

Only SKIN

A wealth of information about the biology of baleen whales has been yielded worldwide through aerial and boat surveys, stranding networks and land-based platforms. Individual recognition through photographs, satellite telemetry, bioacoustics and behavioural methodologies have unravelled several aspects of the complex biological patterns and processes of cetaceans. However, some questions could only be addressed borrowing techniques from molecular sciences. Genetic tools have recently helped us to fulfill important knowledge gaps concerning their biology and conservation.

In order to conduct these studies, fresh epidermic fragments need to be gained via the standard procedure, which involves the shot of an adapted dart from a crossbow. Despite being the most efficient and straightforward method, the biopsy sampling is an intrusive technique. Thus, to ensure an ethical sampling and the animals' welfare, it is important to evaluate their reactions.

Humpback whales (*Megaptera novaeangliae*) make long annual migrations, from high-latitude feeding areas during the summer, to wintering in breeding grounds near the tropics. The Abrolhos Bank, on the Brazilian coastal shelf, is the main reproductive area of the species in the western South Atlantic Ocean. This remnant of an exploited population has been monitored since 1988. Biopsy sampling was crucial to detect the high genetic diversity of this stock, for both the analysis of mitochondrial DNA and nuclear microsatellite loci. It suggests that commercial whaling did not last for enough generations to significantly reduce their genetic diversity.

Additionally, the Brazilian whales presented low genetic similarity with the Antarctic Peninsula stock, but a high mtDNA and microsatellite similarity with the population from the South Georgia/South Sandwich sub-Antarctic region. These findings point to this area as the main feeding ground for the Brazilian whales, and is confirmed by satellite tagging data and photo-identification matches. On a broader scale, this material contributed to define the populations' boundaries of the southern hemisphere. The mtDNA population structure and migration rates of humpback whales within the western and eastern South Atlantic, and the south-western and northern Indian Oceans showed that these areas hold four strongly structured populations, in accordance with the current criteria for conservation.

Moreover, aspects of the social organization were recently confirmed through genetics. Humpback whales typically form small and unstable groups. Brief co-operation when foraging can be observed, while agonistic behaviour among

males competing for females is frequent at the breeding grounds. These associations are not based on kinship, which was expected since the main resources (prey and mates) are patchily distributed.

Overall, the impact of this biopsy sampling procedure is a mildly noxious stimulus. Whales are exposed to numerous disturbances (e.g. vessel traffic, industrial activities, noise and whale-watching) which can result in greater behaviour change than for biopsy collection. In fact, only instantaneous behavioural reactions to the darts have been reported. The reactions are usually low-level, characterized by a startle response, such as a muscle contraction in the target region. Because biopsy sampling is an abrupt stimulus, the intensity of response varies with group size, behaviour and location (migration, breeding or feeding grounds). Disturbances are of concern when they affect survival or fertility. In the absence of these long-term impacts, and considering all the conclusions obtained from genetic analysis, the level of disturbances incurred in biopsy sampling may be acceptable.



FIGURE 1



FIGURE 2

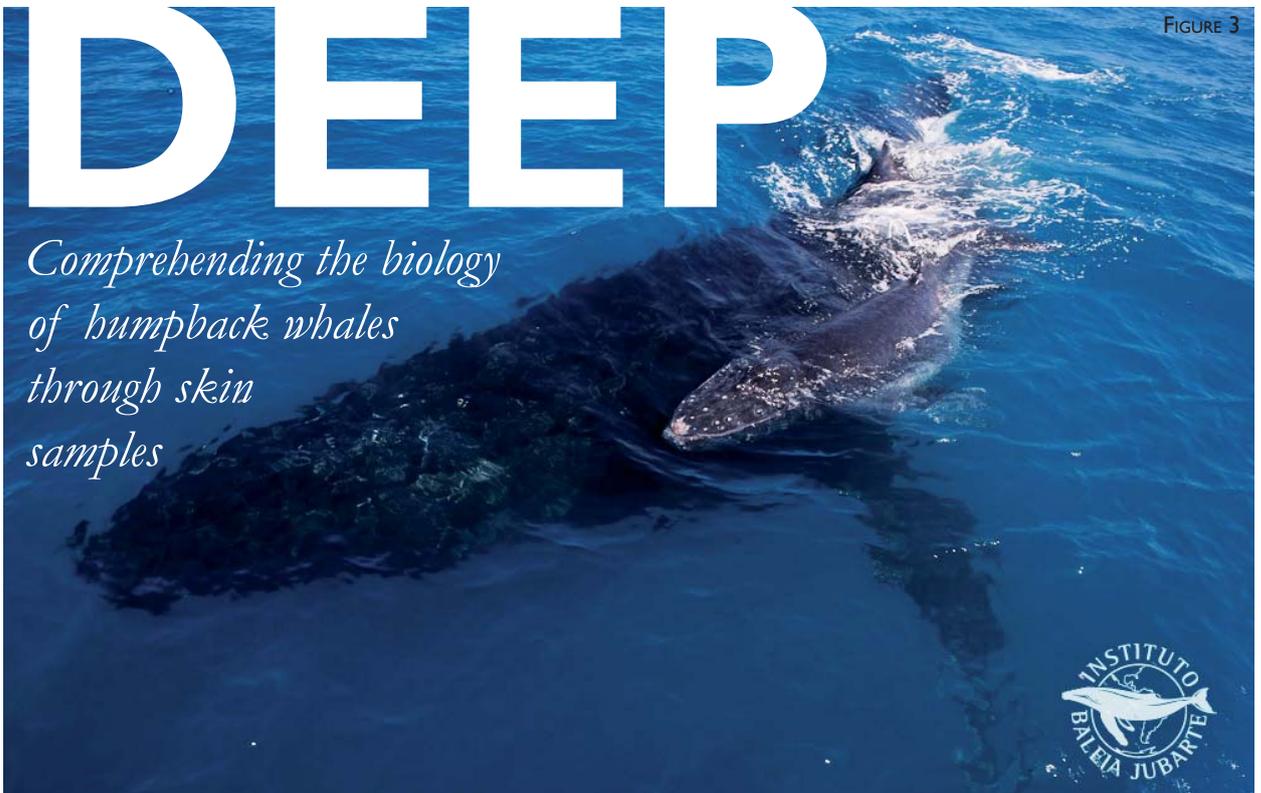


FIGURE 3

DEEP

Comprehending the biology of humpback whales through skin samples



FIGURE 4



FIGURE 5

MAURICIO CANTOR
m.cantor@ymail.com
MÁRCIA H. ENGEL
Instituto Baleia Jubarte, Brazil

OTHER JMBA PUBLICATIONS:
Cantor, M., Cachuba, T., Fernandes, L. & Engel, M.H., 2010, Behavioural reactions of wintering humpback whales (*Megaptera novaeangliae*) to biopsy sampling in the western South Atlantic. *JMBA*, **90(8)**

FIGURES

FIGURE 1—Three humpback whales, *Megaptera novaeangliae*.

FIGURE 2—Skin sampling using a modified dart.

FIGURE 3—A surfacing humpback mother and calf.

FIGURE 4—A fluke slap reaction to the biopsy collection

FIGURE 5—Obtaining skin samples.

FIGURE 6—Two whales engaged in 'tail-up' behaviour

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FIGURE 6

