

## The floristic diversity of the vegetation of the littoral in the area of Tlemcen (Western Algeria)

Hassiba Stambouli-Meziane\*, Mohamed Bouazza

Department of Ecology and Environnement, University of Tlemcen 13000 Algiers, (ALGERIA)

E-mail : madiocre@yahoo.fr

### ABSTRACT

This study is devoted to the analysis of the vegetation of coastal dunes in the region of Tlemcen. Results were obtained on these in general, including the biological and ecological. These results allowed us to individualize different phytosociological classes: The Cakiletea maritimae and Ammophiletea for cash at the beach; the Thero Brachypodietea and Quercetea ilicis in the sand dune and fixed dunes. Class Cakiletea maritimae and Ammophiletea grouped species of embryonic dunes. Thero Brachypodietea class includes species of sand dune. The class of Quercetea ilicis includes species of the dunes most advanced and most determined. Using phytosociological data and plant dynamics, we understand the evolution of the vegetation and its diversity.

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### KEYWORDS

Phytoecology;  
Phytosociology;  
Coast;  
Dune;  
Diversity;  
Algeria.

### INTRODUCTION

Mediterranean coastal ecosystems are characterized by strong climatic constraints and pedological salinity, wind, drought and shallow soils or mobile. While moving of the beach to the interior, we find a succession of landscape elements of dunes whose character and morphological vegetal is linked to the progressive modification of ambience salinity, wind power and sandy motions.

The work we present here concerns the coastal vegetation since the beach of Beni Saf up Marsat Ben M'hidi Figure 1. This one is related to a high proportion of sand, always greater than 60%. The vegetation of the region of Tlemcen provides a good example of study of the plant diversity and above all interesting synthesis of natural ecosystem dynamics, coastal. This type

of work has been addressed by several authors. Quote Mainly<sup>[1-4]</sup>

### MATERIALS AND METHODS

The study covers the analysis of the distribution of species in the the coastal region of Tlemcen: study sites were chosen. From the beach Beni Saf up Marsat Ben M'hidi, we have specified the distribution of taxa and identify the botanical and ecological components of of these species. They help us to better understand the vegetation dynamics but also to better understand the ecological factors.

For this we chose two areas repartees as follows:

- Representative areas them live dunes and dune embryonic (from the beach Beni-Saf up to Marsat Ben M'hidi).

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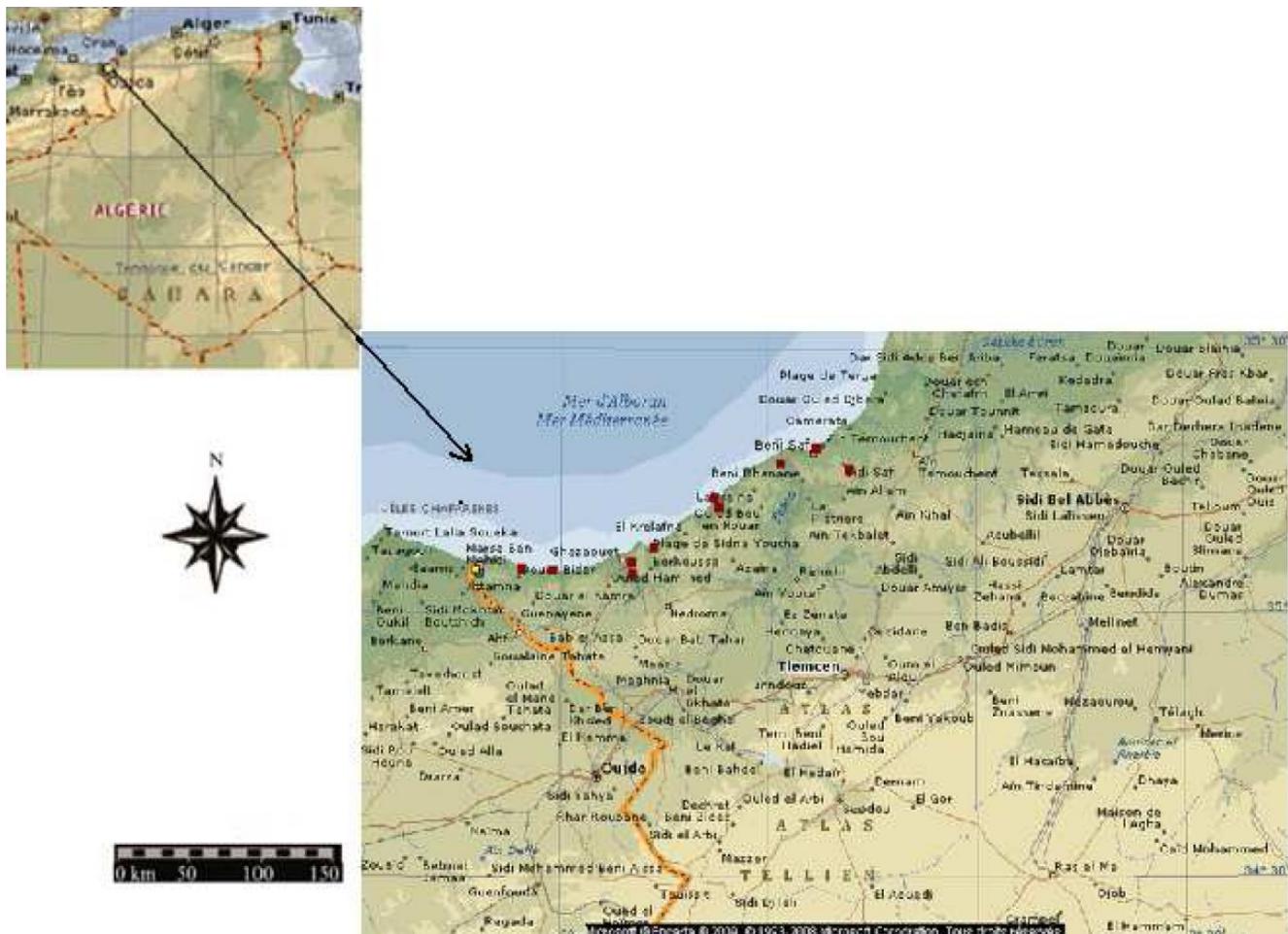


Figure 1 : Location of studies stations

- Zones representing the semi-fixed dunes (Ghazaouet cement factory station (Beni-Saf).

These two areas differ from each another by: geographical location, climate, topography, edaphic conditions, anthropogenic factors and plant diversity.

Stratify From sampling, we have selected ten study sites representative so the study of coastal vegetation in the region of Tlemcen.

Each of these stations has several fundamentally different situations.

These stations are localized in the western part of the north-western Algeria.

They are located between 1 o and 1 o 27\_ 51\_ west longitude and 34 o and 35 o 27\_ 18\_ north latitude. The zone is restricted geographically:

- To the north by the Mediterranean Sea;
- the south by the mounts of Tlemcen;
- to the west by the Algéro-Moroccan border;
- to the east by the wilaya of Témouchent.

### Beni saf

Those lands are limestone lithothamniées rich in fossil shells lumachellique of type post- tablecloths Miocene. rest on these limestones intercalations clays to sandstone Tortonian age (Miocene). The limestones constitute a plateau called “Sidi Safi plateau” from which is calcium carbonate noted for cement plant Beni Saf These limestones are covered with places by volcanic formations of type basaltic, Guardia<sup>[12]</sup>.

### Rachgoune

The station is located at the mouth of Tafna. These are the dune deposits at “El Guedim” and, on the right bank of the Oued, in these dunes appear basalt flows black color inter stratified with the volcanic tuffs, Guardia<sup>[12]</sup>.

### Genesis of sea dunes

Under the effect of erosion, sand particles are going to move grace to winds to feed the dune ridge of coastline.

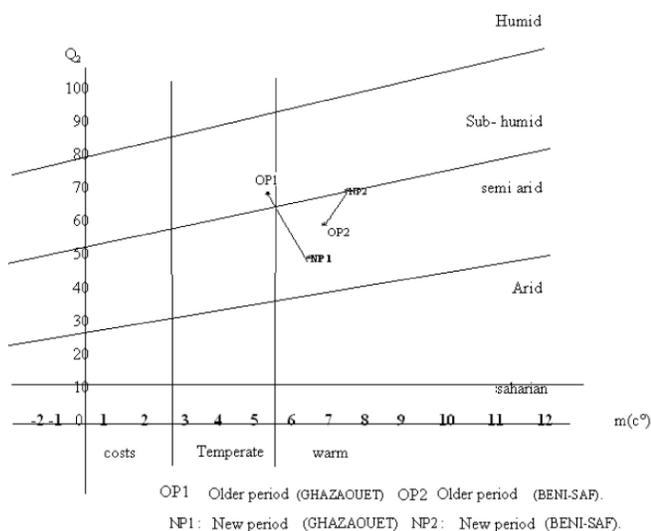
### Dunes

The wind pushes the sand which will hang on waste brought by the sea. This forms a hump get bigger and bigger. This is the birth of a dune where embryonic going to develop a ephemeral vegetation based on: *Medicago marina*; *Cakile maritima*; *Euphorbia paralias*. According to<sup>[13]</sup>, dune is a deposition of sand edified by the wind into coming up against various obstacles such as vegetation and asperities terrain encountered between the beach and the mainland.

The dynamics of dunes depends on the one hand of the Wind speed and the dimension of sand particles and, on the other hand, obstacles which are the vegetation or the reliefs. As a function of the latter we distinguish 04 kinds of dunes.

- **The high dunes:** encountered the vicinity of the sea (beach Rachgoune, Beidar, Egla M’Khaled).
- **Dunes on slopes:** are on slopes exposed to the sea (the valleys Rachgoune).
- **Suspended dunes:** are formed on the cliffs parallel to neighborhood of the sea (Ouled Ayad).
- **Dunes clad:** depots constitutes tackles against of the scree of slope. It is characterized by a vegetation based on: *Crucianella maritima*, *Thymelaea hirsuta* and *Elichrysum stoechas*. (Marsat Ben M’hidi)

The bioclimatic study for two periods (1913-1938) and (1970-2002) Figure 2 showed a vertical indent of each station in direct relation with the Q2 Emberger. Station Ghazaouet, despite falling on of the value of Q2 always under floor lower semi-arid to hot winter



**Figure 2 : Temperature and humidity within them different zones**

This climate favors the extension of a vegetation therophytic xerophyte..

### RESULTS AND DISCUSSION

Due to all this work it is possible to present specify the distribution of taxa and identify botanical and ecological components of coastal vegetation of the region of Tlemcen<sup>[11]</sup> Figure 3.

This vegetation is distributed at 63 Studied Families. The genres most represented belong to two families (22 and 14 Asteraceae Poaceae). These two families alone represent more than 40% of the flora species studied Figure 4. Some families (Cupressaceae, Ephedracées, Frankéniacées and Convolvulaceae) are a very small percentage, but play an extremely important role in the genesis and the formation of dunes (eg, Juniperus phoenicea family Cupressaceae which fixes the stabilizing the dunes.

The number of families ranges from 06 for the beach of Beni Saf reaching a maximum of the 17a 18 families for beach Egla there by characterizing embryonic dunes, in inwards pointing the number of families increases is the case of the 02 stations Ghazaouet and Rachgoune representative so semi-fixed dunes even fixed for the case of the station of Beni Saf (the cement plant).

The biological types are conditioned by environment factors determines the type and physiognomic of the vegetation. We determined the biological spectra of these formations.

The enumeration of species by biological types is performed on all the species inventoried in each part and gives us the global list the following compositions:

TABLE 1 and Figure 4 show that the distribution of biological types within these formations remains very heterogeneous. These spectra show a reduction, or even the total absence of phanerophytes due essentially to phenomena of degradation and an increase therophytes especially in stations Beider and Ghazaouet (79.14% and 85%).

The composition of general spectrum accuses predominance of therophytes in relation to other. The diagram of the study area is of type Figures 5, 6, 7, 8:

**Therophytes > Chamaephytes > Geophytes > Hemicryptophytes > Phanerophytes.**

Ghazaouet station and the valleys of Rachgoune show a complete lack of the phanerophytes and domi-

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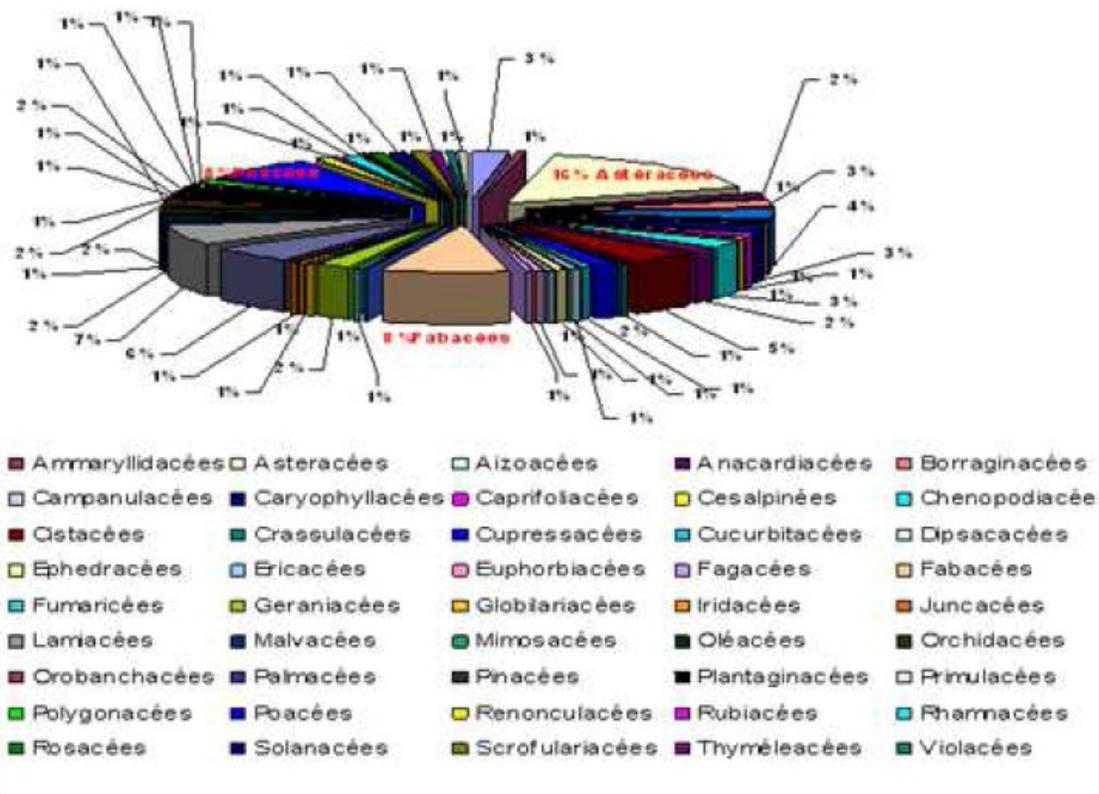
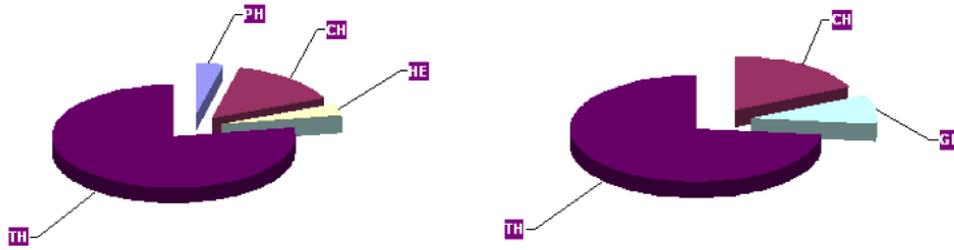


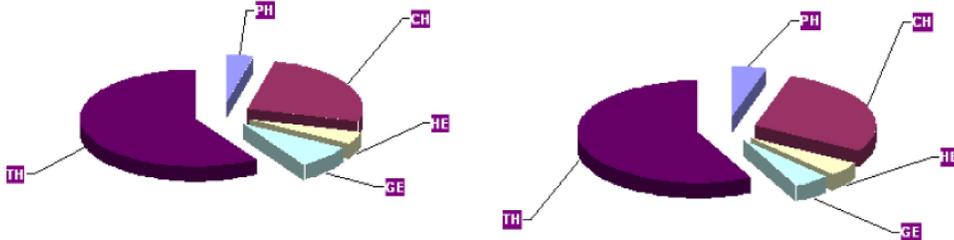
Figure 3 : The percentage of families of Littoral of species

TABLE 1 : Biological types of littoral in percentage

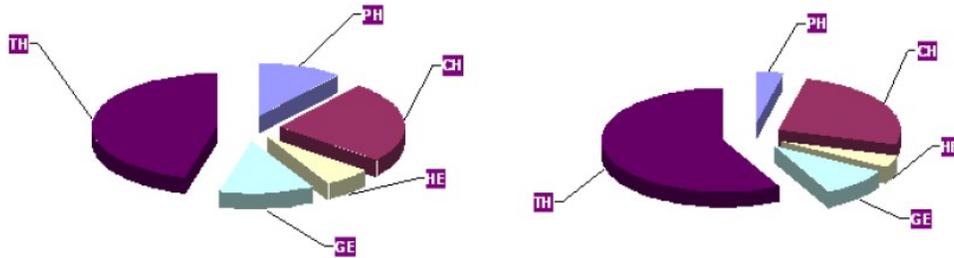
Biological types		PH	CH	HE	GE	TH	all
Beach of Béni- Saf	Nbr	16	37	9	18	68	148
	%	10.81	25.67	6.08	12.16	45.94	
Beach of Rachgoune	Nbr	1	4	1	0	21	27
	%	3.70	14.81	3.70	0	77.77	
Valleys of Rachgoune	Nbr	0	10	0	5	41	56
	%	0	18	0	9	74	
Beach of M'Khaled	Nbr	1	6	2	3	12	24
	%	4.16	25	8.33	12.5	50	
Beach of Eglá	Nbr	1	6	1	1	12	21
	%	7.76	21.57	4.76	4.76	57.14	
Ghazaouet beach Ouled Ayad	Nbr	0	2	0	2	22	26
	%	0	7.69	0	7.69	84.61	
Beidar	Nbr	1	5	1	0	27	34
	%	2.94	14.70	2.94	0	79.14	
Station of Béni-Saf	Nbr	2	14	2	5	31	54
	%	3.7	25.9	3.7	9.2	4.7	
Station of Ghazaouet	Nbr	2	13	2	4	30	51
	%	7.8	25.4	3.9	7.8	58.8	
Marsat Ben M'hidi	Nbr	1	8	0	1	16	26
	%	3.84	30.76	0	3.84	61.53	
the study area	Nbr	25	284	18	48	181	556
	%	0.44	51.04	3.23	8.63	32.55	



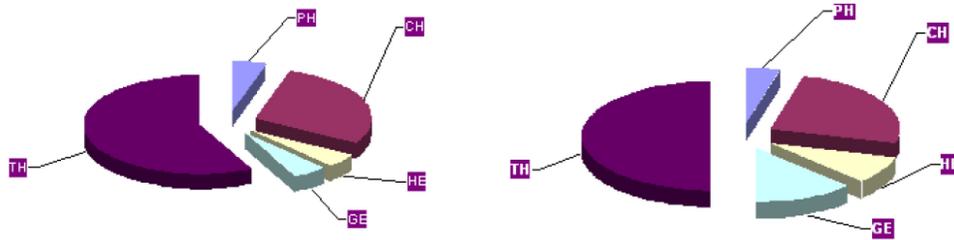
**Figure 4 : Type the biological species from coastline of Rachgoune**



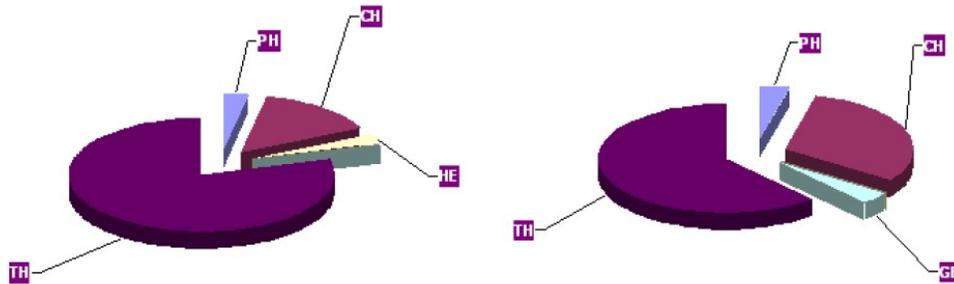
**Figure 5 : Type biological of the coastal species of Ghazaouet and Ouled Ben Ayad**



**Figure 6 : Type biological of the coastal species of Béni Saf**



**Figure 7 : Type biological of the coastal species of Egla and M' Khaled**



**Figure 8 : Type biological of the coastal species of Beidar and Marsat Ben M'hidi**

nance of the therophytes.

These therophytes have the ability to withstand the stresses imposed on by sand. The character of therophytisation these stations, and in particular their geographical position has enabled us to classify them among the back-dunes whose are the first influenced

by the ocean spray (embryonic dunes) and the by the following steppic (littoral dunes).

The percentage of therophytes of other stations (Beni-saf, Beach of then Rechgoune, Egla M'Khaled and Ghazaouet) seems more or less balanced with 57.14%, 58.16%, 77.77% and 50% respectively.

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Hemicryptophytes are totally absent in the beach Ouled Ben Ayad Ben and Marsat M'hidi, this can be explained by the poverty of soil organic matter and weak altitude (about 100 m) represented by these stations. This phenomenon has been confirmed by<sup>[5]</sup>: Indeed, the abundance of hemicryptophytes is explained by richness in organic matter in forest and altitude.

Despite the importance of therophytes, the chamaephytes keeping an important part in them vegetation. They are better adapted to aridity.

For our case we recorded a percentage 21 to 27%, and among species met: we have

- *Ziziphus lotus*
- *Lavandula stoechas*
- *Lavandula multifida*
- *Ulex boivinii*
- *Ulex parviflorus*

And finally, geophytes are everywhere less dominant with only 8 to 11%. They are represented by:

- *Asparagus acutifolius*
- *Asparagus stipularis*
- *Iris xiphium*
- *Orchis morio*
- *Serapias neglecta*
- *Orchis maculata*

In the stations of Rachgoune and Beidar, geophytes are completely absent<sup>[10]</sup> are also larger proportions in geophytes in Mediterranean region in steppic domain. Them climatic rigors and structural instability of the soil (sandy substrate) foster the development of species to be short life cycle, more or less demanding to the needs hydric and trophic.<sup>[9]</sup> Points out that the highlands Algerians the increase is in relation of therophytes with a gradient of increasing aridity.

The importance of therophyte is in direct relation with the disturbance index which has been calculated from the number of species encountered in our floristic surveys.

For full stations, this index remains high in relation to results<sup>[8]</sup> in Tunisia where there is obtained 70% as high value.

For our case, the disturbance index being of the order of 81% TABLE 2 for the entire study area, the high degradation engendered by action of man is distinctly visible (clearing, fires, grazing and urbanization). In this context,<sup>[7]</sup> report that the disturbances caused by humans and his herds are numerous and correspond

to two situations more severe ranging of the matorralisation up of desertification passing by the steppisation.

The importance of the disruption index is proportional to the dominance of therophytes who find here their favorable environment for their development (sandy substrate, Poverty in organic matter) again reflecting a more open environment.

These ephemeral species resistant constraints imposed by the wind (movement of sand particles) and sea spray. They are also called passive dryland because they stop all metabolic activity during adverse condi-

TABLE 2 : Disturbance index of stations studied

Station	Disturbance index
beach of Béni-Saf	71.62%
La station of Rachgoune	92%
Les vallées of Rachgoune	92.59%
beach of M'Khaled	75%
Station of Béni Saf	83%
Station of Ghazaouet	84%
beach of Egla	85%
beach of Ben yard	92%
beach of Beidar	94%
Marsat of Ben M'hidi	92%
the study area	79%

tions.

This index shows the thérophytisation of the zone follows a steppisation which is treated as the ultimate stage of degradation of different ecosystems with the species dominance sub-nitrophilous related to over-grazing<sup>[7]</sup>

## CONCLUSION

The study of the vegetation of the littoral has enabled us to bring out the following results:

The group Poaceae, Asteraceae, Fabaceae and Caryophyllaceae unquestionably dominates the field.

The biological type "therophytes" largely dominates them stations studied in the coastal come second them chamaephytes, geophytes and finally hemi cryptophytes. The latter, according to<sup>[5]</sup> require a medium rich in organic matter and a strong altitude, which is not for our case

Phanerophytes by against are totally absent in the valleys of Rachgoune and Ghazaouet; but shyly repre-

sented (with 2%) in the beaches of Rachgoune and Beidar.

The calculation of the index of perturbation is proportional to the species dominance therophytic in all the stations studied. The dominant character is linked therophytisation to swamping of annual species, disseminated by the herds, especially in the study area. In this regard,<sup>[6]</sup> explains the by therophytisation ultimate stage of degradation of the ecosystems with species sub-nitrophilous related to overgrazing.

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