Diachronic cartography within an Important Plant Area: case study of Mount Chenoua (Tipasa, Algeria)

Methodological approach and preliminary results.

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This work aims to present the GIS set up on Mount Chenoua, one of the 39 plant Key Biodiversity Areas in Algeria.

It should also be an opportunity to initiate a debate around:

- **methodological precautions** to be considered in habitat mapping;
- **regional typologies** of habitats.
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Chenoua GIS:

Main data taken into account for Chenoua’s GIS development:
- Field inventories
- Thematic map data
  - Thematic map (phytosociology, geology)
- Topographic map data
- Multi-date satellite data (LANSAT TM5 and TM8, SENTINEL 2)
- Radar Data (SRTM)
- Current aerial photographs (BingMap)
- OSM data (linear road)
General characterization of the IPA/KBA for plants

Mount Chenoua

- A rugged coastal area that rises to 905 m.
- A protected terrestrial area with a total of 9,100 ha.
- Exceptional landscape, with preserved natural and cultural heritage.
- Patrimonial value at the local and regional level, due to the presence of well-preserved ecosystems.
Mount Chenoua’s types of vegetation

- Pure Tetaclinis or mixed forest with Aleppo pine and, more rarely, holm oak.

- Matorral of Aleppo pine and Olea europea with Pistacia lentiscus and Phillyrea angustifolia subsp. angustifolia

- Maquis of Kermes Oak, Erica arborea, Olea europea, Arbustus unedo and Ampelodesmos mauritanicus.

- Garrigue of Linum narbonense, Micromeria fontanesii et Galium brunnaeum.

- Formation on rocks and limestone scree represented by Crucianella latifolia and Lathyrus saxatilis.

- Riparian forests of Populus alba, Fraxinus angustifolia subsp. oxycarpa, Ulmus campestris, Salix pedicellata and Salix alba.
1. General problematic

The cartographic approach carried out aims for:

✓ The **identification of all the species concerned by conservation issues**, their precise location in the field and their ecological characterization;

✓ The **establishment of a typology to describe the habitats** where these species are likely to develop;

✓ The **choice of perception levels and data adapted** to the problem pursued in all its dimensions.
1. General problematic

A double objective:

- Identify and map natural and semi-natural habitats using QuantumGis software;

- Vegetation diachronic mapping based on the confrontation of multi-temporal remote sensing data and documents.

This requires a multi-scalar approach from regional to local and focal.

To do this, 3 scales can be selected:

1/50,000 to 1/200,000
Regional scale

1/10,000 to 1/25,000
Local scale

1/5,000 to 1/2,500
Focal scale
Inventory, management and conservation require a multi-scalar approach from regional to local to focal.


<table>
<thead>
<tr>
<th>Administrative scale</th>
<th>Cartographic scale</th>
<th>Type of map</th>
<th>spatial data used</th>
<th>Unit Properties</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communes, ZIPs</td>
<td><strong>Habitats mapping</strong></td>
<td>Ortho-photo SENTINEL 2</td>
<td>Phytocoenoses + Physiographic Elements + Local Ecological Factors + Soil Uses</td>
<td>Local Ecological Planning + Landscape Units + Communication-Education</td>
</tr>
<tr>
<td></td>
<td>Communes, National parks</td>
<td><strong>Habitats mapping</strong></td>
<td>LANDSAT ETM + LANDSAT MSS</td>
<td>Phytocoenoses + Physiographic Elements + Local Ecological Factors + Soil Uses</td>
<td>Regional ecological planning</td>
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<td>Physiographic elements + Vegetation structures + Geomorphological elements</td>
<td>Regional ecological planning</td>
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<td>1/5 000</td>
<td><strong>Habitats mapping</strong></td>
<td>LANDSAT 8 OLI SRTM 30</td>
<td>Phytocoenoses + Physiographic Elements + Local Ecological Factors + Soil Uses</td>
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</tbody>
</table>
1. General problematic

Local level

Sentinel 2: pixel = 10m
LANDSAT, SRTM: pixel = 30 m
Photo aériennes Bing Map: pixel = 1m50

Focal level

Image Bigmap

Image SENTINEL 2
1. General problematic

GIS implementation

- Perception levels Required
- Basic data
- Typology used
- Digital treatments

GIS Coaching

- Users: Scientists, Administrations, Citizen

- Stages requiring regional reflection

Use of free software (i.e.: Qgis)
Continuous training of the staff involved

Habitat mapping sensu UICN-MED

Objectives pursued

- Concepts used

GIS Boarding

Simplified approach

Supported by:

IUCN
CARE MEDIFlORA
Global Diversity Foundation
L-Università ta' Malta

MAW - Fondation pour la nature
Habitats mapping
sensu UICN-MED

Objectives pursued

Concepts used

1. concepts that might be used

GIS implementation

Perception levels Required

Basic data

Typology used

Digital treatments

GIS

Plant formations

Vegetation series

Plant communities

Ecological groups

Landscapes

Simplified approach

Ecological concepts

Objectives pursued

Concepts used

Perception levels Required

Basic data

Typology used

Digital treatments

GIS

Plant formations

Vegetation series

Plant communities

Ecological groups

Landscapes

Simplified approach
3. IPA’s : choice of a suitable typology

Habitat remains an unclear and variable concept, characterized by two centuries of evolution and semantic shifts since its appearance in the early nineteenth century. Concerning vegetation and according to UICN, habitats typology should be adapted to the local context. The different habitats (ecosystems s.l.) could easily be described, as proposed by the IUCN, in terms of vegetation’s type (plant formations) (ie: dense forest, woodland, high matorrals, dense maquis, clear maquis, garrigue, etc.) referring to horizontal and vertical vegetation structures.

In addition, it seems essential to associate the names of the first and second physiognomically dominant species (ie: High matorral with Juniperus oxycedrus and Stipa tenacissima, dense forest with Quercus suber and Cytisus triflorus, etc.), vegetation structure and physiognomically dominant species integrating more than 90% of the information on habitat ecology. To these items, it is necessary to add unvegetated habitats (cliffs, bare soils, rocky slopes, urban, etc.).

This typology is more easily understandable and more practical by scientists, managers, planners and decision-makers.
3. IPA’s: choice of a suitable typology

Composite Colour Phytosociological map

IUCN habitats codes

Sentinel2 Copernicus Data
S2B_MSIL1C_20181007T103019_N0206_R108_T31SDA_20181007T160704.SAFE-
4. IPAs diachronic study

5 items of land cover

Non Supervised Classifications
Kmean15 cls 10 iterations

1987

2018

Supported by: IUCN, CARE MEDIFLORA, ta' Malta.
Multitemporal Satellite Data

- LT05_L1TP_196035_19870621_20170212_01_T1
- LC08_L1TP_196035_20180626_20180704_01_T1

4. IPAs diachronic study

Change Map

- Extraction of the classe « dense forests »
  - In red: situation in 1987
  - In green: situation in 2018
  - In Yellow: unchanged

Non Supervised Classifications
Kmean15 cls 10 iterations

Extracted Data

- 5 classes of land cover
  - 1987
  - 2018

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Dense forests theme

4. IPAs diachronic study

Mutations 1987-2018
4. IPAs diachronic study
Some reflexions

Natural habitats mapping within IPAs should be based on:

- A perfect mastery of the concepts used in ecology;
- The degree of resolution of the GIS;
- Habitat mapping could be a land cover mapping (i.e. vertical and horizontal structure, type of plant formation (forest, maquis), with the first and second physiognomically dominant species which are discriminating to characterize the habitats.
- The choice of a same typology for all IPAs at the national and regional levels;

A Regional discussion seems essential on the typology adopted to describe the habitats as well as a systematic interdisciplinary concertation between scientists and managers.
«The typology of habitats must be undertaken as soon as possible in response to an important national and regional need. It is a long-term project which requires collaboration of different partners, especially researchers and managers.»

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Thank You for your attention.