ON THE ECOLOGY AND PHYTOSOCIOLOGY OF EL-OMAYED AREA

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ABSTRACT

The average of absolute density for 62 perennial species in five types of habitats was recorded. The highest absolute density in coastal sand dune habitat was contributed by *Launaea resedifolia* while, in saline depression, inland plateau and ridge the highest account was recorded for *Salsola tetragona, Launaea. Resedifolia and Scorzonera undulata*. The ridge habitat contributed the highest number of species (32 species), while the lowest number was attained in the non-saline depression (20 species). Sixty-two species belonging to 24 families were recorded. The highest contribution was presented by members belonging to family Compositae followed by Gramineae and Chenopodiaceae (15, 13 and 13 %, respectively). On the community levels the plant community of inland ridge exhibited the highest abundance in terms of absolute density while plant community of the non-saline depression exhibited the lowest value.

Most perennial species exhibit their greatest phonological activity during winter and spring, and were less active or dormant during autumn. However, some species, particularly most shrubs and sub-shrubs, continue to be active throughout the whole year (e.g. *Deverra tortuosa, Helianthemum lippii*, and *Artemisia herba - alba*). The most common life-forms were of the woody species (76 %) which include 41 % non-succulent leaves and 5 % succulent leaves, while the contribution of herbs represented 25 % of which 5 % were non-succulent leaves.

The tallest plants recorded during the growing season in the whole area were those of *Thymelaea hirsuta, Lycium shawii* and *Anabasis articulata* were among shrubly species and *Asphodelus ramosus* of the perennial herbs and the grass *Ammophila arenaria*. On the other hand, the sub-shrubs *Helianthemum lippii and H. kahiricum* were the shortest.

Some other human activities have more impact on the vegetation than the over grazing by livestock. The various activities have different impacts on the plant diversity (e.g. 11 species of the recorded species were rated as endangered species due to human impact or desertification).

Positive significant correlation coefficients were found between soil depth and both abundance of ever-green shrubs with non succulent leaves and with herbs.

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INTRODUCTION

El-Omayed observatory is a part of the Northwestern Mediterranean coastal land of Egypt. It was located 80 km west of Alexandria in the form of transect which consists of a series of elongated ridges, alternating with depressions, running parallel to the Mediterranean coast in NE-SW direction.

The region is characterized by marked physiographic heterogeneity and different types of habitats, which leads to distinct local variations in the distribution of vegetation. It offers a wide spectrum of wild plant species in the range of 110-130 perennials and more than 75 annuals. The vegetation

belongs to the “Steppic Eastern Africa Domain of the East Mediterranean sub-region” according to the classification of Quetzal (Abdel-Razik *et al*., 1996).

The study area is bounded by latitudes 30° 27- and 30° 52- N, and by longitudes 28° 55- and 29° 20-E. It extends for about 17.5 km from the sea shore inland towards. Geomorphologically, the area is characterized by low relief and mild topography. The topography becomes higher in an irregular fashion from coast inland. The relief is characterized by successive undulations of calcareous rocky ridges (with altitudes of 10-70 m) running more or less parallel to the coastal line and are alternating with land depressions. Three distinct major physiographic features are recognized: a) a coastal system covering a small part of the territory and including the coastal sand dunes; b) ridges and depressions (saline and non-saline) system which constitutes the main part of the territory; and c) the inland plateau system close the inland desert. The objective of this part of the study: is to record seasonal changes in the vegetation and soil parameters of rangelands system.

METHODS

Fifteen plots have been carefully selected along a transect intersecting the observatory terrain. These plots were selected to represent the following main habitats: non-saline depression (sites I A,B and C; fenced “1” and unfenced “2”, rocky ridge (sites II A & B), inland plateau (Sites III A; fenced “1” & unfenced “2”), saline depression (sites IV A & B), and coastal and sub-coastal dunes (sites V A, B, & C). Locations of these sites (layed within permanent sampling stands) were fixed in the observatory area.

The area of each sampling stand was 50 x 100 meters.; which was based on many considerations including the morphology of the species, the homogeneity of the vegetation and the topography. In each stand 50 quadrates, each 1x2 meters size, were sampled according to a fixed restricted random distribution layout, hence were marked metal permanent points. These plots were used for quantitative measures of vegetation.

A list of species present in an area can often provide interesting information, particularly if the list includes species which were poor colonists of disturbed areas. Accordingly, a floristic list of species present in each site was recorded each season. Absolute and relative density of each permanent species were calculated. Plant nomenclature was according to Tنckholm (1974) and were updated following Boulos (1995).

Soil description was carried out according to the terminology cited by the U.S. Soil Survey Staff (1975). In each site four sets of soil samples were collected, each set was represented by composite soil samples at three successive depths; 0-15, 15-30, and 30-45 cm. These soil samples were air dried, crushed and passed through 2mm sieve, and subjected to the following determinations: particle size distribution was carried out by sieving for sandy soils and by pipette method for moderately textured soils. $CaCo_3$ was determined using Collin’s calcimeter. Total soluble salts were determined in 1:2.5 soil water extract according to Richards (1954). Organic matter content

was determined according to Walkely and Blak's method. Sodium and potassium was determined by flame photometer, calcium and magnesium were determined volumetrically using Versene method. Chloride was determined by titration with silver nitrate, while carbonate and bicarbonate were determined by titration with standard hydrochloric acid.

RESULTS

Table 1 shows the average of absolute density (individual/100m^2) for 62 perennial species in the five types of habitats. The highest value of absolute density in the coastal sand dune habitat was contributed by *Launaea resedifolia* (412 ind./100m^2) while, in saline depression, inland plateau and ridge the highest value was recorded by *Salsola tetragona, Launaea resedifolia and Scorzonera undulata* (49, 242, and 168 ind./100m^2 respectively). The ridge habitat attained the highest contribution of species (32 species), while the lowest contribution was attained in the non-saline depression (20 species).

Phenological phases, life-forms, families and presence percentage of plant species in the different habitats were represented in Table 2. Sixty two species belonging to 24 families were recorded. The highest contribution was presented by members belonging to family compositae followed by gramineae and chenopodiaceae (15, 13 and 13%, respectively). The most common life-forms were the shrubby species (76%) which have 41% with non-succulent leaves and 5% with succulent leaves, while the contribution of herbs represented 25% of which 5% has non-succulent leaves. The contribution of geophytes was 5%.

Phenophases of plant species in the 15 plots in different habitats during two seasons were presented in Table 2. Most perennial species exhibit greater activity during winter and spring, and were less active or dormant during autumn. However, some species, particularly most of the shrubs and sub-shrubs, continue de to active throughout the whole year (e.g. *Deverra tortuosa, Helianthemum lippii*, *Artemisia herba - alba*). On the other hand, phenological records indicated that most of the species were in the dormant phase, while, some of them start their vegetative activity. For example, the maximum vegetative growth of shrubly species was attained by those of the non-saline depression.

Table (1): Average absolute density (individual/100m^2) of species within the permenant plots in the different habitats of El-Omayed Observatory .

Species \ Habitat	Coastal Sand Dune	Non Saline depression	Saline depression	Inland Plateau	Ridge

Aeluropus lagopoids *(L.) Trin. ex Thwaites*	64.7	0.0	0.0	0.0	0.0
Allium roseum Boiss.	0.7	0.0	0.0	0.5	0.9
Ammophila arenaria (L.) Link.	33.0	0.0	0.0	0.0	0.0
Anabasis articulata (Forssk.)Moq.	0.0	5.2	0.0	4.0	0.0
Anabasis oropediorum Maire	0.0	0.8	1.5	6.5	32.0
Arisarum vulgare Targ.	0.0	0.2	0.0	30.5	0.0
Artemisia herba-alba Asso	0.0	0.0	0.0	0.0	113.0
Artemisia monosperma Delile	0.0	227.7	0.0	0.0	0.0
Asparagus stipularis Forssk.	0.0	0.0	0.0	0.0	3.0
Asphodelus ramosus L.	0.3	43.5	6.5	203.5	56.5
Astragalus spinosus (Forssk.)Muschl.	0.0	0.0	0.5	0.0	0.0
Atractylis carduus (Forssk) C. Chr.	6.7	15.3	0.5	27.0	0.5
Carduncellus eriocephalus Boiss.	0.0	8.5	0.0	10.0	0.0
Crucianella maritima L.	138.7	0.0	0.0	0.0	0.0
Dactylis glomerata L.	0.0	0.0	0.0	0.0	24.0
Deverra tortuosa (Desf.)DC.	1.7	--	1.5	3.0	28.0
Ebenus armitagei Schweinf.& Taub.	0.0	0.0	0.0	0.0	3.0
Echinops spinosissmus Turra	44.0	0.5	0.0	13.0	18.0
Echiochilon fruticosum Desf.	0.0	14.3	0.0	126.5	0.0
Echium sericeum (Vahl) Klotz	8.0	0.0	0.0	0.0	0.0
Elymus farctus (Viv.)Runemark ex Melderis	20.0	0.0	0.0	0.0	0.0
Erodium glaucophyllum (L.) L' Her.	0.0	3.5	0.0	0.0	0.0
Erodium hirtum Willd.	0.0	0.2	0.0	5.5	14.0
Euphorbia bivonae Steud.	0.0	0.0	0.0	0.0	0.5
Euphorbia paralias L.	2.7	0.0	0.0	0.0	0.0
Frankenia revoluta Forssk.	0.0	0.0	0.5	0.0	0.0
Gymnocrpos decandrum Forssk.	0.0	1.2	0.0	16.0	68.5
Helianthemum kahiricum Del	-	-	17.5	-	119.0
Helianthemum lippii (L.) Dum.	22.0	20.7	4.0	209.5	-
Herniaria hemistemon J. Gay.	-	-	0.5	-	1.0
Hyoseris radiata L.	2.0	-	-	-	-
Iris sisyrinchium L.	-	-	0.5	-	10.5
Kicksia aegyptiaca (L.) Nabelek	-	-	1.0	-	0.5
Launaea nudicaulis (L.) Hook.	0.6	8.0	3.0	2.0	28.5
Launaea resedifolia (L.) Kuntze	411.7	13.7	-	242.0	-
Limoniastrum monopetalum (L.) Boiss.	-	-	37.0	-	-
Limonium tubiflorum (Delile) Kuntze	-	-	-	-	19.0
Lotus creticus L.	-	-	-	-	0.5
Lotus polyphyllos E.D. Clarke	38.3	-	-	-	-
Lycium shawii Roem & Schult.	0.3	0.7	-	5.0	1.5
Lygeum spartum Loefl ex L.	-	-	0.5	-	6.0
Noaea mucronata (Frossk.) Asch.& Schweinf.	0.0	12.0	0.0	33.5	57.5
Ononis vaginalis Vahl	63.0	-	-	-	-
Otanthus maritimus (L.) Hoffmanns & Link.	0.3	-	-	-	-
Pancratium maritimum L.	0.3	-	-	-	-
Phagnalon schweinfurthii Sch.	-	-	-	10.5	-
Phlomis floccosa D. Don.	-	-	-	-	0.5
Plantago albicans L.	1.0	2.0	25.0	123.0	--

Table (1): Cont.

Polygonum equisetiforme Sm.	4.3	-	-	-	-
Reaumuria hirtella Jaub. & Spach.	-	-	8.5	-	18.5
Salsola longifolia Forssk.	1.0	-	4.0	-	-
Salsola tetragona Delile	-	-	49.0	-	11.0
Salsola tetrandra Forssk.	-	-	22.0	-	-
Salvia aegyptiaca L.	9.0	-	0.5	-	-

Salvia lanigera Poir.	17.0	-	6.0	5.5	2.5
Scorzonera undulata Vahl.	-	-	21.0	18.5	168.0
Stipagrostis ciliata (Desf.) de Winter	-	1.7	-	5.0	1.0
Suaeda pruinosa Lange	0.3	-	17.0	-	-
Teucrium polium L.	-	-	-	-	3.0
Thymelaea hirsuta (L.) Endl.	1.7	0.2	-	14.0	3.0
Urginea undulata (Desf.) Steinh.	-	-	-	-	1.5
Zygophyllum album L.	3.0	-	-	-	-

The average height of different plant species recorded in the study were ranges between 1 and 80 cm (Table 3). Although it varies widely in different sites and habitats, it depends to some extent on the life-forms of such species and it sometimes varies with the pheological behavior of some species especially perennial herbs and grasses. The shrubby species *Thymelaea hirsuta, Lycium showii* and *Anabasis articulata*, the perennial herb *Asphodelus ramosus* and the grass *Ammophila arenaria* were the tallest recorded plants in the growing season in the whole were. On the other hand, the sub-shrubs *Helianthemum lippii and H. kahiricum* were the shortest.

The average physical and chemical properties of the soil in different habitats of the study area were presented in (Table 4). The largest particle size (coarse fraction) was attained in the inland plateau at depth 0- 15 cm followed by the saline depression at depth 30- 45 cm. Fine particles ranged from 0.12 to 0.06 mm. It reached its highest percentage in the saline depression (22.9%) in the depth of 15-30 cm, followed by the non-saline depression (13.4%) at depth 0- 15 cm while the maximum percentage of clay was attained in the saline depression (7.5 and 5%) at depths 30-45 cm, and 15-30 cm , respectively.

The highest values of electric conductivity (EC) were attained in the saline depression. Remarkable variations in the electric conductivity were noticed at the same habitat. For example, in the non-saline depression EC value at 15 cm depth was 4.41 dsm^{-1} while, it was 5.0 dsm^{-1} at 30 – 45 cm depth. In the sand dunes, EC was 0.88 dsm^{-1} at 15 cm depth while it was 2.7 dsm^{-1} at 30-45 cm depth. No significant variations in pH (soil reaction) in all different habitats were found. The maximum concentration of Ca, Na was attained in the saline depression habitat with relative increase with depth in sand dune habitat. Mostly, all the anions reach its maximum value in the sand dunes followed by saline depression, while, there was a reverse trend for HCO_3^- and SO_4^{--}, with the notable increase in Cl, SO_4 and $CaCO_3$ (34.2 %, 21.3 % and 50.4 % respectively)Correlation between life-forms and soil properties at different depths in different habitats during the two sampling seasons (spring and autumn) were shown in Table 5. Positive significant correlations were found between soil depth and the abundance of both evergreen shrubs with non-succulent leaves and the herbs.2c

2c 3c

DISCUSSION

The present-day vegetation was the result of a complex interactive network of a large number of various factors (Le Houèrou , 1992). 1) Floristic factors: The flora was the result of geologic, paleoclimatic and paleogeographic history and biological evolution. This flora was a mixture of recent paleartic and inherited palaeotropical elements (Quézel, 1976). 2) Climatic: The governing climatic factors were rainfall amount and distribution, drought stress; temperature and cold, and the P/PET ratio (where P = annual precipitation and PET = potential evapotranspiration). 3) Edaphic: Geology,petrology, physiography, topography, hydrology, erosion, soil, water and nutrient budgets. 4) Anthropozoic activities: The pressure of man and animals (particularly livestock) on ecosystems.

A considerable proportion of all ecological work in the past and to a considerable extent at the present time has been directed towards the description of vegetation. The object of such description was to enable ecologists to build a mental picture of an area and its vegetation and to allow the comparison and ultimate classification of the different units of vegetation.

Detailed description of the stratification of vegetation and the measurement of height of the abundant species form an important part in the understanding and recording of the vegetation structure (Kershaw, 1985). In desert ecosystems of the Western Mediterranean coastal land of Egypt, the stratification of the vegetation has not been long recognized as one of its characteristic features. This may be due to the fact that the variation of species height between and within habitats were not remarkable (Le Houèrou 1991; Abdel-Razik *et al*. 1996). Generally, there was no notable effect of fencing on plant species height in the new fenced area. But the most striking observation in this area was that *Aspodelus ramosus* always exhibit a notably lower height in the freely grazed sites as compwered with that in the protected sites. Meanwhile, through the long field observation extended for several years in different habitats with different grazing pressures, there were obvious variations in height of the perennial range species as result of different grazing pressures.

Results of the present study demonstrated clearly the importance of soil salinity and $CaCO_3$ on vegetation composition. Zahran *et al.* (1990); Shaltout and Sharaf El-Din (1988) recognized these soil factors together with moisture availability as the most critical factors determining the type of vegetation as well as its richness in other area. Highly significant correlations were found between soil salinity (EC) and $CaCO_3$ content. The most affected life-forms were those of the evergreen shrubs and herbs during autumn and spring. The positive relationships obtained were also in agreement with the results of Sheng *et al.* (1994) where soil pH, soil structure and soil humidity were the main acting factors controlling the pattern and distribution of weed community in Huoqui Country of China.

Variations in abundance measurements, density (individual m^{-2}) in the different habitats and for the different life-forms of the community were as follows:

Habitat	Herbs	Sub-shrub	Shrub	Community
Coastal dunes	184	298	2.6	484.6
Non-saline depression	77.7	275.9	6.9	360.5
Saline depression	66	143.5	18.5	228
Inland plateau	40.2	409.5	29.5	479.2
Ridge	353	411.5	36.5	801

The plant community under study was composed of 51 herbs, 49 sub-shrubs and 17 shrubs. Besides spatial variations in the vegetation composition of the plant communities, the composition of life-forms reflects the response of vegetation to variati0ons in certain environmental factor (Zahran *et al.* 1990). In this respect, chamaephytes represent the most abundant life-form and attained the maximum figures in the study area, while the geophytes, attained the minimum. At the community level, (integrating the data from the life-forms), plant community of the ridge habitat exhibited the highest abundance in terms of absolute density while the lowest was exhibited by plant community of the non-saline depression. However, the abundance of woody species (sub-shrubs and shrubs) was the highest followed by that of herbs. On the other hand, shrubby species showed the lowest abundance at the community level as well as the habitat level.

The impact of man was a dominant factor in arid environments of the world. In particular, the desert of the Middle East have been affected by human activities for thousand of years (Zohary, 1973). The percentages of different land use type at Omayed: was summarized by Kamal (1996) in the following Table:

Land use type					
Rangeland		Cereal cultivation		Orchard plantation	
Area					
Hectare	Percentage	Hectare	Percentage	Hectare	Percentage
4039.5	80.9	272.5	5.4	661	13.3

It was obvious that overgrazing and eradication of woody species were the dominant land use types. Heneidy (1992); Heneidy and El-Darier (1995) at Omayed area recorded that the human activities (e.g. clearing and wood cutting of natural vegetation) were more effective on the vegetation than over grazing by livestock. The various activities have different impacts. Generally, crop expansion, overgrazing, and firewood collection were the most harmful, and were responsible for 80 % or more of the havoc (Le Houèrou and Gillet, 1990). In the observatory, 11 species rated as endangered species due to human impact or desertification (Abdel Razik *et al.,* 1996) were listed in the following table.

Species	Probable cause of endangered
Ebenus armitagei	Desertification
Echium sericeum	Pressure of man
Euphorbia bivonae	Desertification
Euphorbia paralias	Human activity
Kicksia aegyptiaca	Desertification
Otanthus maritimus	Human impact
Pancratium maritimum	Human impact
Salsola tetragona	Human impact
Scorzonera alexandrium	Human activity
Urginea undulata	Human activity

There were direct and indirect causes for ecosystem degradation and species impoverishment in the study were. The direct causes were related mainly to the ways in which man has used and misused the natural resources since its early history. More recent, land use activities were even more devastating (Ayyad, 1973). Evaluation of the effects of the environmental factors threatening the wild life should be also taken in consideration. Many of the range land species in the present study area were highly palatable particularly dwarf species (Abdel-Razik *et al*., 1988a,b and Heneidy, 1992). On the other hand, Heneidy and Bidak, (1998) recorded that many of species in the coastal region especially the palatable ones will be threatened with continuing the overgrazing. Depending on the status of the range conditions and human impact in the study were most of the recorded species in the present study could be classified as a good pasture and have multipurpose uses but required careful management throughout the year.

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دراسة بيئية عن منطقة العميد

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[٢] مركز بحوث الصحراء ، المطرية القاهرة

سجلت الدراسة ٦٢ نوعاً نباتياً معمراً فى خمس موائل مختلفة من خلال تقدير الكثافة المطلقة (فرد/١٠٠م٢) وتنتمى إلى ٢٤ عائلة نباتية وكانت أكثر العائلات مشاركة هى المركبة يليها النجيلية ثم الزربيحية وقد سجل نبات *launaea resedifolia* أعلى كثافة فى مؤل الكثبان الرملية (٢١٤ فرد/١٠٠م٢) بينما سجل نبات *Salsola tetragona* أعلى كثافة (٤٢ فرد/١٠٠م٢) فى مؤل الهضبة الداخلية وكذلك نبات *Scorzonera undulata* (١٦٨فرد/١٠٠م٢) فى مؤل الحدبة الداخلية.

أظهرت الدراسة أن معظم الأنواع المعمرة تسجل أعلى نشاط من الناحية المظهرية فى موسمى الشتاء والربيع وأقل نشاط فى فصلى الخريف والصيف إلا إن بعض الأنواع تستمر فى نشاطها طوال العام (*Deverra tortuosa, Heliathemum lippi, Artemisia herba-alba*) وأثبتت الدراسة إن نمط الحياة السائد هو للأنواع المعمرة الخشبية (٧٦%) والتى تشمل النباتات ذات الأوراق غير العصيرية (٤١%) وذات الأوراق العصيرية بنسبة (٥%) بينما تليها الأنواع المعمرة العشبية بنسبة (٢٥%) وتشمل ٥% فقط ذات أوراق عصيرية. وقد سجل أكبر عدد من الأنواع النباتية وكذلك الوفرة (٣٢ نوع) فى مؤل الحدبة الداخلية وأقل عدد ووفرة فى مؤل المنخفض غير الملحى.

وقد هدفت الدراسة أيضاً إلى قياس التباين فى إرتفاع النبات مع إختلاف الموائل وأتضح الأنواع المعمرة الخشبية مثل نبات (*Thymelaea hirsute, Lycium showii, Anabasis articulata*) والأنواع الأخرى العشبية مثل نبات *Ammophila arenaria, Asphodelus ramosus* هى أكثر الأنواع أرتفاعاً خلال العام فى موسم نموها. وكانت الأنواع الأقل إرتفاعاً خلال العام فى موسم نموها. وكانت الأنواع الأقل إرتفاعاً هى *Helianthemum lipii, H. kahiricum* .

وقد خلصت الدراسة إلى أن النشاط البشرى هو أكثر العومل البيئة المؤثرة فى المؤائل المختلفة وبدورها على الأنواع النباتية مقارنة بالعوامل الآخرى مثل الرعى وخلافه ، مما يساهم فى إختفاء و ندرة بعض الأنواع النباتية ذات الأهمية البيئية والأقتصادية. وأثبتت الدراسة أن هناك علاقة معنوية بين نمط الحياة لبعض الأنواع النباتية وبعض عوامل التربة وعمقها وخصوصاً للأنواع الخشبية ذات الأوراق غير العصيرية.