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# OBSERVATIONS OF HUMPBACK WHALES *Megaptera novaeangliae* IN NEW CALEDONIAN WATERS DURING 1991–1993

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**Abstract**

*Recent sightings confirm that humpback whales* Megaptera novaeangliae *migrate to New Caledonia. Totals of 37 and 73 incidental sightings were made during the winter and spring of 1991 and 1992 respectively. Sightings were distributed widely all around New Caledonia, but concentrated in the south, mainly around Noumea, Ile des Pins and the Southeast Lagoon, areas with the highest human visitation. Very young calves were photographed in some sightings.*

*Encouraged by the number of sightings, in August 1993 we commenced a programme of photo-identification and behavioural observation in the Southeast Lagoon. In five days of field work, 12 humpback whales were individually identified. One of these was a resight of an animal previously photographed off the coast of Queensland, Australia, in 1991. This supports the hypothesis that humpback whales migrating to New Caledonia are from Antarctic Area V stock.*

*'Surface active' group behaviour, typical of male competition for females in breeding areas, was also noted, and humpback whale song was detected on every day on which it was monitored for in the study area. Several juvenile animals were also observed. We interpret these observations as strong evidence that humpback whales mate and calve in New Caledonian waters.*

*Keywords:* humpback whales, *Megaptera novaeangliae*, photo-identification, behavioural observation.

## INTRODUCTION

For management purposes, southern hemisphere baleen whales have been classified into six groups or areas by the International Whaling Commission on the basis of their aggregation in Antarctic summer feeding grounds (Mackintosh, 1965). The IWC banned the capture of southern humpback whales *Megaptera novaeangliae* in 1963. The Area V Antarctic stock (130°E–170°W), as suggested by Dawbin (1966), segregates into at least two streams after feeding in Antarctic waters. One migratory stream, the 'east Australian group', passes the eastern Australian coast and another, the 'New Zealand group', passes New Zealand to Norfolk island, Tonga and Fiji (Brydent *et al.*, 1990). Humpback whales have been recently reported from Tonga (Abernethy *et al.*, 1992). From a retrospective pre-whaling estimate of 10 000 animals passing the east coast of Australia, Chittleborough (1965) considered that approximatively 500 animals survived at the end of 1962.

Reports of humpback whales in the New Caledonian archipelago date from at least 1842 (Pisier, 1975), and another early report cites 'hundreds' seen at Lifou in the Loyalty Islands (Bérard, 1854). Recent oral history interviews indicate that a few humpback whales wintered around New Caledonia and in the Loyalty Islands in living memory, and humpbacks were 'Discovery'-tagged around the Loyalty Islands during the 1950s (Dawbin, 1964).

However, the number of incidental sightings appears to have increased during recent years, so in 1991 we decided to initiate a survey of the New Caledonian lagoons by collecting incidental sightings information from frequent users of the sea. Most of the incidental sightings information presented in this paper results from the interest of the general public in whales. We recognise that with this type of data it is impossible to quantify sightings effort, so we will not attempt to discuss abundance of the humpback whale population. However, we feel that such a survey can give useful information on the distribution and population composition of humpback whales in these waters.

Encouraged by the results of the incidental sightings survey, we conducted a preliminary photo-identification and behavioural study in August 1993.

## METHODS

### Incidental sightings

In 1991 and 1992 requests for notification of humpback whale sightings were published in the local newspaper

'Les Nouvelles Calédoniennes' (daily circulation 18 000 copies) and a standard whale sighting form was distributed to a wide range of potential observers such as marine researchers, fishermen, charterboat operators, dive shop owners, the navy, and airborne police. In 1992 the sightings form was also published in the free newspaper 'Le Gratuit' (circulation 8000, twice weekly), and in the CNC (Club Nautique Caledonien) quarterly bulletin. It was also distributed at the two main harbours of Nouméa (CNC and Port Moselle), at the Fisheries Division of each New Caledonian Province, at the Aquarium, at the University, and at ship chandlers.

Readers were asked to record details of location, time and date of sighting, direction of travel, group sizes, presence of calves and observed behaviour. All observers were encouraged to forward photographs of sightings. Upon receiving the sighting forms we established the reliability of species identification either by examination of photos presented by the observers, or by discussion with them. If identification could not be confirmed beyond doubt, sightings reports were discarded. The data thus obtained were then analysed to obtain temporal and spatial distribution of the animals. For spatial distribution, New Caledonian waters were arbitrarily divided into six geographical zones, as indicated on Fig. 1(a) and (b).

Different social groupings were categorised according to Darling *et al.* (1983), in order to calculate frequencies of each. They comprised (a) 1 adult; (b) 1 adult + 1 calf; (c) 2 adults + 1 calf; (d) more than 2 adults and 1 or more than 1 calf; (e) 2 or 3 adults only; (f) more than 3 adults only. We have added a seventh group: (g) 1 or more than 1 calf alone.

**Photo-identification and behavioural study**

Humpback whales often have unique pigmentation patterns on their tail flukes and on their flanks (Kaufman *et al.*, 1987); and the shape and markings of the dorsal fin may also be unique (Chu & Nieukirk, 1988). Photo-ID of these features permits the histories of individual animals and possible migratory routes to be determined by resighting. It also permits the evaluation of the population size after successive years of study (IWC, 1990).

In August 1993 a pilot photo-identification and behavioural observation programme was commenced in the Southeast Lagoon with the logistic support of the Provincial Government. Five days were spent between Ile Ouen and Havanah Pass in Zone II. Humpback whales were first sighted in the early mornings from the lighthouse at Cap N'doua (22° 24' S, 166° 55' E; height a.s.l. 189 m), which affords an excellent view of the study area. The 15 m vessel (equipped with GPS for accurate position fixing) then approached the whales, and they were followed for photo-ID using 35 mm SLR cameras with 200 and 300 mm lenses and behavioural observations recorded in real time using cassette recorders. Acoustic monitoring for whale sounds was conducted whenever possible, using an Edmund Scientific 41759 hydrophone, connected to a Sony WMD6-C Walkman Professional cassette recorder via a 40 dB preamplifier (system response 30-6000 Hz).

**Table 1. Temporal distribution of the humpback whale sightings in 1991 and 1992**

| Months | 1991 sightings | 1992 sightings |
|---|---|---|
| June | 1 | 3 |
| July | 4 | 11 |
| August | 11 | 28 |
| September | 12 | 21 |
| October | 7 | 7 |
| November | 2 | 2 |
| December | 0 | 1 |
| Total | 37 | 73 |

## RESULTS

**Incidental sightings**

We are unable to establish a relationship between the number of sightings and the number of whales sighted, and for this reason the present results will be expressed in terms of the number of sightings, rather than the number of whales.

Temporal and spatial distribution of sightings are presented in Fig. 1.

*Temporal distribution*

Encounters with humpback whales occurred from June to November inclusive. Table 1 shows the distribution of the sightings by month for 1991 and 1992 respectively. The sightings peaked in August and September in both years. They represent, respectively for 1991 and 1992, 62·2 and 67·1% of all observations. First sightings for the season were made on 24 June 1991 and 18 June 1992. Last sightings were on 10 November 1991 and 8 December 1992.

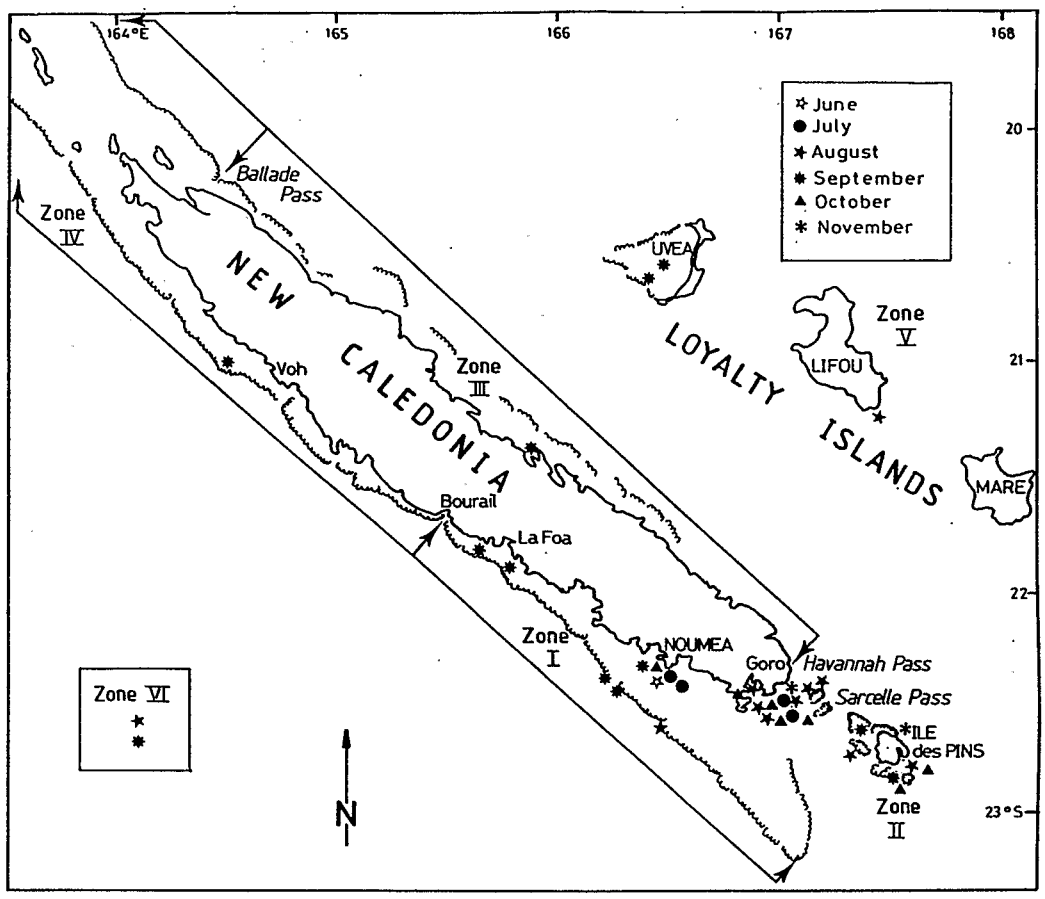
*Spatial distribution*

Humpback whales were reported in all zones around New Caledonia and in the Loyalty Islands (Fig. 1). About half of the sightings were made in zone I (62·2% in 1991 and 47·9% in 1992).

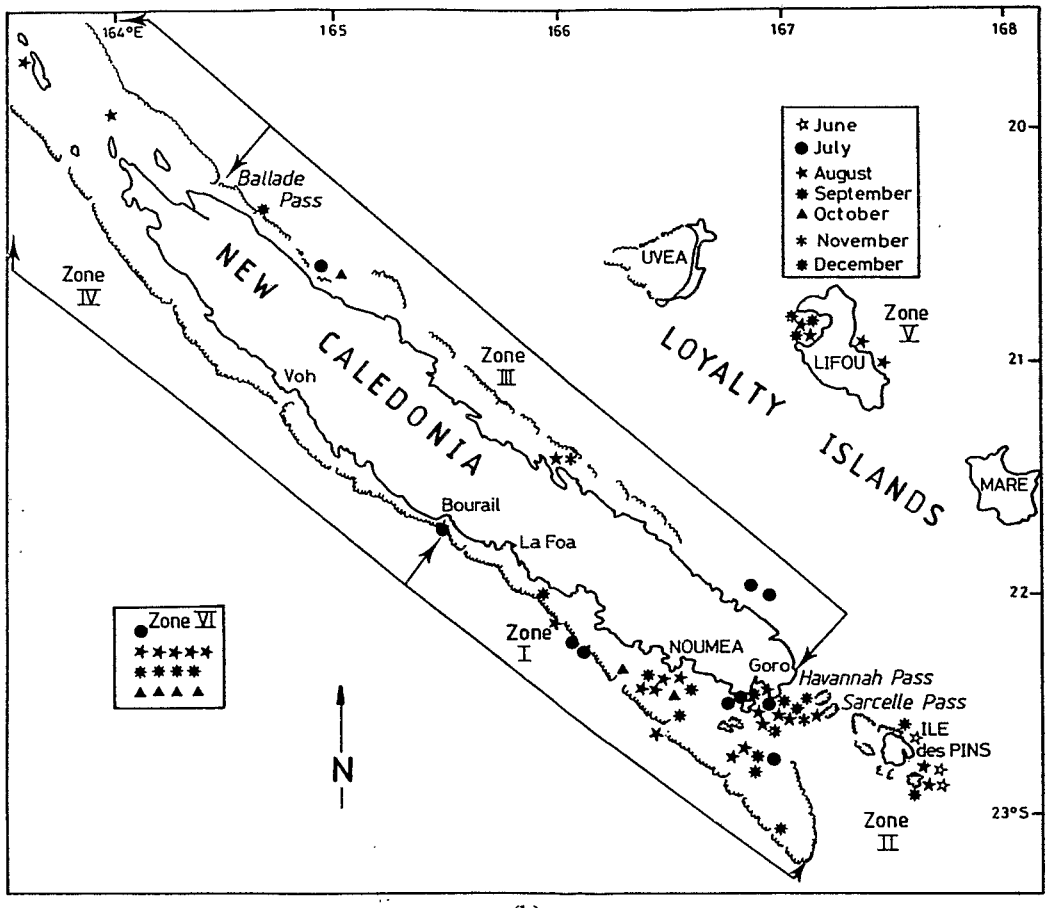
*Social groupings*

Spatial distribution of the various categories of social groupings are presented in Fig. 2, and their temporal distribution in Table 2. Calves were first reported on 16 August 1991 and on 18 June 1992. About half of all calves were accompanied by only one other animal, presumably the mother. The most common grouping observed in 1991 was more than three adults without calf, and in 1992 one adult alone, next was a group of two or three adults without calf.

While the identification of calves depended on the subjective judgement of the observers, we have seen two photographs taken on 10 September 1991 and 17 September 1992 (Fig. 3), which clearly show very young

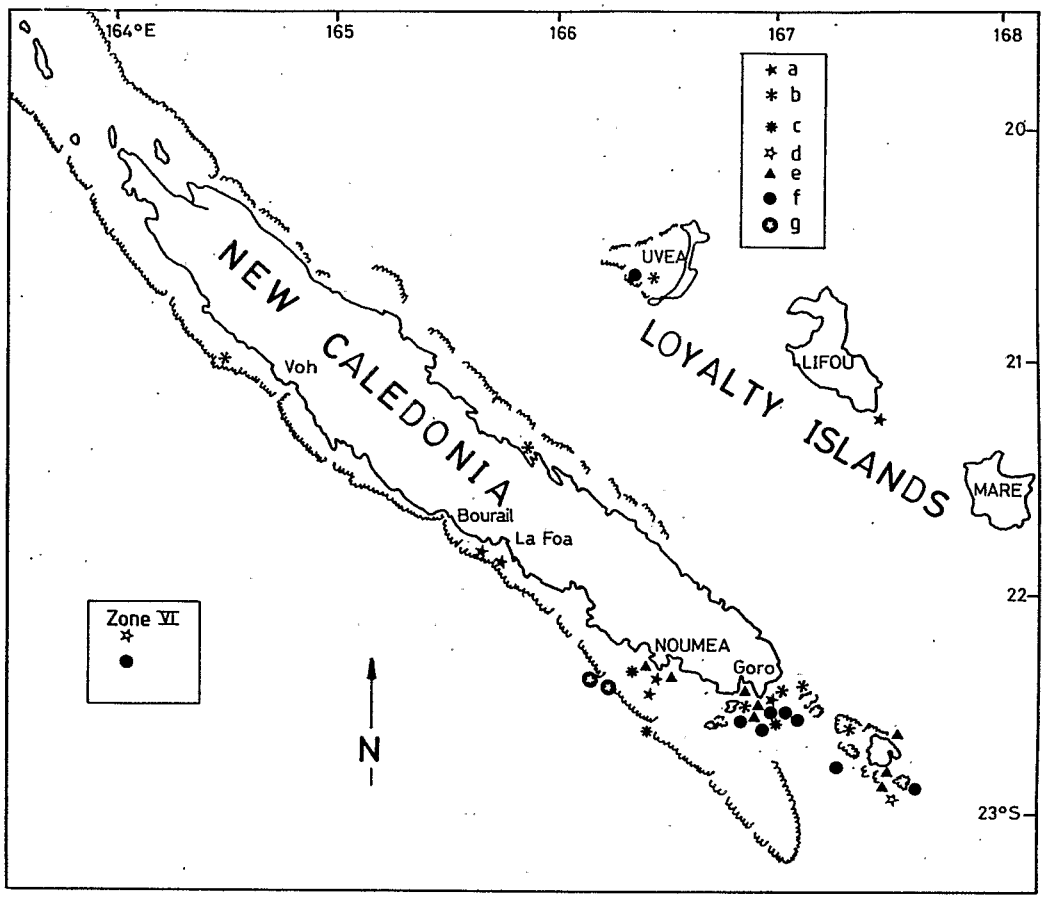



(a)

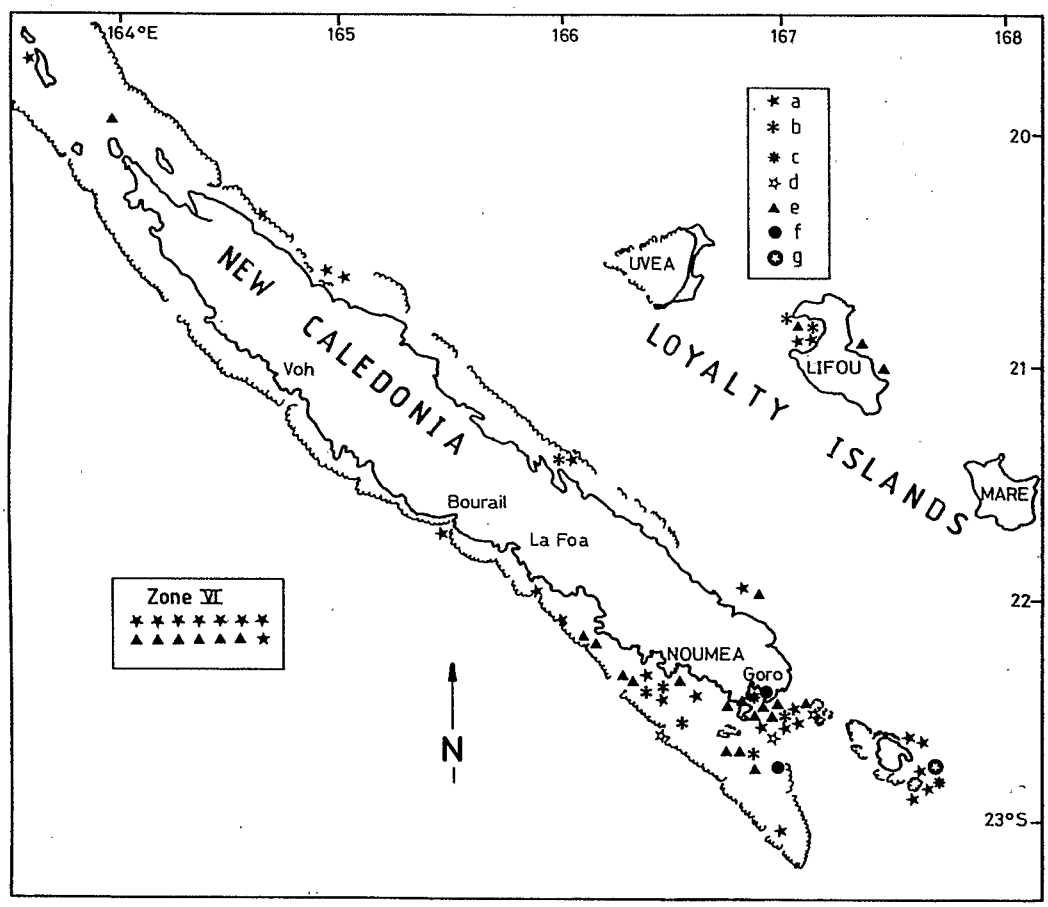



(b)

**Fig. 1.** Occurrence of humpback whales around New Caledonia during various months in (a) 1991 and (b) 1992. Each symbol represents a group of whales.




(a)




(b)

**Fig. 2.** Occurrence of social groupings sighted during (a) 1991 and (b) 1992. For explanation of categories (a) to (g), see Methods.

**Table 2. Temporal distribution of the social groupings of humpback whales during 1991 and 1992[a]**

| Months | 1991 | | | | | | | 1992 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | c | d | e | f | g | a | b | c | d | e | f | g |
| June | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| July | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 4 | 0 | 0 | 0 | 7 | 0 | 0 |
| August | 1 | 3 | 1 | 0 | 2 | 4 | 0 | 9 | 3 | 0 | 2 | 12 | 1 | 1 |
| September | 2 | 4 | 1 | 2 | 0 | 1 | 2 | 11 | 4 | 1 | 1 | 4 | 0 | 0 |
| October | 1 | 0 | 0 | 0 | 3 | 3 | 0 | 4 | 1 | 0 | 0 | 2 | 0 | 0 |
| November | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| December | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Total | 6 | 7 | 3 | 2 | 8 | 9 | 2 | 31 | 8 | 2 | 3 | 26 | 1 | 2 |

[a]For explanation of social groupings (a) to (g), see Methods.

animals. The first of these was apparently newborn (based on body proportions, wrinkled skin, and pale coloration) and solitary, possibly abandoned by its mother.

## Field observations

*Photo-ID*

Adverse weather conditions and unavailability of vessels limited fieldwork to only five days, during some of which conditions (winds of 20 knots or more) made detection of whales difficult. Nevertheless, we were able to identify 12 individuals of an estimated 15 observed. Of these, two were identified by lateral body surface (including the dorsal fin) only, and the remainder by either the ventral surface of the flukes alone, or by the ventral surface of the flukes as well as the lateral body surface including the dorsal fin.

A photographic match for an animal identified on 19 August 1993 (animal number HNC002) was found in a recently published catalogue of Australian humpback whale flukes (Kaufman, 1993). Identified as catalogue number E1000, it had been photographed in Hervey Bay (25°S 153°10'E) and off Point Lookout (27°26'S 153°33'E), Queensland, in 1991, by the Pacific Whale Foundation.

*Observed size classes*

Animals were classed according to size as adult, or mature (11 m or more), juvenile or yearling (around 8 m), or subadult (intermediate sizes) (Leatherwood & Reeves, 1983). Totals of nine adults, three subadults, and three juveniles were observed. No calves were observed. On two occasions adult–subadult pairs were seen, on one occasion four adult animals were seen together (see Observed behaviour, below), and on three occasions solitary juveniles were seen. Occasionally other whales were seen breaching in the distance, but were not approached for identification or determination of size.

*Observed behaviour*

High-energy displays and song were observed in various groups and individuals. On 24 August a group of four mature animals was observed for nearly two hours, during which the group moved rapidly and erratically, frequently displaying pectoral slaps, peduncle slaps, tail slashes, head lunges and physical charges (all often directed at another animal in close proximity), as well as bubblestreams, 'trumpet' blows, social sounds and song (Fig. 4). These behaviours are considered to be typical of groups in which males compete for reproductive access to a female (Tyack & Whitehead, 1983;

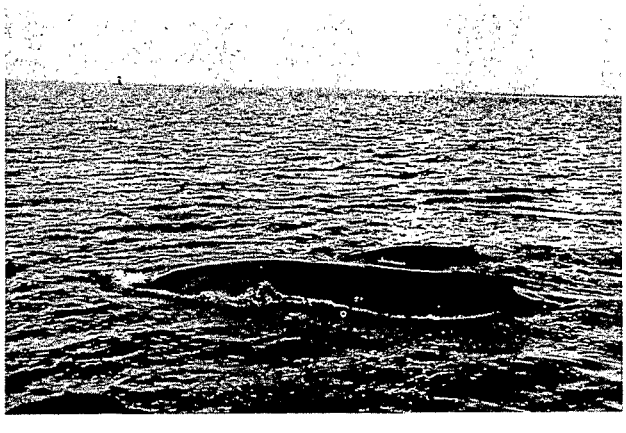


**Fig. 3.** Humpback whale mother and calf, 17 September 1992.

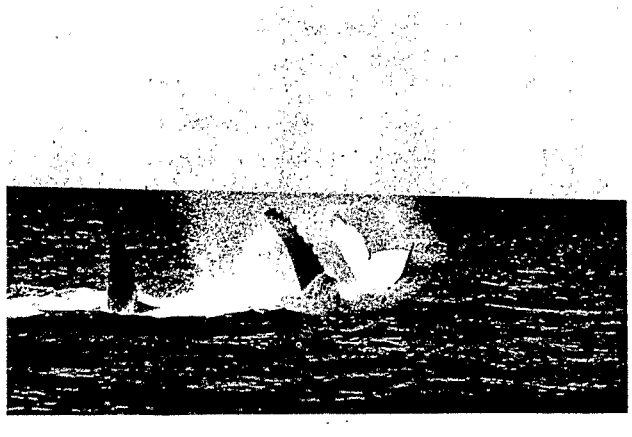


**Fig. 4.** Surface active group of humpback whales, 24 August 1993

Baker & Herman, 1984; Silber, 1986), and this was the first time they have been reported in New Caledonian waters.

The three juvenile animals observed characteristically displayed initial avoidance of the vessel, followed on two occasions by displays such as breaching and lob-tailing. All were solitary when sighted, although one of the three affiliated and disaffiliated several times with an adult–immature pair over a 90-min period. The third juvenile sighted, after initial avoidance, closely approached the stationary vessel and permitted swimmers in the water with it for nearly an hour.

On two occasions, mature–immature pairs remained in close proximity to each other for the entire observation period of over an hour in each case.

Song was heard on every day when monitoring was possible, or on 10 of 20 occasions monitored for. This compares favourably with Tonga, where song was heard on only three of 32 occasions (Abernethy *et al.*, 1992). However, our studies were confined to one area, whereas the Tongan study surveyed a wide area, so this comparison may not be valid. Songs recorded in the New Caledonia study area in 1992 and 1993 have undergone a preliminary comparison with song from eastern Australia to enable determination of stock identity (Payne & Guinee, 1983). While this analysis will be reported in detail elsewhere (Gill *et al.*, in press) it has shown that song from both areas is structurally very similar.

## DISCUSSION

A great barrier reef of 1600 km rings the coasts of New Caledonia from 19°S to 22°S. It delimits a lagoon of 23 400 km$^2$ (Testau & Conand, 1983). On the west coast the reef closely approaches the coast, so from La Foa (21°50'S) to Voh (21°S) there is just a very shallow lagoon which cannot be used by humpback whales. The North Lagoon is the largest but very few people visit it, though humpback whale song has been recorded there in 1992 by one of us (P.C.G.). On the east coast the barrier reef is discontinuous whereas in the southwest the Southeast Lagoon is well delimited by the barrier reef. The southern part of the reef draws away from the coast and opens to the sea. The Southeast Lagoon thus resembles a funnel leading towards the Baie du Prony where many whale sightings have been made, and where the study area for 1993 was situated. It is possible that whales enter the lagoon by this route and follow it in a northerly stream. If they then swim up the west coast they must exit the lagoon when the water becomes too shallow; they can then re-enter further north. If they travel up the east coast, they can navigate inside or outside of the lagoon according to breaks in the barrier reef.

Most of the incidental sightings occurred in the southern part of New Caledonia (zones I and II). This may simply be a result of the pattern of human usage of the region, which is frequently visited by many people, including fishermen. Noumea, the main town of New Caledonia, is situated in zone I where many people engage in recreational boating or fishing during weekends and school holidays. Due to the remoteness of some other areas, it is possible that they were not surveyed. It is also likely that many people have sighted whales but not reported them, due to ignorance of the survey, or for other reasons. We are unable to determine whether the low number of records from the East, North and West lagoons (zones III and IV) is an artifact of low levels of human activity, or a reliable indication of whale habitat usage. The increase of sightings in zone VI (surrounding oceanic waters) during 1992 is explained by the increasing number of deep-sea fishermen interested in our request. They are the first and the last people to see whales during the season.

Slijper (1962) considered that the Area V humpback whale stock has three calving grounds: the east Australian coast, the Coral Sea and the Tongan region. Townsend (1935) analysed whale catches from log books from 19th century American whale-ships. They indicated that humpback whales were killed in the vicinity of latitude 20° in their respective hemispheres during late winter and spring months, but the species was not recorded (i.e. not taken by whalers) in the lagoon waters of New Caledonia (probably because navigation inside the reefs was too dangerous for whaling vessels) or in the Loyalty Islands. However, Townsend (1935) does not discuss French whaling vessels, some of which certainly killed humpback whales in New Caledonian waters (du Pasquier, 1982). The great majority of kills described by Townsend (1935) were taken near Tonga and in the eastern Coral Sea during the months of July, August and September and it has been assumed that these areas were calving grounds. Dawbin and Falla (1949) considered that the vicinity of Chesterfields Islands, in the Coral Sea northwest of New Caledonia (about 17°–22°S; 157°–163°E) was the breeding ground of humpback whales passing the eastern coast of Australia; their opinion was based on Townsend's (1935) charts. However, Paterson and Paterson (1984, 1989) and Simmons and Marsh (1986) reported that an important calving ground for the east Australian humpback whale population is in Great Barrier reef waters in the vicinity of 20°S.

There is an oral tradition of humpback whaling at Lifou in the Loyalty Islands, and small numbers of humpback whales were marked near Vanuatu and New Caledonia in the eastern Coral Sea in the 1950s, though none of those marks was subsequently recovered elsewhere (Dawbin, 1964). Also, no humpback whaling is known to have occurred in these waters during this century (Dawbin, 1964), so animals marked in Australian waters could not be recovered near Vanuatu or New Caledonia. Consequently a humpback whale migratory connection between the east Australian coast and the eastern Coral Sea has been unproven until now (Paterson & Paterson, 1984; Paterson, 1990). The photographic resight in New Caledonia of a whale initially identified in eastern Australia has finally established that there is migratory interchange between the

two areas, and that humpback whales which migrate to New Caledonia are from Area V stock. This is further supported by close similarity in song between the two areas (Gill *et al.*, in prep.). While migration routes to New Caledonia remain unknown, humpback whales were taken at Norfolk and Lord Howe Islands in the southern Coral Sea (Townsend, 1935; Dawbin, 1964), so a migratory path north from New Zealand along submarine ridges past these islands cannot be ruled out.

In eastern Australia the main northward migratory stream of humpback whales passes through the waters of southern Queensland in June and July while the southward migrating whales traverse this area in September and October (Bryden, 1985; Paterson, 1985, 1990), and whales are present in the breeding waters off north Queensland from June to October (Simmons & Marsh, 1986). In New Caledonian waters, the pattern is more similar to northern than to southern Queensland. During the season, humpback whales may be seen moving either north or south along the coasts in approximately equal numbers. In Hawaii and the West Indies, breeding areas are characterized by shallow waters (15–60 m deep) with surface water temperatures of 25°C, and 24–28°C respectively, and sheltered areas for mothers with young calves (Herman & Antinoja, 1977; Whitehead & Moore, 1982). Many of the New Caledonian lagoons are of suitable depths (Richer de Forges, 1991), and contain an abundance of protective reefs and islets, although water temperatures are lower than in Hawaii and the West Indies, reaching a minimum of about 20°C.

We therefore propose that the lagoon waters of New Caledonia (and the lagoons and bays of the Loyalty Islands) are not merely points past which humpback whales migrate to a destination further north though it is likely that some do continue as far as Vanuatu, where recent sightings have also been reported, but in fact constitute migratory breeding destinations in themselves. In support of this, we cite the following evidence: humpback whales are frequently sighted during the austral winter and spring in waters surrounding New Caledonia, including newborn calves; group behaviour (including frequent song) indicative of breeding has now been observed; and juvenile animals, which are likely to show maternally directed fidelity to breeding grounds (Baker *et al.*, 1990), have been observed in the 1993 season.

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