Typology and cartography of the south of Tlemcen (western Algeria)

Bekkouche Assia [1], Chalane Fatiha [*2], Benabdelmoumene Fatna [3], Chemouri Fatima Zahra [4], Ammam Abdelkader [5],Bensmira Zaza [6], Bouyahia Hadj [7], Bensmira Meriem [8], Arabi Zohra [9], Cherif Ismahene [10], Samai Ibtissem [11], Belmamoun Ahmed Reda [12], Amirat Mokhtar [13]

[1] Naama University Centre, Algeria Laboratory Ecology and Management of Natural Ecosystems, 13500 Tlemcen Algeria.

[*2] Laboratory of hydric resources and environment University Dr Moulay Tahar Saida, (Algeria)

[3] Abou Bekr Belkaid University (UABB), LECGEN, SNVSTU, 13000 Tlemcen, Algeria, Laboratory Ecology and Management of Natural Ecosystems, Tlemcen Algeria.

[4] Mohamed-Cherif Messaadia University - Souk Ahras, , Laboratory Ecology and Management of Natural Ecosystems, Tlemcen Algeria.

[5] Moulay Tahar University, BP 20000, Saida, Algeria.

[6] University of Mustapha Stambouli Mascara . Algeria.

[7] University center Naama (Algeria)/ Laboratory Geo-environment and space development University of Mustapha Stambouli, Mascara. Algeria.

[8] University of Mustapha Stambouli Mascara, Algeria.

[9] Faculty of Natural and Life Sciences, Ibn Khaldoun University, BP 14000, Tiaret; Algeria.

[10] Abou Bekr Belkaid University (UABB), LECGEN, SNVSTU, 13000 Tlemcen, Algeria, Laboratory Ecology and Management of Natural Ecosystems, Tlemcen Algeria.

[11] Laboratory Researches of Soil and Sustainable Development, Department of Biology, Faculty of Sciences, Badji Mokhtar University. BP2, 23000 Annaba, Algeria.

[12] DjillaliLiabes University, BP 22000, Sidi-Bel-Abbes, Algeria;

[13] Institute of Veterinary Sciences Ibn Khaldoun University of Tiaret, Algeria

*Correspondence Author-mail: doctchalane@yahoo.com

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Abstract

The northern area of the Tlemcen mountains was characterized by steppes rich in perennial Poaceae, currently these grasses have disappeared to the detriment of annual Poaceae. This study aims to produce a physiognomic map of the steppe landscape using the most precise, sensitive, and stable indicator, vegetation. The joint use of statistical analysis (CFA) of interspecific linkages was applied to our floristic surveys, which allowed us to sketch the contours of a current physiognomic and typology map of the steppe landscape to appreciate the current state of the natural distribution area of this steppe landscape.

Keywords:-South of Tlemcen ; western Algeria-steppe; vegetation dynamics; biogeography; bioclimate; typology; cartography.

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Introduction

Today, with the emergence of biodiversity since the United Nations conference in Rio de Janeiro (1992) [1], various questions are being asked about the place of plant structures that shape our landscapes.

In Algeria, the steppes with Stipa tenacissima regenerate with great difficulty and we are therefore witnessing a regression of the plant cover which takes on a worrying appearance resulting in an acceleration of desertification [2],[3].

For the steppes of our regions, [4] specify: “These steppes constitute a poor floristic procession subjected to strong anthropozoic pressure and have for many years been in the process of regression; the reasons for this phenomenon seem, a priori, to be linked to an often-excessive exploitation of the resources offered by this natural ecosystem”.

[5] emphasizes that: “The diagnosis made by the specialists seems final: overgrazing, floristic impoverishment, loss of vigor in the vegetation, degradation of the ecosystem are the most obvious signs. The state of the steppes is considered worrying", the reason which allowed us to carry out a physiognomic and typology map in a territory that is characterized by a great floristic diversity linked to the combination of ecological factors which are very varied, and an anthropozoogenic action very important, to estimate the current state of the studied steppe landscape.Location of the study area

The prospected region (Figure 1) corresponds to a part of the high plateaus (south of Tlemcen, western Algeria) which constitutes a vast tabular formation located at an average altitude of 1200 m. Referring to the topographic map of Tlemcen Sheet No. 270, 1/50,000th published in 1962, the study area extends between:

34° 34' 44.1 and 34° 5' 20.8 North latitude ;1° 46' 59 and 0° 50' 26.8 East longitude.

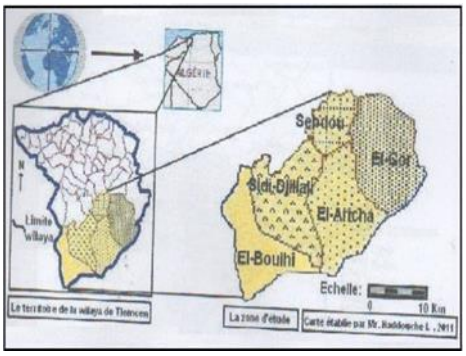

Figure 1: Geographical location of the region studied.Type Style and Fonts Methodology

The realization of a typology of the steppe, of the zone of study, requires a choice of necessary and sufficient factors to give a complete description of the environment in its relations with the vegetation [6]. Our study relates to these three stations:

Station 1: "Sebdou"

Subject to a semi-arid bioclimatic atmosphere, this resort is in a valley a few kilometers from the town of Sebdou. It is characterized by an altitude of around 1007m and it is located at 34°62'45 North latitude, 1°23'38 West longitude with a South-West orientation. It represents a recovery rate of 60% and the slopes are 10% to 15%.

This station is dominated by Stipa tenacissima L. with the presence of the following species:

Aegilops triuncialis L.; Alyssum parviflorum Fisch;

Bellis annuaL.;Bellis sylvestris L.;

Avena sterilis L.; Gagea arvensis (Pers.) Dumort.;

Rœmeria hybrida (L.) DC.; Scabiosa stellata L.;

Scandix australis L. Ziziphora capitata L.

Station 2: "Sidi Djilali"

The station is traversed by a road of Wilaya N°107 connecting Sebdou and Sidi-Djilali. It is located on the southern slope and has a recovery rate of around 50%.

The altitudinal section of the station varies between 1325 and 1336 m. Its corresponding coordinates are 34°53'64 North latitude, 1°35'40 West longitude. Also note a slope less than and/or equal to only 5%.

The vegetation is dominated by:

Stipa tenacissima L.; Trifolium stellatum L.;

Scorzonera undulata Vahl.; Reseda phyteuma L.;

Plantago psyllium L.; Paronychia argentea (Pourr.)Lamk.;

Rosmarinus officinalis L.; Astragalus armatus Willd.

Thymus ciliatus subsp coloratus (bois.etReut.) Batt.

Station 3: "El Bouihi"

Located at an altitude of 1260 m to 1280 m with a South-South-West exposure; this station has a recovery of 40%, dominated by:

Stipa tenacissimaL.;Stipa parviflora Desf.;

Lygeum spartum L.; Arthrophytum scoparium (pommel) Iljin;

Eryngium triquetrum Vahl. Ajuga iva (L.)Schreb;

Brachypodium distachyum (L) P.B.;Menta peligium L.;

Helianthemum helianthemoïdes Desf.; Retama sphaerocarpa (L.) Boiss.

The microrelief is characterized by a 10% slope and there is an outcrop of the bedrock.

At this station, the state of Stipa tenacissima L., Arthrophytum scoparium (pommel) Iljin, and Lygeum spartum L. is very stunted. HIRCHE [7] and MELZI [8]explain that the state of the Lygeum spartum facies demonstrates that the most pastorally interesting facies undergo more intense degradation and reveal very advanced levels or states of degradation. up to their disappearance.

Station 4: "El Aricha"

Lies at an altitude of approximately 1230 m to 1240 m. It is located between 34°33'46 North latitude, and 1°16' West longitude, with an overlap rate of approximately 30% to 40%.

This station is oriented towards the south-southwest of Tlemcen with a slope hardly exceeding 15%.

The species listed are:

- Asphodelus microcarpus Salzm.et Viv.
- Ulex boivini Webb.
- Allyssum linifoloum Steph.
- Alyssum parviflorum Fisch.
- Lipidium glastifolium Desf.
- Raffenaldia primuloides Godr.
- Raphanus raphanistrum L.

Station 5: "El Gor"

El Gor is located southeast of the wilaya of Tlemcen, with an altitude of 1260 m to 1270 m and a slope of 10% to 15%. It represents a recovery rate of 40% with a clayey to loamy clay texture.

Land clearing has become an easy task in recent years; because of mechanization (plowing with a tractor) which destroys the perennial vegetation and allows the appropriation of large areas to the detriment of collective routes [9].

Floristically, this station is home to the following plant species:

Stipa tenacissimaL.;Stipa parviflora Desf.;

Shismus barbatus P.B.; Poa bulbosa L.

Lolium rigidum Gaud.; Hordeum murinum Witth.;

Plantago lagopus L.; Retama retama Webb.;

Retama retama Webb.; Retama sphaerocarpa (L.)Boiss.;

Brachypodium distachyum (L) P.B.; Plantago psyllium L.;

Work objectives and methodology

The study of steppe flora aimed at several objectives which vary according to the levels of perception:

1. .....At the first level, all the formations in this steppe will be studied in order to know their structure, their typology as well as the main ecological factors responsible for their diversity.

2. .....To make an approach, by the Factorial Correspondence Analysis (FCA) of the groupings which have been described until now by the traditional phytosociological method (method of the tables).

The FCA was chosen as the method of investigation. The treatment strategy followed depends on the levels of perception mentioned above.

The interpretation of the factorial axes is limited to the first three. It is facilitated by the ecological significance of the species presenting on the positive and negative poles of the axes' significant relative contributions. Only species are considered that have contributions greater than twice the arithmetic mean of the relative contributions of all species.

The eigenvalues and the axes' inertia percentages are grouped in Table 1.

Table 1: Eigenvalues and inertia percentages for the first three axes.

	Axis 1	Axis 2	Axis 3
Eigenvalues	8.5155	5.5327	4.8129
Inertia percentages (%)	89	58	50

Results and discussion

The most symbolic Poaceae of these steppes is Stipa tenacissima, which generally grows on shallow, well-drained soils [10].

The examination of the factorial map (Figure 2), shows us the individualization of three groups:

Group A; brings together the records of the floristic procession of Stipa tenacissima.

Group B; brings together the records of the floristic procession of Arthemisia herba alba.

Group C; we find records of Spartium junceum and Artemisia herba alba.

Axis 1 would thus express a regressive dynamic of the vegetation as well as the nature of the substrate.

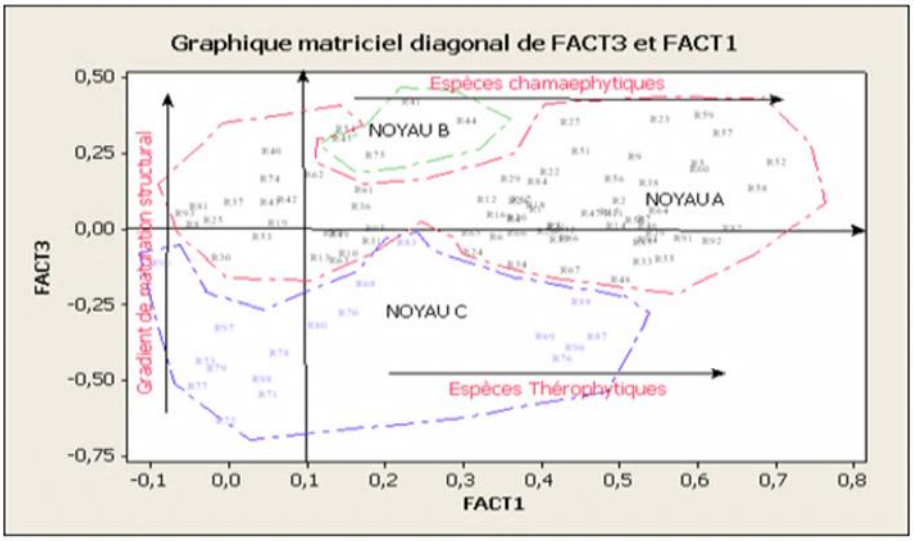

Figure 2: Projection of flora readings according to the factorial plan (Fact 1 - Fact 2).

The floristic analysis of the steppe vegetation of the territory studied makes it possible to recognize three large plant groups which follow one another in space according to a gradient of structural maturation-oriented South-North.

The first corresponds to vestiges of pseudo-steppe which develop in the northernmost part of the studied area. It presents a group of indicator species of steppe landscapes. It is dominated by Stipa tenacissima, with a height that varies between 40 and 60 cm; followed by a floral procession based on:

– .....Poaceae :Brachypodium distachyum, Dactylis glomerata, Stipa parviflora, Avena sterilis, Echinaria capitata, Bromus rubens, Hordeum murinum.

– Fabaceae: Lotus ornithopodioïdes, Medicago rugulosa, Medicago orbicularis, Medicago soleirolii, Hyppocrepis unisiliquosa, Coronella minima,Vicia tetrasperma.

– Annual or biennial species belonging to various families: Senecio vulgaris, Bellis annua, Evax argentea, Atractylis cancellata, Tolpis barbata sub sp. umbellata, Malva aegyptiaca, Micropus bombicinus, Plantago albicans, Scabiosa stellata.

The second brings together the steppe vegetation of the high plateaus characterized mainly by esparto. Depending on its degree of degradation or environmental conditions, esparto may be replaced, locally or over large areas, by other types of species which constitute groups of Artemisia herba-alba.

Of great pastoral interest, the steppe with white sagebrush constitutes a better steppe pasture [11], especially during the summer periods.

Physionomically dominated by Chih (Artemisia herba-alba); this steppe occupies a small area within the study area where it finds its ecological optimum within the spreading areas, and runoff waters as is the case of El Gor and El Aricha. In these stations, the cover of the vegetation is around 35% to 45%, with clumps of 40 cm in height for El Gor and 30 cm in El Aricha with clumps of white sagebrush in a dilapidated state.

The overall floristic composition includes a floristic procession represented by a batch of taxa specific to this type of steppe. Among these species, we note Artemisia herba-alba, Astragalus armatus, Helianthemum virgatum, Helianthemum helianthemoïdes, Helianthemum pilosum, Biscutella didyma, Alyssum parviflorum, Raphanus raphanistrum, Reseda phyteuma, Papaver hybridium, Rœmeria hybrida and Lolium rigidum.

The vegetation of this steppe corresponds to a mosaic of 2 types of communities. On the one hand, the dominance of herbaceous therophytes plants, largely made up of taxa from the floristic procession of Stipa tenacissima; on the other hand, the presence of annual or biennial species belonging to various families such as Daucus carota, Malva aegyptiaca, Linum strictum, Papaver rhoeas, Plantago psyllium, Plantago lagopus, Atractylis cancellata, Picris echioides, Taraxacum laevigatum, Micropus bombicinus, Plantago albicans, Scabiosa stellata; enriching this steppe with Artemisia herba-alba, and providing supplementary grazing for breeders in the region.

The third plant group brings together more xeric vegetation reminiscent of the Saharan zones. There is vegetation based on Spartium junceum and Artemisia herba-alba.

This steppe ensures the transition between, on the one hand, the steppes with alfa, and white sagebrush, the typical vegetation of the high steppe plains where the Mediterranean floristic element predominates 64%, and on the other hand the vegetation of the Sahara represented by Malva aegyptiaca; Saharo-Sindian taxon about 2%.

Physionomically dominated by Spartium junceum, this steppe occupies a large area within the study area; at the El Aricha station where the vegetation cover is around 45%, with clumps of Artemisia herba-alba 30 cm high and clumps of Stipa tenacissima in a dilapidated state.

The global floristic composition makes it possible to recognize a first batch of species exclusive to this type of steppe: Gladiolus segetum, Phillyrea angustifolia, Sanguisorba minor, Asperula hirsuta, Ulex boivinii, Mathiola tricuspidata, Lepidium glastifolium, Adonis aestivalis varflava, and Eruca visicaria.

The identification and characterization of each of these steppes can serve as an initial core for the establishment of a reference typology for the steppe landscape of Tlemcen. An essential typology for the implementation of a policy for the identification of protected areas with a view to the conservation of biodiversity and the sustainable management of natural resources.

The first steppe occupies the upper and lower semi-arid bioclimates. The other steppes appear in arid bioclimates.

Cartography

Thus, at the end of this typology phase, a synthetic map of the steppe landscape observed in this area was established. It visualizes the floristic composition of the main species of the steppe procession.

[12]specify that the increasing xericity over the past ten years has contributed to the deterioration of the alfatières aquifers. The latter, overexploited, no longer find the humidity necessary for their regeneration.

Generally, there is a lack of good Stipa tenacissima and Artemisia herba-alba aquifers. Currently moribund aquifers dominate the steppe landscape.

The developed vegetation map is drawn up by comparing flora readings carried out in the field, aerial photos of the Tlemcen region (1973) [cartography lab, University of Tlemcen], topographic map at 1/50,000th scale (Sheet 270, 1952) and the land use map of Tlemcen (Territorial Development Plan of the wilaya of Tlemcen).

Thus, the vegetation is very varied (Figure 3). Reading this physiognomic map [13]shows the poor state of the steppe landscape in the region.

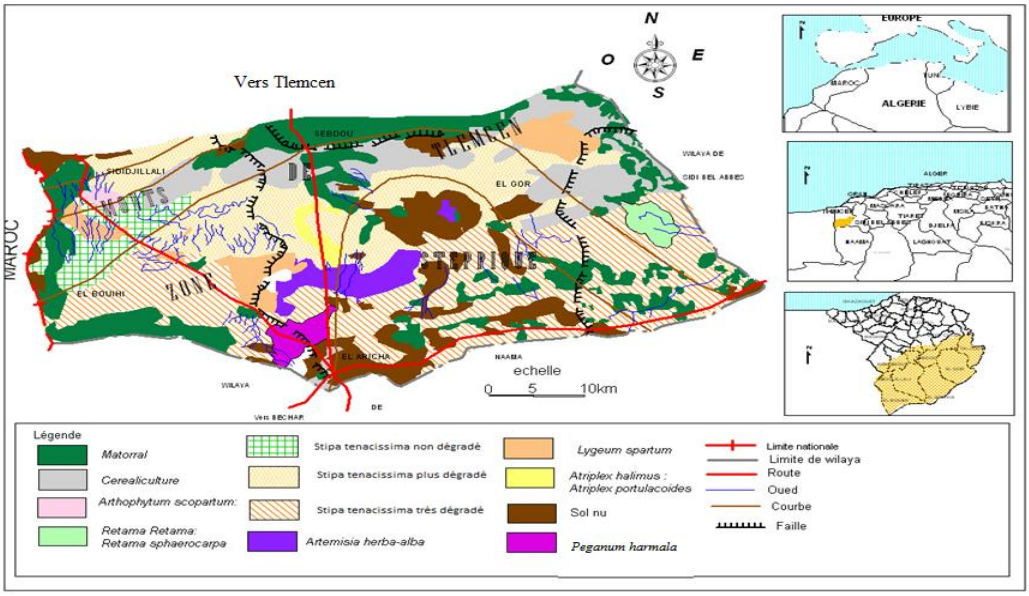

Figure 3: Physiognomy map of the steppe landscape.

Conclusion

In the study area, the esparto aquifers have suffered very significant degradation, especially in the south. The Stipa tenacissima aquifers are in an advanced state of decline.

The combined action of growing anthropogenic pressure on natural resources and severe climatic conditions is causing dysfunctions in the steppe ecosystem.

The current state of the evolution of the vegetation cover has been established through the many recent bibliographic data and especially to observations in the field.

At the end of this analysis, the mode of arrangement of the inventoried species was greatly facilitated by the ascending hierarchical classification. However, at this level, only three distinct sets have been analyzed “Core A, Core B, and Core C”.

This diagnosis allowed us to highlight the floristic and ecological potential of the study area, to understand the relationships that exist between the different groups identified and the ecological factors responsible for the spatial organization of the phytodiversity of the steppe landscape, namely:

– .....humidity

– .....xericity

– .....therophytization

– .....Anthropogenic action

The deterioration of these stational ecological conditions can mark in the study area, vast expanses of bare soil at the stage of desertization.

The distribution of the two major species presents in our steppe landscape, Stipa tenacissima, Artemisiaherba-alba, is as follows.

To the north of the study area Stipa tenacissima is dominant, however, Artemisia herba-alba, when it appears, only exists through isolated plants.

In the center of the study area, these two species equally share the steppe landscape. Stipatenacissima occupies the glacis while Artemisia herba-alba occupies the depressions.

Recommendations and prospects

Install a permanent observatory for the periodic monitoring of the steppe flora and to quantify the degradation of the plant cover in these areas.

Preservation In the South it is Artemisia herba-alba that indisputably dominates. However, in this part appears the good development of Spartium junceum

And safeguarding local genetic resources.

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