

# Zoological Museum Collections: A Resource for Biodiversity Research

Antonina Badalucco<sup>1,2</sup>, Elisabetta Cilli<sup>3</sup>, Gianna Innocenti<sup>4</sup>, Carlo Pipitone<sup>2,5</sup>, Maurizio Sarà<sup>2,6</sup>, Fabrizio Serena<sup>7</sup>, Sabrina Lo Brutto<sup>1,2</sup>

<sup>1</sup>Department of Earth and Marine Sciences (DiSTeM), University of Palermo, Palermo, Italy; <sup>2</sup>National Biodiversity Future Center (NBFC), Palermo, Italy; <sup>3</sup>Laboratory of Ancient DNA, Department of Cultural Heritage (DBC), University of Bologna, Ravenna, Italy; <sup>4</sup>Museo di Storia Naturale dell'Università di Firenze, Sede La Specola, Firenze, Italy; <sup>5</sup>CNR-IAS, Palermo, Italy; <sup>6</sup>Department Biological, Chemical and Pharmaceutical Sciences and Technologies, University of Palermo, Palermo, Italy; <sup>7</sup>CNR-IRBIM, Mazara del Vallo, Italy.

The Natural History Museums play a key role in supporting biodiversity research and nature conservation. The present contribution reports some case studies based on Doderlein's zoological collections at the University of Palermo.



## Threatened species within the Mammalia collection

This study presents the first inventory of the mammals preserved at the Museum of Zoology. The collection includes 157 species, mainly from the Palaearctic region, with a minority of taxa coming from the Afrotropical, Neotropical, Indo-Malayan and Australasian regions. The results highlighted the potential of the museum collection for biodiversity research and conservation. Such material can provide valuable genetic data and historical information about species. The collection includes taxa listed in the IUCN categories as threatened (VU, EN, CR, RE).

Lo Brutto, S., Badalucco, A., Iacovera, R., Cilli, E., Sarà, M. (2023). Checklist of the Mammal Collection Preserved at the University of Palermo under the Framework of the National Biodiversity Future Center. *Diversity*, 15(4), 518.



## The extinct Sicilian wolf

The study analyzed the genetic features of the extinct Sicilian wolf using museum specimens. We were able to recover DNA from four Sicilian wolf specimens and compare it with the genomes of modern dogs and wolves. The results showed that Sicilian wolves were genetically similar to modern Italian wolves, but also had DNA from ancient European dogs. This suggests that interbreeding between wolves and dogs occurred before the Sicilian population became isolated on the island.

Ciucani, M. M., Ramos-Madrigal, J., Hernández-Alonso, G., ... Gopalakrishnan, S. (2023). The extinct Sicilian wolf shows a complex history of isolation and admixture with ancient dogs. *Iscience*, 26(8).



## An unexpectedly interesting Crustacea collection

The study examined for the first time the crustacean collection of the Museum of Zoology. The purpose was to document the history of the specimens and compile an up-to-date catalogue. The collection includes marine specimens collected around the 1980s in the Mediterranean Sea. It consists mainly of decapods and includes species now within the IUCN Red List due to their decline related to the excessive exploitation of fishing. The study describes the conservation status of the specimens, revises the taxonomy according to the valid classification and provides information on the geographical distribution of species. The work highlights the importance of museum collections for the study of biodiversity and the need to digitize them and make accessible online data on specimens held in Italian natural history museums.

Pipitone, C., Innocenti, G., Pepe, P., Tumbiolo, M., Lo Brutto, S. (2023) The Revision of the Crustacea Collection of the Museum of Zoology "P. Doderlein" under the Framework of the National Biodiversity Future Center. *Diversity*, 15(3), 424.



## The never-seen-alive Bramble shark

This study used genetic markers to investigate the relationship between two shark species, the Bramble shark (*Echinorhinus brucus*) and the Prickly shark (*Echinorhinus cookei*). They are deep-sea species, the first never alive in its habitat. The results showed that the Bramble shark can be divided into two lineages, Atlantic and Indian Ocean clusters, which are genetically distinct and may represent separate species. The Pacific Ocean is inhabited by the Prickly shark, which is also genetically distinct from both Bramble shark lineages. These findings suggest that the current taxonomy needs to be revised. The study also highlights the need for further research on the conservation status of these sharks, particularly in areas where they are heavily fished.

Battiata, M., Serena, F., Lo Brutto, S. (2024) Genetic and Distribution Data of the Bramble Shark *Echinorhinus brucus* (Bonnaterre, 1788) and the Prickly Shark *Echinorhinus cookei* Pietschmann, 1928 to Better Reconstruct Their Conservation Status. *Animals*, 14(7), 993



## The restored lion, *Panthera leo*

This study describes the restoration and the genetic analysis of a lion skeleton. As some bones were missing, they were reconstructed using the 3D printing technology. DNA was extracted from a tooth and sequenced to infer the geographical origin of the lion. The analysis showed that the lion belonged to the mtDNA clade of the central Africa. This study emphasizes that museum specimens can be used to study the evolution and population dynamics of species, including endangered species of which information are scattered.

Cilli, E., Fontani, F., Ciucani, M.M., Pizzuto, M., ... Lo Brutto, S. (2023). Museomics provides insights into conservation and education: The instance of an African lion specimen from the Museum of Zoology "Pietro Doderlein". *Diversity*, 15(1), 87.

