

## **The 'Nardò Fossil Project': hunting for fossil marine reptiles in Puglia, Southern Italy**

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In 2018, together with my supervisor Michael Caldwell (University of Alberta, UofA) and other colleagues, we published a study about an exceptionally preserved marine lizard of Late Cretaceous age from Nardò, Puglia ([Paparella et al. 2018 \*Royal Society Open Science\*, 5\(6\):172411](#)). The new lizard shows elements like muscles and skin that are rarely preserved in fossils. So we decided to find a way to go to Nardò and further explore such promising rocks. This is how our collaboration with the local prehistoric museum ([Museo della Preistoria di Nardò](#), MPN) started and this new exciting project came to be.

Nardò is a small town in Puglia, Southern Italy: a famous summer locality, rich of vineyards, olive trees, and many natural and cultural attractions. At the scientific level, it is known for important remains of Sapiens and Neanderthals found in caves along the coastline. More Cretaceous fossils were also discovered in the area some time ago, and some of them are exposed at the MPN, while others are housed in other institutions across Italy.

At the end of 2018, I was invited by the MPN to give a public talk in Nardò and meet up with the local authorities. Thanks to the help of Filomena Ranaldo, director of the MPN, the support of the Superintendencies for the Cultural Heritage and Landscape (Soprintendenza Archeologia, Belle Arti e Paesaggio delle Provincie di Lecce, Brindisi e Taranto) and the governmental authorities of Nardò, we identified a suitable site for our fossil hunt, an inactive stone quarry where fossils were collected during the 70s-80s. Thanks to the dedication of its owners — Giuseppe Agostino Manca, and his daughter Anna Lena Manca after him — the quarry was safeguarded in the years, with the hope that one day it could be used for educational and research purposes. In the end, it was a breakthrough for all of us now actively involved in this project. I was personally very lucky to meet Filomena and Anna Lena, and to have my supervisor Mike Caldwell supporting me all the way through. Also, without the help and support of the community of Nardò, all of this would have never been possible.

Just a few months later, in the summer of 2019, my supervisor Michael Caldwell led his lab from the UofA (me, Aaron LeBlanc, Sydney Mohr, and Alessandro Palci) to Nardò for the first official fieldwork campaign in the Manca quarry. My friend and colleague Angelo Cipriani also joined the team to work on the stratigraphy of the area and establish the exact age of the fossil-rich layers.



The fieldwork team. From left to right: Ilaria Paparella, Angelo Cipriani, Michael Caldwell, Aaron LeBlanc, Alessandro Palci, and Sydney Mohr. Michael Caldwell: professor at the UofA in the Departments of Biological Sciences and Earth and Atmospheric Sciences, and an expert in lizard and snake evolution. Aaron LeBlanc: postdoc in the Caldwell's lab, conducting research on the evolution of teeth and joint histology. Sydney Mohr: PhD student in the Caldwell's lab and a paleoartist, her research focus is on mosasaurs. Alessandro Palci: visiting researcher in the Caldwell's lab and an expert in snake evolution. Me (Ilaria Paparella): working on a second PhD in the Caldwell's lab, focused on the evolution of iguanas. Angelo Cipriani: completed his PhD at the University of Rome "La Sapienza" and collaborates with the Caldwell's lab in the Nardò Project.

From a paleontological point of view, we have limited to none information about the Cretaceous fauna of this portion of the Mediterranean area. This lack of knowledge, however, is clearly not due to a lack of fossil material but simply to the lack of research. In Paleontology, there is a term to describe rock deposits with high quality of preservation of fossils: *lagerstätte*. These are deposits characterized by the presence of numerous and complete fossils. Fossil lagerstätten are quite rare around the world and represent an extremely valuable source of information about the past. Nardò may well be part of this rare category. So for us is very important to continue our research and fieldwork and make this locality known to the international scientific community. For the MPN, this project is important to remark the fact that they are building a research institution and fits perfectly with their idea to reconstruct the prehistory of the territory and valorize its cultural patrimony.

The MPN team currently includes: Filomena Ranaldo, director and lead archaeologist of the MPN; Silvia Strafella, archaeologist and manager of the MPN, in charge of the educational and promoting museum's activities; Dario Massafra, archeologist and curator of the Quaternary collection of the MPN; the archaeozoologist Keiko Kitagawa, a researcher at the University of Tübingen, Germany, coordinator of the study on the Quaternary-Holocene fossil fauna. With much honor and gratification, I am now also part of the team, as coordinator of the Cretaceous fossil collection.



From left to right: Filomena Ranaldo, MPN director; Anna Lena Manca, owner of the quarry; Silvia Strafella, MPN manager; Dario Massafra, archaeologist of the MPN; Angelo Cipriani, lead geologist of the Nardò Cretaceous Fossil Project; and me (Ilaria Paparella), lead paleontologist of the Nardò Cretaceous Fossil Project and coordinator of the Cretaceous fossil collection at the MPN.

The common goal between the Caldwell's team from the UofA and the MPN is now the research and cultural valorization of Nardò and its heritage. The MPN crew is mostly focused on investigating the dynamics of dispersion and organization of the human groups during the Paleolithic, and more specifically in reconstructing their techniques of production of lithic artefacts. The source material for these artefacts is represented by the Cretaceous limestones that are so rich in vertebrate fossils. Hence, collecting data from these rocks will serve the purposes of two research projects: one on the vertebrate

fossils of Cretaceous age, and the other on the Paleolithic remains. The role of Angelo Cipriani as geologist will be key in this sense, as he will be studying the rock deposits both to reconstruct the Cretaceous stratigraphy (age of the fossils, factors that favour the high quality of preservation, geology of the area in general), and help tracing the movements of the Paleolithic men. The 'Nardò Fossil Project' expands the research interests of the MPN to the pre-Quaternary fauna, as well as its role as a research institution and not just a traditional museum.



Two of the fossil specimens found during the new fieldwork in Nardò, now housed at the MPN: a fish on the left and the limb of a turtle on the right.

During the fieldwork 2019, we found over 20 specimens of fossil fish, one turtle, some lizard bones, numerous coprolites (fossil poop), and several invertebrates, including sea urchins (echinoids), molluscs and crustaceans. This is just a preliminary assessment, as some of the fossils are still mostly covered by rock matrix, so we expect more surprises as we proceed with our studies. Moreover, over 50 specimens of undescribed fossil vertebrates are already housed at the MPN. All these fossils together are important not just as discoveries per se, but also to reconstruct the environmental and climatic conditions at the time these animals lived, which is about 70-75 million years ago. These findings will fuel our research for years and we feel highly motivated to continue this project with much enthusiasm and optimism.

Plans for the next fieldwork in 2020 are already underway, so stay tuned!



The finding of a turtle by Angelo Cipriani (top left) and the extraction and packing of the rock blocks with the turtle remains by Michael Caldwell (top right) and me (bottom).

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Links:

<http://museodellapreistoria.com/news/a-caccia-di-rettili-fossili-nei-calcarei-di-nardo/>

<https://royalsocietypublishing.org/doi/10.1098/rsos.172411>

<http://museodellapreistoria.com/news/primitivus-manduriensis/>

<https://aaronrhleblanc.wordpress.com/2020/01/30/hunting-for-the-sea-monsters-of-southern-italy/>

<https://www.ualberta.ca/science/about-us/contact-us/faculty-directory/michael-caldwell>

[https://www.researchgate.net/profile/Ilaria\\_Paparella](https://www.researchgate.net/profile/Ilaria_Paparella)

[https://www.researchgate.net/profile/Angelo\\_Cipriani3](https://www.researchgate.net/profile/Angelo_Cipriani3)

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