

PHYTOGEOGRAPHICAL CONSIDERATIONS ON THE COASTAL VEGETATION OF CYRENAICA

by

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Abstract

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Some phytosociological aspects of the coastal vegetation of Cyrenaica are showed here. Which includes areas such as sandy beaches, dunes, salt-marshes and rocky coasts.

Resumen

BRULLO, S. & F. FURNARI (1981). Consideraciones fitogeográficas sobre la vegetación costera de Cirenaica. *Actas III Congr. OPTIMA. Anales Jard. Bot. Madrid* 37 (2): 765-772 (En inglés).

Se exponen algunos aspectos fitosociológicos sobre la vegetación costera de Cirenaica, atendiendo preferentemente a las zonas de playa, dunas, marismas y acantilados.

INTRODUCTION

A recent work by BOULOS (1972) has brought up-to-date (until 1971) the existing literature about flora and vegetation of Libya. As regards to the knowledge about North Cyrenaica, we have numerous floristic works, whilst the knowledge about vegetation is scarce. An approach to the classification of the plant communities and their ecology has been made by GIMINGHAM & WALTON (1954).

Since 1974 we have had the possibility of visiting Cyrenaica many times, where some phytosociological research has been made (1). For this study, we have collected numerous specimens (about 800 species) and the resulting herbarium is conserved at the Botanical Institute of Catania. The numerous records, which were made in the territory, enable to us the individualization of many associations, which, because of their

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(1) A monographic work on the N. Cyrenaica vegetation is ready for the press. We must thank the Gebel el-Akhdar Authorities who facilitated these researches.

special ecological characteristics and their floristic peculiarities, are nearly all new and ranged in new superior phytosociological units.

A study of therophitic communities and the segetal vegetation of the Gebel el-Akhdar has already been published by us (BRULLO & FURNARI, 1978; BRULLO, 1980).

In the present work, we have thought it better to emphasize some phytosociological aspects of the coastal vegetation of Cyrenaica.

PHYTOGEOGRAPHICAL CONSIDERATIONS

Between Benghazi and Derna, three main coastal environments are represented: the sandy beaches, salt-marshes (locally called sebchet) and the rocky coasts. These habitats, as elsewhere in the Mediterranean, are characterized also here by a very specialized flora and vegetation and are interesting in regard to phytogeographical and phytosociological aspects.

A) Sandy beaches

On the sandy coasts the classical succession generally occurs (Fig. 1). One starts from the initial pioneer plant community which is the nearest to the sea up to the more evolved vegetation of the dunes and the retrodune. In these habitats, we find a certain number of psammophytes with a large Mediterranean or Mediterraneo-Atlantic distribution. Some of these species are less frequent or rare, among which: *Pancratium maritimum* L., *Oianthus maritimus* (L.) Hoffm. & Link, *Euphorbia paralias* L., *Medicago marina* L., *Cyperus kalli* (Forsk.) Murbeck. Others are more frequent: *Agropyron junceum* (L.) Beauv., *Ammophila littoralis* (Beauv.) Rothm., *Lotus creticus* L., *Cutandia maritimam* (L.) Richter, *C. dichotoma* (Forsk.) Trabut, *Pseudorlaya pumila* (L.) Grande, *Sporobolus arenarius* (Gouan) Duv.-Jouve.

The presence of species with South-East Mediterranean distribution (which extend from South Tunisia up to Egypt, sometimes up to South Palestine and Crete) is remarkable. Among these: *Aegialophila pumila* (L.) Boiss., *Silene succulenta* Forsk., *Lotus polyphyllus* Clarke, *Hyoseris lucida* L., *Ononis vaginalis* Vahl. Some interesting species are the Saharo-Arabian and South Mediterranean-Saharo-Arabian, as: *Centaurea dimorpha* Viv., *Echinops spinosissimus* Turra, *Zygophyllum album* L., *Launea resedifolia* (L.) O. Kuntze, *Retama raetam* (Forsk.) Webb. These floristic characteristics allow us to range the psammophilous vegetation in the order *Ammophiletalia* and in a new alliance: *Aegialophilo-Retamion*, which is probably distributed along all the sandy coasts of the South-East Mediterranean area.

The colonization of the sands nearer to the sea starts with an halonitrophilous vegetation of the class *Cakiletea maritimae*, in which we find Mediterraneo-Atlantic species (*Cakile maritima* Scop., *Euphorbia peplis* L.)

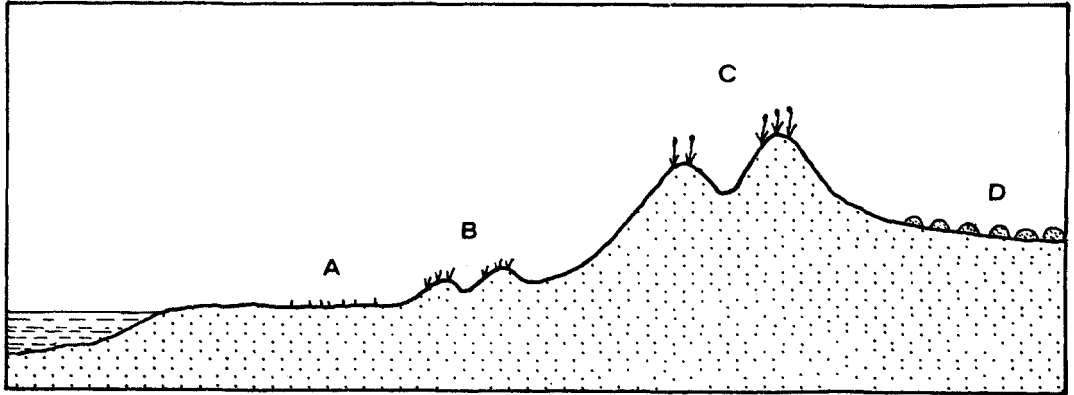


FIG. 1.—Transect of sandy beaches vegetation: A - Ass. of *Sporobolus arenarius* and *Zygophyllum album*. B - Ass. of *Agropyron junceum* and *Aegialophila pumila*. C - Ass. of *Ammophila littoralis* and *Echinops spinosissimus*. D - Ass. of *Ononis vaginalis* and *Centaurea dimorpha*.

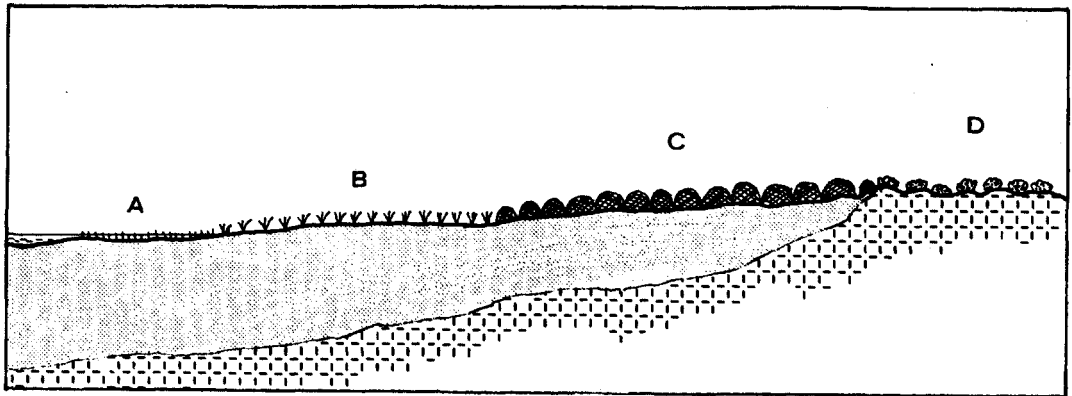


FIG. 2.—Transect of salt-mashes vegetation: A - Ass. of *Salicornia radicans* and *Aeluropus lagopoides*. B - Ass. of *Halocnemum strobilaceum* and *Arthrocnemum glaucum*. C - Ass. of *Limoniastrum monopetalum* and *Suaeda vermiculata*. D - Ass. of *Salsola tetragona* and *Atriplex glauca*.

or Circum-Boreal (*Salsola kali* L.) or Sub-Cosmopolitan ones (*Polygonum maritimum* L.). Dominant species are *Sporobolus arenarius*, which covers large areas, and *Zygophyllum album*.

A more evolved vegetation is represented by the association of *Agropyron junceum* and *Aegialophila pumila*, which has a better capacity to hold the sand and to start the edification of the dune. On the whole, the vegetation is very similar to the *Agropyron junceum* associations which are common in the Mediterranean area, but differs in some floristic particularities. Here *Aegialophila pumila* and *Silene succulenta*, dominating species, confer a special physiognomy to the vegetation.

The highest dunes are colonized by big tufts of *Ammophila littoralis* which grow specially on the crest of the dunes. This species, which is the real builder of the dunes, tends to form a community which is structurally similar to those known in other Mediterranean territories; but, some differences are observed in regard to the floristic composition. In fact, many common species in the associations of *Ammophila littoralis* of the N. Mediterranean countries, are absent or rare in Cyrenaica. Whilst, some species mainly distributed in the Saharo-Arabian territory, are frequent (*Echinops spinosissimus*, *Retama raetam*, *Launea resedifolia*), which therefore, allow us to differentiate a local association (*Ammophila littoralis* & *Echinops spinosissimus* ass.).

The retrodune is occupied by a special shrub association where *Ononis vaginalis* dominates. This vegetation has the same ecological role as the *Crucianella maritima* L. associations which are frequent in the Western Mediterranean. Besides, exclusive species of the *Ononis vaginalis* association are *Centaurea dimorpha* and *Daucus carota* ssp. *hispanicus*.

Between the perennial psammophilous communities occur, specially in the flat surface, some ephemeral associations which are rich in therophytes. A phytosociological study has been made by the authors and numerous associations have been described (BRULLO & FURNARI, 1978). In these associations we remark the presence of the Mediterranean elements [*Anchusa hibryda* Ten., *Minuartia geniculata* (Poir.) Thell., *Silene morisiana* Pign., *Asteriscus aquaticus* (L.) Less., *Senecio leucanthemifolius* Poir., *Euphorbia terracina* L., *Erodium laciniatum* (Cav.) Willd., *Bromus rigidus* Roth., *Corynephorus divaricatus* (Pourr.) Breistr., *Ononis diffusa* Ten., *Medicago disciformis* DC.], Mediterranean-Atlantic [*Vulpia membranacea* (L.) Dumort.], Mediterranean-Irano-Turanian [*Brassica tournefortii* Gouan, *Gynandris sisyrinchium* (L.) Parl.]. Besides, the presence of South-East Mediterranean species is very important, as: *Crucianella herbacea* Forsk., *Anacyclus monanthos* (L.) Thell., *Centaurea alexandrina* Del., *Centaurea contracta* Viv., *Crepis senecioides* Del., *Ifloga spicata* (Forsk.) Sch.-Bip. ssp. *labillardierii* (Pamp.) Chrtek, *Triticum bicorne* Forsk., *Desmazeria philistaea* (Boiss.) H. Scholz ssp. *rholfisiana* (Cosson) H. Scholz, *Vulpia brevis* Boiss. & Kotschy ex Boiss., *Androcymbium rechingeri* Greuter, *Hypocoum aequilobum* Viv., *Plantago crypsoides* Boiss. Some endemic species occur: *Helianthemum cyrenaicum* (Gross.) Brullo & Furnari, *Anthemis taubertii* Durand & Barr. ssp. *arenicola* (Pamp.) Brullo & Furnari, *Teucrium zanonii* Pamp., *Plantago lagopus* L. ssp.

ptolemaidis Brullo & Furnari, *Plantago libyca* Bég. & Vacc. These two last chorological groups are particularly significative and therefore, the aspects of vegetation are well differentiated from the corresponding associations of the W. Mediterranean territories which are ranged in *Malcolmietalia* order. For this reason, the ephemeral psammophilous vegetation of Cyrenaica has been ranged by the authors in a special alliance *Crucianellion herbaceae*.

B) Salt-marshes

Along the sandy coast, some salt-marshes, sometimes very extended, are frequent. These are submerged in winter and dry (partly or totally) in summer. Around these salt-marshes there is a developed and extended halophilous vegetation which is arranged in belts (more or less regular) according to a characteristic succession (Fig. 2).

On the whole, this vegetation, mainly shrubby, presents a remarkable analogy with formations known in other marshy coastal areas of North Africa (e.g. Tunisia, Algery, Egypt) and in some arid territories of Europe as Spain and Sicily. In these habitats, in fact, frequent elements are: Mediterranean-Irano-Turanian [*Arthrocnemum glaucum* (Del.) Ung.-Sternb., *Halocnemum strobilaceum* (Palla) Bieb., *Hymenolobus procumbens* (L.) Nutt., *Frankenia pulverulenta* L., *Hordeum marinum* Huds., *Bupleurum semicompositum* L.], Mediterranean [*Limoniastrum monopetalum* (L.) Boiss., *Limonium oleifolium* Miller, *Parapholis incurva* (L.) C. E. Hubbard, *Sphenopus divaricatus* (Gouan) Reichenb., *Juncus subulatus* Forsk., *Triglochin bulbosum* L. ssp. *barrelieri* (Loisel.) Rouy]. Saharo-Arabian [*Gymnocarpus decandrum* Forsk., *Anabasis articulata* (Forsk.) Moq., *Salsola tetragona* Del., *Suaeda vermiculata* Forsk., *Chlamydomphora tridentata* (Del.) Ehrenb.], South-East Mediterranean [*Sphenopus ehrenbergii* Hausskn., *Chenolea arabica* Boiss., *Limonium pruinosum* (L.) O. Kuntze ssp. *pruinsum*], and Endemic [*Frankenia syrtica* (Maire & Weiller) Brullo & Furnari, *Limonium teuchirae* Brullo].

Not frequent are the halophilous species with a wider distribution as the elements: Borealo-Tropical and Circum Boreal [*Halimione portulacoides* (L.) Aellen, *Suaeda maritima* (L.) Dumort., *Suaeda fruticosa* (L.) Forsk., *Salicornia europaea* L. s.l., *Carex extensa* Good, *Juncus acutus* L., *Juncus maritimus* Lam.], Paleo-Temperate [*Spergularia marina* (L.) Griseb., *Spergularia media* (L.) C. Presl, *Carex divisa* Huds.], Cosmopolitan [*Cressa cretica* L. *Polygonum monspeliensis* (L.) Desf. *Ruppia maritima* L., *Ruppia rostellata* Koch], and some Mediterranean and Mediterraneo-Atlantic [*Inula crithmoides* L., *Parapholis filiformis* (Roth) Hubbard, *Centarium spicatum* (L.) Fritsch, *Centarium tenuiflorum* (Hoffm. & Link) Fritsch, *Lotus preslii* Ten., *Salicornia radicans* Sm., *Plantago coronopus* L.].

The halophilous vegetation, which is very specialised, is not rich floristically. We can distinguish many associations well characterized from the floristic and physiognomic point of view. In the central part of the Sebcha, the association of *Salicornia radicans* and *Aeluropus lagopoides* occurs.

It is linked to stations submerged for a long time and it is observable only in the parts farther away from the sea. To this vegetation, which is floristically the poorest, follows outwards the association of *Halocnemum strobilaceum* and *Arthrocnemum glaucum* which tends to form some belts which are often very wide. It is a markedly halophilous formation which is quite similar to the other associations of *Halocnemum strobilaceum* described in the other parts of the Mediterranean. Going further outwards, we find the association of *Limoniastrum monopetalum* and *Suaeda vermiculata* that occupies the rarely submerged stations and it is quite dense and high. Belts of *Limoniastrum monopetalum* are very frequent in the Mediterranean coasts and, as in Cyrenaica, they are localized on the external margin of the salt-marshes. Particular steppe vegetation, characterized by Saharo-Arabian species, occurs very often towards the inland, externally to the *Limoniastrum monopetalum* vegetation. These are dwarf-shrub formations linked to soils with rocky emergences and characterized (especially near Benghazi) by *Salsola tetragona* and *Atriplex glauca*. Towards Tocra, it is substituted by the association of *Lygeum spartum* and *Gymnocarpus decandrum*. This type of vegetation is to be ranged in the *Limonietales* order of the *Salicornietea*. This is clearly in relation to the remarkable aridity of the territory. Therefore, the absence or rarity of *Salicornietalia fruticosae* associations is justified because this order includes the less thermophilous associations of the class *Salicornietea*.

C) Rocky coasts

The shoreline between Tolmetta and Derna is represented especially by calcareous rocks forming sometimes high cliffs. On this almost continuous belt, characteristic pioneer communities of chamaephytes and nanophanerophytes occur. The prevalence of Mediterranean elements is here remarkable. Among these species we have *Reichardia picroides* Roth var. *maritima* (Willd.) Batt., *Lotus cytisoides* L., *Silene sedoides* Poir., *Limonium oleifolium* Miller, *Sonchus glaucescens* Jord., *Senecio leucanthemifolius* Poir., *Frankenia laevis* L., *Daucus carota* L. ssp. *hispidus* (Arcangeli) Heywood.

To these, one also adds a certain group of South Mediterranean species [*Desmazeria sicula* (Jacq.) Dumort, *Triadenia aegyptiaca* (L.) Boiss.], Mediterranean-Saharo-Arabian [*Thymelaea hirsuta* (L.) Endl.], Mediterraneo-Atlantic [*Plantago coronopus* L., *Crithmum maritimum* L.]. From the floristic and physiognomic point of view, the following species are important: *Cichorium spinosum* L. (East Mediterranean species) and some species South-East Mediterranean [*Helichrysum conglobatum* (Viv.) Steud., *Crucianella rustris* Guss., *Frankenia revoluta* Forsk., *Reaumuria vermiculata* L.] and endemic [*Catapodium syrticum* Barr. & Murb., *Limonium cyrenaicum* (Rouy) Brullo, *L. subrotundifolium* (Bég. & Vacc.) Brullo].

We remark that *Crithmum maritimum*, which is very common on the rocky coasts of the Mediterranean, is very rare in Cyrenaica. According to PAMPANINI (1931), this species has been considered as uncertain for

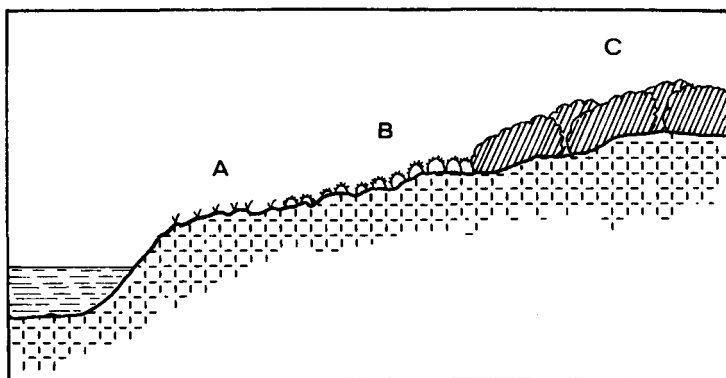


FIG. 3.—Transect of rocky coasts vegetation: A - Ass. of *Limonium cyrenaicum*. B - Ass. of *Helichrysum conglobatum*. C - Maquis.

Cyrenaica. In fact, we have observed some specimens on very shady cliffs, only near Ras El-Hilal. This area coincides with the coastal part characterized by a greater rainfall (350 mm mean per annum).

In the particular rupestrian habitats, we can evidence a characteristic succession according to the sea distance. In the belt which is nearer to the shore, grows a vegetation with a more halophilous character where *Limonium cyrenaicum* has its optimum. This endemic species is very common on all the shorelines and is vicaried in some spots near Derna by *Limonium subrotundifolium*. From the ecological-structural point of view, the association of *Limonium cyrenaicum* corresponds to the belt of *Limonium* sp. pl. and *Crithmum maritimum* which characterizes the Mediterranean rocky coasts.

In the stations more distant from the sea, follows a more evolved and floristically richer vegetation. Physiognomically, this vegetation is characterized by cushion-like species as *Helichrysum conglobatum* and *Thymelaea hirsuta* and besides *Cichorium spinosum* and *Crucianella rupestris*, which are also present in the vegetation of *Limonium* but with a scarce covering. Even the association of *Helichrysum conglobatum* corresponds to analogous formations with *Helichrysum* sp.pl., *Astragalus massiliensis*, *Thymelaea* sp.pl. which are frequent in other Mediterranean coasts.

From the phytosociological point of view, these associations are to be included in the new alliance *Crucianellion rupestris*, which substitutes the *Crithmo-Limonion* in South-East Mediterranean territories. Differential species of *Crucianellion rupestris* are in fact: *Crucianella rupestris*, *Cichorium spinosum*, *Triadenia aegyptiaca* and *Frankenia revoluta*.

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