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ON THE ECOLOGY AND PHYTOSOCIOLOGY OF EL-OMAYED AREA, EGYPT

Heneidy, S. Z. ; S. H. Hendawy*; L. M. Bidak and A. A. El-Khouly*
Botany Department, Faculty of Science, Alexandria University, Alexandria, Egypt.
*Departement of Plant Ecology and Range Management, Desert Research Center, El-Matareya, Cairo, Egypt.

The average of density for 62 perennial species in five types of habitats was recorded. The highest 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 tetrandra, L. resedifolia, 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 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 shrubby 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. 10 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.

Keywords: observatory, human impact, desertification, ever-green succulent leaves species

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 inlandwards. 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.

MATERIALS AND 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 and B), inland plateau (sites III A; fenced "1" and unfenced "2"), saline depression (sites IV A and B) and

coastal and sub-coastal dunes (sites V A, B, and 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 growth-form 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 random distribution layout, then 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 done according to Täkholm (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 (individuals/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 tetrandra, L. resedifolia, 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).

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

Habitat / Species	Coastal Sand Dune	Non Saline depression	Saline depression	Inland Plateau	Ridge
Aeluropus lagopoides (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.and 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 hierosolymitana Boiss	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
Kickxia aegyptiaca(L) Nabelek	-	-	1.0	-	0.5
Launaea nudicaulis (L.) Hook.	0.6	8.0	3.0	2.0	28.5

TABLE (1). Cont.

Habitat / Species	Coastal Sand Dune	Non Saline depression	Saline depression	Inland Plateau	Ridge
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 and Schult.	0.3	0.7	-	5.0	1.5
Lygeum spartum Loefl ex L.	-	-	0.5	-	6.0
Noaea mucronata (Frossk.) Asch.and Schweinf.	0.0	12.0	0.0	33.5	57.5
Ononis vaginalis Vahl	63.0	-	-	-	-
Otanthus maritimus (L.) Hoffmanns and 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	--
Polygonum equisetiforme Sm.	4.3	-	-	-	-
Reaumuria hirtella Jaub. and 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	-	-	-	-

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 survive throughout the 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 shrubby species was attained by those of the non-saline depression.

TABLE (2). Phenophase, life form and presence % of the plant species in the different habitats representing El-Omayed observatory during spring and autumn seasons (Ev=evergreen, Sh=Shrub, L.ns=Leafy non-succulent H=Herb, L.S=Leafy succulent, Ls.S=Leafless succulent, Ds=Deciduous, G=Geophyta ,Vg=vegetative growth, L.o=Leafing out, F.b=flower buds, Fl= flowering, Fr = fruiting, S.s=Seed shading, Dr=Dormancy and P=Presence)

Species	Family	Life form	Spring					Autumn					P%
			Non saline depression	Ridge	Inland Plateau	Saline depression	Sand dune	Non saline depression	Ridge	Inland Plateau	Saline depression	Sand dune	
Aeluropus lagopides	Gramineae	Herb	- -	- -	- -	- -	40Vg 60 Dr	- -	- -	- -	- -	40 Vg 50 Dr 10S.s	20
Ammophila arenaria	Gramineae	Herb	- -	- -	- -	- -	80 g 20F.b	- -	- -	- -	- -	17Vg 83 Dr	20
Anabasis articulata	Chenopodiaceae	Ev. Shrub	75Vg 25 Dr	45 Vg 55 Dr	45vg 55 Dr	34 Vg 66 Dr	- -	50 Vg 50 F.b	40 Vg 60 F.b	35 Vg 65F.b	- -	- -	60
Anabasis urupedilorum	Chenopodiaceae	Ev. Shrub	39Vg 61 Dr	50Vg 50 Dr	45Vg 55 Dr	- -	- -	22 Fl 78Vg	60 Fl 40Vg	50 Fl 30Vg 20 Fr	- -	- -	60
Artemisia herba-alba	Compositae	Ev. Shrub	- -	50 Fr 50S.s	- -	- -	- -	- -	50 F.b 50Vg	- -	- -	- -	20

TABLE (2).Cont.

Artemisa monosperma	Compositae	Ev. Shrub	70 Fr 18S.s 12Vg	-	-	-	-	65 F.b 35Vg	-	-	-	-	20
Asparagus stipularis	Liliaceae	Ev. Shrub	-	100Vg	-	-	-	-	30 Fr 70 Dr	-	-	-	20
Asphodelus ramosus	Liliaceae	Herb	80 Dr 20 Fr	55 Dr 45 Fr	95Vg 5 F.b	80 Dr 20 S.s	-	100 Dr	10L.o 90 Dr	15L.o 85Dr	100 Dr	-	80
Astenatherum forsskaolii	Gramineae	Herb	-	-	-	-	-	-	30Vg 70 Dr	-	-	-	20
Astragalus sphaosus	Leguminosae	Ev. Shrub	-	95 Vg 5 Fl	50L.o 50 Fr	100 Fr	-	-	100 Dr	100 Dr	40 Vg 60 Dr	-	60
Atractylis carduus	Compositae	Sub Shrub	-	-	100 Vg	-	-	-	-	100 Dr	-	-	20
Carduncellus eriocephalus	Compositae	Herb	100 Vg	-	-	-	-	100 Dr	-	-	-	-	20
Colchicum ritchii	Liliaceae	Herb	-	100 Vg	-	-	-	-	100 Dr	-	-	-	20
Convolvulus lanatus	Convolvulaceae	Ev. Shrub	10 Fl	-	-	-	20 Vg	-	30 Vg	-	-	-	40
Crucianella maritima	Rubiaceae	Ev. Shrub	-	-	-	-	-	40F.b	-	-	-	20Vg	20
Cynodon dactylon	Gramineae	Herb	-	-	-	-	-	-	-	-	-	60Vg	20
Dactylis glomerata	Gramineae	Herb	-	-	90Vg 10Fr	-	-	-	-	10Vg 90Dr	-	-	20
Deverra tortuosa	Umbelliferae	Ev.Sh,L.ns.	70 Fr 20 F.b 10 Fl	20 Fr 80 Dr	-	80 Fr 20 Dr	-	70 Fl 30 Fr	85 Fl 15 Fr	20 Fl 80 Vg	20 Fl 80 Vg	20 Fl 80 Vg	100
Ebenus armitagei	Leguminosae	Ev. Shrub	-	-	65Vg 35Dr	-	-	-	-	10Vg 90Dr	-	-	20
Echinops spinosissmus	Compositae	Ev. Shrub	-	60Vg 30L.o 10 Fl	80L.o 20 Fl	65 Vg 35 Dr	-	65VG 35 Fb	100Dr	10 Vg 90 Dr	-	10 Vg 90 Dr	80
Echiochilon fruticosum	Boraginaceae	Ev. Shrub	-	60Vg 40Fl	-	60 F.b 40 Fl		30Vg 70Dr		60Vg 40 Dr	-	-	40
Echium sericeum	Boraginaceae	Herb	-	-	-	-	55VG 45 Fl	-	-	-	-	10 Fl 90 Vg	20
Elymis farctus	Gramineae	Ev. Shrub	80 Fl 20Vg	-	-	-	100Vg	-	-	-	-	30Vg 70Dr	40
Euphorbia Hierosolymitana	Euphorbiaceae	Ev. Shrub	-	15Fl	-	-	-	-	20Vg 80Dr	-	-	-	20
Euphorbia paralias	Euphorbiaceae	Ev. Shrub	-	-	-	-	40Fr 60Fl	-	-	-	-	40Fr 60Dr	20
Frankenia revoluta	Frankeniacea	Ev. Shrub	-	-	-	50Dr 50Fl	-	-	-	-	30Vg 70Dr	-	20
Fumana thymifolia	Cistaceae	Ev. Shrub	-	100S.s	-	-	-	-	10F.b 90Vg	-	-	-	20
Globularia arapica	Globulariaceae	Ev. Shrub	-	50Fl 50Vg	-	-	-	-	100Dr	-	-	-	20

TABLE (2).Cont.

Gymnocarpos decandrum	Caryophyllaceae	Ev. Shrub	40Fr 40Fl 20 Vg	80Fl 20 Fr	70Fl 30Fr	20Fl 80Vg	- -	100 Dr	10L.o 90Dr	20L.o 80Dr	- -	- -	80
Helianthemum karhiricum	Cistaceae	Ev.Sh,L.ns.	-	25 Fl 75 Vg	-	60 Fr 40 Fl	-	-	25 Vg 75 Dr	-	-	-	40
Helianthemum lippii	Cistaceae	Ev.Sh.,L.ns	30 F.b 45 Vg 15 Fl 10 Fr	15 Fl 85 Vg	10 F.b 90 Vg	10 Fr 15 Fl 75 Vg	-	55 F.b 35 Fl 10 Fr	75 Vg 25 Fl	20 Fl 80 Vg	-	10 Fl 90 Vg	80
Hyoseris lucida	Compositae	H	-	-	-	-	53 F.b 47 Fl	-	-	-	-	-	20
Iris sysyrinchium	Iridaceae	H.,G.	-	-	-	-	-	-	100 Dr	-	-	-	20
Kickxia aegyptiaca	Scorophulariaceae	Ev.Sh,L.ns.	-	-	-	60 Fl 40 Vg	-	-	20 Vg 80 Dr	-	-	-	20
Launaea nudicaulis	Compositae	Ev.Sh,L.ns.	-	-	-	-	-	-	80 Fl 20 Vg	-	-	-	20
Limoniastrum monopetalum	Plumbaginaceae	Ev.Sh,L.ns.	-	-	-	67 Vg 33 Dr	-	-	-	-	50 Vg 50 Dr	-	20
Limonium tubiflorum	Plumbaginaceae	Ev.Sh,L.ns.	-	10 Fl 90 Vg	-	-	-	-	80 Fl 20 Vg	-	-	-	20
Lotus creticus	Leguminosae	Ev.Sh,L.ns.	-	-	-	-	-	100 Dr	-	-	-	-	20
Lotus Polyphyllos	Leguminosae	Ev.Sh,L.ns.	-	-	-	-	60 Fl 40 Fr	-	-	-	-	80 Vg 20 Dr	20
Lycium shawii	Solanaceae	Ev.Sh,L.ns.	80 Vg 20 Dr	95 Vg 5 Fl	5 Fr 95 Dr	35 Vg 65 Dr	-	60 Fl 40 Fr	20 F.b 80 Vg	20 Fl 80 Vg	-	-	80
Lygeum spartum	Gramineae	H.,G.	-	50 Vg 50 Dr	-	-	-	-	20 Vg 80 Dr	-	-	-	20
Noaea mucronata	Chenopodiaceae	Ev.Sh,L.ns.	48 Vg 29 L.o 23 F.b	55 Vg 45 L.o	60 Vg 40 Fl	-	-	60 Fl 40 Fr	15 Fl 85 Vg	30 Fl 70 Vg	-	-	60
Ononis vaginalis	Leguminosae	Ev.Sh,L.ns.	-	-	-	-	100 Fl	-	-	-	-	20 Vg 80 Dr	20
Otanthus maritimus	Compositae	Ev.Sh,L.ns.	-	-	-	-	-	-	-	-	-	10 Fl 90 Vg	20
Phagnalon schweinfurthii	Compositae	Ev.Sh,L.ns	-	-	-	-	-	-	20 Vg 80 Dr	-	-	-	20
Phlomis fpoccosa	Labiatae	Ev.Sh,L.ns.	-	90 Fl 10 Vg	-	-	-	-	90 Fr 10 Dr	-	-	-	20
Plantago albicans	Plantaginaceae	Ev.Sh,L.ns.	-	-	100Vg	100Vg	-	15 Vg 85 Dr	-	20 Vg 80 Dr	-	-	40
Polygonum equisetiform	Polygonaceae	H.,L.ns.	-	-	-	-	100Vg	-	-	-	-	60 Fl 40 Vg	40
Reaumuria hirtella	Tamariaceae	Ev.Sh,L.ns.	-	80 Vg 20 Dr	-	80 Vg 20 Dr	-	25 Fr 75 Dr	-	40 Vg 60 Dr	-	-	40
Salsola longifolia	Chenopodiaceae	Ev.Sh.,L.S.	-	-	-	80 Vg 20 Dr	100Vg	-	-	-	30 Fl 70 Vg	-	40
Salsola tetragona	Chenopodiaceae	Ev.Sh.,L.S.	-	-	-	-	-	-	70 Vg 30 Dr	-	55 Vg 45 Fl	-	40
Salsola tetrandra	Chenopodiaceae	Ev.Sh,L.ns.	-	-	-	55 Vg 45 Dr	-	-	-	-	60 Vg 40 Fl	-	40
Salvia aegyptiaca	Labiatae	Ev.Sh,L.ns.	-	-	-	100 Fr	-	-	-	-	-	-	20
Salvia lanigera	Labiatae	Ev.Sh,L.ns.	-	70 Fl 30 Vg	-	80 Fr 20 Fl	90 Fr 10 Fl	-	-	-	-	100Dr	60
Scorzonera undulata	Compositae	H.,L.ns.,G.	-	100Vg	100Vg	100Vg	-	-	100 Dr	-	-	-	60
Stipagrostis ciliata	Gramineae	H.,L.ns.	60 Vg 40 Dr	-	40 Vg 60 Dr	-	-	-	10 Vg 90 Dr	-	-	-	40
Suaeda pruinosa	Chenopodiaceae	Ev.Sh,L.ns.	-	-	-	65 Vg 35 Dr	-	-	-	-	60 Vg 40 Dr	-	20
Suaeda vera	Chenopodiaceae	Ev.Sh,L.ns.	-	-	-	-	-	-	-	-	-	80 Fl 20 Vg	20
Teucrium polium	Labiatae	Ev.Sh,L.ns.	-	90 Vg 10 Fl	-	-	-	-	80 S.s 20 Fr	-	-	-	20
Thymelaea hirsuta	Thymelaeaceae	Ev.Sh,L.ns.	70 Fr 20 Vg 10 Fl	60 Fr 25 Vg 15 Fl	60 Fl 40 Fr	40 Fl 60 Vg	100 Fl	60 Vg 25 F.b 15 Fl	20 F.b 80 Vg	95F.b 5 Fl	-	80 Fl 20 Vg	100
Zygophyllum album	zygophyllaceae	Ev.Sh.,L.S.	-	-	-	-	55 Fr 45 Vg	-	-	-	-	75 Vg 25 Fr	20

The average height of different plant species recorded in the study 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 sometimes varies with the phenological behavior of some species especially perennial herbs and grasses. The shruby species *Thymelaea hirsuta, Lycium shawii* 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 area. On the other hand, the sub-shrubs *Helianthemum lippii and H. kahiricum* were the shortest.

TABLE (3). Average height (upper figure, cm.) ± Standard Error (Lower figure) of the most common species in the different habitats of El-Omayed Observatory during spring and autumn.

Species	Spring					Autumn				
	Non saline depression	Ridge	Inland Plateau	Saline depression	Sand dune	Non saline depression	Ridge	Inland Plateau	Saline depression	Sand dune
Aeluropus Lagopoides	-	-	-	-	10.0 2.4	-	-	-	-	11.6 1.1
Ammophila arenaria	-	-	-	-	51.5 2.3	-	-	-	-	48.0 3.6
Anabasis articulata	41.2 5.7	14.0 5.0	28.0 3.6	12.0 4.4	-	32.0 4.1	29.5 2.1	23.9 3.7	-	-
Anabasis oropediorum	29.4 4.9	10.0 2.0	13.0 3.3	8.0 3.3	-	13.9 1.6	11.1 1.8	18.6 2.4	-	-
Artemisia herba-alba	-	-	-	-	-	-	20.5 2.2	-	-	-
Artemisia monosperma	30.5 8.2	-	-	-	-	42.7 2.7	-	-	-	-
Asphodelus ramosus	33.7 13.3	14.0	38.0 2.7	48.0 8.0	-	-	13.2 2.3	20.0 1.0	-	-
Asparagus stipularis	-	-	-	-	-	-	15.0 1.6	-	-	-
Astragalus spinosus	-	20.0 2.0	35.0 1.1	22.0 5.0	-	-	-	-	12.3 0.7	-
Atractylis Carduus	-	-	23.5	-	-	-	-	-	-	-
Convolvulus lanatus	-	-	-	-	-	11.4 1.2	-	13.4 1.7	-	-
Crucianella maritima	-	-	-	-	19.0 1.0	-	-	-	-	25.9 2.0
Dactylis glomerata	-	-	-	-	-	-	22.2 0.9	-	-	-
Deverra tortuosa	23.5 3.8	24.0 5.1	19 3.5	11.0 2.7	40.0	19.3 6.0	30.5 2.5	15.0 3.1	9.5 0.6	17.5 1.8
Ebenus armitagei	-	15.0 8.0	-	-	-	-	12.7 1.1	-	-	-
Echinops spinosissmus	7.0	15.0 8.0	21.0 2.8	-	23.0 4.0	18.3 1.9	16.0 3.8	5.0 0.7	-	18.5 2.3
Echiochilon fruitcosum	14.5 4.0	-	12.0 2.4	-	-	16.5 1.6	-	8.4 1.0	-	-
Echium sericeum	-	-	-	-	12.0 2.2	-	-	-	-	10.0 0.9
Elymis farctus	-	-	-	-	5.8 1.1	-	-	-	-	12.0 1.2
Euphorbia hierosolymitana	-	13.0 1.1	-	-	-	-	6.5 4.6	-	-	-
Euphorbia paralias	-	-	-	-	36.0 1.7	-	-	-	-	27.7 2.2
Frankenia revoluta	-	-	-	10.0	-	-	-	-	10.4 1.4	-

TABLE (3).Cont.

Globularia Arabica	-	-	-	-	-	-	8.0 1.4	-	-	-
Gymnocarpos decondrum	15.5 5.2	19.0 3.0	18.5 3.8	7.0 3.2	-	16.1 1.1	23.4 2.1	14.4 1.1	-	-
Helianthemum karhiricum	-	3.5 0.6	-	4.0 0.4	-	-	2.0 0.2	-	-	-
Helianthemum lippi	12.0 2.1	2.0 0.9	7.0 0.9	3.0 1.4	21.0 0.1	4.7 0.7	2.1 0.3	3.4 0.3	-	15.0 1.4
Hyoseris radiate	-	-	-	-	25.0	-	-	-	-	-
Gymnocarpos decondrum	15.5 5.2	19.0 3.0	18.5 3.8	7.0 3.2	-	16.1 1.1	23.4 2.1	14.4 1.1	-	-
Helianthemum karhiricum	-	3.5 0.6	-	4.0 0.4	-	-	2.0 0.2	-	-	-
Helianthemum lippi	12.0 2.1	2.0 0.9	7.0 0.9	3.0 1.4	21.0 0.1	4.7 0.7	2.1 0.3	3.4 0.3	-	15.0 1.4
Hyoseris radiate	-	-	-	-	25.0	-	-	-	-	-
Kickxia aegyptiaca	-	-	-	4.0 1.4	-	-	8.5 1.1	-	-	-
Launaea nudicaulis	-	-	-	-	20.0 2.6	-	-	-	-	-
Limoniastrum monopetalum	-	-	-	14.5 7.1	-	-	-	-	21.7 2.4	-
Limonium tubiflorum	-	-	-	12.0	-	-	4.2 0.5	-	-	-
Lotus polyphyllos	-	-	-	-	41.0 12.7	-	-	-	-	29.4 4.2
Lycium shawii	41.3 4.4	52.0 5.1	45.0 4.5	10.0 2.0	-	45.3 3.3	14.9 2.9	54.9 9.4	-	-
Lygeum spartum	-	-	-	-	-	-	17.8 3.4	-	-	-
Lygos raetam	-	-	-	-	-	-	-	-	-	80.0 15.0
Noaea mucronata	18.5 4.9	11.0 1.5	19.0 2.9	-	-	25.4 2.4	23.9 2.7	17.5 3.3	-	-
Ononis vaginalis	-	-	-	-	14.0 2.5	-	-	-	-	30.0 2.9
Otanthus maritimus	-	-	-	-	26.0 9.0	-	-	-	-	30.7 3.3
Phlomis floccose	-	67.0 4.1	-	-	-	-	66.4 3.2	-	-	-
Polygonum equisetiform	-	-	-	-	15.0	-	-	-	-	-
Prasium majus	-	-	-	-	-	-	12.0 1.0	-	-	-
Reaumuria hirtella	-	-	-	13.0 2.5	-	-	-	-	12.2 0.9	-
Salsola longifolia	-	-	-	10.5 3.5	58.0 6.7	-	-	-	10.9 1.8	-
Salsola tetragona	-	-	-	-	-	-	-	-	8.6 0.5	-
Salsola tetrandra	-	-	-	6.0 2.0	-	-	-	-	9.4 2.2	-
Salvia aegyptiaca	-	-	-	6.0 1.5	-	-	-	-	-	-
Salvia lanigera	-	-	-	7.0 2.0	11.5 1.4	-	-	-	-	9.3 1.4
Stipagrostis ciliate	8.5 1.7	-	15 0.1	-	-	-	46.4 3.4	22.0 9.8	-	-
Suaeda pruinosa	-	13.0 0.1	-	13.5 7.0	-	-	-	-	20.3 2.0	-
Thymeloea ahirsuta	59.3 11.3	47.5 5.3	80.5 3.7	35.0 5.0	75.0 6.5	64.8 7.9	53.5 8.5	76.1 6.9	-	66.0 9.0
Zygophyllum album	-	-	-	-	77.0	-	-	-	-	28.8 2.8

The average physical and chemical properties of the soil in different habitats of the study area were presented in table (4). The coarse particle was

found in the inland plateau at depth of 0- 15 cm followed by the saline depression at depth of 30- 45 cm. Clay particles ranged from 0.12 to 0.06 mm. It reached its highest percentage in the saline depression (22.9%) at the depth of 15-30 cm, followed by the non-saline depression (13.4%) at the depth of 0- 15 cm, while the maximum percentage of clay, was attained in the saline depression (7.5 and 5%) at depths of 30-45 cm and 15-30 cm , respectively.

The highest value of electric conductivity EC was attained in the saline depression. Remarkable variations in the EC 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 and Na were 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). Significantly positive correlations were found between soil depth and the abundance of both evergreen shrubs with non-succulent leaves and the herbs.

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, paleogeographic history and biological evolution. This flora was a mixture of recent paleoartic 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 from animals on ecosystems.

TABLE (4). Average of physical and chemical properties of the soil in the different habitats of El-Omayed Observatory . *(Soil depth in cm; a = 0-15 , b= 15-30 ,c = 30-45)*

Parameter / Soil Texture		Habitat / Soil depth	Non Saline depression	Ridge	Inland Plateau	Saline depression	Sand dune
Particle Size % (mm)	2.0-1.0	a	0.48	1.93	6.55	-	0.57
		b	1	-	2.55	4.57	0.54
		c	0.90	-	3.71	5.70	0.47
	1.0-0.5	a	4.94	18.52	21.39	-	27.49
		b	5.70	-	18.64	11.38	65.63
		c	6.036	-	12.56	11.95	31.29
	0.5-0.25	a	27.32	16.53	41.32	-	61.20
		b	52.38	-	56.81	17.72	22.04
		c	43.87	-	55.44	22.55	53.89
	0.25-0.12	a	51.71	48.96	23.57	-	8.50
		b	32.65	-	15.18	38.48	6.26
		c	36.95	-	20.94	34.08	13.01
	0.12-0.06	a	13.4	10.94	5.17	-	0.97
		b	7.28	-	4.81	22.90	0.20
		c	10.24	-	4.01	18.12	0.43
	< 0.06	a	2.08	4.29	2.26	-	1.29
		b	1.35	-	1.96	4.98	5.56
		c	1.95	-	1.67	7.51	0.88
EC ($ds\ m^{-1}$)		a	0.34	0.20	0.23	4.41	2.4
		b	0.43	-	0.24	4.04	2.65
		c	0.29	-	0.28	4.95	3.12
PH		a	8.55	8.7	8.65	8.4	8.2
		b	7.13	-	8.65	8.4	8.26
		c	8.61	-	8.7	8.4	8.25
Ca^{++}		a	1.45	0.82	0.98	22.5	10.66
		b	1.65	-	1.11	20.65	12.16
		c	1.4	-	1.30	23.3	14.16
Mg^{++}		a	0.32	0.24	0.28	10.2	8.42
		b	0.37	-	0.34	9.38	13.14
		c	0.31	-	0.4	10.55	15.6
Na^{+}		a	0.89	0.66	0.75	13.05	7.6
		b	1.01	-	0.86	11.9	12.86
		c	0.875	-	1.03	13.5	15
K^{+}		a	0.035	0.04	0.04	0.95	0.65
		b	0.03	-	0.04	0.86	0.74
		C	0.02	-	0.04	0.9	0.83
Cl^{-}		A	1.29	0.8	094	21.2	15.6
		B	1.46	-	1.08	19.4	17.83
		C	1.23	-	1.28	21.95	34.16
HCO_3^{-}		A	0.18	0.18	0.21	3.39	2.53
		B	0.20	-	0.24	3.1	2.87
		C	0.17	-	0.28	3.5	3.34
So_4^{--}		A	6.39	0.86	0.95	21.9	16.1
		B	7.65	-	1.02	20	18.26
		C	5.99	-	1.23	22.65	21.26
$Ca\ CO_3$ %		A	28.48	24.4	23.3	25.75	49.6
		B	28.71	-	24.6	24.75	49.46
		C	28.68	-	22.5	23.85	50.4
O.M%		A	0.25	0.10	0.16	0.40	0.06
		b	0.21	-	0.15	0.41	0.07
		c	0.17	-	0.19	0.25	0.09

TABLE (5a). Simple correlation coefficient (r) between life-forms and soil properties during autumn

Soil texture	Life form / Soil depth	Herb	Ever green (Ev.Shrub)	Sub Shrub	Ev.Sh L.ns	H.G	H.L.ns
2.0-1.0	a		+	++		+	++
	b			+	+		+
	c	++		+	+		+
1.0-0.5	a	++		+		+	+
	b	++					
	c	++		+			+
0.5-0.25	a			+			+
	b	+		++			++
	c			+			+
0.25-0.12	a		++			++	
	b				+		
	c						
0.12-0.06	a		++				
	b				++	+	
	c				+		
< 0.06	a						
	b	+			+		
	c				++		
EC.(ds m^{-1})	a				++		
	b				++		
	c				++		
PH	a		++	+			+
	b	+		+		++	+
	c	+		+			+
Ca++	a				++		
	b				++		
	c				++		
Mg++	a	+			+		
	b	+			+		
	c	+			+		
Na+	a				++		
	b	+			+		
	c	+			+		
K+	a	+			++		
	b	+			+		
	c	+			+		
Cl^-	a	+			++		
	b	+			+		
	c	++			+		
HCO_3^-	a	+			++		
	b	+			+		
	c	+			+		
$So_4^=$	a	+			+		
	b	+			+		
	c	+			+		
$CaCO_3$%	a	++					
	b	++					
	c	++					
O.M%	a				++		
	b				+		
	c			+	+		+

+ and ++: Denote significance at 0.05 and 0.01 levels of probability, respectively.
Ev=Evergreen, Sh=Shrub, L.ns=Leafy non-succulent, H=herb and G=Geophyta

TABLE (5b). Simple correlation coefficient (r) between life-forms and soil properties during spring

Soil texture	Life form / Soil depth	Herb	Ever green (Ev.Shrub)	Sub Shrub	Ev.Sh L.ns	H.G	H.L.ns
2.0-1.0	a		+	++		+	
	b			+	+		
	c	++		+	+		
1.0-0.5	a	++		+		+	++
	b	++					+
	c	++		+			
0.5-0.25	a			+			+
	b	+		++			
	c			+			
0.25-0.12	a		++			++	+
	b				+		
	c						
0.12-0.06	a		++				+
	b				++	+	
	c				+		
< 0.06	a						
	b	+			+		
	c				++		
EC (ds m^{-1})	a				++		
	b				++		
	c				++		
PH	a		++	+			+
	b	+		+		++	
	c	+		+			
Ca++	a				++		
	b				++		
	c				++		
Mg++	a	+			+		
	b	+			+		
	c	+			+		
Na+	a				++		
	b	+			+		
	c	+			+		
K+	a	+			++		
	b	+			+		
	c	+			+		
Cl	a	+			++		
	b	+			+		
	c	++			+		
HCO_3	a	+			++		
	b	+			+		
	c	+			+		
So_4^-	a	+			+		
	b	+			+		
	c	+			+		
$CaCO_3$%	a	++					+
	b	++					
	c	++					
O.M%	a				++		
	b				+		
	c			+	+		

+ and ++: Denote significance at 0.05 and 0.01 levels of probability, respectively.
H=herb, G=Geophyta and L.ns=Leafy non-succulent

A considerable proportion of all ecological work in the past and to some extent at the present 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 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 compared 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 a 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 areas. 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 are presented in table (6)

TABLE (6). Measurements of abundance in different habitats.

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 variations in certain environmental factor. 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 one 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 table (7).

TABLE (7). The percentage of different land use at Omayed region.

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) and 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, 10 species rated as endangered species due to human impact or desertification (Abdel Razik *et al.*, 1996) were listed in table (8).

TABLE (8). The probable causes of some endangered species at Omayed region.

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

There were direct and indirect causes for ecosystem degradation and species impoverishment in the study area. 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 area 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 فيتوسوسيولوجية لمنطقة العميد – مصر

سليم زيدان هنيدى، سيد حسين هنداوى*، ليلى محمد مصطفى بيدق ،وأحمد الخولى*

قسم النبات– كلية العلوم – جامعة الاسكندرية – الاسكندرية – مصر.
* قسم البيئه النباتية والمراعى – مركز بحوث الصحراء – المطرية– القاهرة .

سجلت الدراسة٦٢ نوعا نباتيا معمرا فى خمس موائل مختلفة من خلال تقدير الكثافة المطلقة (فرد/١٠٠متر^{٢}) وتنتمى الى ٢٤ عائلة نباتية وكانت أكثر العائلات مشاركة هى المركبة يليها النجيلية ثم الزربيحية وقد سجل نبات *Launaea resedifolia* أعلىكثافة فى مؤل الكثبان الرملية (٢١٤ فرد /١٠٠متر^{٢}) بينما سجل نبات *Salsola tetragona* أعلى كثافة (٤٩ فرد/١٠٠متر^{٢}) فى مؤل المنخفضات الملحية و نبات *Launaea resedifolia* (٤٢ فرد/١٠٠ متر^{٢}) فى مؤل الهضبة الداخلية و كذلك نبات *Scorzonera undulata* (١٦٨ فرد / ١٠٠ متر^{٢}) فى مؤل الحدبة الداخلية .

أظهرت الدراسة أن معظم الانواع المعمرة تسجل أعلى نشاط من الناحية المظهرية فى موسمىالشتاء و الربيع وأقل نشاط فى فصلى الخريف و الصيف الا إن بعض الانواع تستمر فى نشاطها طوال العام مثل نباتات *Deverra tortuosa, Helialthemum lippii, Artemisia herba-alba* وأثبتت الدراسة إن نمط الحياة السائد للانواع المعمرة الخشبية (٧٦%) و التى تشمل النباتات ذات الاوراق الغير عصيرية (٤١%) وتلك ذات الاوراق العصيرية (٥%) تليها الانواع المعمرة العشبية (٢٥%) و(٥%) اوراق عصيرية . وقد سجل أكبر عدد من الانواع النباتية و كذلك الوفرة(٣٢ نوع) فى مؤل الحدبة الداخلية وأقل عدد ووفرة فى مؤل المنخفض الغير ملحى .

وقد استهدفت الدراسة ايضا قياس التباين فى ارتفاع النبات مع اختلاف الموائل واتضح إن بعض الانواع المعمرة الخشبية مثل نباتات *Thymelaea hirsuta, Lycium shawii, Anabasis articulata* والأنواع الأخرى العشبية مثل نباتات *Ammophila arenaria and Asphodelus ramosus,* هى أكثر الأنواع أرتفاعا خلال العام فى موسم نموها . وكانت الأنواع الآقل ارتفاعا هى *Helianthemum lippii and H. kahiricum*. وقد خلصت الدراسة الى إن النشاط البشرى هو أكثر العوامل البيئيةالمؤثرة فى الموائل المختلفة وبدورها على الإنواع النباتية مقارنة بالعوامل الإخرى مثل الرعى وخلافة ، مما يساهم فى إختفاء و ندرة بعض الإنواع النباتية ذات الاهمية البيئية و الاقتصادية . و أثبتت الدراسة إن هناك علاقة معنوية بين نمط الحياة لبعض الأنواع النباتية وبعض عوامل التربة وعمقها و خصوصا للأنواع الخشبية ذات الاوراق الغير عصيرية.