

# Exposure of humpback whales to unregulated tourism activities in their main reproductive area in New Caledonia.

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## ABSTRACT

Whale and dolphin watching activities are demonstrating a strong growth worldwide, while raising the issue of their potential effect on cetacean populations and emphasising the need for management. Humpback whales have recently become the focus of an important tourism industry in the South Pacific, particularly popular in New Caledonia where observations focus on a small population of humpback whales in their main breeding ground. Despite considerable growth since its start in 1995, the industry remains unregulated. Between 2005 and 2007, a specific study was conducted in order to assess whale watching activities in New Caledonia. All data was collected from a land-based research station, using a theodolite. On average, whales were in the presence of 3.4 boats for 2 hours. Each boat spent an average of an hour with the same whales, but the cumulative observation time per pod was over 2 hrs 33% of the time. The number of boats with whales proved to be particularly high over weekends. While groups of humpback whales were mostly observed between 100 and 300 metres, boats were within 100 metres of groups with calves 40% of the time. These results indicate that humpback whales are highly exposed to whale watching boats in New Caledonia, to a level exceeding the limits most commonly stated by management measures worldwide. This could be particularly problematic for groups with calves. With the strong site fidelity characteristic of this breeding ground, such exposure also raises the question of cumulative impact. Management measures should be implemented in order to regulate whale watching activities and to ensure the conservation of humpback whales in New Caledonia.

## INTRODUCTION

Whale and dolphin watching activities have been expanding around the world, involving more than 90 countries and approximately 10 million participants each year (Hoyt, 2001). Today, whale and dolphin watching contributes substantially to the local economy of many countries, states and territories (Hoyt, 2001; Economists @ Large & Associates, 2008), and plays an important role in increasing public awareness on the need for conservation of cetacean populations (IFAW, 1997).

This increasing interest in watching cetaceans has led to concerns within the scientific community as to whether the repetitive presence of numerous boats around the animals may have an effect on populations. Several studies have shown that whale and dolphin watching can induce behavioural changes in many of the species exposed to these activities, and may therefore represent a threat to some populations (e.g. Baker et Herman, 1989; Corkeron, 1995; Sousa-Lima *et al.*, 2002; Williams *et al.*, 2002; Scheidat *et al.*, 2004; Bejder *et al.*, 2006; Stockin *et al.*, 2008). Many countries have now implemented management measures in order to regulate approaches to whales and dolphins. Today, managing the development of whale and dolphin watching and minimising the risk of adverse impacts is essential to ensure the conservation of cetacean species (IWC, 2000).

In the South Pacific Islands region, this industry has demonstrated a remarkable growth rate of 45% per annum since 1998 (Economists @ Large & Associates, 2008). In particular, humpback whales (*Megaptera novaeangliae*), migrating every winter from Antarctica to their tropical breeding grounds, attract thousands of tourists, and represent an important part of this development (Schaffar and Garrigue, 2007). New Caledonia is one of few South Pacific islands where humpback whales can be observed during the austral winter. Commercial humpback whale watching activities focus in the Southern Lagoon of New Caledonia, area identified as the main breeding ground for this population (Garrigue *et al.*, 2001). Since its start in 1995, whale watching has grown at an average annual rate of 46% and is now a well-established industry with 18 tour operators (Schaffar *et al.*, 2007). In 2005, approximately 3,109 people participated to humpback whale watching trips, generating a total economic value of US\$652,890 (Economists @ Large & Associates, 2008). Despite this considerable growth, whale watching activities have not yet been regulated in New Caledonia. The local government published guidelines on how to approach whales, but compliance is rare.

Humpback whales wintering in New Caledonian waters could be particularly vulnerable to this unregulated tourism industry. The species has not yet recovered from decades of whaling operations in the Southern Ocean, and the New Caledonian humpback whale population remains one of the smallest across the South Pacific Island region (Baker *et al.*, 2006). Moreover, strong site fidelity (Garrigue *et al.*, 2002), combined with demographic and reproductive isolation (Garrigue *et al.*, 2004), suggests a risk of cumulative exposure over the years (Schaffar and Garrigue, 2006).

Given the development of whale watching in New Caledonia and the characteristics of the humpback whale population, this activity may well have reached its maximum carrying capacity. A study was therefore initiated in 2005 in order to assess the potential effects of whale watching boats on the behaviour of humpback whales and make management recommendations for the conservation of this population. Here we present the results of a first assessment of the exposure of humpback whales to whale watching boats in New Caledonia.

## **METHODS**

All observations were made from a lookout point located 189m above sea level and overlooking the area where the majority of interactions between boats and whales occur. Observations took place from early morning to mid-afternoon over the main period of presence of humpback whales in this area (mid-July to mid-September). A team of three people was required to run the land-based research station.

A Sokkia Set 5 theodolite was used to monitor the movement and behaviour of humpback whales in the absence and in the presence of boats. The theodolite was connected to a laptop computer running the tracking program *Cyclopes* developed by Eric Kniest (University of Newcastle, Australia). This program was used to record data and to transform theodolite readings into GPS points.

Each group of whales was tracked for a minimum of 20 minutes combined with at least five theodolite points. During tracking sessions, the whales' position was fixed with the theodolite as often as possible. Social group type was recorded at the start of each tracking session and any subsequent change was noted along with the time of occurrence. Between each whale point, the position of all boats within 1000m of the whales was also recorded. Each boat was individually identified and difference was made between commercial and recreational boats. Based on the positions taken, the distance of each boat to the pod was calculated for each whale point using *Cyclopes*. Outside of tracking sessions, the number and identity of boats with pods of whales was recorded every 15 minutes. This information was compiled with the data obtained from tracking sessions where whales were in the presence of boats, which allowed to assess the number of boats with whales, the duration of observations for different types of boats, the cumulative time whales were observed by boats, and the distance at which whales were approached.

## **RESULTS**

### **Research effort and sample size**

Data was collected over three field seasons from 2005 to 2007 (Table 1). A total of 194.8 hours were spent tracking whales, within which a total of 175 independent tracking sessions were conducted (Table 2). Groups of whales were tracked for an average of an hour ( $\pm 0.8$ ), with some sessions lasting up to five hours. The majority of pods tracked were singletons and pairs (Figure 1).

### **Exposure to whale watching boats**

Each boat spent an average of an hour ( $\pm 0.7$ ;  $n=553$ ) with a pod of whales. This value was similar across all group types. On occasions, some boats stayed with the same whales for over four hours. Recreational boats tend to spend less time with whales than commercial whale watching boats, respectively 49.8 and 65.4 minutes on average. Each pod of whales was accompanied by boats for a cumulative time of 2 hours on average ( $\pm 1.17$ ;  $n=134$ ), with a maximum of 6.4 hours. Whales were observed by boats for over 2 hours 33% of the time (Figure 2).

Groups of humpback whales were accompanied by an average of 3.4 boats over the length of a tracking session. Over the 3 field seasons, the maximum number of boats simultaneously observed with a pod was 23. There were more than 5 boats with whales 25.4% of the time. A time specific analysis of the number of boats with whales showed that encounters with a high number of boats tend to occur over weekends and between 10am and 2pm (Figure 3).

Groups of humpback whales were mostly observed between 100 and 300 metres (Figures 4 and 5). Boats were within 100 metres of groups with calves 40% of the time.

## DISCUSSION

The results of this assessment tend to show that humpback whales wintering in the Southern Lagoon of New Caledonia are highly exposed to whale watching boats. This is particularly clear when one considers management measures in place around the world. The number of boats with whales, the length of encounters and the distance at which groups with calves are approached, are all above the limits usually enforced.

An analysis of 58 whale watching codes of conduct and regulations showed that the most common observation time allowable for boats was 30 minutes (Garrod and Fennel, 2004). In New Caledonia, commercial whale watching boats tend to spend more than twice that time with the same whales. Moreover, the cumulative duration of encounters often exceeds two hours. Almost half of the management measures reviewed also suggest no more than one boat at a time, 30% specified two, while 20% recommended three boats (Garrod and Fennel, 2004). Our observations have shown that the number of boats with whales is regularly higher than three, especially on weekends.

One of the main characteristics of breeding grounds is that it offers a safe environment for mothers to calve. In this context, regulation of whale watching activities usually contains specific measures regarding the approach of mothers and calves. Approach distances tend to be higher than for groups without calves and are usually restricted to 100 metres (Carlson, 2004). Our study shows that whale watching boats are within 100 metres of groups with calves 40% of the time, which is more than for groups without calves. Mothers and calves could be particularly vulnerable to such exposure as it may interfere with nursing or other social behaviour essential to their survival.

A code of conduct, including guidelines on how to approach and observe humpback whales, was produced by New Caledonian tour operators for the 2007 whale season. This code recommends a minimum approach distance of 100 metres for mothers and calves, and a maximum observation time of half an hour. It also suggests a limitation of 5 boats with a pod of whales at a time. Our results show that these guidelines are often breached and are therefore unlikely to provide accurate protection to humpback whales against the potential effects of whale watching activities in New Caledonia.

Considering the strong site fidelity of humpback whales observed in the Southern Lagoon of New Caledonia (Garrigue *et al.*, 2002), high exposure to whale watching boats raises the issue of cumulative impact. In fact, as many whales are resighted across and between seasons, this unregulated tourism activity is likely to expose repeatedly a small number of animals to a high level of whale watching activity. Further analysis will be required to assess the behavioural response of humpback whales to the presence of boats, and to investigate the potential effect of this repetitive exposure.

In order to minimize the potential effect of whale watching activities in New Caledonia, management measures should be implemented as soon as possible. The results of our assessment provide valuable information, which can be used to assist the development of such measures. First of all, the lack of compliance with voluntary guidelines indicates that self-regulatory measures are not sufficient to ensure the conservation of humpback whales in New Caledonia. Regulations will therefore need to include means of enforcement. It also indicates that specific efforts should be made towards limiting the length of encounters, the approach of mothers and calves, and the high number of boats during weekends.

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Table 1. Research effort.

Year	Dates	Number of days of observation	Number of hours of observations
2005	14 July - 4 September	42	235.85
2006	18 July - 17 September	51	329.03
2007	12 July - 19 September	53	308.00
<b>TOTAL</b>		<b>146</b>	<b>872.88</b>

Table 2. Number and types of humpback whale tracking sessions.

Year	Without boats	With boats	With and without boats	Before, during and after boats	Total
2005	11	23	5	1	40
2006	25	18	21	3	67
2007	26	20	20	2	68
<b>Total</b>	<b>62</b>	<b>61</b>	<b>46</b>	<b>6</b>	<b>175</b>

Figure 1. Percentage of tracking sessions per social group type.

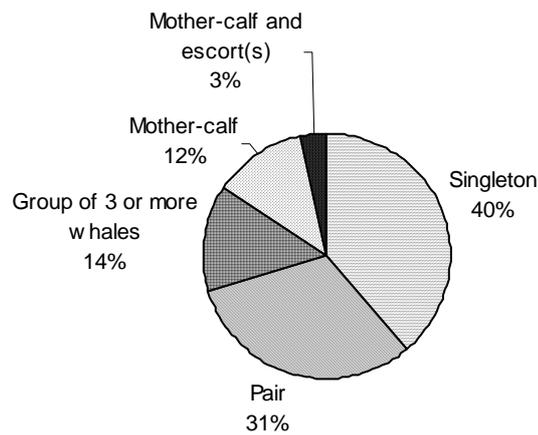


Figure 2. Cumulative time whales were observed by boats.

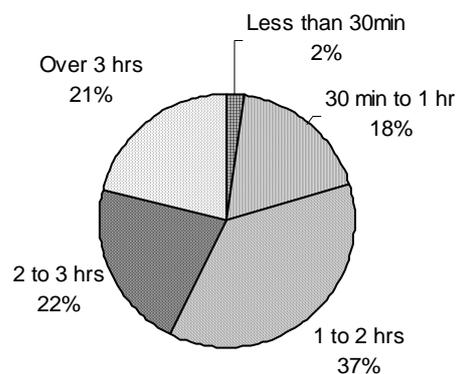


Figure 3. Average number of boats with whales per time of day, and weekdays versus weekends.

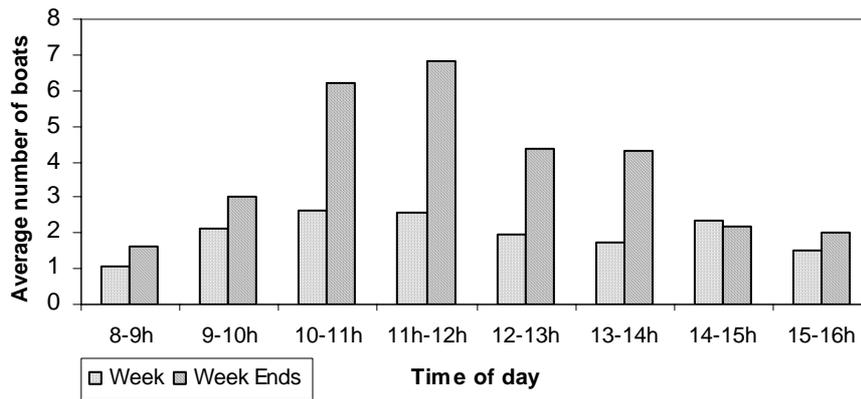


Figure 4. Distance of observation for groups with calves.

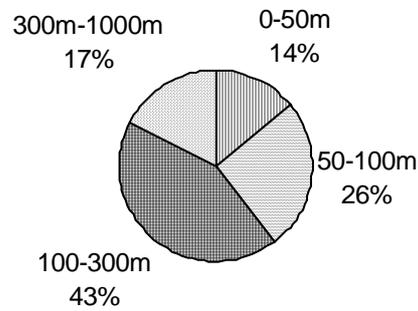


Figure 5. Distance of observation for groups without calves.

