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Plant Life along the Saudi Red Sea Coast Islands 2. Jabal Sabaya, Um Al Qamari, Al Aghtam and Sequala

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ABSTRACT. The present study concerns with Jabal Sabaya & Um Al Qamari Islands, in addition to Al Aghtham and Sequala islets. The studied area lies southwest Al Qunfida town, between the coordinates: Latitudes 18º35′-18º59′N, Longitudes 41º03′-41º40′E, Red Sea, Saudi Arabia. The investigated habitats have in common high values of readily soluble salts. Five different varieties of plant habitats were recognized in Jabal Sabaya Island. These are: 1. coastal plains, 2. wadis, 3. hills, 4. plateau with rocky substratum, 5. runnels and drainage systems. Meanwhile a dense thicket rings both Um Al Qamari Islands, whereas the centers are nearly barren. The vegetation of Al Agtham and Sequala show a mosaic pattern.

Seventy-one species representing 33 families of vascular plants was recorded (2 trees, 11 shrubs, 18 frutescents, 12 perennial herbs & 28 annual herbs). From these 48 species are confined to Jabal Sabaya Island.

Climatic aridity, edaphic characteristics, elevation above sea level, sea currents, birds, all contribute to the composition, structure and the pattern of vegetation.

Introduction

The Saudi Red Sea coast Islands, have a rich and varied flora still inadequately known, however information on the mangroves of Saudi Arabia is very recent (Alwelaie *et al.* 1993; Edwards 1987; Fery *et al.* 1984; Hassan & Al-Hemaid 1996; Khafaji *et al.* 1988; Mandura & Khafaji 1993; Mandura *et al.* 1987, 1988;

Migahid 1996; Saifullah 1996; Saifullah *et al.* 1989, Vessey-Fitzgerald 1955, 1957 and Zahran *et al.* 1983).

The present investigation is the second in a series of studies on the plant life of the Saudi Red Sea cost Islands (El Karemy & Al-Zahrani, in press); it deals with Jabal Sabaya an Um Al Qamari Islands, in addition to Al Aghtham and Sequala islets.

Study Area

The study area comprises three Red Sea Islands namely Jabal Sabaya, Eastern and Western Um Al Qamari (Fig. 1), in addition to Al Aghtham and Sequala islets.

Jabal Sabaya (in arabic means young ladies mountain) is situated 50 km southwest of Al Qunfida town, about 13 km from the seashore, with an overall area of about 11.25 km^2 (4.5 × 2.5 km). It lies between the coordinates: Latitude 18º36′-18º40′N, Longitude 41º02′- 41º05′E (Fig. 1). The island rises to an elevation of 41 m above sea level and is fringed by a reef on its eastern side. On the southeastern side there are remains of a village, while a salt lake is found at the northern end.

Um Al Qamari Islands are situated at about 19 km south of Al Qunfida. They composed of two far-apart Islands and not exceeding 7 m above sea level (Fig. 1). Eastern Um Al Qamari Island (18º59′N and 41°60′E), has an overall area of about 120,000 m^2 (ca. 400 EW × 300 m NE), while western Um Al Qamari Island (18º58′N and 41′40′E) has and overall area of 62,500 m^2 (250 × 250 m).

Both Um Al Qamari Islands are of great ecological significant. They are the main resting site for the collard dove (*Streptopelio rosegrisea*) which means Al Qomri (plural Qamari) in Arabic (hence the Island's name). Um Al Qamari was announced a protected area since about 10 years.

Al Aghtham and Sequala are two separate islets, situated 2-3 km south of Al Qunfida. The first with an area of about 800 m^2, while the second is relatively smaller (ca. 650 m^2). Both islands are wintering grounds for migration birds such as *Bubulcus ibis, Egretta gularis, Butorides striatus and Prinia gracilis.*

The climatic conditions over the study area are illustrated by the meteorological data of stations of Jeddah and Gizan (Table 1). The area of the present study exhibits minor fluctuations in climatic elements throughout the year. The tidal amplitude is low (about 0.5 m), and the mean sea level increase during winter season (Edwards, 1987).

FIG. 1. Location map of the study area.

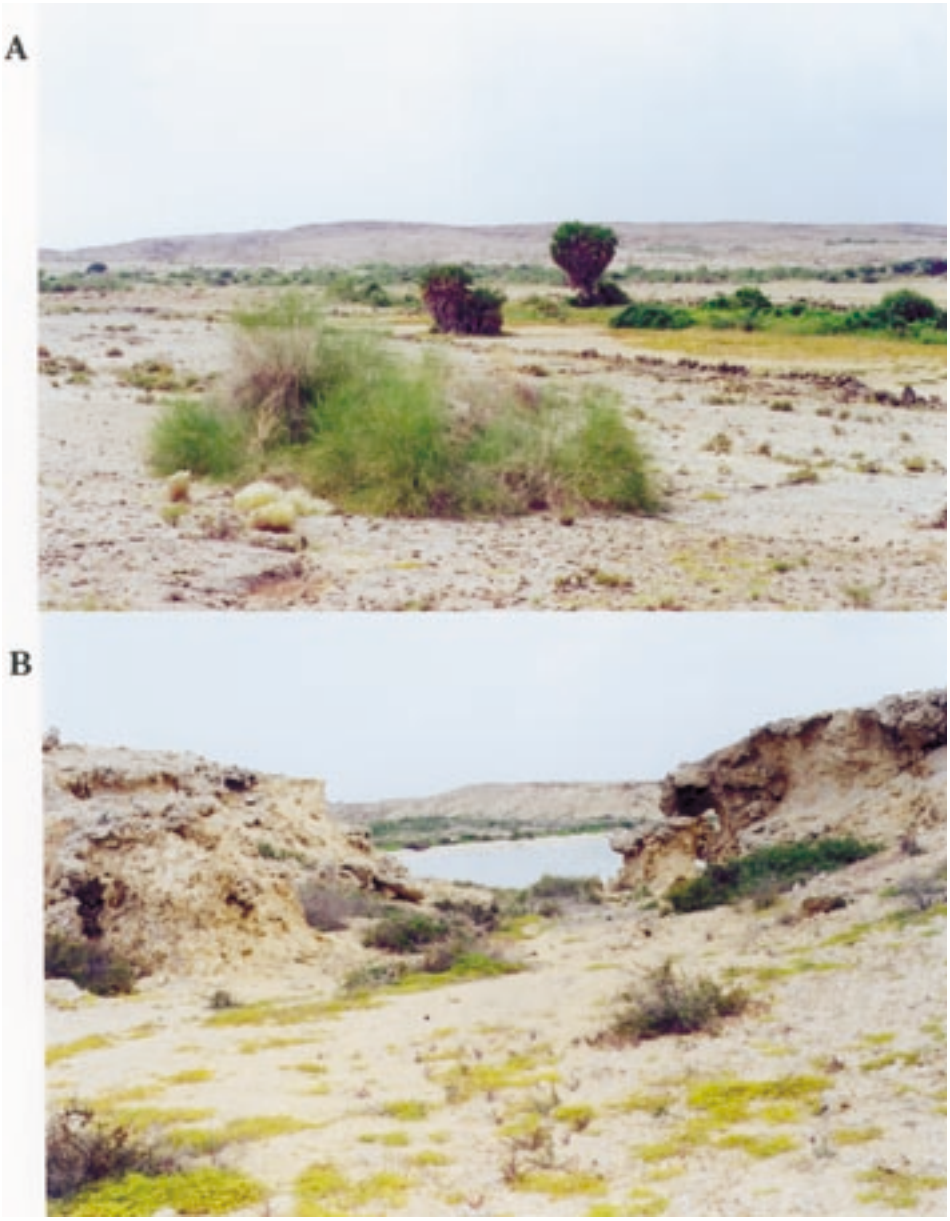

Fig. 2. Two stands showing the runnels (A) and wadis (B) vegetation of Jabal Sabaya island.

TABLE 1. Annual means of some meteorological data of Jeddah and Gizan over the period from 1989 to 1998 (Anonymous, 1999).

Climatic elements	Jeddah	Gizan
Total precipitation (mm)	96	97
Temperature, daily (ºC / year)		
Maximum	40.3	40.4
Minimum	14.5	20.2
Mean	28.0	30.1
Relative humidity (%)		
Maximum	100	100
Minimum	3	15
Mean	60	68
Wind prevailing direction	N-NNW	W
Mean speed (km/h)	8	6
Extreme (km/h)	50	110
Number of days with thunderstorm	11.7	40.2
Dust/sand storm	3.6	16.1
Mist	50.8	2.3
Haze	41.6	92.9

Methods and Techniques

The vegetation has been studied along the required transects for each Island either E/W or S/N direction through the whole length of the Islands. In each transect stands were chosen where variations in vegetation were observed. In each of these stands the species were recorded. Soil samples were collected from various gradients along each transect, approximately from the rhizosphere of the plants representing each habitat type. These were analyzed according to Piper (1950).

Three complete sets of the collected plant specimens are deposited in the Herbarium of Cairo University (CAI), the Herbarium of Assiut University, Egypt as well as in the Herbarium of King Abdulaziz University, Saudi Arabia. The specimens identified mainly according to Chaudhary (1999), Collenette (1999), Migahid (1996) as well as Miller and Cope (1996).

Results

Edaphic Characteristics

The edaphic characteristics are shown in Table 2. The soils are generally alkaline with no significant differences in the different recognized localities. The investigated habitats have in common a high content of readily soluble salts. It

is to be noted that the runnels and drainage systems soil of Jabal Sabaya island is characterized by the lowest content of salts. This is may be attributed to the wash caused by the rain water. On the other hand the soil collected from Sequala has the highest content of salts due to the tidal inundation effect, since the sea water covers most parts of the islet ground. Organic matter content values show no significant differences between the investigated areas, but also the runnels and drainage systems soil of Jabal Sabaya has the highest organic matter content.

TABLE 2. Chemical properties of the soil collected from the different recognized localities.

Localities	pH	Organic carbon (%)	TSS Mg/g DW
Jabal Sabaya			
Wadis	7.71	3.6 ± 0.6*	19.2 ± 0.2
Runnels & drainage systems	7.02	5.5 ± 0.4	4.5 ± 0.05
Eastern Um Al Qamari			
Coastal plains	7.67	3.8 ± 0.1	56.1 ± 8.0
Dense thicket vegetation	7.36	4.3 ± 0.2	28.6 ± 0.6
Inland barren parts	7.31	3.9 ± 0.2	48.2 ± 6.0
Sequala			
Mosaic vegetation	7.17	4.4 ± –	97.0 ± 1.0

*Mean ± s.e.

Vegetation

1. Jabal Sabaya Island

Regarding altitudinal variation, biotic and edaphic attributes, five different habitats may be recognized:

One Coastal plains (0-7 m).
Two Wadis (7-15 m).
Three Hills (10-30 m).
Four Plateau with rocky substratum (over 30 m).
Five Runnels and drainage systems (15-25 m).

Each of these habitats has its particular soil attributes, water resources and microclimate as well. The vegetation is generally open and characterized by a permanent framework of perennial herbaceous species (Table 3).

2. Um Al Qamari Islands

Both islands are ringed by a dense thicket of *Salvadora persica* interspersed with large shrubs of *Suaeda monoica.* The center of the islands, slightly raised,

and is really barren. Small population of *Atriplex farinosa* is confined to the western island, while another population of *Euphorbia cactus* is restricted to the Eastern one. Sevel associated species was also recorded (Table 3).

Table 3. A list of the species recorded in the investigated areas (+ means present).

Species	Habit	1*					2	3	4	5
		a	b	c	d	e				
ACANTHACEAE										
Justicia heterocarpa T. Anderson	Annual					+				
AIZOACEAE										
Aizoon canariense L.	Annual		+			+				
AMARANTHACEAE										
Aerva javanica (Burm. f.) Juss. ex, Schult.	Shrub		+	+	+	+				
Amaranthus graecizans L.	Annual					+	+	+	+	+
Digera muricata (L.) Mart.	Annual					+	+			
ASCLEPIADACEAE										
Glossonema boveanum (Decne.) Decne.	Perennial			+	+					
Leptadenia pyrotechnica (Forssk.) Decne.	Shrub or small tree					+				
ASPHODELACEAE										
Asphodelus tenuifolius Cav.	Annual					+				
BORAGINACEAE										
Arnebia hispidissima (Lehm.) DC.	Annual		+		+	+				
Heliotropium zeylanicum (Burm.) Lam	Frutescent					+				
CAPPARACEAE										
Cadaba farinosa Forssk.	Shrub					+				
Cadaba rotundifolia Forssk.	Shrub or small tree						+	+		
Cleome brachycarpa DC	Annual or short-lived perennial			+	+	+	+			+
CARYOPHYLLACEAE										
Polycarpaea spicata Arn.	Annual	+	+	+	+	+	+	+	+	+

Table 3. Contd.

Species	Habit	1*					2	3	4	5
		a	b	c	d	e				
CHENOPODICEAE										
Atriplex farinosa Forssk.	Frutescent						+			
Arthrocnemum macrostachyum (Moric.) K. Koch	Frutescent	+							+	+
Halopeplis perfoliata (Forssk.) Asch.	Frutescent	+								
Salsola spinescens Moq.	Frutescent	+								
Suaeda monoica Forssk. ex J.E. Gmel	Shrub or small tree	+	+				+	+	+	+
Suaeda vermiculata Forssk. ex J.E. Gmel	Shrub	+					+	+		
COMMELINACEAE										
Commelina forsskaolii Vahl	Perennial					+				
COMPOISTAE										
Launaea intybacea (Jacq) Beauv.	Annual or short-lived perennial					+				
Pulicaria crispa (Forssk.) Oliv.	Frutescent					+				
CONVOLVULACEAE										
Convulvulus glomeratus Choisy	Perennial					+				
Cressa cretica L.	Perennial	+								
Ipomoea eriocarpa R.Br.	Annual					+				
CRUCIFERAE										
Sisymbrum rio L.	Annual					+				
CUCURBITACEAE										
Cucumis melo L. var. *agrestis* Naudin	Annual					+				
Momordica balsamina L.	Annual					+				
CYPERACEAE										
Cyperus conglomeratus Rottb.	Perennial		+	+	+	+	+	+	+	+
Cyperus jeminicus Rottb.	Perennial		+			+	+		+	
Cyperus rotundus	Perennial					+				

TABLE 3. Contd.

Species	Habit	1*					2	3	4	5
		a	b	c	d	e				
EUPHORBIACEAE										
Euphorbia granulata Forssk.	Annual		+	+	+	+		+		
Euphorbia cactus Ehrenb.	Succulent spiny shrub							+		
GRAMINEAE										
Aeluropus logopoides (L.) Trin. ex Thwaites	Perennial	+	+						+	+
Dactyloctenium aristatum Link	Annual				+	+				
Dichanthium foveolatum (Delile) Roberty	Annual		+							
Echinochloa colona (L.) Link	Annual					+				
Lasiurus scindicus Henrard	Perennial				+	+				
Sporobolus helvolus (Trin.) T. Durrand & Schinz	Perennial	+						+	+	
Sporobolus spicatus (Vahl) Kunth	Perennial	+						+	+	+
Coelachyrum brevifolium Hochst. & Nees	Annual			+	+					
LEGUMINOSAE										
Acacia ehrenbergiana Hayne	Shrub					+				
Crotolaria microphylla Vahl	Annual					+				
Indigofera coerulea Roxb.	Shrub					+				
Indigofera hochstetteri Baker	Annual					+				
Indigofera linifolia (L.f.) Retz.	Annual					+				
Indigofera spinosa Forssk.	Shrub		+	+	+	+				
Rhynchosia minima (L.) DC. var. *minima*	Perennial					+				
MALVACEAE										
Abutilon pannosum (G. Forst.) Schltdl.	Frutescent					+				
Senra incana Cav.	Perennial					+				
MOLLUGINACEAE										
Gisekia pharnaceoides L.	Annual					+				
NYCTAGINACEAE										
Commicarpus grandiflorus (A. Rich) Standl.	Perennial					+				

Table 3. Contd.

Species	Habit	1*					2	3	4	5
		a	b	c	d	e				
PALMAE										
Hyphaene thebaica (L.) Mart.	Tree					+				
PLUMBAGINACEAE										
Limonium axillare (Forssk.) Kuntze	Frutescent	+	+	+						
Limonium cylindrifolium (Forssk.) Verdc.	Frutescent	+								
POLYGALACEAE										
Polygala abyssinica R.Br. ex Fresen.	Perennial				+					
Polygala erioptera DC.	Annual or short-lived perennial				+					
PORTULACACEAE										
Portulaca oleracea L.	Annual				+	+	+			
POSIDONIACEAE										
Posidonia oceanica (L.) Delile	Perennial						+	+		
RHAMNACEAE										
Ziziphus spina-christi (L.) Desf.	Tree					+				
RUBIACEAE										
Kohautia caespitosa Schnitzl. var. *caespitosa*	Annual or short-lived perennial		+	+	+	+		+		
SALVADORACEAE										
Salvadora persica L.	Shrub					+	+	+		
SCROPHULARIACEAE										
Lindenbergia indica var. *indica* (L.) Kuntze	Frutescent			+	+					
TILIACEAE										
Corchorus depressus (L.) Stocks	Perennial			+		+				
Corchorus trilocularis L.	Annual					+				
VITACEAE										
Cissus quadrangularis L.	Perennial					+				

TABLE 3. Contd.

Species	Habit	1*					2	3	4	5
		a	b	c	d	e				
ZYGOPHYLLACEAE										
Tribulus terrestris L. var. *terrestris*	Annual		+		+	+	+	+		+
Zygophyllum album L.f.	Frutescent						+	+	+	+
Zygophyllum coccineum L.	Frutescent	+								
Zygophyllum simplex L.	Annual	+	+	+	+	+	+	+	+	+

*1, Jabal Sabaya (a, coastal plains; b, wadis; c, hills; d, plateau with rocky substratum; e, runnels and drainage systems); 2, Eastern Um Al Qamari; 3, Western Um Al Qamari; 4, Al Aghtham; 5, Sequala.

3. Al Aghtham and Sequala Islets

The vegetation of these islets show a mosaic pattern (Monod, 1954). The marginal parts occupied mainly by *Suaeda monoica* and *Arthrocnemum macrostachyum,* whereas the central sector supports the growth of *Zygophyllum album* together with *Polycarpaea spicuta.* Moreover, several associated species was also recorded such as *Amaranthus graecizans* and *Cyperus conglomeratus* (Table 3). It is to be mentioned that Seqala islet, in particular, seems to be a vital nesting site for many species of migrating birds.

Table 3 included a list of the recorded species and their distribution among the investigated areas. Seventy one species including 33 families of vascular plants was recorded. Largest families are: Graminae (8 species), Leguminosae (7), Chenopodiaceae (6). On the other hand 48 of the recorded species are confined to Jabal Sabaya island, namely in the alluvial areas, runnels and drainage systems (31 species), while other species are widely distributed in all the investigated islands viz. *Zygophyllum simplex, Polycarpaea spicata, Amaranthus graecizans and Suaeda monoica.*

Discussion

With the exception of Jabal Sabaya island, with species density attaining 66 species (2 trees, 9 shrubs, 11 frutescents, 16 perennials & 28 annuals), the other investigated islands have obviously low species density: Eastern Um Al Qamari 15 (4 shrubs, 2 frutescents, 2 perennials & 7 annuals), Western Um Al Qamari 16 (5 shrubs, 1 frutescent, 3 perennials & 7 annuals), Al Aghtham 11 (1 shrub, 2 frutescents, 5 perennials & 3 annuals) and Sequala 11 (1 shrub, 2 frutescents, 3 perennials & 5 annuals).

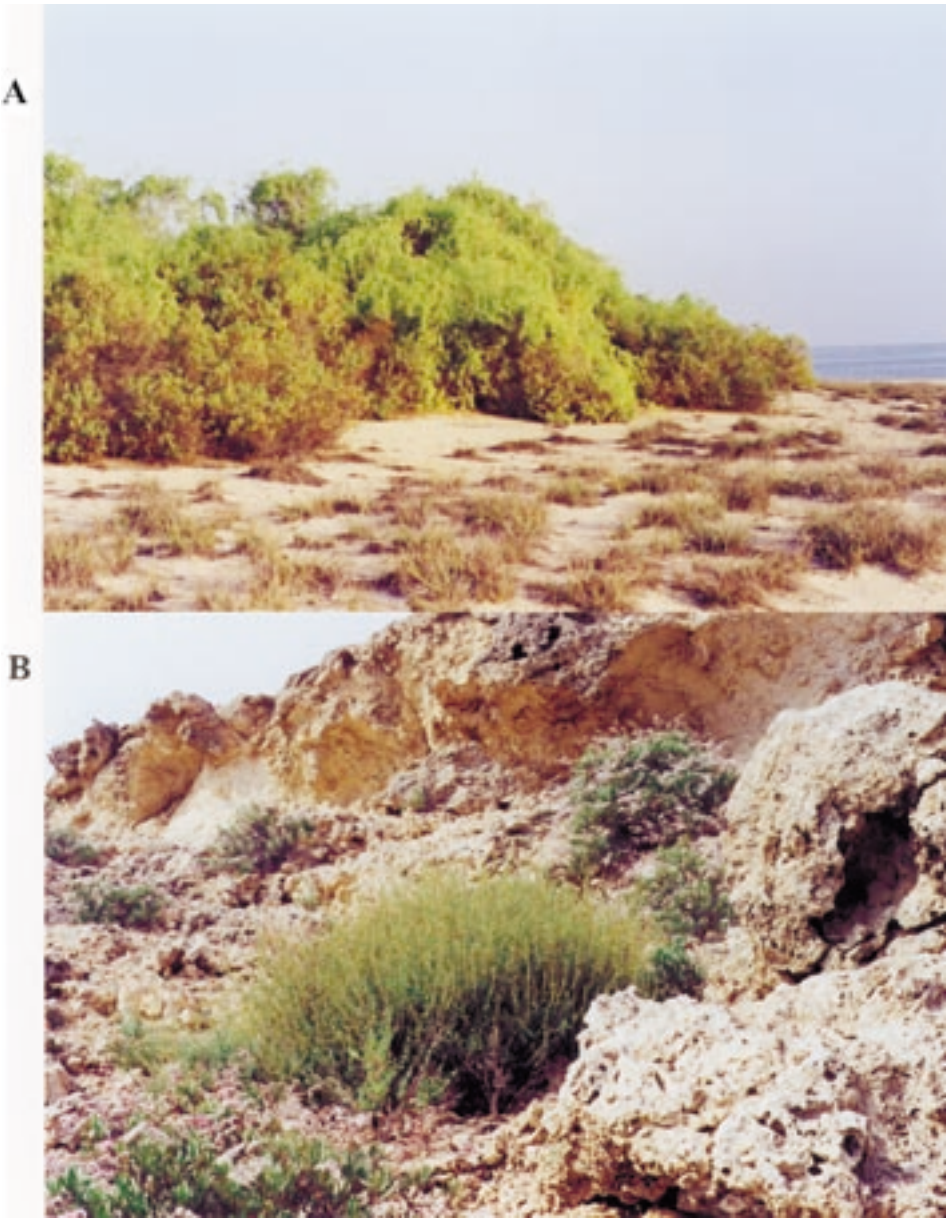

Fig. 3. (A) The dense thicket of *Salvadora persica* & *Suaeda monoica* riging Eastern Um Al Qamari Island; (B) Fossil coral shelter many plants of Jabal Sabaya island.

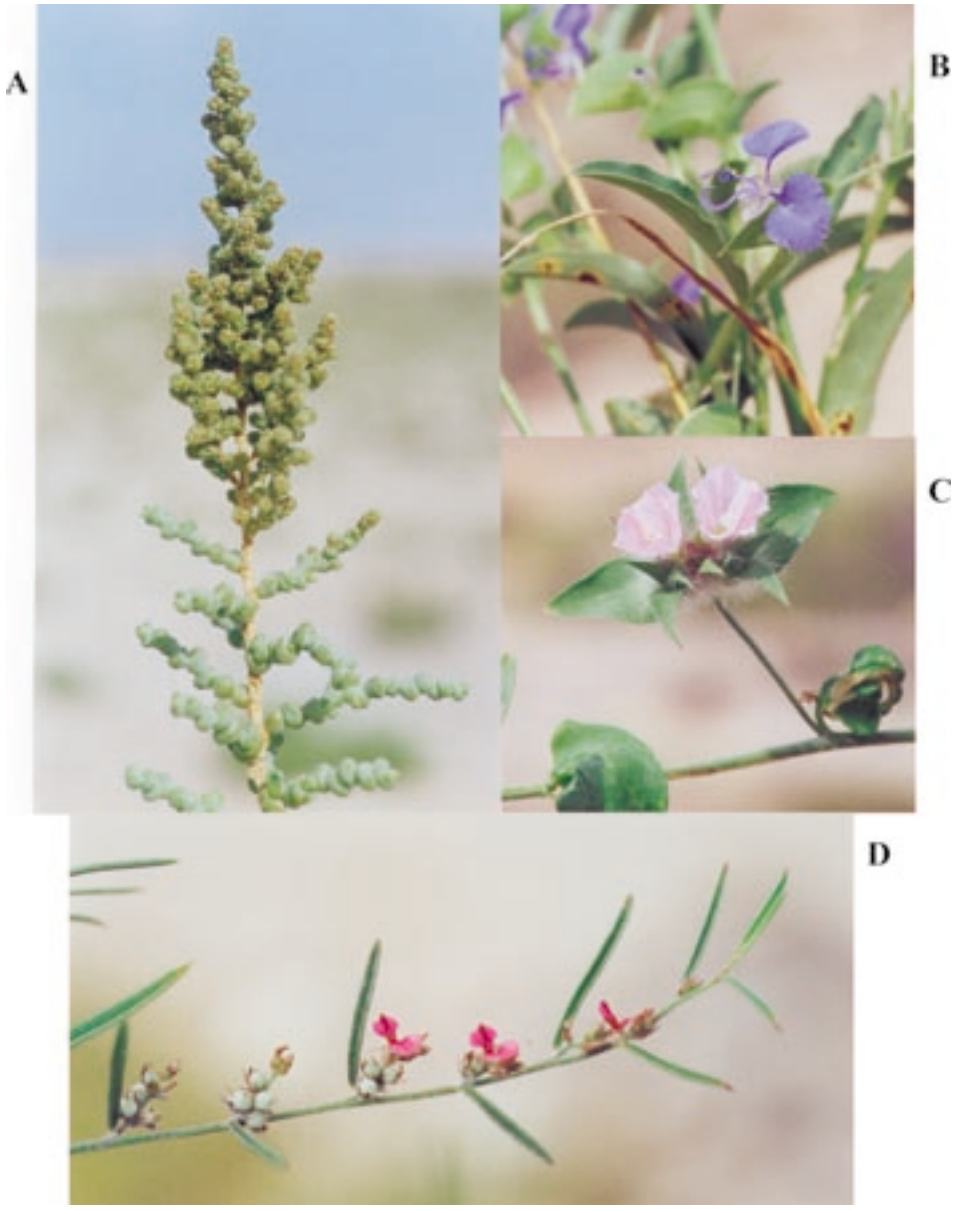

Fig. 4. Flourishing species of the vegetation of the study area: *Halopeplis perfoliata* (A), *Commelina forsskaolii* (B), *Convolvulus glomeratus* (C) & *Indigofera linifolia* (D).

Fig. 5. Plants in full growth (flowering or fruiting), *Indigofera coerulea* (A), *Atriplex farinosa* (B) & *Justicia* heteracarpa (C).

Tree layer is confined to Jabal Sabaya Island, being represented by widely spaced individuals of *Hyphaene thebaica* and *Ziziphus spina-christi.* On the other hand shrub and shrublet layer is relatively well represented: *Acacia ehrenbergiana, Salvadora persica, Cadaba farinosa, Leptadenia pyrotechnica, Indigofera spinosa, Indigofera coerulea* & *Aerva javanica* (Jabal Sabaya), *Salvadora persica & Suaeda vermiculata* (Jabal Sobaya, Eastern and western Um Al Qamari), *Cadaba rotundifolia* (Eastern and Western Um Al Qamari), The succulent spiny shrub *Euphorbia cactus* (Western Um Al Qamari) and *Suaeda monoica* (All the investigated islands). Moreover, it was found that the herbaceous layer comprises the rest of the recorded species (12 frutescent, 17 perennials & 28 annuals).

Coastal lowlands with relatively high water table and high content of salts in the soil represent unfavorable conditions for the growth of most plants. Consequently, it is only salt-tolerant halophytes that can live in such habitats: *Suaeda monoica, Suaeda vermiculata, Arthrocnemum macrostachyum* and *Halopeplis perfoliata.* Wadis, runnels and drainage systems receive an additional supply of fine soil and runoff water from surrounding elevated areas, enabling vegetation to grow richly in number. A few centimeters difference in level between two neighboring desert areas makes a very big difference in the condition of the vegetation (Migahid & El-Sheikh, 1977). Hence wadis, runnels and drainage systems, with fine-textured soil, support the growth of some species such as *Hyphaene thebaica, Leptadenia pyrotechnica, Cadaba farinosa* and *Ziziphus spina - christi.* On the other hand the ecological conditions are less favorable for plant growth in the rocky habitats. Here exposure to wind and other atmospheric evaporating factors in addition to resistance to penetration of plant roots resulting in partial loss of rain water. Consequently the number of specials is limited. Plants are confined to notches and crevices in which some rain and fine soil are retained: *Aerva javanica, Cleome brachycarpa, Indigofera spinosa and Lindenbergia indica.*

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حياة النبات في جزر ساحل البحر الأحمر السعودي
٢- جبل الصبايا ، أم القمارى ، الأغثم وسقالة

حسن سعيد الزهراني* و زينب أحمد الكريمي**

**قسم علوم الأحياء ، كلية العلوم ، جامعة الملك عبد العزيز ، جـــدة – المملكة العربية السعودية*

***قسم النبات ، كلية التربية للبنات ، الأقسام العملية ، البغدادية جـــدة – المملكة العربية السعودية*

المستخلص. تتناول الدراسة الحالية حياة النبات في جزر جبل الصبايا، أم القمارى الشرقية، أم القمارى الغربية، الأغثم والسقالة، وذلك كدراسة ثانية في سلسلة الدراسات عن جزر ساحل البحر الأحمر السعودي. وتقع مجموعة الجزر ، محل الدراسة الحالية ، جنوبي غرب مدينة القنفذة.

ولقد أمكن تسجيل ٧١ نوعًا نباتيًا تنتمي إلى ٣٣ فصيلة من فصائل النباتات الوعائية. ومن بين هذه المجموعة النباتية اقتصر نمو ٤٨ نوعًا على جزيرة جبل الصبايا فقط موزعة على ٥ بيئات متباينة: السهول الساحلية – الأودية – الأراضي الصخرية – التلال – المسارب المائية ذات التربة الغرينية . وفيما يتعلق بجزر أم القمارى فلقد وجد أن كلاهما يحيطه غطاء نباتي كثيف يتكون أساسًا من نباتات الأراك *Salvadora persica* يتخللها نبات السواد *Suaeda fruticosa* وذلك في الوقت الذي وجدت فيه الأجزاء الداخلية، المرتفعة نسبيًا، خالية تقريبًا من الغطاء النباتي . تميز الغطاء النباتي بكل من جزيرتي الأغثم وسقالة بكثافته النسبية مع قلة التنوع.

ولقد وجد أن الجفاف الشديد وخصائص التربة والارتفاع عن سطح البحر بالإضافة إلى تأثير الرياح والتيارات البحرية والطيور المهاجرة كلها ساهمت في التأثير على طرز الكساء الخضري في المناطق التي تمت دراستها.