<u>Press release</u>

Better protection of marine megafauna through social networks and artificial intelligence.

Two digital tools for biodiversity

Scientists from three joint research units (MARBEC, ENTROPIE and LIRMM) have just published a study using the latest technological advances to identify charismatic species of the marine megafauna of New Caledonia: dugongs, turtles and sharks. This work, entitled " Leveraging social media and deep learning to detect rare megafauna in video surveys" and published in the international journal Conservation Biology, is partly the result of the Pelagic research project financed by the Foundation for Research on Biodiversity (FRBPelagic project frb
) within its Centre for Biodiversity Synthesis and Analysis (Cesab), and is based on the collection of aerial videos financed by the Explorations de Monaco.

The rise of artificial intelligence

For several years now, deep learning has been developing in many fields. This form of artificial intelligence applied to pattern recognition has become an essential tool for the automated remote monitoring of animal populations using photographs, videos or even sounds.

The performance and accuracy of species recognition algorithms are dependent on their learning capacity, i.e. the number and variety of images with which researchers are able to feed them. For rare and endangered species, aerial video monitoring programmes are proving very useful for land-based census, as is the case for elephants, and have recently been extended to the marine domain and its surface megafauna, mainly mammals.

The marine environment issue

How can deep learning be used for rare marine species such as the dugong, or stealthy species such as sharks, for which few images are available? In New Caledonia, research is currently focused on dugongs, sharks and sea turtles, as they are the subject of specific action and protection plans, at the interface between political, societal, economic and environmental issues.

The acquisition of very large quantities of images to improve the performance of automated recognition algorithms is therefore a major challenge for these species, for which aerial monitoring is still limited and provides only a small number of observations.

The contribution of social networks

The originality of the approach presented in this study is to demonstrate the potential of videos available on social networks, as a complement to aerial video monitoring, to optimise and train deep learning models to detect marine megafauna.

Rare or endangered species of marine megafauna are indeed the subject of abundant activity by the general public on social networks. This spontaneous production of images and videos is encouraged by the joint development of ecotourism, inexpensive digital devices such as GoPro cameras or drones, and broadband Internet.

In this study applied to the New Caledonian dugong, the exploitation of these resources has made it possible to build an unprecedented database. Indeed, more than a thousand images from six regions of the world covering the dugong's range were collected on the web. These images from social networks are of limited value for in situ monitoring, due to the lack of precise geolocation information, but their major interest is to contribute to the constitution of an enriched and solid database for the optimisation of deep learning models and the automated detection of dugongs.

A new and efficient method and a hope for conservation

This method has made it possible to process aerial tracking of dugongs quickly and accurately. Indeed, 80% of the individuals present on the images are successfully detected automatically. It offers a new and powerful way to count and map dugongs and other charismatic marine species in order to better protect them. By combining digital technologies and massive data from social networks, it fits into the broader framework of iEcology: the study of ecological processes using online data generated for other purposes and stored digitally. This study opens up new perspectives for the large-scale spatial monitoring of large marine ecosystems.

From left to right: Dugong, Manta ray, shark and marine turtle spotted during survey flight in New Caledonia.

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- **University of Montpellier**

In its 800 years of existence, the University of Montpellier has never ceased to meet scientific and societal challenges. With its 16 faculties, schools and institutes, and 72 research structures, the University of Montpellier brings together a vast community of knowledge: science, technology, physical activities and sports, medicine, pharmacy, law, political science, economics and management. The University of Montpellier thus enjoys international recognition in a wide range of scientific fields such as biology-health, agro-environment, chemistry, information and communication sciences and technologies, law, etc.

More information on Montpellier University

- **The Foundation for Research and Biodiversity**

The FRB is a scientific cooperation foundation whose missions are to promote research on biodiversity, mobilise public and private expertise around research issues and communicate the results of science. The FRB's flagship programme, the Cesab (Centre for Biodiversity Synthesis and Analysis) is a research structure with an international scope whose objective is to implement innovative work on the synthesis and analysis of existing data sets in the biodiversity field. The Centre, located in Montpellier, welcomes many researchers from all continents every year.

More information on the Cesab

- **The Monaco Explorations Society**

Monaco Explorations is a collective platform financed by the Government of the Principality of Monaco, serving the commitment of H.S.H. Prince Albert II of Monaco to the knowledge, sustainable management and protection of the Ocean. It brings together, under the aegis of the Prince's Government, the Prince Albert II of Monaco Foundation, the Oceanographic Institute, the Monaco Scientific Centre and the Yacht Club of Monaco. It supports these institutions by coordinating or supporting collaborative international missions throughout the world.

More informations on Monaco Explorations