



# ASSESSMENT OF HUMPBACK WHALE (*Megaptera novaeangliae*) WATCHING ACTIVITIES IN VAVA'U, TONGA

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## PILOT STUDY

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# 1. CONTEXT OF STUDY

Whale-watching has recently developed into an important industry within the South Pacific islands region (Economists @ Large & Associates, 2008a). In particular, the presence of humpback whales at high latitudes during the winter months has become of great interest over the last 10 years (Schaffar and Garrigue, 2007). In the Kingdom of Tonga, whale-watching activities began in 1994 and focus on a small population of humpback whales utilising the waters around Vava'u as their main breeding ground between the months of July and October. The whale-watching industry in Tonga is unique as it is one of the only countries worldwide to actively promote swimming with humpback whales.

The Kingdom of Tonga is today considered as the leading whale-watching country within the islands of the South Pacific. A growing number of tourists undertake whale-watching tours every winter and 9,800 participations were estimated in 2006 (Economists @ Large & Associates, 2008b). The industry has grown at an average annual rate of 20% over the last 8 years (Economists @ Large & Associates, 2008b). In 2007, 13 licensed operators offered whale-watching tours in Vava'u. Humpback whales have now become the symbol of Vava'u and are used as an advertising tool in all aspects of tourism on the island. The presence of humpback whales in Tonga during the southern winter contributes substantially to the local economy (Economists @ Large & Associates, 2008b; Orams, 1999).

With the growth of cetacean-orientated tourism worldwide, scientists have raised the question of the potential effects such activities may have on the animals. Studies conducted on different cetacean species, including humpback whales, have now shown that the presence of boats can induce behavioural changes (Baker and Herman, 1989; Bejder et al., 2006; Corkeron, 1995; Scheidat et al., 2004; Sousa-Lima et al., 2002; Williams et al., 2002). Many international and regional conventions, such as the International Whaling Commission (IWC, 2000), therefore consider the management of the whale watching industry as a priority in order to minimise the risks of adverse impacts.

In the recent years, the sustainability of whale watching activities in Tonga has been questioned. Despite the publication of guidelines by the Tonga Whale Watching Operators Association, the industry remains unregulated. Conservation orientated organisations, scientists, government authorities and tour operators have on several occasions required an assessment of the potential effects of boats and swimmers on the behaviour of humpback whales in Vava'u (SPREP & IFAW, 2006). Such study has been identified as a priority in the recently revised SPREP Whale and Dolphin Action Plan (SPREP, 2007), and is necessary to implement appropriate management measures.

In order to respond to the need for a study monitoring whale watching activities in Vava'u, a research project overseen by SPREP was initiated in 2007. In October 2007, the main investigator of this project (Aline Schaffar) undertook a trip to Vava'u to present the research to be conducted and to assess potential sites for land-based surveys. The project proved to be feasible and received great support from all stakeholders consulted (Schaffar, 2007). In October 2008, the main investigator accompanied by an assistant (Patrice Plichon) went back to Vava'u to

set up the research station and collect some preliminary data. The present report summarises the results of this pilot study.

## **2. PROJECT OVERVIEW**

This pilot study is part of a wider research project which aims at assessing the level of exposure of humpback whales to boats and swimmers in Vava'u, Tonga, and to compare the behaviour of whales in the presence and absence of tourism activities.

For the purpose of this project, land-based surveys will be conducted over two field seasons of two months each. These observations will allow to obtain baseline data on the behaviour of humpback whales in the absence of human influence, which is essential to assess potential disturbance. In order to evaluate more specific variables, in particular those related to swimming activities, boat-based data will also be collected by an additional observer onboard commercial tour boats.

The land-based research station will be equipped with a theodolite, a survey instrument which allows to determine the exact position of animals located from land, and to obtain information on their movements. Such instrument can also be used to collect precise data on interactions between whales and boats, and is therefore recommended for whale and dolphin tourism studies (Bejder and Samuels, 2004).

In order to assess potential disturbance, humpback whales' speed, dive time, path linearity, and dispersion will be compared in the presence and absence of boats and swimmers. Group type will also be taken into account in order to identify any differences amongst social groups.

## **3. OBJECTIVES**

The objectives of the pilot study were to:

- Provide an update on the proposed study to all stakeholders involved (NGOs, tour operators, government authorities).
- Set up the land-based research station.
- Collect preliminary data on the interactions between humpback whales and whale watching boats.

## **4. WORK UNDERTAKEN**

The main investigator (Aline Schaffar) accompanied by one assistant (Patrice Plichon) spent a total of 21 days in Tonga from the 6th to the 27th of October 2008.

Two days were first spent in Nuku'alofa, Tongatapu, in order to meet with the different government departments.



Nineteen days were then spent in Vava'u. A meeting was held with the whale watch tour operators, the Tongan Visitors Bureau, and IFAW. Further discussions were undertaken with IFAW, the Tongan Whale Watch Operators Association, the Tongan Visitors Bureau, and the Vava'u Department of Environment, on an individual basis. Four days were spent setting up the land-based research station at Mo'ungalafa. Finally, observations were conducted from the site during nine days.

## 5. MEETING WITH STAKEHOLDERS

### 5.1 Meeting with government authorities

A meeting was held in Nukua'alofa, Tongatapu on the 8<sup>th</sup> of October 2008. The list of participants can be found in Appendix 1. The Ministry of Fisheries was convened to the meeting but could not attend due to other duties.

A presentation was first given by the main investigator and reviewed the following topics:

- Background information on the proposed project ;
- Research objectives ;
- Results of the feasibility study conducted in 2007 ;
- Objectives of the pilot study ;
- Next steps of the project ;
- Update on a similar project conducted in New Caledonia.

Following the presentation, several points were discussed amongst participants:

- **Outcomes of the research project.** The project will provide the first scientific assessment of whale watching activities in Vava'u and will describe the level of exposure of different social groups to these activities. In particular, the number of boats and swimmers with whales, the time spent with whales, and the presence of recreational versus commercial vessels with whales will be evaluated. This project will also allow to identify the potential behavioural changes caused by the presence of boats and swimmers with the whales. Such information will enable government authorities to manage the whale watching industry based on local sound scientific data. This project will therefore contribute to both the conservation of the local humpback whale population and the sustainable development of whale-watching activities in Tonga.
- **Context of the study.** The whale watching industry in Vava'u has shown a strong growth over the last few years but information on the potential impact of these activities is still lacking. The results of impact studies conducted on many cetacean species worldwide, including humpback whales, tend to show that whale watching activities can induce behavioural changes, and can have some long term consequences, such as the displacement from impacted sites. Therefore, the 2008-2012 SPREP Whale and Dolphin Action Plan recommended the completion of a whale watching impact study in Tonga.

- **Tour operators.** The Tonga Whale Watch Tour Operator Association was consulted in 2007 and showed strong support towards the proposed project. A few questions have been raised since and a meeting will be held with the operators in Vava'u in order to clarify potential issues.
- **Capacity building.** Capacity building is an important component of this project. Therefore, the research proposal includes the participation of local conservation officers from government departments. Training in data collection and analysis will allow them to engage in long term monitoring of humpback whales and of the whale watching industry in Tonga, beyond the length of this project.
- **Migration of humpback whales.** Information was required by the government departments on humpback whales' migration routes to and from Tonga. Only limited data is available up to date. Satellite tags were deployed on humpback whales in New Caledonia and in the Cook Islands in 2007 but did not provide enough data to identify the migration routes to Antarctica.
- **Assistance of government departments.** The Ministry of Tourism and the Ministry of Environment wish to collaborate on this project, and department officers will be available to provide assistance to the research team during their stay in Vava'u.

The government authorities will be kept informed of the progress made within this project and will be consulted again before the start of fieldwork.

## 5.2 Meeting with tour operators

A meeting was held in Neiafu, Vava'u on the 14<sup>th</sup> of October 2008. The list of participants can be found in Appendix 2. Sione Paea from the Department of Environment was convened to the meeting but could not attend due to other duties.

The following points were discussed during this meeting:

- **Methodology.** Questions were raised by the operators regarding the methodology to be used and its relevance in regards to the characteristics of the Tongan humpback whale population and of the local whale watching industry. The data collection protocol set for this project relies on a strong combination of research techniques that have been widely used within impact studies on cetaceans. This protocol has also taken into account the specificity of the site, and will therefore include both land-based and boat-based observations. The criteria used for the choice of the location of the land-based research station were also re-emphasised.
- **Outcomes.** The tour operators expressed concerns towards the outcomes of this research project, and how it may affect the whale watching industry. The main objective of this study is to provide scientific data on the behaviour of humpback whales in the presence of boats, which can be used by government authorities to assess whether further management measures should be implemented.
- **Capacity building.** The involvement of Tongan people in the proposed project was questioned. Consultancy with all stakeholders, including the Tongan Government, is an ongoing process since the project was initiated.

Furthermore, the participation of local officers from government departments is included in the proposal. People from local villages around the land-based research station are also being involved in the project.

- **Research project in New Caledonia.** The main investigator recently conducted a whale watching impact study on humpback whales in New Caledonia. Several questions were raised regarding this research. Caution should be made when comparing the two research projects as the characteristics of the New Caledonian humpback whale population and of the local whale watching industry are extremely different from Vava'u. In fact, humpback whales in New Caledonia are one of the smallest populations in the South Pacific, and the sighting rate is therefore relatively low. Observations of mother-calf pairs are also rare. The whale watching season only lasts two months and only represent a small part of the operators' activities.

The Tonga Whale Watch Operators Association will be kept informed of the progress made within this project.

Information on the preliminary data collected was also given to the President of the Association upon completion of the pilot study.

## 6. STATION SET UP

During the feasibility study conducted in 2007, Mo'ungalafa was identified as the best site to conduct land-based observations on the interactions between humpback whales and whale watching boats in Vava'u. Mo'ungalafa is the highest point of the main island of Vava'u, located at 166 metres above sea level in the South Western part of the island (Figure 1). Compared to other sites, Mo'ungalafa offers a wide view over the area used by whales and boats, and is relatively easy to access.



Figure 1. Location of the land-based research station.

Reaching Mo'ungalafa takes about an hour by car from Neiafu (Figure 2). At the end of the road, a 20-minute walk leads to the site.



Figure 2. Road to the site from Neiafu.

Setting up a land-based research station at Mo'ungalafa required some clearing of the vegetation in order to have an open view over the area of interest. A group of people from the village of Longomapu assisted us in this task (Figure 3). As a result, the research site provided an extended view of the inshore waters of the Vava'u island group, from Utungake to the East, to Tulungasika to the West (Figure 4).



Figure 3. The main investigator and the clearing team.



Figure 4. View from the land-based research station at Mo'ungalafa.

The theodolite and the rest of the equipment were then put in place (Figure 5). In order to obtain accurate data, the theodolite needs to be set up at the exact same location everyday. Therefore, wedges were made out of cement to ensure that the tripod on which the theodolite was affixed would always be set up in the same way. The final position of the theodolite was  $18^{\circ}39.904'$  South and  $174^{\circ}03.181'$  West. The azimuth of the theodolite also needs to be regularly adjusted on a reference object. For that purpose, the church located in Ovea on Kapa Island at  $18^{\circ}41.402'$  South and  $174^{\circ}01.937'$  West was used.

On-site storage and overnight surveillance were also organised. Tongan flags and posters explaining the work conducted from the site (in Tongan) were posted around the land-based research station.



Figure 5. The land-based research station.



## 7. PRELIMINARY DATA COLLECTION

All data were collected under a research permit granted by the Tongan Prime Minister's Office for the length of the pilot study.

Only land-based surveys were conducted during this pilot study.

### 7.1 Sampling methods

The study area was continuously scanned either using naked eyes or binoculars until humpback whales were spotted. A precise tracking protocol was then used to collect data on the whales as well as on any boats in close proximity. This protocol consists in recording the position of whales and boats as often as possible, for a minimum of twenty minutes combined with at least five surfacing bouts. Each blow of the whales is also recorded. This protocol will allow to build a strong database representative of the whales' behaviour in the presence and absence of boats.

The position of whale groups for which the sampling protocol could not be completed was used to assess the distribution of humpback whales sighted from the land-based research station.

The type of group observed was recorded upon first sighting of the whales and updated along with the time of occurrence in case of any subsequent changes. The following categories were used:

- Mother and calf;
- Mother-calf and escort(s);
- Singleton;
- Pair;
- Groups of three or more adult whales ; and,
- Unknown group type.

Each boat within 1,000 meters of the whales was individually tracked. Information on the type of boat (sailboat, motorboat, monohull, catamaran), its size (less than 10 metres, between 10 and 20 metres, over 20 metres), and if known, the name of the vessel, was recorded. Recreational and commercial whale watching boats were recorded separately. Data on the timing of swimming events was also collected.

Once a tracking session was completed, the number and the identity of boats present with a group of humpback whales were recorded every 15 minutes in order to assess the level of exposure of humpback whales to boats with accuracy.

Theodolite readings were entered in a voice-recorder on site and into a computer-based tracking program (*Cyclopes*) at the end of each day. This program transforms the theodolite data into exact latitude and longitude, and calculates behavioural variables such as speed and path linearity.

### 7.2 Research effort

All data were collected between the 15<sup>th</sup> and the 23<sup>rd</sup> of October 2008, for a total of nine days or 49 hours and 15 minutes of observation (Table 1). Out of these nine days, bad weather conditions limited the possibility of spotting whales from the land-based research station on only one occasion (October 15<sup>th</sup>).

Table 1. Summary of the research effort during the pilot study.

<b>Date</b>	<b>Hours of observation</b>
15.10.2008	3h46
16.10.2008	6h23
17.10.2008	5h45
18.10.2008	6h10
19.10.2008	4h36
20.10.2008	5h56
21.10.2008	5h18
22.10.2008	6h21
23.10.2008	5h00
<b>Total</b>	<b>49h15</b>

### 7.3 Commercial whale watching activities

A total of 35 trips were undertaken by commercial whale watch companies over the nine days of observations (Table 2). However, the data collected does not allow to identify whether these trips were carried out to watch and/or swim with humpback whales or for other purposes such as diving. Out of these 35 trips, boats were sighted with humpback whales on 18 occasions.

Table 2. Potential whale watching activities sighted during the pilot study.

<b>Company</b>	<b>Number of trips</b>	<b>Sighted with whales</b>
Beluga Diving	7	2
Dive Vava'u	5	2
Endangered Encounters	3	1
Pacific Dolphin Diving	10	4
Whale Watch Vava'u	3	3
Whales in the Wild	7	6
<b>Total</b>	<b>35</b>	<b>18</b>

### 7.4 Data collected

During the nine days of observations conducted within the pilot study, a total of 54 groups of humpback whales were sighted from the research station, of which 13 were tracked using the theodolite (Table 3). Thirty distribution points were also recorded. Groups of humpback whales were sighted every day, except on the 15<sup>th</sup> of

October when weather conditions were poor. No whales were tracked on the 18<sup>th</sup> of October due to technical failure of the theodolite. The position of eleven of the groups sighted could not be recorded, either because another group was tracked at the time or because it was rapidly out of sight.

Table 3. Number of humpback whale groups sighted and tracked during the pilot study.

Date	Groups sighted	Groups tracked	Distribution points
15.10.2008	0	0	0
16.10.2008	4	2	2
17.10.2008	4	1	2
18.10.2008	8	0	4
19.10.2008	8	2	6
20.10.2008	10	2	5
21.10.2008	6	2	3
22.10.2008	7	1	4
23.10.2008	7	3	4
<b>Total</b>	<b>54</b>	<b>13</b>	<b>30</b>

A majority of the humpback whale groups sighted and tracked from the land-based research station were mothers and calves (Table 4). A few singletons were also observed but this type of group proved to be rather difficult to track due to long dive times or rapid movements. The composition of 13 groups remained unknown because they were sighted either over a short period of time or at a far distance from the site.

Table 4. Number of theodolite tracks and distribution points for the different group types.

Group type	Theodolite tracks	Distribution points	Total
Mother and calf	9	3	12
Mother-calf escort(s)	1	2	3
Singleton	1	8	9
Pair	0	2	2
Group of 3 or more adult whales	2	2	4
Unknown	0	13	13
<b>Total</b>	<b>13</b>	<b>30</b>	<b>43</b>

Five groups of humpback whales were tracked only without boats (38%), and three were tracks only in the presence of boats (23%) (Figure 6). Five groups were



tracked both in the presence and absence of boats, either before (8%), after (23%), or before and after (8%) being observed by boats.

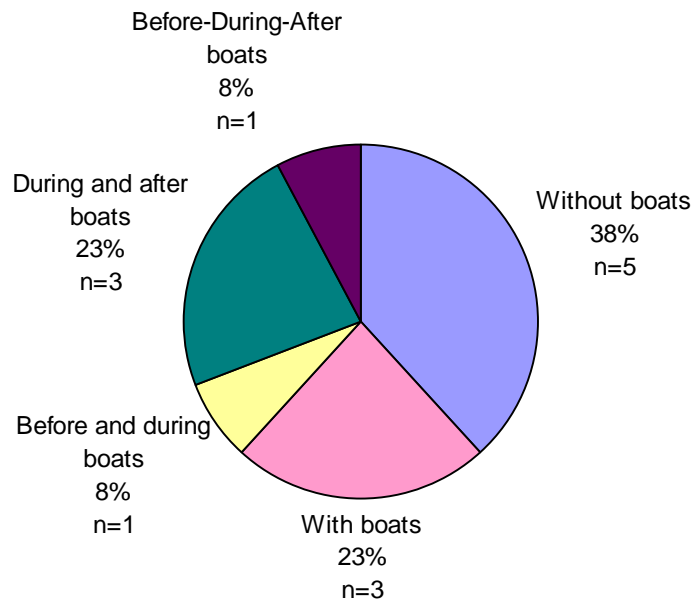


Figure 6. Percentage of the different types of tracks completed.

Humpback whales were mostly sighted in the Southern part of the Hunga channel and to the West of Hunga Island (Figure 7). Only a few groups were observed in the Eastern part of the study area.

Because land-based observations do not allow individual identification of the whales, it is not possible to know whether the same groups and/or individuals were sighted on more than one day.

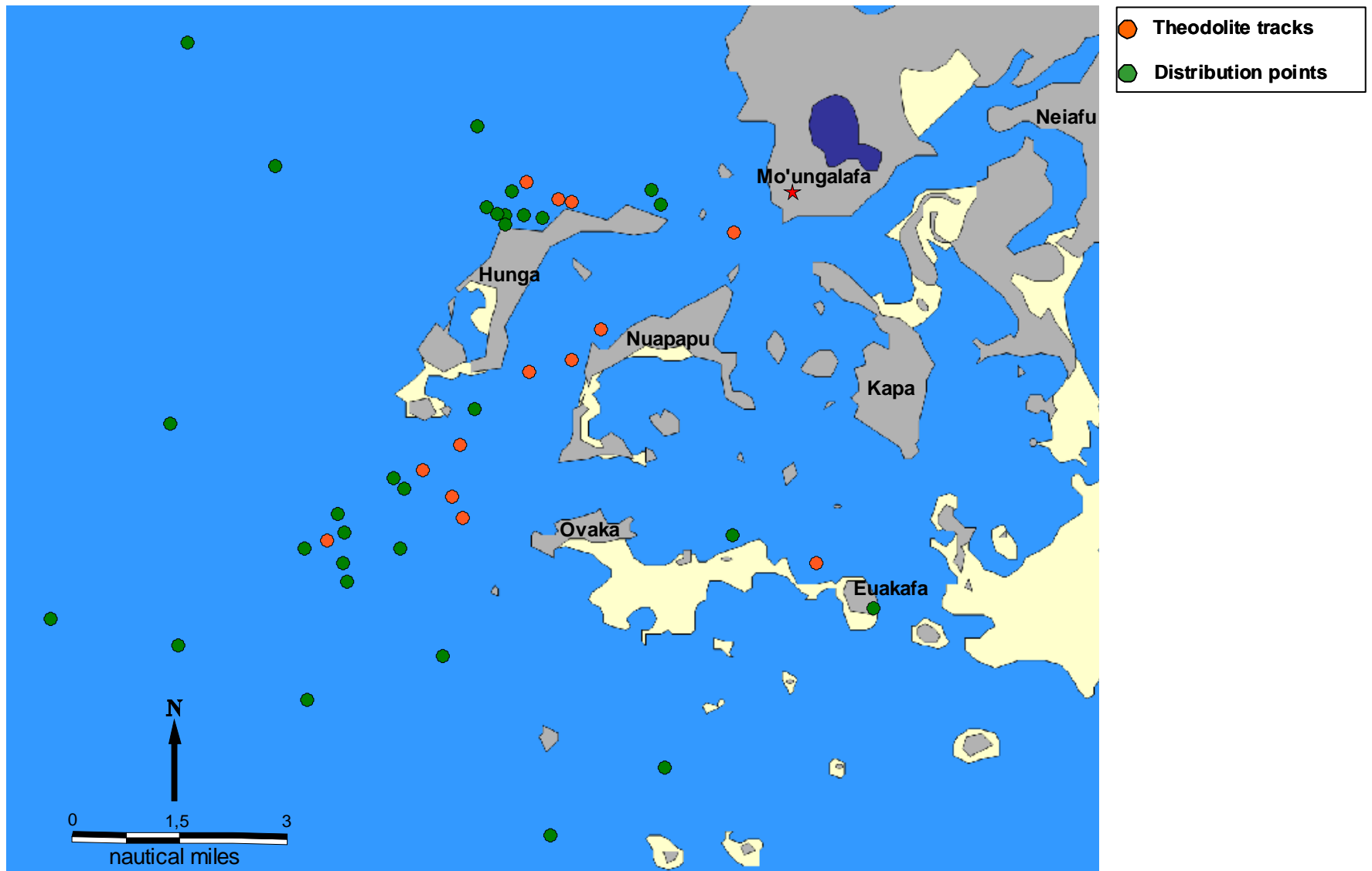


Figure 7. Distribution of humpback whale groups spotted from the land-based research station.

## 8. CONCLUSION

The pilot study conducted towards the assessment of humpback whale watching activities in Vava'u, Tonga, proved very successful and allowed to meet the different objectives appointed.

The collaboration with the different stakeholders initiated by the main investigator in 2007 was reinforced. Throughout the pilot study, group meetings and individual interviews were organised and enabled to provide an update on the project to a majority of the people consulted in 2007. Remaining issues and questions surrounding the research to be conducted also had the opportunity to be discussed.

The land-based research station was set up at Mo'ungalafa, the site which had been identified as most accurate for this project in 2007. It can now be used over the main part of this research project, and only needs the equipment to be reinstalled every year.

During the nine days available for data collection, a high number of humpback whale groups were sighted, and theodolite tracks were conducted both in the presence and in the absence of boats. The site chosen therefore proved to be efficient in collecting the type of data required to assess the potential effect of whale watching activities on humpback whales in Vava'u. The number of tracks obtained also tends to show that the two field seasons of two months each planned in the research proposal will provide sufficient data to conduct strong statistical analysis.

Due to the limited time available for data collection, the information gathered within the theodolite tracks is not sufficient to conduct statistical analysis, and therefore no conclusions can be drawn from this initial study. However, such information will be integrated to the final data set which will be used to compare the behaviour of humpback whales in the presence and absence of boats and swimmers at the end of this project.

By having fulfilled all the objectives set in this pilot study, another step has been taken towards the assessment of humpback whale watching activities in Vava'u. Information on the potential impact of these activities has now been strongly requested by NGOs, government authorities and tour operators for many years. Today, the completion of the main part of this long awaited project over the next two years is essential to ensure the sustainable development of the whale watching industry and the conservation of humpback whales in Tonga.

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## APPENDIX 1: participants to meeting in Nuku'alofa

First Name	Last Name	Department	Position	Email
Kepreen	Aho Veetutu	Tourism	Senior Tourist Officer	<a href="mailto:k_aho80@hotmail.com">k_aho80@hotmail.com</a>
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## APPENDIX 2: participants to meeting in Neiafu

First Name	Last Name	Organisation	Position	Email
Allan	Bowe	Whale Watch Vava'u	Owner	<a href="mailto:mounu@tonfon.to">mounu@tonfon.to</a>
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Bruno	Toke	Tonga Visitors Bureau	Officer in charge	<a href="mailto:tvbv@kalianet.to">tvbv@kalianet.to</a>
Paul	Stone	Dive Vava'u	Owner/Guide	<a href="mailto:info@divevavau.com">info@divevavau.com</a>
Kirsty	Russell	South Pacific Whale Research Consortium	Researcher	<a href="mailto:kirsty@cps.co.nz">kirsty@cps.co.nz</a>
Filipe	Tonga	IFAW Marine Centre	Manager	<a href="mailto:ifawvav@kalianetvav.to">ifawvav@kalianetvav.to</a>
Emma		Tonga Visitors Bureau	Australian Youth Ambassador	
Christy		Tonga Whale Watch Operators Association	Secretary	<a href="mailto:melindaseaadventures@yahoo.com">melindaseaadventures@yahoo.com</a>