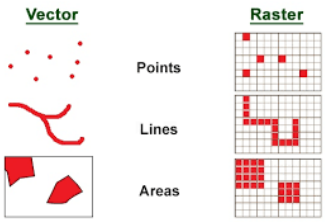
ZMT LEIBNIZ CENTRE for Tropical Marine Research

Species Distribution Data

Don’t get lost without a map!

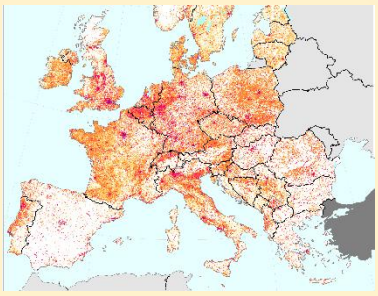
An important part of the scientific research in ecology and biodiversity consists in studying the **distribution of organisms in the planet**. Some species have recently expanded their distribution, but most of them have seen it reduced as a consequence of direct (e.g. fishing, hunting, forest exploitation) or indirect (e.g. global warming, ocean acidification) anthropogenic pressures. Studying the relationship between the different **human pressures** or any **environmental variables** with different species distribution has been a challenge for scientists in recent years, and one of the techniques applied are in the field are the **Species Distribution Modelling** (SDM).

Before deepening into the modelling world, it is important to understand the different types of **geospatial data**: vectors and rasters.



Vectors are basically lines and shapes represent spatial features such as streams, forests, cities, etc.

Raster are cells with specific values of a specific characteristics of the geographical space, such as temperature, type of land coverage, humidity, etc. The size of each cell determines the resolution of the raster layer.



This picture shows a raster of Europe with different values of human density (colours) overlapped with a vector layer representing European borders.

When having a **list of coordinates** associated to presence or absence **of organisms**, Geographical Information System (GIS) software such as QGIS, help us to **plot** the coordinates as **points** in a map.

Once the species presence data are already available (through direct sampling or from already existing databases), raster data can be obtained from different sources to understand the reasons for which a particular organism is in a particular location. Terrestrial data such as temperature, precipitation, radiation, humidity and many more, are available from public space satellites that measure these variables from the space. This data is stored in online portals such as **Copernicus, Earthdata** (NASA portal) or **ESA Earth Observation Data** (ESA portal). Sometimes, it can be a bit tricky to work with raw data, but most portals have user-friendly interfaces to guide the user to find the appropriate format.

The relationship between presence locations and raster layers of the **environmental** variables that determine our organism distribution, including, possibly, human pressures, is indeed a model of the species niche. This model, called **Species Distribution Model**, can be used to describe **the potential niche** of the organism. This can then have many applications, from predicting the future evolution of the species distribution, in parallel with the environmental changes expected for the region, to predict the response of a species to different managing strategies. Once this relationship is well understood, it is possible to predict the evolution of the species distribution in parallel to the predicted environmental changes.