRF project progress and developments in 2008;
- Dwarf Minke Whale Tourism Monitoring Programme 2008 Pre-Season Industry Workshop, 30 May 2008; Birtles update on MTSRF project progress, preliminary results and data collection through 2008.

5. More detailed project overview

5.1 Surveys undertaken

To explore the social and relative economic values of different species from live-aboard operations (including sharks, turtles, large fishes and minke whales) we designed three different visitor (passenger) surveys. Since the live-aboard operations schedule trips to different locations on the GBR at different times of the year, passengers are likely to encounter different species at different times of the year. So we tailored the questionnaires to specifically 'target' the different species most likely to be encountered on the different trips. All questionnaires were self-administered to their passengers by vessel crew and completion by passengers was entirely voluntary. The questionnaires were designed to elicit passenger values, perceptions, experiences and satisfaction from the interactions with key marine species, as well as information about expenditure patterns while in the Cairns and Port Douglas region.

We also conducted a survey on the three swim-with dwarf minke whale endorsed day boat operations over June and July 2007. Due to a low response rate (passengers only completed a questionnaire after a minke whale encounter, which were relatively infrequent¹); we designed a new questionnaire version for daily use irrespective of whether whales were encountered. This survey was implemented in June 2008 and incorporates all of the main specialised dive/snorkel commercial day boat operations (n=6) from Port Douglas.

Another survey was designed to evaluate the social and relative economic values of key marine species with specific regard to the S.S. Yongala wreck. This survey was implemented in June 2008 and incorporates the only two-day boat operations (one in Townsville and one in Ayr) conducting regular trips to the S.S. Yongala wreck.

An operator expenditure survey and key informant interview was also undertaken.

Details of each survey are given below.

5.1.1 2006-2007 Far Northern GBR Passenger Survey

This survey was conducted in 2006 and 2007 on the only two live-aboard dive tourism vessels (*Undersea Explorer* and *Nimrod Explorer*) conducting regular, scheduled, specialised expeditions to the far northern section of the Great Barrier Reef Marine Park between October and December. Key features of these trips include sightings and interactions with large (breeding) aggregations of green turtles (*Chelonia mydas*) in the vicinity of remote and significant turtle nesting islands (e.g. Raine Island), as well as relatively high concentrations of sharks and pelagic fishes, encountered more opportunistically at a number of shelf edge sites.

An additional feature of the *Undersea Explorer* far northern expeditions includes the capture, tagging and release of tiger sharks (*Galeocerdo cuvier*), conducted by R. Fitzpatrick as part of a satellite tracking program. The opportunity for tourists to watch the shark being tagged (from the safety of the vessel) is promoted as a highlight of the trip.

Data collection and response rate

Due to the fact that only two vessels (with passenger capacities of 18 and 21) conduct a limited number of expeditions to this region in October and December each year, the sampling period for this survey is being conducted over three years (2006-2008). A total of fourteen trips (eight by *Undersea Explorer* and six by *Nimrod Explorer*) were sampled from

¹ Mangott *et al.* (2004) showed there was a one in ten chance of encountering a minke whale aboard these vessels and Mangott *et al.* (2005) reported a one in five chance.

October to December in 2006 and 2007. Two hundred and thirteen passengers (122 in 2006; 91 in 2007) were carried by the two vessels in those two years. From these, a total of 177 completed questionnaires were returned. Two questionnaires from 2006 were excluded from the analyses, as one was only partially completed and one was filled in by a crew member. The response rate is therefore calculated as 177/213, or 83%.

5.1.2 2007 Live-aboard GBR (Minke Whale) Passenger Survey

This survey was conducted in 2007 on all four swim-with dwarf minke whale endorsed live-aboard dive tourism vessels (*Undersea Explorer*, *TAKA*, *Nimrod Explorer*, *SpoilSport*) which currently operate scheduled weekly trips over the dwarf minke whale season (June-July). These trips are advertised as providing dive opportunities along the Ribbon Reefs in the Cairns/Cooktown Section of the GBR and swims with dwarf minke whales (*Balaenoptera acutorostrata* subsp.), whenever possible. These vessels also offer berth spaces for James Cook University researchers from the Minke Whale Project (led by A. Birtles), who collect: (i) data on the biology and behaviour of the whales; (ii) data on the operation and management of the vessels; (iii) questionnaires from crew and passengers; and (iv) provide biology slide-shows to crew and passengers.

Data collection and response rate

A total of 824 passengers were carried by the four live-aboard vessels over June-July 2007. Of those passengers, 575 completed a Minke Whale Questionnaire, giving an overall response rate of 69.8%

5.1.3 2007 Day-boat GBR (Minke Whale) Passenger Survey

This survey was conducted in 2007 on all three swim-with dwarf minke whale endorsed day snorkel and dive tourism vessels (*Poseidon III*, *Aristocat IV*, *Silver Sonic*) over the dwarf minke whale season (June-July). These operations take passengers out to snorkel and dive on the outer Great Barrier Reef for a whole day. The day on the reef is pre-scheduled to three different dive/snorkel sites where they conduct their leisure activities. In the event of a dwarf minke whale encounter these operations may also provide the opportunity to swim with these whales.

Data collection is ongoing, and results will be presented in subsequent reports/publications.

5.1.4 2008-2009 S.S. Yongala Wreck Marine Wildlife Survey

This questionnaire was distributed to the only two day boat operations (Pro Dive/Adrenalin Dive in Townsville and Yongala Dive in Ayr) with regular scheduled trips to the S.S. Yongala Wreck. This wreck is regarded among the dive community as one of the top ten wreck dives in the world, with regular encounters of sharks, bull rays, large fish (e.g. Queensland groupers, giant trevallies, Maori wrasses), marine turtles and a huge variety of coral.

Data collection commenced in June 2008 and results will be presented in subsequent reports/publications.

5.1.5 2007-2008 GBR and Coral Sea Reefs (e.g. Osprey) Passenger Survey

This questionnaire was distributed on five live-aboard dive vessels (*Undersea Explorer*, *TAKA*, *SpoilSport*, *Nimrod Explorer* and *Spirit of Freedom*) operating along the Ribbon Reefs with regular scheduled trips (weather dependent) to Osprey Reef in the Coral Sea. Highlights of the trips include the dive site 'Cod Hole' where Potato Cods (*Epinephelus tukula*) are encountered with high predictability. Several of these operators also conduct a controlled feed of these fish in front of divers. Osprey Reef is renowned for its spectacular wall diving and regular and close encounters with several shark species (e.g. white-tip reef sharks, grey reef sharks, silver tip sharks and occasionally hammerheads and tiger sharks, etc.) as well as manta rays.

Data collection and response rate

A total of 350 questionnaires were completed by passengers from the five live-aboard vessels over December 2007 until mid May 2008. A total of 1,008 passengers were carried by those vessels over this period, giving an overall response rate of 34.7%. A passenger information sheet was developed and distributed on the vessels to inform passengers about the importance of the study and encourage them to complete a questionnaire. The lower response rate for this survey is probably due to the absence of researchers on the vessels during this period. During the minke whale sampling period, researchers on board are able to facilitate a higher response rate by explaining the value and aims of the research to crew and passengers.

5.1.6 Operator expenditure survey and key informant interviews

In order to establish the direct and indirect economic contributions of GBR dive tourism operators to their local economy, a Business Expenditure Survey and Key Informant Interview (Appendix 8) were designed by the research team and sampling began in mid April 2007. A strict agreement about confidentiality of data from this survey was undertaken with each respondent, ensuring that no operators or individuals will be identifiable from the results.

In order to encourage participation by GBR tourism operators, a promotional 'Information Sheet' was developed and distributed to operators via email, accompanying requests for their participation.

It is important to note that prior to the commencement of this project, members of the research team (Birtles, Valentine, Curnock and Mangott) had established a strong collaborative relationship with many of the Cairns and Port Douglas dive tourism operators included in the target sample, over a twelve-year period, via the Minke Whale Project (led by Birtles). The confidence of the tourism industry in this research project and their trust of the research team have proven invaluable in achieving industry support for the Project and high levels of participation in the surveys. Due to the survey length and the detailed and sensitive nature of the financial data requested expenditure survey, the sampling approach taken by the research team has been to allow operators to 'take their time' in providing their financial data.

Sampling progress

All live-aboard operators from Cairns and Port Douglas (n=5), from whom we reported data in this study, completed the Business Expenditure Survey and conducted the Key Informant interview.

The operator expenditure data is ready for input and will be analysed in a manner that will allow one to identify WHERE the money which boat visitors spend goes to within the regional economy (as per Figure 1).

Results of this analysis – and of the key informant interviews – will be made available in subsequent publications.

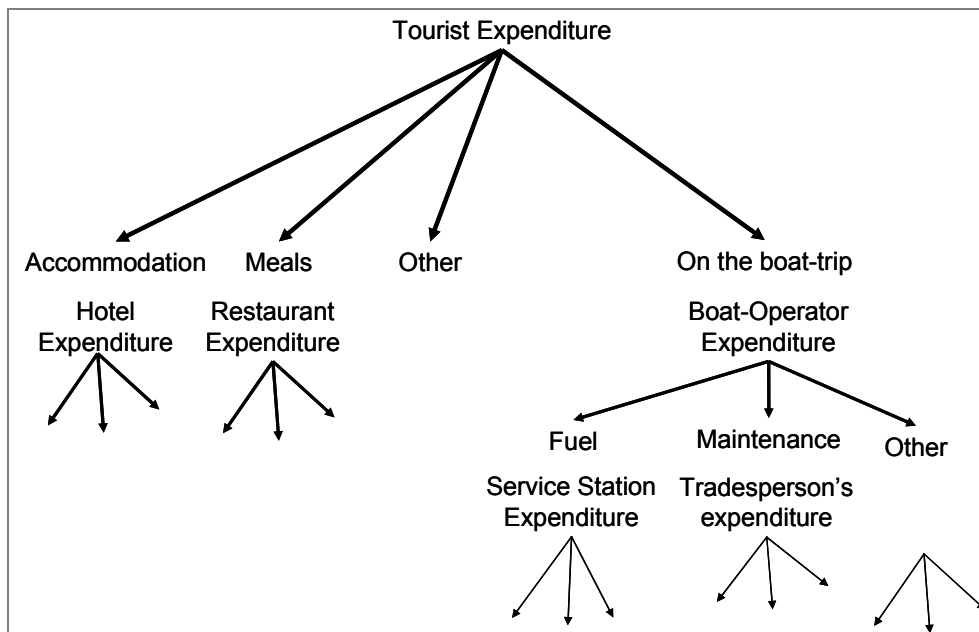


Figure 1: Distribution of visitor expenditure.

5.2 Preliminary results from passenger surveys

The following results represent preliminary analyses of the three live-aboard passenger surveys (Far Northern GBR 2006 and 2007, Minke Whale survey 2007 and the GBR and Coral Sea Reef survey 2007-2008). Further in-depth analyses are continuing through 2008 for a peer-reviewed publication planned for submission by the end of 2008 (see Section 6 for further details).

5.2.1 Sample demographics

For the total sample, encompassing all surveys (Far Northern GBR, Minke Whale and GBR and Coral Sea Reef survey), the majority of respondents were male and came from Australia, the United States or the United Kingdom (Table 2). Most of the respondents to all three surveys were highly experienced SCUBA divers, with 87.7%, 61.9% and 80.6% of the samples, respectively, holding Advanced Open Water (PADI) certification or higher (Table 2). The far northern GBR attracted the most experienced divers with an average of 14.6 years' diving experience and a median of 282 dives, followed by GBR and Coral Sea Reef and the Minke Whale experience, with a mean of 9.9 and 8.4 years' experience and a median of 85 and 59 dives, respectively (Table 2).

The majority (63.3%) of respondents to the far northern GBR survey has been to the Great Barrier Reef before, but for about eighty percent it was the first time they had visited the far northern section. For most of the respondents (about 60%) to the Minke Whale and the GBR and Coral Reef survey it was their first time on the Great Barrier Reef. For 60.5% of total respondents, visiting the far northern GBR was the main purpose of their trip away from home. For respondents to the Minke Whale and GBR and Coral Sea Reef surveys the diving trip was of slightly less importance (40.5% and 37.2% respectively) (Table 3).

Table 2: Demographics, dive certification levels and dive history of respondents from the far northern GBR, GBR (Minke Whale) and GBR and Coral Sea Reef Surveys (* range).

Survey	Demographics			Dive certification level and history		
	Top three countries of origin (n)	Male (%)	Mean age (yrs)	PADI Advanced or higher (%)	Dive experience (mean yrs)	Total dives (median)
Far Northern GBR (n=177)	Australia (55) USA (52) UK (21)	59	47 (20-71)*	88	14.6 (1-47)*	282 (9-3,000)*
GBR (Minke Whale) (n=575)	USA (170) Australia (160) UK (50)	52	36 (10-75)*	62	8.4 (0-47)*	59 (0-8,000)*
GBR and Coral Sea Reefs (n=350)	USA (74) Australia (64) UK (49)	59	38 (15-65)*	81	9.9 (0-46)*	85 (0-7,000)*

Table 3: First time visits to the GBR by respondents and main purpose for their trip away from home. Sample from Far Northern GBR, GBR (Minke Whale) and GBR and Coral Sea Reef surveys.

Survey	First time visit to the GBR (%)	Main purpose of trip away from home		
		This particular dive trip (%)	Dive trip was one of several activities (%)	Dive trip was not a pre-planned activity (%)
Far Northern GBR (n=177)	36.7	60.5	36.6	2.9
GBR (Minke Whale) (n=575)	60.3	40.5	52.8	6.7
GBR and Coral Sea Reef (n=350)	60.2	37.2	55.7	7.6

5.2.2 Satisfaction and expectations of respondents

Respondents to the Far Northern and GBR and Coral Reef Wildlife surveys were asked to rate their overall satisfaction (on a rating scale from 1 = 'very poor' to 10 = 'excellent') with their diving trip. The mean rating was 8.6 and 8.7 respectively. They were also asked to rate their level of satisfaction with wildlife experiences on the dive trip. The mean rating for both surveys was 8.4. The results indicate that respondents were highly satisfied with both the dive trip and their wildlife experiences (Table 4).

Respondents of both surveys were also asked, "Overall, how well did this diving trip meet your expectations?" The mean rating for this question was 3.5 and 3.8 (out of 5) for the Far Northern and GBR and Coral Reef Wildlife survey, respectively. Thus, on average passengers' expectations of the trip were slightly exceeded by their experience (Table 4).

Respondents were asked to rate the 'environmental quality' of the sites they visited on their dive trip. 'Environmental quality' was defined as "How healthy do you perceive the reefs and wildlife populations to be in the region?" and a ten-point rating scale (1 = 'very poor environmental quality' to 10 = 'excellent environmental quality') was provided. The mean rating for this question was 8.2 and 8.0 for the question in the Far Northern and GBR and Coral Reef Wildlife survey respectively. The mean rating for a follow up question asking "Did the environmental quality of the sites you visited meet your expectations?" (both 3.4 out of 5) indicates that on average respondents expectations were met or slightly exceeded (Table 4).

As the GBR (Minke Whale) survey is part of a PhD study by Matt Curnock, questions regarding passengers' levels of satisfaction and expectations were directly targeted to their 'swim with dwarf minke whale' experience. Respondents were asked to rate their overall satisfaction with their minke whale experience. The mean score for this question was 9, indicating that most respondents were highly satisfied. The mean rating for the follow up question, "Overall, how well did your minke whale experience(s) meet your expectations?" (4.2 out of 5) indicates that the expectations for most passengers were exceeded (Table 4).

Table 4: Respondents' mean satisfaction and expectation rating of their dive trip and satisfaction rating of their overall wildlife experience. Samples from Far Northern GBR, GBR (Minke Whale) and GBR and Coral Sea Reef surveys.

Survey	Respondents mean satisfaction* and expectation**		
	Dive trip		Wildlife experience
	Satisfaction	Expectation	Satisfaction
Far Northern GBR (n=177)	8.6	3.5	8.4
GBR and Coral Sea Reef (n=350)	8.7	3.8	8.4
GBR (Minke Whale)*** (n=575)	-	4.2	9

* Rating scale from 1 = 'Very Poor' to 10 = 'Excellent'.

** Rating scale from 1 = 'Well below' to 5 = 'Well above my expectations'.

*** Questions directly targeted to their swim-with dwarf minke whale experience.

5.2.3 Wildlife species / groups contributing to satisfaction

To identify how much particular species of marine wildlife contribute to the satisfaction of passengers on their trip, respondents were asked, "How much did your interactions with each of the following types of marine wildlife contribute to your overall satisfaction with your trip?" Respondents were asked to rate their satisfaction on a ten-point semantic differential scale (1 = 'Didn't contribute at all to my satisfaction' and 10 = 'Contributed a great deal to my satisfaction') for the identified or nominated key marine wildlife groups. They were also asked to list 'any species in particular' for each group, and were provided the option to tick a box if they did not see this wildlife.

The key marine wildlife groups varied slightly between the three surveys. For example, as dwarf minke whales show only a limited presence over the year (May-August) they were only included in the Minke Whale survey. In the same survey the 'sea birds' category was excluded due to space reasons (Table 5). In addition, the question on 'seeing many different types of wildlife' was incorporated after June 2007, hence only some of the surveys could be used for this particular rating.

For all the surveys, respondents' mean satisfaction was high to very high for all wildlife categories, but sea birds (Table 5). This indicates that sea birds may not be as attractive to divers as under water marine species. Dwarf minke whales scored the highest mean satisfaction rating (9.3) of all the species.

Table 5: Mean rating of respondents' satisfaction with different wildlife on their dive trip. Sample from Far Northern GBR, GBR (Minke Whale) and GBR and Coral Sea Reef surveys.

Wildlife groups	Mean rating of respondents' satisfaction with wildlife on their trip		
	Far Northern GBR (n=177)	GBR and Coral Sea Reefs (n=350)	GBR (Minke Whale) (n=575)
Minke whales	-	-	9.3
Sharks	8.2	8.1	7.3
Marine turtles	7.4	7.5	7.4
Large fishes (incl. Potato cod)	8.4	8.1	7.5
Sea birds	5	3.7	-
Other wildlife	6.9	8.2	8.5
Seeing many different types of marine wildlife	8.7*	8.6	-

* Category included in 2007 (n=90).

Table 6: Particular species listed by survey respondents ('# Resp.' = Number of respondents).

Far Northern GBR (n=177) survey		GBR and Coral Sea Reef (n=350) survey		GBR (Minke Whale) (n=575) survey	
Wildlife species	# Resp.	Wildlife species	# Resp.	Wildlife species	# Resp.
TURTLES					
Green turtle	23	Green turtle	10	Green turtle	6
Loggerhead	1	Loggerhead	5	Loggerhead	2
Hawksbill	3	Hawksbill	3		
		Turtle sp.	2		
Total Turtles	27		20		8
SHARKS AND RAYS					
Silvertips	20	White tip reef shark	32	White tip reef shark	19
Tiger sharks	14	Grey reef shark	25	Grey reef shark	12
Grey reef shark	10	Silvertip	5	Wobbegong	2
White tip reef shark	3	Black tip reef shark	3	Bull shark	1
Wobbegong	6	Thresher shark	2	Hammerhead	1
Epaulette shark	4	Leopard shark	2	Silvertip	1
Leopard shark	2	Hammerhead	1	Black tip reef shark	1
Hammerhead	1	Oceanic white tip	1	Nurse shark	1
Tawny nurse shark	1	Wobbegong	1		
Silky shark	1				
Total Sharks	62		72		38
Manta ray	1	Manta ray	8	Manta ray	8
Eagle ray	1	Stingray	1	Other rays	2
Sting ray	1				
Total Rays	3		9		10
Total Sharks and Rays	65		81		48
LARGE FISH					
Potato cod	5	Maori wrasse	15	Barracuda	3
Queensland grouper	2	Barracuda	13	Maori wrasse	1

Far Northern GBR (n=177) survey		GBR and Coral Sea Reef (n=350) survey		GBR (Minke Whale) (n=575) survey	
Wildlife species	# Resp.	Wildlife species	# Resp.	Wildlife species	# Resp.
Maori wrasse	2	Bump headed parrot	9	Coral trout	1
Dogtooth tuna	2	Grouper	6	Parrotfish	1
Giant trevally	2	Giant trevally	6		
Groupers	1	Tuna	5		
Bump headed parrot	1	Parrot fish	4		
Barracuda	1	Snapper	2		
Sail fin snapper	1	Cod	2		
Clown triggerfish	1	Coral trout	2		
		Batfish	1		
		Red bass	1		
		Mackerel	1		
Total Large Fish	18		67		6
SEA BIRDS					
Boobies	10	Terns	2	Terns	1
Frigate birds	9	Boobies	1	Shearwaters	1
Gannets	1			Gannets	1
Total Sea Birds	20		3		3
OTHER WILDLIFE					
Dolphins	8	Dolphins	3	Dolphins	6
Whales	4	Whales	1	Whales	2
Dugongs	5				
Total Marine Mammals	17		4		8
Crocodiles	1	Sea snakes	9	Sea snakes	12
Total Other Reptiles	1		9		12
Sail fin snapper	1	Anemone fish	17	Lionfish	12
Clown trigger	1	Lion fish	14	L. scorpion fish	8
Anemone fish	1	Stonefish	8	Morey eels	5
Scorpion fish	1	Scorpion fish	8	Anemone fish	4
Stonefish	1	Damsel fish	4	Stonefish	4
Leopard blenny	1	Triggerfish	3	Red bass	1
Morey eel	1	Filefish	3	Unicorn fish	1
		Moorish idol	3	Glass fish	1
		Angle fish	2	Puffer fish	1
		Unicorn fish	1	Gobies	1
		Puffer fish	1	Pipefish	1
		Frog fish	1	Seahorse	1
		Sea horse	1		
		Pipefish	1		
Total Small Fish	7		67		40
Nudibranchs	8	Nudibranchs	7	Coral	9
Coral	6	Coral	6	Nudibranchs	9
Invertebrates	1	Flame file shell	2	Echinoderms	3
		Giant clam	2	Flame file shell	2

Far Northern GBR (n=177) survey		GBR and Coral Sea Reef (n=350) survey		GBR (Minke Whale) (n=575) survey	
Wildlife species	# Resp.	Wildlife species	# Resp.	Wildlife species	# Resp.
		Shrimps	2	Shrimps	2
				Crabs	2
				Jelly fish	2
				Clams	1
				Ascidian	1
				Flatworms	1
				Polychaets	1
Total Other Benthos	15		19		34
Cuttlefish	5	Octopus	4	Cuttlefish	3
Nautilus	3	Cuttlefish	3	Octopus	3
Octopus	1				
Cephalopod sp.	1				
Total Cephalopods	10		7		6
Total Other Wildlife	50		106		100

5.2.4 Visitor expenditure within the Cairns / Port Douglas region

5.2.4.1 Daily (non-boat) expenditure

Respondents were asked to indicate the approximate amount of money they had spent per day on different categories of goods. This was done by asking them to tick an appropriate expenditure category, as per the questionnaire excerpt below:

Item – Cost PER DAY	\$0	\$1-20	\$21-50	\$51-100	\$101-150	\$151-200	\$201-300	>\$300
<i>Food or drinks from a takeaway</i>								
<i>Meals in a café or restaurant</i>								
<i>Groceries</i>								
<i>Accommodation</i>								
<i>Other (please specify):</i>								

When estimating total expenditure on each category of goods, we used the mid-point of each (e.g. \$35 for the range \$21-\$50; \$75 for the range \$51-\$100, etc.), although the lowest amount (e.g. \$300) was used for the top category, giving an unambiguous downward bias to final estimates.

These mid-points were then added together to arrive at an estimate of daily regional expenditures across all items (excluding money spent on the boat) as shown in Table 7 (here, 'n' does not represent the number of surveys collected, rather it shows the valid number of responses to the expenditure question).

Table 7: Mean daily non-boat regional expenditure by survey respondents.

Survey	Daily non-boat regional expenditure
Far Northern GBR (n=134)	\$349.42
GBR (Minke Whale) (n=472)	\$306.88
GBR and Coral Sea Reefs (n=284)	\$331.67

5.2.4.2 Total regional (non-boat) expenditure

Visitors were also asked to indicate the total number of days they spent in the Cairns and Port Douglas region before and after the boat trip (Table 8).

Table 8: Mean number of days spent in the region by survey respondents.

Survey	Number of days spent in Port Douglas region (before and after boat trip)	Number of days spent in Cairns region (before and after boat trip)
Far Northern GBR (n=160)	1.7	4.4
GBR (Minke Whale) (n=490)	1.7	6.9
GBR and Coral Sea Reefs (n=289)	1.2	4.0

Daily expenditure estimates were then multiplied by the total number of days spent in the region, to generate an estimate of total regional non-boat spending. Visitors staying for thirty days or more were excluded from the analysis.

Preliminary estimates indicate that the average visitor spent between \$1,600 and \$2,000 whilst in the region and that the majority of that expenditure occurred in Cairns.

Table 9: Mean total non-boat regional expenditures.

Survey	Total non-boat regional expenditure	Proportion of non-boat expenditure spent in Cairns
Far Northern GBR	\$1,609.43 (N=131)	0.77 (N=155)
GBR (Minke Whale)	\$1,922.18 (N=419)	0.77 (N=522)
GBR and Coral Sea Reefs	\$2,004.08 (N=217)	0.79 (N=312)

5.2.4.3 Proportion of non-boat expenditure attributable to boat trips

Responses to the question below were used to determine how much *Total (non-boat) regional expenditure* was attributable to the boat trip (hereafter termed *Boat Attribution*).

If you had not been able to go on this boat trip, would you have still taken this trip to the Cairns/Port Douglas region?
 (please mark [✓] the appropriate box for the scenario that best fits your travel choices)

Yes, and I would have spent the same amount of time in the Cairns/Port Douglas region (If so, please choose from box below):

But I would have gone on a different Reef/boat trip instead
 - What type of dive/boat trip would you have taken instead? _____

But I would have done something else in the Cairns/Port Douglas region instead
 - What type of activity would you have done instead? _____

Yes, but I would have spent less time/fewer days in the Cairns/Port Douglas region:
 - If so, how much? I would have spent _____ fewer days in this region.

No, I would have travelled elsewhere.

No, I would not have taken the trip away from home at all.

I don't know.

Specifically:

- If the respondent was a local resident, or was spending more than thirty days in the region, then *Boat Attribution* was set to zero.
- If the respondent would have visited the region even if they could not have undertaken the boat trip – and spent the same amount of time – then *Boat Attribution* was set to zero.
- If the respondent would not have come to the region if they could not have undertaken the boat trip (i.e. travelled elsewhere or not taken the trip away from home), then *Boat Attribution* was set to one.
- If the respondent would have still visited the region but spent less time then *Boat Attribution* was set equal to the reduction in time that would have occurred divided by the total time actually spent in the region.

A preliminary analysis of responses indicates that a large proportion of non-boat visitor expenditure is attributable to the boats. This means that other local businesses are benefiting from the boat industry: they would only have earned a small portion of the \$1,600 to \$2,000 reported above if these tourists had not had the opportunity to go on boat trips like these.

Table 11: Mean proportion of non-boat regional expenditure attributable to boat-trip.

Survey	Proportion of non-boat regional expenditure attributable to boat trip
Far Northern GBR (n=140)	0.91
GBR (Minke Whale) (n=474)	0.87

5.2.4.4 Total regional expenditure – boat and non-boat

Estimates of the *total* regional per-visitor expenditure (including dive boat expenditures) were then generated by adding the total regional expenditure estimates to:

- The publicly advertised price of the boat trip; and
- (Self-reported) extra expenditures incurred by the respondents while on the boat trip.

Mean preliminary estimates indicate that respondents spent between \$3,600 and \$5,000 while in the region (Note, estimates of total expenditures were up to \$700 higher when calculated using self-reported estimates of trip-costs rather than advertised prices). These figures are higher than those reported in the study of *Access Economics* (2007, p 69), where expenditure per night for overnight visitors to the Tropical Far North during 2004-2005 and 2005-2006 was listed as being in the order of \$170-\$171 per night. The estimates are also higher than the average daily expenditure estimates of Stoeckl *et al.* (2005) in their study of whale-watchers in Hervey Bay – approximately \$103 per person per day, and higher than the Suh and Gartner (2004) study of visitor expenditure in Seoul, Korea (between \$US150 and \$US200 per person per day). Interestingly, Mules *et al.* (2005) found that overnight visitors to the New South Wales Alpine region of Australia (where there are many opportunities for skiing) spent, on average up to \$523 per person per night – almost four times the daily expenditure of non-skiing visitors.

Table 12: Mean total regional expenditures (boat AND non-boat).

Survey	Total regional expenditure PLUS advertised price of boat-trip PLUS additional on-board expenditure
Far Northern GBR (n=131)	\$5,052.57
GBR (Minke Whale) (n=419)	\$3,642.75
GBR and Coral Sea Reefs (n=217)	\$3,728.45

5.2.5 Willingness to pay for ‘improvements’ in the resource

One way of attempting to estimate the ‘value’ of marine tourism is to examine current/actual visitor expenditures. This provides information about (a) how much tourists actually spend to interact with key marine species; and (b) the aggregate economic ‘impact’ of that expenditure on regional communities.

Another way of attempting to estimate the ‘value’ of key marine species is to see how much people are willing to pay to see improvements in the resource (e.g. to have an increased probability of sighting particular species when on a boat trip). To elicit that type of information, the original 2006 questionnaire was amended to include questions about passenger willingness to pay for a (hypothetical) 100% guarantee of seeing a range of different marine species. This is a standard contingent valuation study; using a bid-card (or payment-card) approach. The question was amended after piloting (on the 2007 minke-whale day boat passengers), so as to control for starting point and/or interval bias. The question is now printed in four different versions: two different starting points (lowest or highest); and two different interval ranges, and has been included in all 2008 surveys.

Preliminary results indicate that respondents are willing to pay more for guaranteed sightings of some species (e.g. sharks and whales) than others (e.g. seabirds) and that respondents also have a relatively high, mean willingness to pay for viewing a ‘wide variety’ of species. However these results need to be interpreted carefully, and in context. They will not,

therefore, be presented until further analysis can be done. The results of this analysis will appear in subsequent publications.

6. Progress on the peer-reviewed publication (December 2008 agreed MTSRF milestone)

A paper that uses visitor expenditure data to draw inferences about the 'value' of key marine species to regional communities is nearly complete. The methodological approach used in this paper is similar to that used in the pilot study (as per the June 2007 milestone report) although it is used for (a) the 2007 Far Northern (Pilot) Survey; (b) the 2007 Live-aboard GBR (minke whale) survey; (c) the 2008 Far Northern Survey; and (d) the 2008 GBR and Coral Sea Reefs (incl. Osprey) marine wildlife survey. A draft of this paper has not been included in this report (so as to avoid potential copyright issues that may arise when it is published in a journal).

7. References

Access Economics (2007), /Measuring the Economic and Financial Value of the Great Barrier Reef Marine Park, 2005-06/, http://www.gbrmpa.gov.au/_data/assets/pdf_file/0017/22661/rp_87-GBRCA-economic-contribution-2005-06-final-report.pdf, (accessed 5 December 2007).

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