Avencas Marine Protected Area: Predict the future of the local ecosystem and its species

Challenge Provider: City of Cascais

Cascais Municipality is a local authority body that coordinates the life in the territory for those who live there, but also for those who visit, work or study in the municipality. With a proactive attitude and constant search for solutions that pursue a sustainable future, it has been able to unite with the right partners, encourage public participation, and gather knowledge from talented human resources that it has been attracting.

Cascais Municipality bets on the power of synergies derived from innovation hubs, co-creation projects, and innovation for sustainability to increase its pioneering spirit. We combine tradition and history with innovation: collecting knowledge, analyzing data and foreseeing possibilities.

Context

The classification and management of coastal marine protected areas is traditionally implemented without a strong public participation process in its early stage, resulting in conflicts. A bottom-up approach with public participation before defining regulations is an innovative, yet difficult process.

The case study presented is a local experience of Avencas Biophysical Interest Zone in Cascais, Portugal, classified in 1998 and reclassified as a Marine Protected Area, fully managed by the Municipality in 2018. Several actions were taken between 2010 (when the biological monitoring first started) and 2018:

- Public participation assemblies were conducted to welcome input from the fishing community regarding the new regulation.
- Visual census and interviews directed at different users were used to assess the short-term effectiveness of the implemented management actions.

As a result, a new regulation is now implemented, and user management actions have been created including visitors' pathways through the rocky platforms and information spots displaying signs with area specific rules at the entrance to the beach.

Positive results point to the success of this approach, as visitors either agreed or respected the various management actions implemented. A survey showed that 84% of visitors look favorable upon the information spots and 76% agree with the location of the access pathways.

Recreational fishers are now mostly located outside the protected area, though there are still some who choose to stay inside, which indicates the need to change some points in the regulation, to improve compliance within the fishing community.

In summary: the short-term evaluation methodology was effective in detecting changes in usage patterns from users when the bottom-up approach was applied.

However a long-term analysis is needed.

The local usages are now under control, and a greater compliance with the current regulation allows for a decrease in the anthropogenic stress of this small MPA, so in theory the intertidal ecosystem should be recovering at a faster rate than what is being recorded by our team of biologists. Perhaps what is missing in the ecosystem analysis performed in 2017 is changes at a local rocky-shore due to the impact of climate change. Help is needed to understand the influence of environmental variables on the biodiversity and abundance of the species composition in this Marine Protected Area.

Once the most important variable or variables impacting the local marine ecosystem are identified, it is possible to adapt the management actions taken on the MPA, to hopefully minimize the impact of Climate Change in this highly sensitive coastal zone.

Legenda

Área Marinha Protegida das Avencas
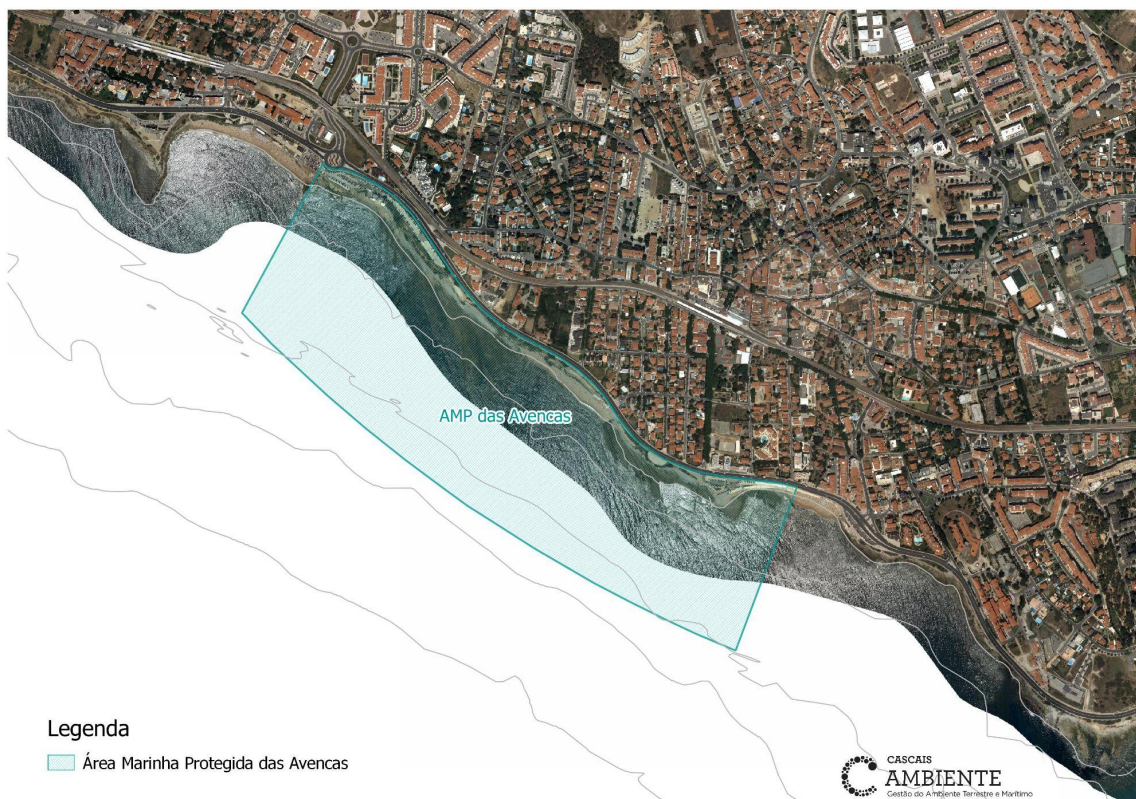
Further Background Information

- The details on how the data was collected can be found in this paper by Ana Ferreira, Ana Sofia Alves, João Carlos Marques and Sónia Seixas. (Full text PDF).
- Find more information about endangered species on the IUCN website.

Goal

The goal of this challenge is to identify variables that potentially impact the marine ecosystem of the Avencas Marine Protected Area and predict further developments with a special focus on endangered and invasive species.

Sustainable Development Goal

14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development
14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.
14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels

Outcome

Create a predictive model that provides insights into future developments of endangered and invasive species in the AMPA. The model needs to take into consideration the developments in species during the observation period. A special focus should be put on feature engineering and in that process identifying potential factors leading to the slower than expected recovery of the ecosystem using publicly available data.
Ideally the model should be scalable for use in other marine ecosystems where similar data has been collected.

Available Resources

All the data resources can be found here:
https://wdl-data.fra1.digitaloceanspaces.com/cascais/cascais_data.zip

As a reminder, you can also use any data that is open, free and legally available.

The datasets are provided by the city of Municipality of Cascais under the conditions listed in the license agreement you will sign when accessing the data, full public sharing of the dataset is expressly forbidden.

The following datasets are available for you to use:

- % coverage with sessile species in samples taken between 2011 - 2020 in AMPA.
- Number of mobile species in samples taken between 2011 - 2020 in AMPA.
- A reference list which species are considered invasive and which are considered endangered according to the IUCN. (Note that for some species the Portugal-specific conservation status assigned by the IUCN is given)
- Bathymetric data of AMPA.

The description of the datasets can be found in the data dictionary.

You can also use the following resources:
- Cascais open data portal with various datasets:
  https://data.cascais.pt/en/geral/data-hub/open-data (Website partially in Portuguese)
- Detailed datasets about climate change and temperature data can be found on the website from the Climate Research Unit of the University of East Anglia.
- Datasets on ocean acidification by NOAA National Centers for Environmental Information.
- World Ocean Database. Datasets with parameters like salinity and oxygen.

Tips

- Start by defining what will be the end product and what is it going to answer;
- Don't forget to explore the data in visual and geographical terms;
- Don't forget to explore the data in the "Nature perspective" (eg. Spring time is very different than Winter time for marine animals);
- Consider first defining a metric to measure the quantity of an aspect you are exploring and then addressing the quality of the aspect in a second step.
- Some species' conservation status is described as insufficiently known. Consider treating these species as potentially endangered (see also More than half of data deficient species predicted to be threatened by extinction by Borgelt et al).

Submissions

Deadline: 18th May 23H59 AoE

Don't forget that you will need to submit the solution report (notebook template with the link below) and executive summary (markdown template below). You also need to submit a **3-minute** video summary of your solution.

Solution report template: https://bit.ly/wdl2023-notebook
Executive summary template: https://bit.ly/wdl2023-summary