

The importance of the biological collections: an assessment of the Biological Reference Collection of Cetaceans of the Macaronesia (CBRCM)

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INTRODUCTION

Biological collections are indispensable for documenting biodiversity and advancing scientific knowledge. These are essential in scientific development and a unique tool for documenting biodiversity, especially at this time, characterized by the increasing loss of marine species and entire ecosystems due to habitat fragmentation, climate change, emergence of new pathogens, environmental pollution and direct and indirect catches, among other factors. Beyond taxonomy, the biological collections document historical changes in distribution, diet, contamination, making them vital for conservation efforts.

Established in 1993, the Society for the Study of Cetaceans in the Canary Archipelago (SECAC) created the Biological Reference Collection of Cetaceans of the Macaronesia (CBRCM) encompassing specimens dating back to the 1980s. The CBRCM includes a tissue bank, osteological material (skulls and skeletons), parasites and stomach contents of 24 different species belonging to stranded cetaceans and biopsies in the Canary Islands.

The CBRCM has the largest number of specimens of the Gervais' beaked whale (*Mesoplodon europaeus*) after the American Museum of Natural History (AMNH) of the Smithsonian Institution in Washington D.C.

MATERIAL AND METHODS

The CBRCM stands as the most important representation of cetaceans within the Macaronesia region, in which rare species within Kogiidae and Ziphiidae family can be found.

The collection originated from biological studies conducted on stranded cetaceans of the Canary Islands. This work encompassed the collection of biological samples (skin tissues, blubber, parasite, stomach content, etc.). The tissues and blubber samples are stored frozen at -25°C, preserved in absolute alcohol or in DMSO. The stomach contents and parasite specimens are preserved in alcohol 70%. The reproductive systems (ovaries and testicles) are stored in formol.

These steps are followed by meticulous osteological preparation. First, the carcass is carefully prepared by burying it to facilitate natural decomposition. Once the soft tissues have decomposed, the bones are excavated and undergo thorough cleaning to remove any remaining organic matter. Special techniques are employed to ensure the preservation of delicate structures. Finally, the cleaned bones are meticulously cataloged, identified, and prepared for further scientific study. All the procedures involved rigorous efforts in cleaning, maintenance, and cataloging of all specimens, adhering strictly to scientific protocols. Such systematic cataloging ensures the integrity and usability of the samples for both current and future research endeavors.



Figure 1. Skull of a male of Blainville's beaked whale (*Mesoplodon densirostris*).

Figure 2. Skulls of pygmy sperm whale (*Kogia breviceps*).

Figure 3. Skull of a male of Gervais' beaked whale (*Mesoplodon europaeus*).

Figure 4. Skulls of dwarf sperm whale (*Kogia sima*).

RESULTS

The CBRCM's osteological collection is constituted of 253 samples, encompassing skulls, bones and complete skeletons. The predominant species is the striped dolphin (*Stenella coeruleoalba*), accounting for 22% of the samples, followed by the Atlantic spotted dolphin (*Stenella frontalis*) (16%), common dolphin (*Delphinus delphis*) (16%), bottlenose dolphin (*Tursiops truncatus*) (11%) and rough-toothed dolphin (*Steno bredanensis*) (11%). The remaining species, such as pygmy sperm whale (*Kogia breviceps*), Cuvier's beaked whale (*Ziphius cavirostris*), Gervais' beaked whale (*Mesoplodon europaeus*), Blainville's beaked whale (*Mesoplodon densirostris*), sperm whale (*Physeter macrocephalus*), and dwarf sperm whale (*Kogia sima*), constitute 38% of the total osteological samples (see Figure 5). Given its rarity and lack of global information, the most relevant species are *M. europaeus*, *Z. cavirostris*, and the specimens of *K. breviceps* and *K. sima*. (see Figure 1, 2, 3 and 4).

The CBRCM's tissue bank consists of 528 samples collected from 22 different species, with a total of 222 biopsies across all samples.

Moreover, the collection encompasses 286 stomach contents from 18 distinct species of stranded cetaceans, with particular emphasis on samples from the families Ziphiidae and Kogiidae (see Figure 6).

It is noteworthy the diversity of parasite samples. Out of the 522 samples, 220 (42%) are nematodes, 140 (27%) are cestodes, and 90 (17%) are trematodes, with the remaining 14% consisting of ectoparasitic crustaceans. The most common genus include *Anisakis* spp. and *Crassicauda* spp. (Nematodes), *Monorygma* spp. and *Phyllobotrium* spp. (Cestodes), *Nasitrema* spp. and *Pholeter gastrophilus* (Trematodes), as well as *Xenobalanus globicipitis*, *Penella* spp., *Conchoderma auritum* and *Conchoderma virgatum* (ectoparasitic crustaceans).

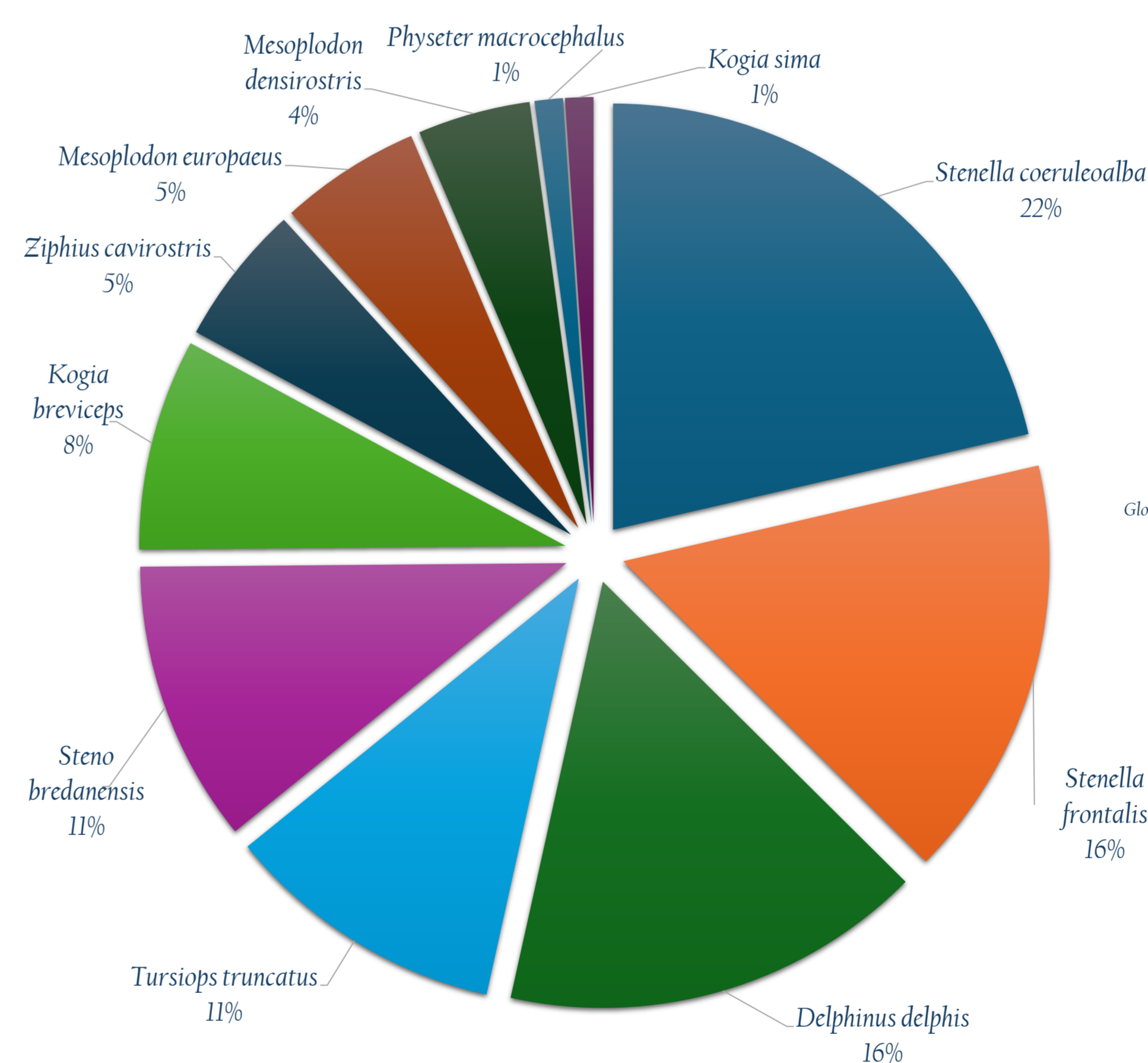


Figure 5.
Osteological samples

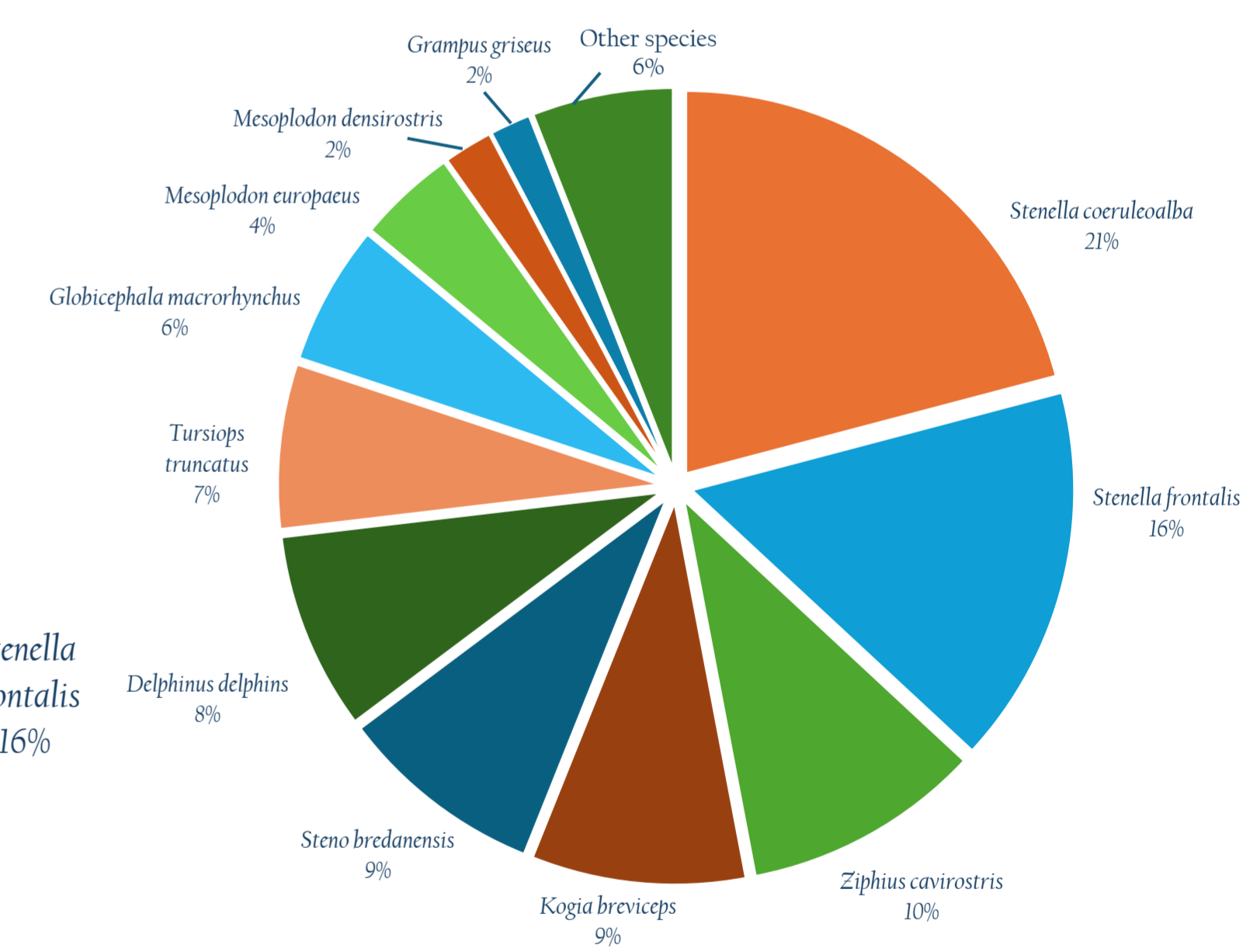


Figure 6.
Stomach content samples

CONCLUSION

The Biological Reference Collection of Cetaceans of the Macaronesia (CBRCM) is the foremost osteological and biological collection of cetaceans in the Macaronesia region, showcasing samples collected over 40 years from 24 different cetacean species. Despite comprising the majority of the collection, samples from the striped dolphin and Atlantic spotted dolphin, the specimens from the families Ziphiidae, Physeteridae and Kogiidae hold exceptional scientific value despite the limited available information. The CBRCM assumes a vital role, serving as an indispensable wellspring of scientific data for biodiversity conservation, historical analyses, and outreach endeavors. The objective of SECAC is to promote, facilitate and regulate this collection with a dual purpose: as a basis for current and future research by the scientific community and its use in exhibitions for educational purposes. This research was conducted within the framework of the BIOCETCAN Project, funded by the Canary Government.

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