CETACEANS IN WATERS OF MARTINIQUE (FWI), LESSER ANTILLES: RESULT FROM A FIRST DEDICATED SURVEY.

Jérémie S. (1,2), Bourreau S. (2,3), Gannier A. (2,3) and Nicolas J-C. (1).

(1) Société d'Etude de Protection d'Aménagement de la Nature à la MARtinique 140 Cité Saint-George, 92233 Schoelcher, Martinique (FWI)

(2) Groupe de Recherche sur les Cétacés BP 715, 06633 Antibes, France

(3) Centre de Recherche sur les Cétacés-Marineland 306 avenue Mozart, 06600Antibes, France

INTRODUCTION

Oligotrophic to mesotrophic waters can be observed in Lesser Antilles in contrast to only oligotrophic waters found further north in the Caribbean Sea (Agard & Gobin, 2000). A large diversity of cetacean inhabit the Caribbean Sea waters including near thirty species that are subtropical, tropical or widely distributed in the Atlantic Ocean (Debrot *et al.*, 1998). In the Lesser Antilles, twenty-five species occurs (Ward & Moscrop, 1999) but few data were available so far. From 14 March to 4 April 2003, a survey initiated by SEPANMAR took place in waters of Martinique with the assistance of C.R.C-Marineland and GREC. This initial survey enabled to determine 11 species with indications on abundance and distribution.

MATERIAL AND METHODS

Field Methods

The survey was carried out during twenty-two days within 12 to 15 nautical miles from coastline with a 11 m catamaran. Random "zig zag" transects were defined and cruised weather permitting (Fig.1). The survey was divided in two distinctives periods :

- a first period from 14 and 23 March on the leeward side of the island offered workable sea condition despite a relatively strong wind.
- a second period from 24 March to 4 April allowed to sample the windward side taking advantage of better weather condition.

The survey protocol was an application of the line transect method (Buckland *et al.*,1993). On each segment, the speed of the boat was maintained between 4.5 and 6 knots and a GPS was used to record the track.

Three experienced observers were searching frontal sectors with naked eyes (2.5 m above the sea level) and reticulated binoculars were used for measuring bearing and radial distance to the detected animals. A 40 m towed hydrophone allowed to perform acoustic sampling every 2 miles or 20 min. Boat's track and a number of informations about sighted animals (species, number, group composition, behaviour, etc) were logged on standard forms and further loaded in a computer database.

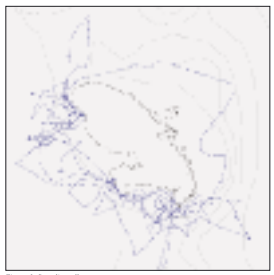

Figure 1. Sampling effort.

Data analysis

For all on-effort sightings, distance to shore was mesured on charts and *Oedipe* software (Massé & Cadiou, 1994) used to assess species distribution. From *delphinids* visual data Relative Abundance Index (RAI) was computed with Distance 2.2 software (Laake *et al.*, 1994). Our relative abundance was obtained from the density estimator of Buckland *et al.* (1993) : $D = (n / L) \cdot E(s) / 2\,esw$

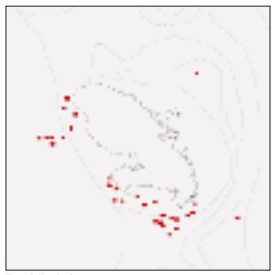

Figure 2. Visual sightings

Where **n** is the number of sightings, **L** is the effective effort in km, **E(s)** is the mean school size and **esw** is the effective detection half-width, wich was considered constant for each period of survey. Then, **R = (n/L) * E(s)** was estimated for each period with only effort covered with a sea state and wind conditions of Beaufort 3 as in Gannier (1999). [(n/L) represents the sighting rate].

Acoustic datas were used to calculate acoustic abondance index as following: **FAS j,k % = (Nda j)k / Σ (Nda j)** where **Nda** is the number of positive sightings for a species, **j,** within a stratum, **k.** Distribution pattern for each species, were estimated as a relative sighting rate for individuals in each stratum shallow waters area (0-1000 m) and deep waters (>1000m).

Jérémie. S.

RESULTS

The global effort totalised 1315 km from wich we obtained an effective effort (sea state under Beaufort 3) of 815 km (62%) respectively divided in 542 km for the first period and 273 km for the second.

Results from visual data

A total of 33 sightings (Fig.2) allowed to observe 39 groups of cetaceans. They belong to 14 different species from which 11 were identified with certitude: *Stenella attenuata, Stenella frontalis, Lagenodelphis hosei, Kogia simus, Tursiops truncatus, Grampus griseus, Globicephala macrorhynchus, Pseudorca crassidens, Ziphius cavirostris, Physeter macrocephalus*, and *Megaptera novaeangliae.* Three others species needed to be confirmed: (*Stenella clymene, Feresa attenuata and Mesoplodon sp*). Relative abundance index shows a constant sighting rate across periods while school size and R shows differences between the two periods of survey (Table 1): R1=0.155 delphinids/km (CV: 43%)
R2=0.381 delphinids/km (CV: 56.4%)

Relative abundance present significal difference between the beginning and the end of the survey (Test-T : p<0.05 ; T=-3.531, p≈0.001).

Table 1: basic statistic from visual data.

Results from acoustic data

The sampling effort was correctly spread on leeward and windward sides (Fig.3). 280 stations (75.5%) out of a total of 371 indicated the presence of cetaceans. Map of acoustic sightings (Fig. 4) shows that cetaceans occurred in each geographic sectors in Martinique waters. This technique also enhanced visual research as indicated by the ratio of visualy detected animals (58.4 %) previously heard by acoustic.

Figure 3: acoustic sampling effort.

In Martinique waters, used of passive acoustic technique permitted a better understanding of the distribution of the species rarely visualy observed (Table 2.). Acoustic detections of humpback whale (as singers) showed a distinctive distribution between shallow waters (FAD = 56.8%) and deeper waters (FAD = 43.2%). Sperm whales, only heard on leeward side, mainly occurred in deep waters (FAD = 94.7%) and rarely above the shallow waters (FAD = 5.3%). Delphinids occurred in deep waters (FAD = 60 %) as well as in shallow waters (FAD = 40 %).

Figure 4: distribution of acoustic sightings

Table 2: Frequency of distribution from acoustic datas (FAD).

DISCUSSION

This result suggest that changes in the biological conditions could occur during this early spring survey.

Cetaceans diversity is high in spite of the short research period. Delphinids relative abundance is comparable to other tropical island sush as Marquesas (Gannier, 2000) or Society (Gannier, 2002). Increased of RAI obtained between the beginning and the end of the survey (0.155 delphinid/ to 0.381 delphinid/km), may indicate a migratory trend that could be in link with the inflow of green waters from south america (observed on the field). Acoustic assessment emphasized the activity of particular species that were much less sighted than detected by hydrophone (*e.g. P.macrocephalus* and *M.novaeangliae*).

CONCLUSION

The first results obtained after twenty-two days of feeld work draw a preliminary trend of cetaceans occurrence distribution during early spring in Lesser Antilles. The large diversity already revealed shows the importance of a better understanding of this particular ecosystem. Therefor, additionnal surveys are needed to provide an accurate knowledge of each species status promoting long term monitoring for the conservation of Martinique's populations.

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