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# Identification of a juvenile pygmy blue whale (*Balaenoptera musculus brevicauda*) in New Caledonia, South-West Pacific

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## ABSTRACT

This paper presents the first record of a blue whale (*Balaenoptera musculus*) in New Caledonia, south-west Pacific. The individual observed was a juvenile male. It spent more than a month in the shallow waters of the lagoon of New Caledonia, during which its condition appeared to slowly deteriorate, until it was attacked and eaten by sharks.

## INTRODUCTION

Blue whales have been severely decimated by the commercial whaling operations and despite a full world-wide protection since 1966 (Klinowska, 1991) their number still appear to be reduced except for a population of the eastern North Pacific (Baskin, 1993; Clapham et al., 1999). The distribution of blue whales in the high latitudes has been studied extensively from whaling operations (Nasu, 1963, 1966; Nemoto, 1957, 1959, 1970). Outside of these areas, Sears et al. (1987) reported observation in the sea of Cortez. Reilly and Thayer (1990) using twenty years of sightings effort in the ETP showed the presence of blue whales year-round in the vicinity of the Costa Rica Dome. And Palacios (1999) presented the occurrence of the species off the Galapagos. But evidence of blue whales are scarce in the central and western tropical Pacific Ocean except near the Solomon's Islands where some specimens have been observed in August (Reeves et al., 1999) and in the Cook Islands were a vertebrae has recently been identified using genetic tools as belonging to a blue whale (N.Hauser and M.Dalebout, pers. com.). Therefore observations of blue whale in areas where no information are still available are useful to better understand the distribution of the species. In this paper we present the first record of a blue whale in New Caledonia (166° E, 22° S), South West of the Pacific Ocean.

## MATERIALS AND METHODS

The platforms of opportunity used to observe the whale, were small motor boat and sailing boat. Some observation were also realised from land overhanging the bay. Behaviour was noted, interval between blows defined as « time between consecutive breaths per surfacing sequence » (Stone et al., 1992) were measured on the 11th, 16th, 20th and 27th of January. Photos and videos were taken and classified using the categories presented by Kato et al. (2002) to separate the true and the pygmy blue whales.

Skin sample was collected for genetic analysis using a crossbow and a special adapted bolt (Lambertsen et al., 1994). The sample was preserved in ethanol 70%. DNA extraction followed the protocol described by Sambrook et al. (1989) modified by Baker et al. (1994). A 550 base pair (bp) segment of the 5' end of the mitochondrial (mt) DNA control region was amplified using the Polymerase Chain Reaction (PCR) and the primers, M13-Dlp1.5-L and Dlp5-H (Baker at al, 1998). Temperature profiles consisted of denaturation at 94°C for 30 sec, annealing at 56°C for 40 sec and polymerase extension at 72°C for 40 sec. The PCR products were sequenced on an ABI 377 automated sequencer (Applied Biosystems Inc.) using BigDye™ Dye Terminator Chemistry. Molecular identification of the sex was carried out using the SRY system and ZFX positive control described in Gilson and Syvanen, (1998). The analyses were performed in the laboratory of Ecology and Evolution in the University of Auckland (New Zealand).

## RESULTS

### Species identification

#### Genetic

The skin sample was registered under the code NC02-01. The mtDNA sequence was introduced in the DNA surveillance software created by Ecology and Evolution laboratory at the University of Auckland, New Zealand. It was identified as a blue whale species (*Balaenoptera musculus*) based on published sequences as implemented in the DNA/surveillance program (Ross et al., in press) (Figure 3).

**Photographic**
The elongated shape of the body (figure 4) and the distinctive colour of the whale with the grey blue pattern, first allow to identify the animal as a blue whale *Balaenoptera musculus* (figures 4 and 5). Some photos were analysed in more detail in order to compare some anatomic characters to the ones described by Kato et al. (2002) in their attempt to distinguish true blue whale from pygmy blue whale. The shape of the blow hole (figure 6) presents an anterior tip of the central groove beyond anterior tip of nostrils. Named type A in Kato et al. (2002) this shape is only available in the pygmy form. The dorsal hump (figure 5) shows no humps while ridge present (type 3 in Kato et al. 2002). The general shape of the body could fit the "tadpole shape" of Kato at al. (2002).

**Field observation**
From the 26th of December 2001 to the 27th of January 2002 a juvenile blue whale was observed in the lagoon of New Caledonia where it stayed until its death. A total of 21 days of opportunistic and/or scientific observations were done. A total of 19 hours were spent at sea to collect information on behaviour. The first opportunistic sighting of this animal was the 26th of December 2001 in the western lagoon of New Caledonia (figure 1). An helicopter pilot described surface activity behaviour as "pectoral slapping". The following days opportunistic sightings reported that the animal was slightly moving to the east through the lagoon until it arrived in the Baie de Prony where it was first sighted on the 9th of January 2002.
From this date scientific observations were carried on. The behaviour of the animal and its dive pattern were noted. From the 9th to the 27th of January the whale stayed into the Baie de Prony , a 7 NM width bay composed of different small subsections (figure 2). Most of the bay is relatively deep, going under 40 m. Freshwater is running at the bottom of the bay. The animal first stayed in the open part of the bay, then from the 16th of January it moved deeper into the bay until its death the 27th of January. The animal spent this last day in very shallow water of just a few meters depth. Part of its body was cover with red mud that constitute the bottom of the bay.
From the 29th of December until the 26th of January, the blue whale was mostly swimming in a clockwise direction at slow speed. If a boat was present the animal took the boat as the middle point of its circle and if the boat try to go out of the circle, the whale always moved in order to again have the boat as the centre of its movement. It sometimes came and swam under the boat. This was the only behaviour reported. No fluke up have been seen. No feeding behaviour was observed although the whale was in a few instances observed with his mouth half-open, despite of considerable observation it was never seen feeding or defecating.
The means of the interval between blows are presented in table 1. It decreased regularly from the 11th of January until the 27th of January. The health status of the animal appears to decrease with time. The whale became thinner with bulging vertebrae. On the last day and during the whole day the animal was attacked by shark, at the end of the day it succumbed to these repeated attacks. The size evaluated to 16 m (J. Lebreus pers. com.) was measured after stranding to be 17.6m. Part of the skeleton, especially the skull are conserved at the Maritime Museum in Noumea, New Caledonia.

## DISCUSSION

We are aware that two forms of blue whales have been described from the Southern Hemisphere. The pygmy form (*Balaenoptera musculus brevicauda*) found primarily north of 60°S and the true blue form (*Balaenoptera musculus musculus*) found south of 60°S during the summer feeding season. For purpose of management, attempts was made to distinguish the true blue of the pygmy blue (Le Duc et al., 2001; Kato et al., 2002). The genetic distinctiveness of these two forms has not been yet established. Thus, we were not able to conclude which form our specimen represents, based on genetic data coming from the mtDNA.
Kato et al. (2002) identified three physical characteristics that could be used to separate the subspecies; they are the shapes of the blow hole, of the back and of the entire body. The blow hole region of the animal photograph in New Caledonia fits with the category A described in his paper which is only available in the pygmy form. Kato et al. calculated a posterior probability of 0.947 (CV:0.053) that a whale having a type A is a pygmy blue whale.
The shape of the back fits with the type 3 that could be find in the two subspecies but which is more widely distributed in the pygmy blue. This physical design must be taken with care as it could also be due to the starving state of the animal. The body shape could be classified as a "tadpole shape" that is also characteristic of the pygmy subspecies. Following the physical characteristics described in Kato et al. (2002) the blue whale that died in Baie de Prony could be identified as belonging to the subspecies *Balaenoptera musculus brevicauda* or pygmy blue whale with a probability range between 0.947 and 0.999.
The reason why this animal spent a month in the lagoon is not clear. No scars were observed on the animal that could have been interpreted as an attack by predators (Sears, 1990) therefore we concluded that the stay in the Baie de Prony was not due to predator attacks. Most of the information on feeding ecology of blue whale comes from cold temperate North Hemisphere with the exception of the population of blue whale that feed in the southern Australian coastal upwelling zone that have been recently discovered (Gill, 2002). The fact that no

feeding behaviour was observed during the stay in the lagoon corroborates that foraging have not been considered as a factor in the low latitude distribution (Macintosh, 1966).
From the small size of the whale we could hypothesis that this young animal have not yet been weaned and that it entered the lagoon searching for a refuge. Considering the timing of occurrence of whales on the southern Australian feeding ground with whales observed from December and a peak of the season in March and April we could hypothesise that the juvenile blue whale that died in the Baie de Prony could have been "en route" to the feeding ground.

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**Table 1 – Interval between blows**

| Date | mean | N |
|---|---|---|
| 11 January 2001 | 3'08 | 31 |
| 16 January 2001 | 2'13 | 41 |
| 20 January 2001 | 1'30 | 92 |
| 27 January 2001 | 0'44 | 222 |

**Figure 1 – Location of New Caledonia in the South Pacific**

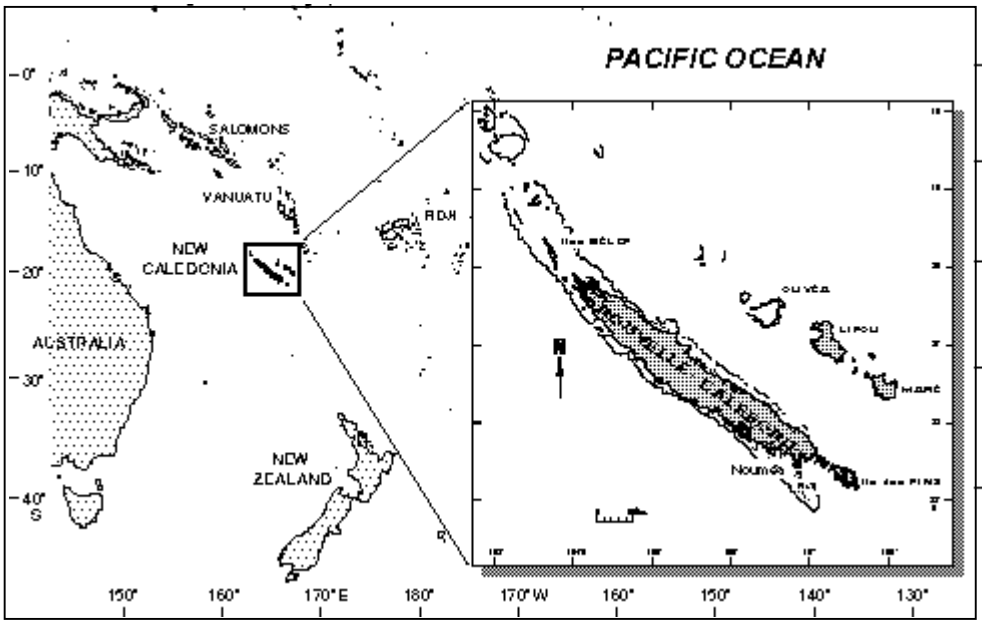


**Figure 2 –Location of Baie de Prony where the whale stay for a month.**

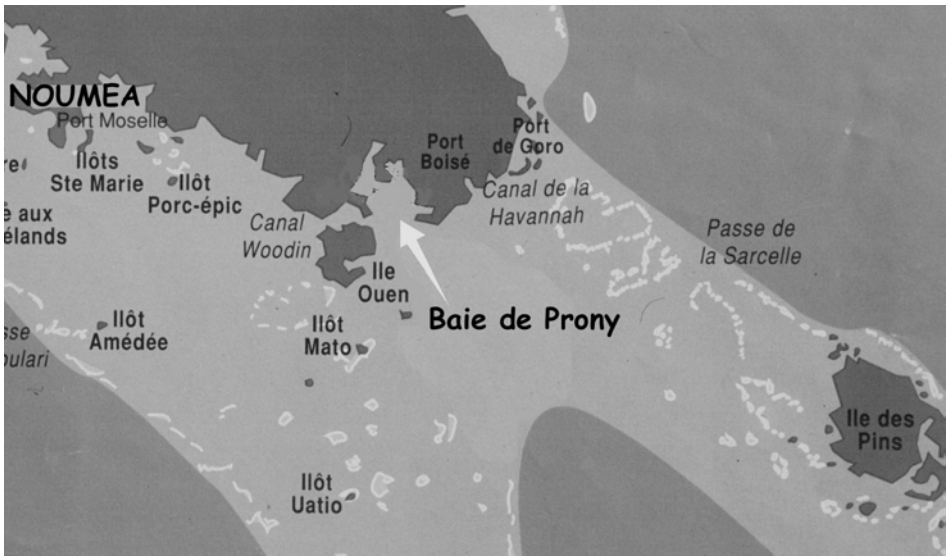

**Figure 3 – Result of the analysis performed by the DNA/surveillance program**

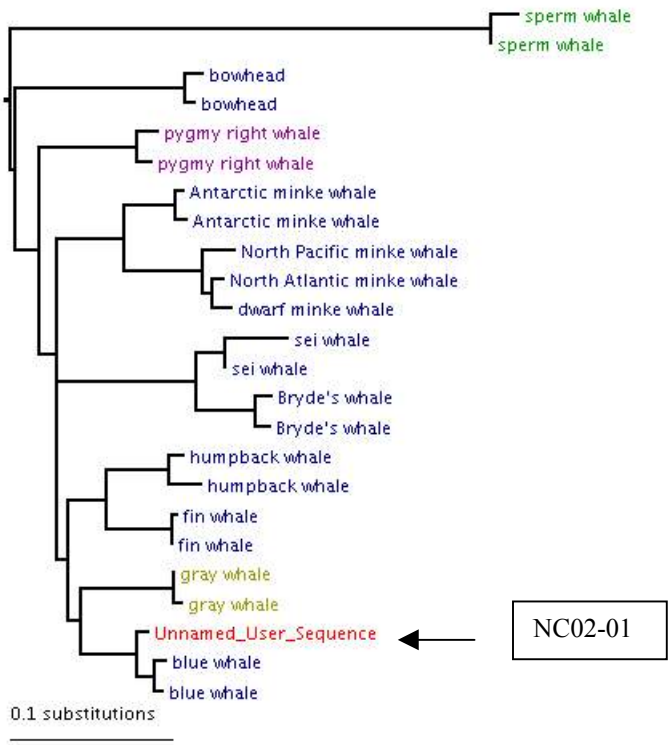

**Figure 4 – Aerial view (Photo: P.Larue)**

**Figure 5 – Shape of the back (Photo: D.Breitenstein)**

**Figure 6 – Shape of the blow hole (Photo : D.Breitenstein)**