THE FLORA OF THE UNITED ARAB EMIRATES

AN INTRODUCTION

A. R. WESTERN

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1989

P.A. Western

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FOREWORD

by H.E. Sheikh Nahyan bin Mubarak al Nahyan
Chancellor, Emirates University

ONE of the key functions of any University, or, indeed, of any institute of higher education, is the encouragement and carrying out of original research, designed to add to the sum total of human knowledge.

Only through such research is it possible both to ensure that the education provided remains in touch with changing circumstances and to continually broaden its scope.

That function has a particular relevance in a country like the United Arab Emirates, still a relative newcomer to the international scene, and a country whose history and environment is still relatively unexamined, unresearched, and unknown.

The Emirates University, itself little more than a decade old, has made a point of encouraging original research on the country. If we of the Emirates do not study ourselves and our land, we cannot expect others to do it for us.

The long story of historical and scientific research, however, has always shown that it is not merely the full-time academic who contributes to the expanding of the frontiers of knowledge. There has always been, and there will always be, a place for the talented and dedicated amateur.

This book, the first definitive study of the flora of the United Arab Emirates, is the result of more than ten years of work by such a dedicated amateur, Rob Western, who, with his colleagues in the Emirates Natural History Group, has collected, analysed and collated much previously unknown information.

The Emirates University Press is pleased to publish this unique study as a valuable addition to the knowledge of the UAE, to which academics and amateurs, citizens and expatriates all have a contribution to make.

Nahyan bin Mubarak al Nahyan

PREFACE

THE purpose of this guide is two-fold. First, it offers an introduction to the flora of the United Arab Emirates for those who are unfamiliar with but who wish to appreciate the extent and variety of the indigenous vegetation. Second, it provides information collected between 1981 and 1988 which may be used as a basis for further research by those who are more professionally concerned with the flora of this part of Arabia.

This book does not attempt to include all those species so far recorded in the country, but covers a representative selection of the commoner flowering plants. Much more systematic fieldwork is required to provide a complete flora, a project being planned by the country's University. A checklist of U.A.E. recordings to date is provided in an Appendix, while the Herbarium at Edinburgh Royal Botanic Garden holds a large number of pressed specimens which complement the text and following descriptions. Some specimens, particularly of grasses, are also housed at the Royal Botanic Garden, Kew.

The country has been incompletely surveyed to date as far as its vegetation is concerned and new records are being added to the list every year. In 1982 Prof. A. El-Ghonemy and Z. Qutob of the United Arab Emirates University produced a volume in Arabic entitled **Man and Environment in the Eastern Province of Abu Dhabi Emirate, U.A.E.** which gives a useful introduction to the vegetation of that particular corner of the country. This was followed in 1985 by Vol I of Prof. El-Ghonemy's **Ecology and Flora of Al Ain Region,** in English, covering the ecology and detailed descriptions of the monocotyledons of that area. M. Jongbloed's **The Living Desert,** a title in the 'Arabian Heritage' series, published in 1987, illustrates well over a hundred local flowering plants but does not provide a key or individual descriptions.

Articles appear from time to time in the local press on such topics as afforestation, desert plants and the economics of various imported species, but such information generally contributes little that is new apart from raising public consciousness on the issues of vegetation in a fragile environment. Whereas floras have been published for other Gulf States, the UAE has entered the stage at a later date, with botanical research only now receiving enhanced priority.

The writer is not a trained botanist and assumes that neither are most people who show an interest in local plants. Botanical nomenclature is therefore kept to a minimum.

This guide would not have been published without the generous sponsorship of the United Arab Emirates University. In particular the advice and encouragement of the Chancellor, Shaikh Nahyan bin Mubarak Al Nahyan, and of the Vice-Chancellor, Dr. Abdul Hafez El-Kordy, have been instrumental. They both recognised a gap in the literature and felt that the University should be strongly associated. Support and constructive criticism have also come from Mohamed Hadi Amiri, Director of the University's Marine and Desert Environment Research Centre, and Prof. A. El-Ghonemy of Desert Resources and Dr. R. Qassimi of Marine Resources.

I would like also to acknowledge the tremendous assistance given to me over several years by staff at Edinburgh Royal Botanic Garden, and in particular to Mr. I. Hedge and his colleagues who have supplied the vast majority of identifications. Also to Dr. T. Cope and Mr. C. Townsend of the Royal Botanic Garden, Kew, for their invaluable help. I am also indebted to Mrs. E. Aston for notes on geology. Finally I thank all those members of the Emirates Natural History Group (Abu Dhabi) and in particular Mr. J.N.B. ('Bish') Brown, who have had to put up with my idiosyncracies while out collecting and taking photographs on field trips.

Das Island, Abu Dhabi
1989

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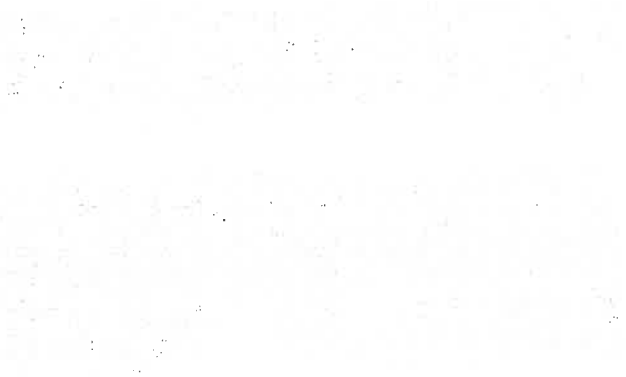


INTRODUCTION

Physiography and Geology

THE seven states of the United Arab Emirates enclose a total area of about 83,000 km^2 — just a little larger than Scotland — lying at the southwestern tip of the Arabian Peninsula between 20°50' and 26°N and 51° and 56°E. To the west lies the Arabian Gulf and Qatar; to the north an enclave of Oman facing the Strait of Hormuz; to the east the Gulf of Oman and the Sultanate of Oman; and to the south the Rub al Khali, or Empty Quarter of Arabia.

There are a number of small islands in the Arabian Gulf which are territories of the U.A.E., the majority close to the mainland but a few dotted further out, the most distant of which is Das, located some 110 kms north of Ruwais. Although there are distinct physiographic zones, their boundaries are indistinct, hence the following divisions are generalised. Apart from the mountains, the landscape is dominated by geologically recent overlying limestone sediments plus marls, shale deposits and evaporites. Folded sediments occasionally protrude through the sands as isolated jebels, or hills, such as Hafit and Hawrah. Present-day scenery is a relict of Pleistocene and post-Pleistocene times, when the climate was wetter and the alluvial fans of the east were created. Increasing aridity since then, plus some uplift have led to riverine cutting of wadi sediments and the formation of coastal salt flats.

Coastal Lowlands

THE U.A.E. has two coastlands, one east and one west, and for our purposes these are treated as separate zones. The western coastline extends the length of the country for some 600 kms along the Arabian Gulf. The eastern coast runs for some 75 kms along the Gulf of Oman.

Between Qatar and Dubai there are large areas of recently-formed saline flats (sabkha), extending inland for up to 30 kms. These are bounded at the tidal zone by a very narrow raised beachline of calcareous sand, and on the inland side by a low escarpment of Tertiary rocks. The sabkha is most extensive in the far west where it is barely above present high tide level, and after prolonged rain it may remain inundated for several weeks. In late February and March 1988 several dozen square kms were flooded up to a depth of 50 cms east and west of Tarif. The true sabkha with its impermeable substrata and evaporitic crust of gypsums, anhydrites and calcites, supports no vegetation except subsurface algae. After the floodwaters have evaporated, the surface is crusted with an unbroken layer of dazzling crystalline salt. Eroded flat-topped limestone and sandstone outcrops are a feature of this bleak landscape; these often form raised areas extending to the coast and thus effectively separate the salt flats. Two such barriers exist at Al Hamra and at Al Marfa.

The Abu Dhabi region consists of a drowned coastline with a high number of inshore islands, some of them only true islands at high tide. North of the federal capital the coast gradually becomes more clearly-defined and open with a beach barrier directly facing the prevailing northwesterly winds. The creeks and lagoons of Dubai, Sharjah, Ajman and Umm al Qawain are interspersed with small sabkhas, some of them with a thin covering of wind-blown sand. Southwest of Ras al Khaimah the coastline is a little higher but still indented with lagoons and minor promontories, as at Jazirat al Hamrah. The lagoon at Ras al Khaimah town is now partly infilled and the surrounding coastline is raised and capable of supporting some vegetation.

Inland from the coast the land rises very gradually in a series of shallow graded slopes to a maximum height of about 100m. Generally the elevation is much lower, and the coastal highway rarely rises above 30m except in Ras al Khaimah.

In the far west the landscape is very flat and monotonous apart from the few flat-topped bluffs, and the region between the border post at Al Sila and Jebel Dhanna is dominated by the extremely low-lying Sabkhat Matti which extends from the coast to some 100 kms inland. Further east the landscape is more undulating around Al Marfa and Tarif, and from there on to Abu Dhabi a low escarpment is generally visible inland beyond the sabkha. Between Abu Dhabi and Dubai the slope inland is imperceptible except for the presence of small stabilised dunes. Fossil dunes are a feature north of Sharjah, but beyond Ras al Khaimah the coastal plain becomes more and more constricted by the curve of the mountain belt which reaches to the sea at Ash Sha'm and which provides a physical boundary between the U.A.E. and the northern tip of Oman.

The east coast, from Khor Kalba in the south to Dibba in the north, consists of a very narrow plain dividing the shoreline from the mountains which extend rocky spurs to the sea. This coastal plain is up to 6 kms wide in the south but narrower further north apart from the wide alluvial Dibba plain. The highest of the coastal peaks is Jebel Jabsah, northwest of Fujeirah town, at 881m. There are no permanent streams along the coast but at Fujeirah and Dibba wide seasonal wadis debouch into the sea. There are major bays at Khor Fakkan and Dibba, both of which are being developed into modern harbours. Around Khor Kalba and Fujeirah there is some saline marshland but further north the coast is rocky. Significant passes through the mountains occur only at Fujeirah (Wadi Ham) and at Dibba.

Offshore Islands

WHEREAS the mainland coast and associated islands consist of recent sedimentary carbonates, the isolated offshore islands have a much older origin. Through a process of salt diapirism the cores of these islands are pre-Cambrian Hormuz outcrops which have pierced the earth's surface at the highest point of the salt dome to form conical hills. In Pleistocene times low carbonate plains accumulated around these hills, along with associated coral reefs, particularly on the more protected south and east sides. None of the islands is very large and because most have no natural source of fresh water (Delma is an exception) they were generally uninhabited until recently when a few of them were adopted as bases by oil companies. One or two of the islands, such as Sir Bu Nuair, reveal deposits of igneous rock, and the numerous fissures are often rimed with yellow sulphur deposits. Jebel Dhanna is the one example in the country of these formations that does not in fact lie off-shore. The hills of these islands are steep and deeply incised as a result of erosion, and the original elevations are now much reduced, though the summits are still higher than any point on the corresponding coast, apart from Jebel Dhanna. Zirku for example rises to 130 m., compared with 33 m. for the highest point of the road between Qatar and Abu Dhabi. The coastline of these islands consists of undercut limestone ledges upto 3 m. high and a few tiny sandy coves. Only the larger islands have developed miniature shallow wadi systems fanning out from the hills.

The Western Dune Plains

THE southwest region of the country comprises extensive gravel plains with banks of aeolian sand piled up by the prevailing winds. Low towards the coast, these banks increase until they form awesome dune barriers with slip faces rising 70 m. above the gravel floor. In contrast to the white calcareous sand of the coast, these inland dunes are yellow or orange with iron oxide and quartzite grains. The whole region conforms to a hyperarid bioclimatic zone with thin vegetation cover, a limited number of species and an absence of trees. In the centre lies Al Liwa, an east-west crescent of oasis hamlets and gardens stretching for some 80 kms. So far off the beaten track was the area that it was first publicised only after World War II with Wilfred Thesiger's account in the National Geographic magazine. Until very recently Al Liwa was the only permanently inhabited part of this region but several towns and villages have recently been established to the north and there also exist oil camps and several forestry plantations and nurseries. The presence of a high water table at the base of the higher dunes led to the development of date palm cultivation, but nowhere is there any surface water. The small gravel plains interspersed between the dunes are saline to a greater or lesser degree, partly depending on their height above sea level, often with a fine horizon of blown sand. That the region must have been more habitable within the last few thousand years can be seen from the number of post-Neolithic flint finds on the surface. Al Liwa is bounded on the west by the Sabkhat Matti, while to the east the gravel plains increase in area as they encroach upon the alluvial fans of the Hajjar Al Gharbi mountains in Oman. To the northeast the dunes, though remaining extensive, decrease in individual size towards the central desert.

The Central Desert

BETWEEN Abu Dhabi and Al Ain semi-mobile dunes are the dominant visual feature, with a relatively high water table resulting in evaporatic crusts in the many depressions. As along the coastal region, these inland sabkhas may hold surface water for many weeks after winter rains, especially around Sueyhan. While the dunes become increasingly stable further north and inland of the coastal lowlands, they remain high in the east and actually abut on to the Hajjar Mountains at Shwayb. Limestone outcrops of the Simsima and Hawasima formations occur in a thin line running north from Al Ain, though many of these are virtually covered with wind-blown sand, as at Jebel Mahijir near Al Hair and at Qarn bint Saud.

The central desert region extends north beyond Falaj Al Moalla where it is dissected by Wadi Lamah. The sands remain fairly well demarcated between the coastal oolitics and the inland aeolian, and in the northern Emirates the gravel depressions largely disappear. The landscape is gently undulating, lacking in surface water, and there are few large outcrops apart from the Jebel Faiya group between Madam and Dhaid.

There is greater vegetation cover than on the western dune plains, especially further north. In particularly wet winter rainy seasons there can be a high incidence of annuals and new grass growth may be very extensive. Remnants of Acacia forest occur between Shwayb and Al Hair, and inland of Jebel Ali, but the stands are becoming more scattered and individual trees are often in poor condition.

The Alluvial Plains

THE alluvial fans that spread out westwards from the Hajjar range form extensive plains with a shallow and ever-decreasing slope until levelling out when they meet the central desert. These piedmont fans consist of pebble and rock detritus overlying gravelly alluvium close to the mountains, and sand and gravel further west where the grain size decreases and winds have formed low dunes interspersed with fluviatile deposits. Here the main wadi systems lose themselves, though their courses are marked by occasional sabkha areas and thin lines of vegetation.

Around Khatt and Digdaga the Jiri Plain is fertile with a high concentration of sands and silts in the alluvium. Combined with a high water table this results in a fairly dense vegetation cover. Further south the Dhaid, Gharif, Madam and Al Ain Plains also constitute the major agricultural regions of the country, though in each case a caliche horizon exists below the gravels which with recent water drawoff is beginning to have a serious effect on permeability. Small sections of the Fujeirah coast also fall into this category. Around Al Ain the plains have a depleted vegetation cover and surface erosion is greater. The Jaww Plain, between Jebel Hafit and the Wadi Jizzi, is being extensively quarried and this has already led to surface degradation as fragile layers are broken up and blown away contributing towards a dust bowl effect.

The Mountain Belt

THE Hajjar range forms the easterly boundary of the U.A.E. near Al Ain and a northerly extension separates Fujeirah from the rest of the country. Hatta and Masfut nestle in westward facing enclaves among the mountains which here straddle the border with Oman. Geologically this mountain zone is a distinct entity, comprising a suite of metamorphic and igneous rocks which are rarely found on the earth's surface elsewhere. These lavas, oozes and crusts are believed to have been formed at the site of a mid-oceanic ridge in the Indian Ocean. This mantle was gradually shifted and deposited on the edge of the Arabian peninsula during Cretaceous times. During the subsequent Tertiary the region was uplifted, and ever since then erosion has carved out the spectacular scenery of today. Many of the mountains peak at over 1000m. and in the southern Ruus al Jibal the highest are over 1500m. Forming an effective barrier between the two Gulfs, this mountain range is some 30 kms. wide in U.A.E. territory and portrays an almost lunar effect with its ragged open slopes and numerous deeply-twisting wadis, a few of which contain permanent streams. Some of these wadis were originally much wider, as evidenced by the wide terraces and gullies cut through the consolidated sediments of former river beds. The Wadi Al Bih is the largest of these wadi systems in U.A.E. territory, extending from the Ruus al Jibal to Ras al Khaimah.

Although geologically and physically separated from this main range, there are two other notable outcrops. Jebel Hafit, just south of Al Ain, is a 10 km. long foreland anticline of late Miocene date overlain with a limestone mantle, peaking at 1180m. It is surrounded by alluvial detritus scored by numerous dry wadi systems, the eastern ones merging into the Jaww Plain and the western ones losing themselves in the red dunes either side of Ain al Faidah. Oligocene reefs extend northwards into the suburbs of Al Ain.

Further north, between Madam and Dhaid, lie Jebels Faiya and Mileiha, peaking at 421m, and 394m. respectively. These are Cretaceous in origin and huge sand deposits have built up on their eastern flanks. Like Jebel Hafit, the limestone mantles of these outcrops contain a highly varied suite of marine fossils.

Climate

THE climate of the U.A.E. is characterised by low rainfall and high temperatures.

Abu Dhabi town averages 10 days per year when some rainfall is recorded; further west this

decreases to 5 days, but in the mountains to the east and north rainfall is usually higher. The annual total anywhere in the country is highly variable. The following table shows data from the **Khaleej Times** for a six-day period early in 1988. Recording points were at the respective main airports and figures are in mms.

FEBRUARY	DUBAI	SHARJAH	RAS AL KHAIMAH	ABU DHABI
14th	1.0	0.2	0.5	5.0
15th	5.5	4.0	0.9	3.0
16th	7.5	6.0	3.0	17.0
17th	150.2	116.0	75.0	31.4
18th	0	trace	0.1	0
19th	trace	trace	0.1	119.9

The previous highest total rainfall recorded in one day in February at Dubai was 60.2mm, and the total on one day for any previous single month was 73.0mm. The rainfall on the one day, 17th February 1988, exceeded the annual total for any year on record except 1982.

At Bateen Airport in Abu Dhabi the following annual totals were recorded over a four year period:

1982 — 195.2
1983 — 97.7
1984 — 24.5
1985 — 2.4

The annual average at Bateen based on records over 20 years is around 45mm. At Bateen the combined total for the 5 year period 1977-1981 was only 151.9mm. The total rainfall there for 1981 was 36.4mm, of which 26.3mm fell in one night in May.

The northern Emirates traditionally receive more rainfall. The longterm average at Sharjah (where records go back to the 1930s) is 95.8mm annually and for parts of Fujeirah it is over 150mm. Records from Al Ain display a similar erratic pattern. Average annual rainfall there for the period 1966-1979 was 77.6mm; 1972 received 272.5mm. but 1967 only 14.8mm. Enormous damage may be caused by heavy winter and spring storms, not only to property but also to vegetation. On March 29th 1987 Shwayb dam in the Madam valley burst and floodwater spilled into the desert to the north and east over several square kilometres, destroying all **Acacia tortilis** and **Calotropis procera** trees in its path and levelling the dunes. A vast tract of **Hammada elegans** and **Calligonum comosum** shrubs disappeared entirely.

Most precipitation occurs between December and April, though inland the odd summer shower along the mountainous border with Oman is not uncommon. Shwayb recorded at least two such showers in July and August 1984, for example, but no rain was recorded at Al Hair some 15 km south. The temporary freshening effect of summer showers is soon dissipated by heat and evaporation, but such rainfall is important for the germination of some species, such as **Tribulus.** Winter and spring rains are of the cold front type; although essential for aquifer recharge and to dampen the soil surface, the main catalyst for germination of ephemerals would appear to be a rise in mean temperature, which may not occur until several weeks after the most recent rainfall.

Absolute maximum temperatures rise to 49°C on the Arabian Gulf coast in July, and a degree or two higher inland. In January temperatures can be as low as 5°C, though this is rare on the coast because of the moderating influence of the sea. The mean maximum for Abu Dhabi in July is 40.1°C and the mean minimum daily means for the year are 32.2°C and 21.0°C respectively.

As with rainfall, there can be freak temperatures too. Between 8th and 10th July 1987 temperatures reached 52°C on the Fujeirah coast, causing extensive damage to fruit plantations there. It was estimated that 80% of the region's crops of lemons, 60% of guavas, 40% of dates and 30% of oranges and mandarins were totally ruined. The mangroves at Khor Kalba were badly scorched for the first time in living memory.

Mean annual relative humidity is over 60% for Abu Dhabi, with winter months generally over 70%. Diurnal means display great variability. Foggy days, i.e. with rising sand, are recorded in all months. In March 1983 five such days were recorded at the new Abu Dhabi Airport (visibility less than 1000m), but in April that year only one. In summer there is a high incidence of suspended dust throughout the country brought by the prevailing wind from the head of the Arabian Gulf. The dust haze remains in circulation because of the barrier effect of the Hajjar Mountains. Visibility is less than 8000m for half the summer; August 1984 witnessed 26 days of restricted visibility at the new Abu Dhabi Airport.

Local fogs are frequent in the early hours of the morning inland of the sabkhas. The radiative cooling effect around Al-Dafrah, south of Abu Dhabi, causes moist air in that region brought in by

afternoon sea breezes to condense and form fog. Cold air valleys between the dunes enhance this surface condensation effect and dense fogs may result which can penetrate to the coast. As solar radiation is weak in winter, it takes some time to 'burn off' this fog. Advective fogs also occur, when air of high dew point over the sea moves landwards where it is forced to rise over the cooler and denser desert air. Such fog blankets may extend inland for up to 100 kms.

Dewfall is the only fairly regular source of moisture for plants, since fogs and rains are mostly restricted to the winter and spring months. Dew does not occur every night, but it is a feature of a large number of nights each month, and in the summer constitutes the only source of surface moisture over much of the desert. Little data has been collected within the U.A.E., but the results of experiments conducted by a Royal Geographical Society team in the Wahiba Sands south of Muscat in Oman in early 1986 indicate that dewfall is a most important contributor of surface moisture.

The persistent summer wind is the northwest 'shamal,' which occurs as a result of two circulating pressure centres, a low one over Iran and Afghanistan and a high one over Saudi Arabia. The Gulf in between acts as a conduit for enhanced winds from surface level up to 5000 feet, and it is this force which brings so much dust haze into the country. The winds generally drop during the night. In the winter winds are more variable but velocities are raised during storms caused by low pressure and passing jet streams. Gusts of up to 120 kph were recorded in Abu Dhabi on 27th March 1987.

Mean daily sunshine for the year is 10.3 hours at the new Abu Dhabi Airport (1985 figures) with a maximum daily mean of 11.4 hours in June and a daily mean of 8.4 hours in January.

Water Resources

UNDERGROUND aquifers throughout the country continue to be depleted as the investment in agriculture grows. A study initiated by the Ministry of Agriculture and Fisheries in 1984 estimated that at current extraction rates the existing water supplies would be exhausted within thirteen years. The main aquifers lie between 10 and 200 metres below the surface, and as an example ground-water levels in parts of Ras al Khaimah fell by 10 metres between 1977 and 1984. In 1988 several wells in that Emirate dried up completely for the first time. Some four-fifths of the annual consumption of some 656 million cubic metres (1984 figures) comes from underground reserves and is used primarily for agriculture. As the aquifers are depleted salinity levels rise and seawater seeps into coastal areas. It would appear reasonable to surmise that the gradual dying off of **Prosopis** and **Acacia** trees north of Al Ain is caused by the lowering of ground water levels.

Apart from a few permanent wadis in near-inaccessible areas, and the surface water channels in oases ('aflaj'), there is no lasting source of surface water present. The major dams rapidly fill in very wet rainy seasons, as in the spring of 1983 and 1988, but in the mid-1980s all dams were completely dry. We have seen that rainfall is erratic from year to year and, given the rate of artificial drawoff, is not sufficient to replenish aquifers sufficiently. The nature of surface soils, often with an impermeable subsurface, accounts for fast runoff and the formation of saline pools in depressions.

Temperature apart, winter and spring rains are the most important factor in determining the density of germination for many annuals. This was evident from the vast numbers of seedlings throughout the country in the spring of 1982 and 1988. 1983 also experienced a wet spring but the germination rate was far less pronounced than in the previous year, perhaps because of some conservation limiting factor in the species themselves. Certainly 1984, with its dry spring, witnessed only a small proportion of seedlings despite the quantities of fruit produced in the previous two years.

Whereas in 1982 whole areas of the northern Emirates were covered with young **Arnebia hispidissima** plants, this species was extremely scarce in following years until the spring of 1988. In contrast, the seedlings of some perennials, especially woody halophytes such as **Zygophyllum** and **Salsola** species, are able to become fully established in very wet seasons provided they are not flooded. These species, amongst others, colonised large areas of sabkha margins between Abu Dhabi and Sueyhan in the early 1980s.

Rainfall on dunes infiltrates to various depths depending on the intensity and period of precipitation. After brief summer storms the sandy hollows between dunes can be damp to a depth of up to 20 cms. though at that time of year the dune surfaces dry out fast. Because the depth of wet sand is less after summer showers, and temperatures are high, a crust forms on the dune sides which dries and tends to slip down the dunes and breaks up. This occurs to a lesser extent after winter and spring rains, but the overall wet depth then may be much deeper. The overlying crust insulates this damp layer, providing continued moisture for seedlings. It is noticeable that in sand areas, the bulk of successful germination is at the dune bases and intervening hollows, precisely the areas where date palm cultivation occurs in Al Liwa.

The alluvial fans mostly contain sufficient subsurface water to sustain growth of trees and other large perennials. This is true of apparently dry mountain wadis too. Very large **Ficus salicifolia** and **Zizyphus spina-christi** trees are a feature of such wadis.

Relatively fresh water also accumulates beneath the dunes along the coasts, sufficient in the past for the establishment of urban communities, including the major towns of the Arabian Gulf littoral. Fresh water is less dense than sea water and forms a lens which, if undisturbed by drawoff, can maintain hydrostatic pressure. This factor helps to explain the density of desert vegetation along the coast north of the Abu Dhabi sabkhas and the fact that trees can be successfully planted in coastal cities.

Apart from irrigation, the only other form of moisture available for plants is dew and night fog. Although neither of these contributes to water storage in the soil they are important for shallow and lateral-rooting species. Throughout the year there is a high incidence of dews and fogs in open desert areas particularly which contribute a significant amount of moisture despite rapid evaporation after sunrise. The amount of dew deposited varies with the height and topography of the surface but little data is available from the U.A.E. Results from the Royal Geographical Society's Wahiba Sands Project in Oman indicate daily average catches at a variety of dune sites in March 1986 to be up to 2g of dew per night (equivalent to 0.5mm of rainfall). Major variations affecting the catch were height above ground level and degree of exposure, but dewfall is the only regular source of water throughout the year.

Soils

THE sabkha deposits adjoining the coast between Qatar and Dubai often have a deep profile but the texture is poorly developed because of anaerobic conditions between a high water table and a surface crust of salts and gypsums. These soils are devoid of surface vegetation. The Western Region of Abu Dhabi Emirate contains the bulk of high, unstable aeolian dunes of mixed fine-grained sand in the country. There is little or no horizon differentiation and plants have a precarious existence on the steeper slopes. The gravel depressions in the central plains are very close to the water table which varies from between one and ten metres below the surface in most such regions. Samples of subsurface water from the Abu Dhabi to Sueyhan road analysed in August 1984 gave the following figures: 50 kms. inland from the coast samples contained up to 36 grammes per litre of dissolved salts and a high magnesium and calcium content. 25 kms. further inland the figure was upto 46 gms./l. but with lower magnesium/calcium content. Both samples came from a water table less than one metre below the ground surface. **Halopeplis perfoliata** is the only species growing directly into the water table at the highest salt concentrations, though **Limonium axillare** and **Zygophyllum hamiense** are usually in close proximity.

The gravel plains around Al Ain, Madam, Dhaid and Khatt are partly sand-covered to a shallow depth. The gravel layer itself is often thin and may overlie a horizon of loamy calcium which is low in nutrients, phosphorus in particular being unavailable in natural form. Continuous irrigation leads to a leaching and the development of salinity at higher levels, affecting all vegetation. Further east are alluvial soils with a high lime content. Soils here are often deep though not well consolidated and despite the frequency of **Acacias,** the number of perennial species tends to be limited. The mountain soils are often rich but shallow because of extensive runoff, though in places terraces have been built in the past to create and preserve silt deposits suitable for cultivation. The cracks and crannies present on all mountain slopes however still contain a large number of perennials even to the summits, and they also support the widest variety of ephemerals of any physiographic zone in the country.

In general, biological activity in local soils is very low, and only some three per cent of the whole country is naturally suitable for arable farming. At present, largescale attempts to level some dune areas by means of bulldozers and then to create farms with a supply of water and imported fertilisers are proving successful. Wind erosion in such areas is a problem partly solved by means of shelterbelts, but elsewhere severe surface breakdown is a standard feature of the landscape, particularly where sand cover is minimal. This erosion is not new; it has taken thousands of years of diurnal contraction and expansion, high winds, the presence of hydrated salts and a scarcity of plants to produce today's landscape. In the western dune regions trees in the natural state are non-existent, and here the soils are most skeletal. Further north vegetation cover gradually builds up but there is always space between plants throughout the central plains. The relict nature of now-stunted forests of **Prosopis** and **Acacia** in the centre of the country suggests that overuse of timber resources combined with more recent lower rainfall levels has helped to desertify the region. It has been suggested that the processing of copper ore on a large scale in the third millennium BC and again in the tenth and twelfth centuries AD in the hills east of Al Ain and around Hatta, has contributed directly to the loss of tree cover and consequent degradation of soils. Once perennials have disappeared on a large scale the soil is rapidly

broken down by erosion, and only a period of wetter climate can reverse this trend.

The only soils that tend to develop in the flat surface of a desert environment are fine-grained silts, the result of rainwater runoff collecting in large pools. Initial absorption of water is high, but the clay particles swell and the soil rapidly seals into a pan. The surface water is then evaporated, resulting in a precipitation of salts and attendant problems.

Man's Influence

ONLY in those areas where man has a direct influence, as in towns, villages, farms and beside roads, has there been any significant alteration to the desert environment in recent years. The effects of pumping out subsurface water still have to be fully evaluated though this does seem to be adversely affecting some perennials. The mountain regions have been but little affected since the population is low and scattered. In the denser population centres there have certainly been big changes; on Abu Dhabi Island indigenous species such as **Polygala erioptera, Halopyrum mucronata** and **Crotalaria aegyptiaca** have virtually disappeared, though their tenacity for survival is remarkable. Other species in marginal marshy environments, including **Lippia nodiflora, Typha domingensis** and **Phragmites australis** are all under imminent threat on the Island. However, urban areas have also witnessed an influx of exotic species and, along with fertilizers, seeds of species that may now be considered naturalised but which are unlikely to survive without irrigation and good soil conditions. A number of weeds fall into this category, notably the grasses **Cynodon dactylon** and **Echinocloa colonum** and the legumes **Medicago laciniata** and **Trigonella hamosa.** This pattern is repeated in plantations throughout the country, where they are further protected by fencing. Many truly indigenous plants have also taken full advantage of this combination of shelter, water and fertiliser afforded by rapidly-expanding urbanisation. **Alhagi maurorum,** for example, is the dominant low shrub in Abu Dhabi town in the summer months.

There is a widescale attempt to create forests in some of the most arid parts of the country which, though it is very unlikely to have any real effect on the overall climate, will increase the range of micro-habitats. The main benefits of such projects, though, is in the provision of shelterbelts and stabilisation of dunes, thus reducing but not wholly preventing the effects of desert encroachment.

At present the hinterland is a large area, only partially exploited. In the past a significant amount of land was used for nomadic herding, but these traditional rangelands are now less affected as the local populations are settled into rural communities. The immediate vicinity of the new villages tend to be overgrazed by sheep, goats and camels, but further out there are signs of some regeneration in one or two areas. An indicator of degraded rangeland is the dominant presence of **Cornulaca monacantha** over much of inland Umm al Qawain and Ras al Khaimah.

Camels still roam parts of the country in numbers, however. Along the coastal lowlands perennials have restricted growth and grasses appear tough and stunted. Larger species are grazed as high as a camel can reach, so that **Prosopis** trees invariably depict an umbrella profile. Goats are adept at climbing into the lower branches of **Zizyphus** and **Acacia** trees to feed, a notable feature of the Northern Emirates.

Largescale works can and do endanger fragile zones. The bridge and road scheme to link Abu Dhabi and Dubai road if and when completed, is likely to have an adverse effect on the mangroves in the lagoons on the landward side as water levels are altered. Oil pollution has received much recent attention in the media but surveys have revealed a certain tolerance on the part of the most-threatened species, mostly **Avicennia marina** and **Arthrocnemum macrostachyum.** Analysis of affected mangrove pneumatophores in 1983 and 1984 has shown that while the tissue itself is not directly contaminated, superficial oiling may be responsible for impeding the passage of oxygen. However, in some areas both dead and healthy mangroves show no sign of recent fouling by oil, and one reason for die-back could be attacks by fungus.

Until the coming of oil natural resources were few in the region and so what was available was utilised. From folklore and documentary evidence it seems a large number of plants were put to a variety of uses. **Calotropis procera** was once a source of timber for the manufacture of charcoal; the flower heads of **Aerva javanica** were used for packing pillows and camel saddles; and **Calligonum comosum** was widely used for firewood. Several species of course were a food resource, including the mountain caper **(Capparis spinosa),** wild dock **(Rumex vesicarius)** and the fruits of **Zizyphus spina-christi.** In hard times the leaves of **Calligonum comosum** were eaten too. Other plants were, and still are, used for making dyes, among them the parasite **Cynomorium coccineum.**

Despite this exploitation it is unlikely that many native species will die out completely. Very few species have such restricted niches that they can be considered under great threat except very locally. On the contrary, fenced-off areas have enabled many to grow far more luxuriantly than was ever the case in the open desert.

Characteristics of Desert Vegetation

TO a newcomer, plant life in the U.A.E. seems sparse. Compared with temperate lands there is a distinct lack of woodland and continuous grassland. Space between individual plants is very noticeable, particularly in the more sandy areas. Plant communities appear stereotyped and rigid, leading perhaps to the assumption that there exists a primitive vegetation climax. This is not so. Plants are adept at extending their range to environmental limits. Just as in upland Britain heather species will dominate moorland, so in the U.A.E. there are habitats highly suitable for another locally-dominant plant, the sea lavender. That there are apparent constraints on vegetation in the desert does not alter the fact that plants adapt to the best of their ability and become highly efficient not just in surviving as individuals, but in propagating too. We humans tend to regard the desert as an inhospitable environment, and so it is for us. Food resources are limited, the heat often intense and water shortage a fact of life. Yet in the past Bedouin groups have more than survived in the most hostile desert surroundings, demonstrating that man can adapt, albeit with the advantage of movement and therefore the choice of escape. Plants cannot transplant themselves to more equable surroundings, but they have been around a lot longer than man and have had plenty of time to evolve some sophisticated adaptive mechanisms and techniques.

The mosaic of habitats and associations throughout the U.A.E. represents present status only. Whether bordering the salt flats, or in mountain crevices, or among the high dunes, each habitat contains fairly distinct associations, but this remains true only while present conditions prevail. The vegetation cover fluctuates according to a number of variables, including short-term climatic change and the influence of man's pressure upon finite land resources. A steady increase in rainfall over a number of years would very likely result in the establishment of a greater number of perennials. This was dramatically illustrated by the vast increase in the number of **Zygophyllum hamiense** plants in depressions along the road between Abu Dhabi Airport and Sueyhan attributable directly to the heavy winter and spring rains of 1982 and 1983. On the other hand, man's exploitation of the desert can have the opposite effect. The raking of surface soils for the construction industry has left patches of eroded and depleted desert, an increase in windborne particles and the disappearance of some species of the original vegetation. It must be said, however, that even in the most disturbed areas the resilience of some species is a tribute to nature's capacity for survival against the odds.

There is not the same distinction of seasons in the U.A.E. as a temperate climes. The transition from winter to summer is fairly rapid in terms of temperature rise and plants and seeds respond to the stimuli of increasing warmth in soil and air, and to the presence of moisture. Given that there is sufficient depth of soil there is a surge in growth, though this may not be luxuriant if rainfall has been minimal.

There are three basic types of vegetation able to cope with desert conditions: ephemerals, succulent perennials and woody perennials.

a) Ephemerals

These consist of herbaceous, non-woody species which opt out of the most rigorous months of the year by remaining dormant as seeds. They constitute over half of all plant species present, and have a typically short growing and reproductive season. Roots are shallow, the mature plants small or slender, but they do produce copious amounts of seed, much of which is lost by various means but enough always survives to ensure the continuation of the species. In the U.A.E. there are both winter and spring ephemerals, but the vast majority and those making the strongest visual impression appear as the temperatures gradually rise between February and May.

b) Succulent perennials

Succulence occurs when the outer leaf or stem cells enlarge so as to increase volume for water storage. A waxy layer on the outside prevents moisture loss as well as lending extra support for the leaf or stem. Such plants are very common fringing the coasts, sabkha, and inland depressions. They can usually tolerate a high level of salinity and are often fleshy throughout the year. Many of them flower in the summer or autumn, but the petals are generally miniscule, yellow or white, and should not be confused with the papery fruit wings that follow on several species.

c) Woody perennials

Woody perennials are dominant in terms of individual size, as this category includes trees and most of the larger shrubs. Numerically, however, they constitute the smallest type. All species in this group are tough and able to contend with heat, wind, drought and herbivores. These plants are slow growing with long, central root systems to tap deep aquifers. Seeds are less numerous than is the case with other types, but tend to be individually larger and very tough.

Adaptations to a Desert Environment

THE physical appearance of much of a desert vegetation distinguishes it from plants of temperate climes — individuals are often small, with fewer or reduced leaves and a higher proportion of dead tissue. Such features are an evolved response to restrictions placed on growth and reproductive patterns by an unstable environment. It is very noticeable that where living conditions are improved, such as in gardens and plantations, species generally grow larger than their cousins in the open desert outside. Structural alterations are the most obvious. Roots of woody perennials are deep, in young plants several times longer than the shoot, in order to seek out a permanent water layer. Above the surface such plants are slow-growing as they take time to become fully established in the soil below. Many perennial grass species, on the other hand, produce wide-ranging lateral roots, which receive moisture mostly from surface dew. A common sight on open sand desert is the number of thin strands on the surface where dune movements and winds have revealed these radiating roots. Lateral root systems also reduce competition and contribute to the open space around individuals. Very young shoots are often hard and in some species, such as **Cornulaca,** spiny, to help withstand both the abrasive effects of flying sand particles and the attention of herbivores.

Desert perennials may appear to be in poor condition, with little foliage and dead branches, especially in summer. One way of conserving water is to reduce the number of leaves and green parts. Growth then resumes in a more favourable season. **Calligonum comosum** shrubs, for example, frequently look quite lifeless apart from a few green shoots drooping from a branch. Continued browsing also affects perennials to the extent that the only leaves may be those protected within a barrier of intricate, sometimes spinescent, branches and twigs. A good example is **Ficus carica** in the Ruus al Jibal. A typical sight is of a once larger shrub reduced to a thickened, stunted base and short branches which are repeatedly grazed back. However, a reduction in overall surface area also means less chance of water loss, hence many perennials tend to be compact.

Hairs, spines and bristles give protection from direct sunlight, help to deter some herbivores, and create humid microclimates around the stem, branch or leaf which reduce the effects of radiated heat. Stomata may be protected within grooves, as with **Anabasis setifera,** while stems may be jointed at short intervals to provide extra support as with several succulent species. Stems and branches may also be very pliable, especially in open desert habitats where the wind factor can be considerable. The outer stems of true xerophytes are generally very woody, while the inner cells continue to function normally.

Leaf size and shape are very variable. Some halophytic species produce fleshy, globular leaves in which the outer cells expand to increase water storage. Such leaves are usually glossy with a waxy surface designed to reduce moisture loss. Leaves may be small or virtually absent; in such species photosynthesis is conducted by the green stem and branches. Basal leaves are usually largest, as they benefit from the protection and shade provided by the plant rising and spreading above. Hairs and warts break up the leaf surface while the undersides are sometimes much lighter in colour to reduce the amount of heat reflected from the ground.

The presence or absence of conspicuous flowers is largely determined by the method of pollination adopted. Some ephemerals tend to produce large, colourful flowers to attract insects over a relatively short period. Wind pollinated species, however, tend to carry smaller but often numerous flowers. Fruits also display a wide variety of size and shape. Ephemerals tend to produce numerous small seeds, the idea being that some are bound to survive, while those of woody perennials are generally fewer but larger, sometimes with hooks and hairs to aid dispersal by birds and animals. Many seed types have hard shells resistant to high temperatures, the abrasive effects of flying sand and some even the digestive systems of rodents.

Ephemerality is one major functional adaptation that has already been commented upon. Another concerns photosynthesis. The necessity for this process to continue to be conducted during the hottest months in an arid environment places constraints on a plant's ability to withstand moisture loss. A method evolved to bypass this problem is to delay chemical exchange so that it can take place during the cooler, more humid night-time. This means the stomata do not have to open during the day. This applies to species as diverse as **Portulaca oleracea, Aizoon canariense, Citrullus colocynthis** and several grasses. The build-up of water during the night is also one reason why so many desert animals are nocturnal grazers. Several species of plant are partly deciduous in summer to minimise active photosynthesis while still ensuring survival. Others have evolved mechanisms to protect leaves from excessive heat by folding, curling or rolling up to present the smallest possible surface area to the sun; others. such as members of the **Apocynaceae** family, may die back from the tip.

Some halophytes, notably **Limonium** and **Tamarix** species, are able to excrete salts in concentrated form. It is possible to see the glistening white crystals on stems and leaves, especially in summer.

Close examination of plants can usually give a clue to some of these adaptations. Species have evolved not just one, but a number of mechanisms to ensure the best chances of survival. Water remains a limiting factor, however, as seen in a comparison between crop plantations and the natural vegetation. Alfalfa **Medicago sativa** grows prolifically and can be cut regularly if the crop is continually irrigated, and such fields are very sharply demarcated against the visually sparse desert. However, adaptations have resulted in the concept of the ecological niche, so that opportunism and flexibility thrive in unstable conditions.

Plant Associations

THROUGHOUT most of Abu Dhabi Emirate the vegetation is open, increasingly so towards the south and west. The other Emirates, which between them occupy less than a quarter of the country's total land area, have a denser vegetation cover due to varying factors of topography, soil structure and water supply. These factors make it difficult to classify the country into distinct bioclimatic zones, especially as changes do occur in vegetation patterns over the short term. An exceptionally wet season, for example, affects the cover of ephemerals and may enable some perennial species to become dominant locally. The cover of some off-shore islands has been totally altered by man's activities and urban areas have also seen dramatic changes in a short time. Vegetation patterns are never static even in untouched localities, though most species rely on certain environmental parameters such as water supply, shade and adequate soil depth. There is also a strong relationship among species, whether in competition, or in dependence (e.g. parasites) or in complement (e.g. the different root depths of perennials and ephemerals).

Since high temperatures, low rainfall and salinity levels are vital factors in the UAE environment, natural species tend to fall under the following classification:

halophytes	—	salt tolerant
xerophytes	—	drought resistant
phreatophytes	—	with root systems long enough to tap a permanent water supply
ephemerals	—	winter/spring annuals

Grazing is also an important factor, but adaptation in order to survive is a feature of desert plants.

Given these constraints, the vegetation of the U.A.E. is fairly rich, running into several hundred individual species. There is a high number of distinct habitats, each of which contains a range of species known as a plant association. Knowledge of habitat, therefore, can help in the identification of major species. As these habitats are related to the country's physiography, the following groups of associations conform very approximately to the geographical divisions given earlier. It must be stressed that this is only a general description and that innumerable micro-habitats also exist.

(a) Coastal Lowlands

Qatar — Tarif.

Zygophyllum hamiense/Salsola baryosma association

This coastal strip is extensive because of its length and includes a portion of the Sabkhat Matti in the far west. For broad stretches just inland from the coast these two species predominate on carbonate and semi-gypseous soils but not in true sabkha depressions. Interspersed are mixed groups of **Fagonia ovalifolia, Heliotropium kotschyi** and clumps of **Panicum turgidum. Z. hamiense** is fully dominant on the red sands east of the Sabkhat Matti, while mixed communities of this species and **Hammada elegans** begin to appear further inland.

Just above the tidelines **Suaeda aegyptiaca** and **Bienertia cycloptera** form a clear line in places, along with occasional **Lotus garcinii** and **Suaeda vermiculata.** Persistent annuals include **Monsonia nivea, Zygophyllum simplex** and **Savigyna parviflora.** In places, notably on inland slopes of bluffs west of Jebel Dhanna, the little lily **Dipcadi erythraeum** lends a welcome splash of colour in late March. On the higher bluffs **Cyperus conglomeratus, Cornulaca monacantha, Fagonia bruguieri and Heliotropium kotschyi** form the main groupings. **Stipagrostis plumosa** is the chief grass of limestone slopes and higher gravel areas. Despite the presence of sabkhas the sides of the coastal highway are being colonised by **C. conglomeratus** and **S. baryosma.**

Tarif — Dubai border.

Avicennia marina/Arthrocnemum macrostachyum association

In the sheltered lagoons either side of Abu Dhabi Island these two species dominate the tideline, both being tolerant of regular flooding. **Halocnemum strobilaceum** forms large patches adjoining some of the algal mats inland of these lagoons. Just above high tide **Halopeplis perfoliata, Anabasis setifera** and **Salsola baryosma** are common species while **Limonium axillare** is conspicuous in older sabkha areas which have an overlying veneer of tidal mud. **Cornulaca monacantha, Heliotropium kotschyi, Salsola rubescens, Convolvulus deserti** and **Dipterygium glaucum** are all frequent wherever sand has accumulated to form low dunes, especially further away from the beach.

Further inland **Astragalus hauarensis, Indigofera argentea** and **Hammada elegans** are all noticeable. The vegetation along the main Abu Dhabi-Dubai road is dominated by **C. monacantha, Cyperus conglomeratus** and **Zygophyllum hamiense,** with large patches of **Sphaerocoma aucheri** and smaller ones of **Rhynchosia** sp. evident towards the border. **Sporobolus arabicus** and **Halopyrum mucronatum** are common grasses near the coast, and **Pennisetum divisum** and **Panicum turgidum** further inland.

The inshore islands around Abu Dhabi, such as Futaisi, Sadiyat and Ghurab each supports a broadly similar vegetation. The coastlines are dominated by **Suaeda vermiculata** on rock and **L. axillare, H. perfoliata** and **Atriplex leucoclada** in sandy and silty depressions. **A. macrostachyum** is abundant in sheltered creeks on the landward side along with dwarf mangroves.

Jebel Ali — Sharjah

Halopyrum mucronatum/Salsola baryosma association

These two species form the dominant association on dunes along the coastline, and behind them are mixed stands of **Cornulaca monacantha, Anabasis setifera** and **Atriplex leucoclada.** Occasional grazed bushes of **Pergularia tomentosa** and the odd **Calligonum comosum** can be found in stunted dwarf form. **Crotalaria persica, Taverniera spartea** and **Sphaerocoma aucheri** are abundant on higher ground around Jebel Ali while depressions continue to be dominated by **Halopeplis perfoliata, Halocnemum strobilaceum and A. setifera.** Inland of the coastal road **Helianthemum lippii** and **Echiochilon kotschyi** are abundant on thin gravel deposits. **Arnebia hispidissima, Launaea capitata, Silene villosa** and **Savigyna parviflora** form dominant associations of ephemerals between March and May. The first trees along this coastline east of Qatar, **Prosopis cinerea,** now appear as individuals to 5 m., plus the odd **Acacia tortilis** in bush form.

Sharjah — Ras al Khaimah

Cornulaca monacantha/Cyperus conglomeratus association

This coastline is heavily indented with spits and lagoons, especially around Umm al Qawain, and is characterised by fossil dunes and ancient shell mound deposits. The coastline has receded in the last few hundred years leaving a semi-sabkha area of salt-tolerant halophytes and grasses. For much of this coast the main road demarcates the line between sabkha and dunes and the difference in vegetation on either side is often quite marked. On the seaward side **Halopeplis perfoliata** tends to be very red in depressions while on the landward side sand mounds are covered with dense grasses, notably large clumps of **Pennisetum divisum, Panicum turgidum** and **Sporobolus arabicus.** The small grass **Cutandia memphitica** is very common locally. The sands slope up to a more stable dune area dominated by the major association of the region. **Helianthemum lippii** is a common sub-shrub associated with the local truffle ('fougah'), for which local families search after spring showers, using sticks to poke at the telltale broken surface marks in the wet sand. **Acacia** and **Prosopis** are now much commoner than further south, each tree shading its own micro-habitat that contains **Lycium shawii** shrubs and the annuals **Malva parviflora** and **Chenopodium murale.** This coastline is rich in ephemerals in some years, when **Arnebia hispidissima** may form vast yellow carpets. The little composite **Senecio glaucus** subsp. **coronopifolius** with its yellow flowerheads for ever waving in the wind crowd the sides of the main road every March.

Just south of Ras al Khaimah town is a 10 km. stretch of high coastal dunes which are thickly covered with **Acacia** and **Prosopis** scrub, including **Leptadenia pyrotechnica, Calotropis procera** and an understory of leafy plants such as **Emex spinosus, M. parviflora** and various **Launaea** spp. in spring. Grass species here include **P. divisum, Cenchrus ciliaris** and **Coelachyrum piercii.** This unique area of high dunes is now being parcelled out for private housing.

Ras al Khaimah — Ash Sha'm.

Phoenix dactylifera/Acacia tortilis association

As a well-settled area with abundant water supplies, this narrowing coastline contains sizeable date plantations around the large villages of Al Nakheel, Rams, Dhayah, Ghalilah and Ash Sha'm. Between the old-established date groves are large areas of **A. tortilis** spreading up to the base of the mountains. Here there is some **A. arabica** and a shrub layer of **Chrozophora oblongifolia, Tephrosia apollinea** and **Fagonia indica,** indicative of a submontane zone. This becomes very evident at the foot of the mountains where **Zizyphus spina-christi, Physorrhynchus chamaerapistrum, Astragalus fasciculifolius, Cassia italica** and **Aerva javanica** all crowd together. In early spring this piedmont plain, composed of pebbles and alluvial detritus with a thin sand cover in places, is noted for its dense stands of the lily **Asphodelus tenuifolius.**

The coastline contains a few creeks and lagoons which support thriving stands of **Avicennia marina.** The landward sides of these lagoons are virtually dry and one or two near Rams contain the only recorded colony of **Limonium carnosum** in the U.A.E., mixed with **Scirpus maritimus** and **Atriplex leucoclada.** There are some large colonies of **Phragmites australis** along this coast.

The East Coast.

Arthrocnemum macrostachyum/Tephrosia apollinea association

This association reflects very closely the nature of the landscape with a narrow plain, marshy in places, between the sea and the mountains. The southern end around Kalba and Fujeirah consists of wide beaches and an equally wide if not broader hinterland where large colonies of **A. macrcostachyum** thrive, along with **Limonium axillare** and **Halocnemum strobilaceum. Avicennia marina** occurs in huge, well-established stands around the inlets at Khor Kalba. This is undoubtedly the best-preserved area of mangroves in the country. Above the beach line **Heliotropium kotschyi** is abundant, along with a variety of Caryophyllaceae spp. in spring. On firmer soils **Corchorus depressus** and **Tribulus terrestris** are abundant.

Further north, between Murbah and Dibba, the coastline is rocky and hemmed in against the mountains. Here **T.apollinea** dominates on stony ground, and the grass **Aeluropus massauensis** in saline depressions between the road and the beach. Date plantations are numerous, with their own sheltered habitats containing **Abutilon panosum, Pergularia tomentosa** and **Vernonia arabica** on the edges of fields and paths through the groves. These plantations are also extensively colonised by ruderals especially of the Chenopodiaceae, Leguminosae and Malvaceae families. Abandoned plantations contain a subshrub cover of **L.axillare, Taverniera spartea, Crotalaria aegyptiaca, Indigofera oblongifolia** and the creeper **Ephedra foliata.** Occasional stands of **Aloe sp.** are conspicuous, often related to neglected grave yards.

Hills and rocky promontories along this coast are dense with **Acacia tortilis** scrub, **Haplophyllum tuberculatum, Cleome cf. dolichostyla** and **Jaubertia aucheri.**

(b) Offshore Islands.

Suaeda vermiculata/Salsola baryosma association

Undisturbed offshore islands tend to contain reasonably standard associations comprising mostly halophytes and ephemerals. **S. vermiculata** forms dense barriers on the low carbonate shelves ringing these islands expecially on the protected southern and eastern sides, while **S.baryosma** is often dominant on the upper slopes. Where the hills are deeply fissured **Capparis spinosa** is a noticeable constituent, along with **Reseda aucheri, Convolvulus prostratus** and **Zygophyllum hamiense** (in a gnarled, stunted form). Winter ephemerals are profuse after good rains but may be almost nonexistent in dry years. They include **Argyrolobium roseum, Spergula fallax, Zygophyllum simplex, Malva parviflora** and the grasses **Poa annua** and **Stipa capensis.** Trees are generally absent; the one **Zizyphus spina-christi** on Sir Bu Nuair is certainly an import to give shade to an old cistern on the north-east side of the island. Several **Salsolas (S.baryosma, S. schweinfurthii, S. tetranda)** are present on these relatively undisturbed islands.

Those islands that have been extensively industrialised have lost much of their indigenous cover, though pockets remain. Just above the beach line **Anabasis setifera, Suaeda aegyptiaca** and **Salsola baryosma** usually survive. **Euphorbia serpens** may be found in drier patches, while species such as **Portulaca oleracea, Echinocloa colonum, Sporobolus spicatus** and **Cynodon dactylon** thrive in the dampness below dripping air conditioner units and in gardens. Exotic trees also do well, given sufficient water and fertiliser. On Das Island palms, ornamental acacias and oleanders are all grown successfully.

(c) The Western Dune Plains.

Calligonum comosum/Cyperus conglomeratus association

The high dunes of the Western Region of Abu Dhabi Emirate carry a sparse vegetation cover except in the depressions where the water table is high and the soil, though saline, is stable. Here halophytes such as **Zygophyllum hamiense, Halopeplis perfoliata** and **Salsola rubescens** flourish, along with occasional areas of **Limonium axillare.** In spring these flat depressions are fringed with **Cistanche tubulosa** hosting on a variety of halophytes. Most of the region however, is taken up by huge mobile dune fields, and here **C.comosum,** an indicator of sweet subsurface water, and the ubiquitous sedge **C.conglomeratus** are common and they are still used to help bind sand on slipfaces in an effort to hinder the movements of the dunes onto plantations below. **Tribulus omanense** lends a welcome splash of yellow in spring but there is a general lack of species variety. **Heliotropium digynum** and **Limeum arabicum** tolerate deep sand conditions and **Fagonia ovalifolia** may be found in abundance along with **Hammada elegans** and **Zygophyllum hamiense** where the dunes begin to merge wth higher gravel plateaux towards the coast.

The date plantations of the Liwa crescent contain a variety of weeds including **Solanum nigrum, Portulaca oleracea, Convolvulus arvensis, Launaea** spp. and the grasses **Cenchrus ciliaris** and **Dactyloctenium scindicum.** The main grasses of the surrounding desert include **Panicum turgidum, Stipagrostis plumosa** and **Astenatherum forskahlii.**

Several nurseries have been established since the early 1970s in deep hollows among the dunes where there are sources of less saline water close to the surface and here tree species such as **Zizyphus spina-christi, Casuarina equisetifolia, Eucalyptus camaldulensis, Prosopis juliflora,** plus local **Acacia** and **Tamarix** spp. are being successfully reared prior to transplantation into plantations and farms in the region. There is an emphasis on promoting stocks of natural vegetation particularly for shelterbelt purposes. **Calligonum comosum** itself, though successful in the wild, is also cultivated in quantity in nurseries. As new towns like Medina Zayed and Al Giathy expand, so some species of the natural vegetation will benefit in pockets from water, fertiliser and protection.

(d) The Central Desert.

Hammada elegans/Cornulaca monacantha association

The southern section of this area overlaps with the high dunes further west and this is reflected in the vegetation cover. A band of **Haloxylon persicum** runs east-west south of the Al Ain to Abu Dhabi lorry road. This strip curves from south of Remah to west of Asab, and the species is not recorded elsewhere in the country. **Cyperus conglomeratus** remains a major component but as the flatter plains and depressions increase in size and number further north **C. monacantha** and **H. elegans** take over as the dominant association. **Acacia** and **Prosopis** are sparse except in the east, north of Al Ain, where they are mixed with some **Salvadora persica. Tamarix** spp. are a feature of open water habitats, for example where desert quarrying has exposed the water table. Large clumps of **Phragmites australis** and **Saccharum ravennae** occupy the fringes of some of these pools.

Grasses are more varied and numerous than in the west, and include **Setaria verticillata, Eragrostis barrelieri, Coelachyrum brevifolium, Cenchrus pennisetiformis** as well as the standard desert species everywhere, **Stipagrostis plumosa** and **Astenatherum forskahlii.** Further east, where the dunes are red and orange, **Chrozophora oblongifolia** is locally abundant even on deep sand, and in spring **Cleome amblyocarpa** anmd **Eremobium aegyptiacum** are numerous. In fenced-off areas **Crotalaria aegyptiaca, Indigofera argentea, Heliotropium digynum** and **Tribulus omanense** thrive, along with odd shrubs of **Leptadenia pyrotechnica,** which does well whether protected or not. In wet seasons the plains may be completely green with a layer of mixed ephemerals including **Silene villosa, Arnebia hispidissima, Seetzenia lanata, Savigyna parviflora** and **Neurada procumbens.**

The whole of the central desert remains subject to extensive grazing, and the major association is a result of this rangeland degradation. Herds and small groups of camels are common, and around villages goats do a lot of damage to vegetation. Very few perennials apart from halophytes and trees (which must have been originally protected as saplings) are permitted to grow freely and the vegetation is mostly stunted; even the larger grass clumps are straggly as new shoots are chewed off.

Saline depressions are few except around Sueyhan, and further east the deeper sands are host to larger perennials including **Leptadenia pyrotechnica** and **Calligonum comosum.** The desert gourd **Citrullus colocynthis** is fairly common on these deeper sands, especially where cut by seasonal wadis. East of Dubai and Sharjah the desert is fairly stable and supports a great variety of perennial and ephemeral vegetation. Indeed, from this region north to Ras al Khaimah the central desert is richest in numbers and density of species.

(e) The Alluvial Plains

Jiri Plain. Prosopis cinerea/Pulicaria undulata association

The most northerly of the alluvial fan plains, Jiri includes the agricultural centres of Digdaga and Khatt and extends south towards Idhn. **P. cinerea** is an important landscape feature in the north, along with **Acacia tortilis** and **Calotropis procera.** These trees are fewer in the south as the plain merges with mobile dunes and mountain spurs around Idhn. In abandoned fields and other disturbed soils **P. undulata** is the dominant shrub, often mixed with **Hammada elegans** and a variety of weeds. Ground cover in spring includes **Vicoa pentanema, Ammi majus, Cichorium intybus, Emex spinosa, Malva parviflora** and **Heliotropium calcareum. Rhanterium eppaposum** is plentiful but overgrazed especially further south. **Crotalaria aegyptiaca** and **Leptadenia pyrotechnica** are common on shifting sand while **Calligonum comosum** is widespread around Idhn. South of Khatt and backing onto the hills is an extensive tract of **A. tortilis** and associated **Lycium** scrub.

Dhaid and Madam Plains.

Acacia tortilis/Hammada elegans association

Here soils tend to be shallower and gravel cover is increased. Between Dhaid town and the foothills this association is interspersed with individual **Tephrosia persica** and **Leptadenia pyrotechnica** shrubs. Ground cover includes **Morettia parviflora** and **Polycarpea** spp. in spring. Just south of Dhaid is an area of **Rhazya stricta** among several small allotments, but in the open desert **H. elegans** is dominant. Between the two plains lies the Jebel Faiya group with its hill species which include **Capparis cartilaginea** and **Ochradenus arabicus.** The main association is again very evident on Madam Plain, along with **Cyperus conglomeratus.** Much of the perennial vegetation of the southern end, towards Shwayb, was severely damaged in the floods of March 1987 and February 1988. On rocky spurs to the east large clumps of **Salvadora persica** have established sizeable colonies. Major grass species include **Astenatherum forskahlii, Tragus berteronianus** and **Cenchrus pennisetiformis.**

Al Ain.

Rhazya stricta/Aerva javanica association

The town of Al Ain is now an important agricultural centre and the desert around is a vast network of farms, forestries and associated villages. There has been much removal and levelling of surface soils and in some areas, particularly the Jaww Plain to the east, natural vegetation is very sparse. **R. stricta** can tolerate disturbed conditions and is a major component south of Ain al Faydah on gravel horizons. **A. javanica** is to be found mostly in dry wadi beds and other stony localities. The natural vegetation has regenerated within the protected fenced-off plantation areas and has benefitted from irrigation. **Zilla spinosa, Fagonia ovalifolia, Indigofera argentea, Heliotropium kotschyi, Astragalus** and **Centaurea** spp. all thrive under these improved conditions. To the west and north the region overlaps with the central desert, while to the east it abuts onto the mountain belt.

(f) The Mountain Belt.

Euphoria larica/Tephrosia apollinea association

The mountains contain a multitude of minor associations but these two species are found throughout the zone apart from the very summits, where **T. apollinea** is missing. At lower rocky wadi level range perennials include **Jaubertia aucheri, Pteropyrum scoparium** and **Pulicaria glutinosa.** Because of erosion, there is a large amount of scree, plus cliffs and overhangs, and over the millennia water has brought down crumbling rock and silts so that there are niches and crannies everywhere for plants to gain a foothold. From a distance the mountains look bare, but close up they display a great variety of families and species, with many showy flowers.

Among the commoner shrubs are **Physorrhynchus chamaerapistrum, Ochradenus aucheri, Fagonia indica** and, especially on carbonate sediments such as Jebel Hafit, **Capparis cartilaginea.** In spring the lower slopes are rich in annuals including **Hippocrepis constricta, Argyrolobium roseum, Cometes surattensis, Spergula fallax, Erodium neuradifolium** and **Viola cinerea.** Summit species include **Dodonaea viscosa, Farsetia linearis, Reseda aucheri** and **Helichrysum makranicum. Moringa peregrina** is a persistent tree at higher levels on Hafit and in Fujeirah. The very highest peaks, in the southern Ruus al Jibal, support **Amygdalus arabicus,** presumably originally imported from Iran. The two fig species are **Ficus salicifolia** and **F. carica** at lower and higher elevations respectively. Grasses are abundant and include **Cymbopogon parkeri, Eleusine compressa** and **Aristida adscensionis.** Composites are well-represented and include **Launaea spinosa, Filago desertorum, Ifloga spicata, Senecio flavus, Reichardia tingitana,** and **Urospermum picroides.** Several species found in the desert lowlands are also present at higher mountain elevations. Examples include **Sphaerocoma aucheri, Indigofera arabica, Salsola rubescens** and **Suaeda aegyptiaca.**

Wherever there is permanent water flow **Nerium mascatense** forms conspicuous stands, with **Forsskaolea tenacissima, Trichodesma** sp. and **Sida urens.** Species that rely on permanently damp conditions are **Adiantum capillus-veneris, Bacopa monnieri** and **Oxalis corniculata** (this last restricted to mountain oases). The tiny fern **Onychium divaricatum** is ubiquitous amongst scree in spring around Masafi and in northern Fujeirah. Umbellifers are particularly well-represented.

Plant Species of the United Arab Emirates

THE following descriptions include a wide variety of indigenous and naturalised species. The former refers to those species that have been present for millennia, and the latter to those which have been introduced some time in the past (either by man or accidentally) and which have been able to find a permanent niche in the country. These include several species regarded as weeds. The list is not complete, for the simple reason that a full-scale survey of the whole country has not yet been conducted and 'new' species are always turning up. However, this guide does attempt to show the variety of species to be found in different habitats, and some 250 of the commoner ones are illustrated. Altogether I have recorded over 380 species to date; many are rare enough to have been recorded only once or twice over a period of years, and some occupy a very restricted habitat and are unlikely to be noticed unless specifically searched for. Only the commoner grass species are included as a full description accompanied by illustrations of the Gramineae would take up too much space in a guide of this nature. Hence I have been selective in order not to burden the reader with an over-scientific approach. A provisional check-list of U.A.E. species recorded to date has kindly been compiled by Ian Hedge at Edinburgh Royal Botanic Garden and is included as an Appendix. A short list of some introduced species is also included as an Appendix. Mosses, liverworts, lichens, algae and fungi are beyond the scope of this book.

Although each description indicates whether the plant is an annual or a perennial, these terms are not precise for some species in a desert environment. Certain species may be commonly thought of as annuals, but in successive wet seasons individual plants may survive and thrive for two or more years. This is a characteristic, for example, of **Arnebia hispidissima,** which has both annual and non-annual forms.

The months given for flowering periods are also rough parameters, as so much in any given year depends on the quantity, distribution and seasonality of rainfall, while temperature, wind, habitat and elevation add further complications.

The descriptions have been kept deliberately simple so that they can be used in the field for identification purposes by the non-botanist. Many species display a great variety of appearance not only between young and old but among mature specimens too. In such cases, a middle course has been selected that outlines general standard characteristics. Particular distinguishing features are emphasised but the descriptive format is as follows:

i) general aspect and maximum height/length
ii) stems and branches
iii) leaves
iv) flowers and flowering period
v) fruit
vi) status and habitat

There is no doubt that future surveys will extend the total list, and I would expect a final score of at least 450–500 indigenous and naturalised species for the U.A.E. The majority of new species will probably be rare or unusual annuals, but there are likely to be several hitherto unrecorded species and subspecies of perennials too, particularly in some of the more remote mountain regions.

As the country becomes more and more urbanised over a very short period, habitats will come under increasing threat. The Wetlands Reserve on the east coast of Abu Dhabi Island is one approach towards conservation; it is to be hoped that other habitats can be protected so that future generations of researchers and tourists alike may be able to enjoy what is at present an abundant variety of species.

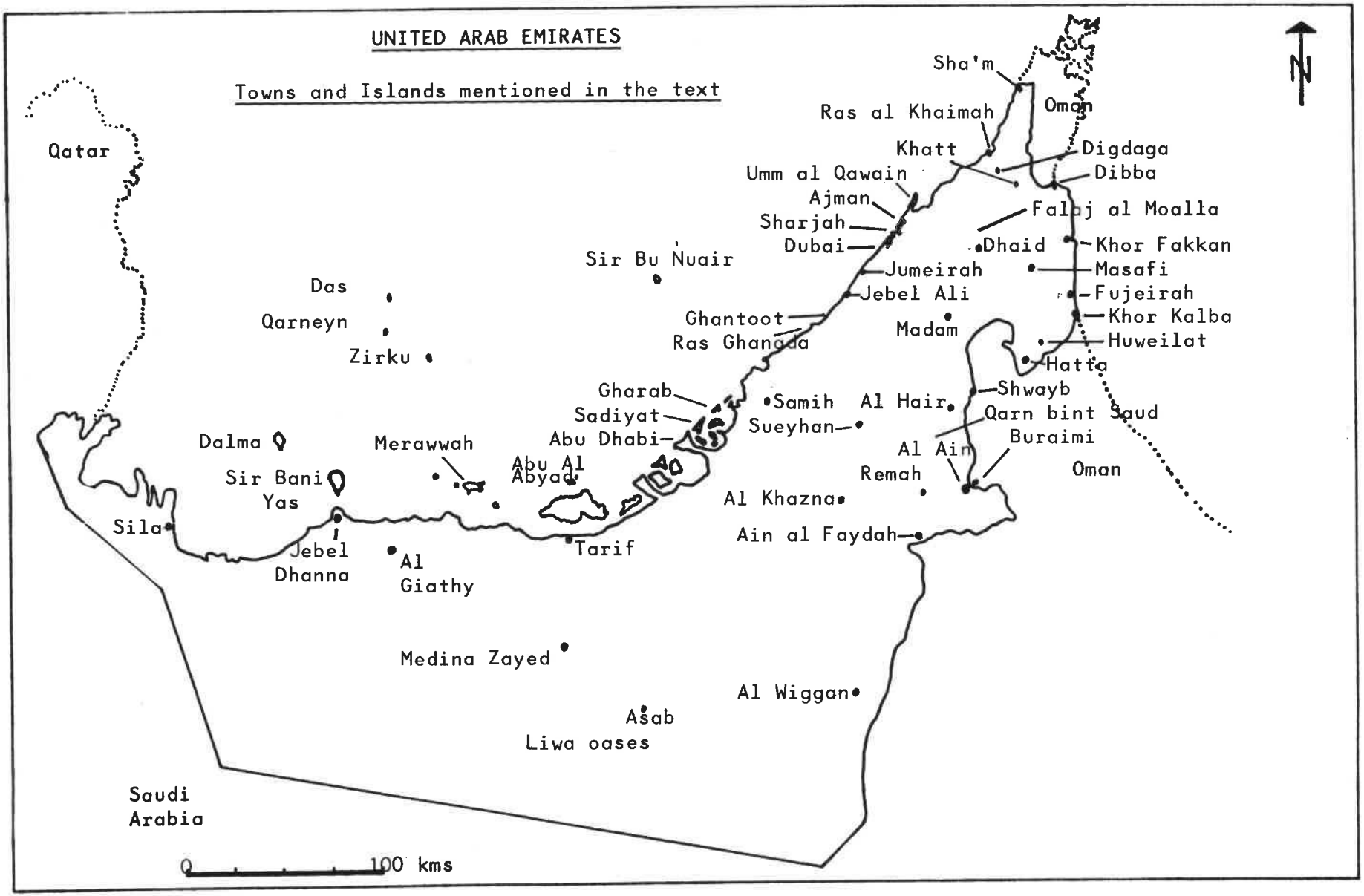
Plants carry two scientific names. The first always begins with a capital letter and relates to the genus of a family. The second never begins with a capital letter and is often a descriptive epithet indicating a specific feature; for example 'spinosa' (with spines) and 'aphylla' (without leaves). There are also commemorative epithets; for example 'kotschyi' (T. Kotschy, a nineteenth century botanist and collector) and 'bruguieri' (J.G. Bruguière, a late eighteenth century traveller and collector). Geographical epithets such as 'arabica', 'aegyptiaca' and 'omanense' are easily recognised. The name or names (or abbreviations of names) after the two Latin names refer to the botanist or botanists originally responsible for the scientific description of that particular species. Brackets indicate a transfer from one rank of botanist to another. The full names of these botanists are not given.

Complicated botanical vocabulary has been minimised, but a few necessary items are explained here to avoid extensive repetition of lengthy meanings in the text:

axil	– junction between stem and stalk
bract	– a leaf-like organ, often very reduced, just below the flower
calyx	– the usually green leaf-like sepals that surround the corolla; the inner part of the perianth
capsule	– a dry fruit that usually splits when mature
corolla	– the petals collectively
follicle	– a dry, pod-like fruit, opening along one side only
halophyte	– a plant able to grow in saline soils
herb	– a plant that dies back to the base in unfavourable seasons; includes both annuals and perennials
legume	– a pod-like fruit opening along opposite sides
lip	– the upper or lower outer part of tubular petals
node	– the part of a stem where a leaf arises; in internode is the length between nodes
nut	– a dry, one-seeded, nut-like fruit
panicle	– a branched inflorescence with flowers on individual lateral stalks
perianth	– the calyx and corolla combined
pinnate	– a leaf divided into leaflets along both sides of a stalk
sepals	– the individual leaf-life segments that collectively form the calyx and which surround the corolla; the outer part of the perianth
shrub	– a woody, much-branched plant, smaller than a tree
simple	– of leaves, not divided into separate leaflets
trifoliate	– of leaves, divided into three leaflets
umbel	– a flat-topped spray of flowers all on stalks arising from the same point
xerophyte	– a plant tolerant of arid conditions

Family and species descriptions

Sequence of families according to A. Engler, **Syllabus der Pfanzenfamilien** (12th ed., Hans Melchior, 1964). Genera and family species are arranged alphabetically. The brief family descriptions are only relevant to the U.A.E.


UNITED ARAB EMIRATES
Towns and Islands mentioned in the text
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Qatar
Sha'm
Oman
Ras al Khaimah
Khatt
Digdaga
Umm al Qawain
Dibba
Ajman
Falaj al Moalla
Sharjah
Dubai
Dhaid
Khor Fakkan
Sir Bu Nuair
Jumeirah
Masafi
Das
Jebel Ali
Fujeirah
Qarneyn
Ghantoot
Madam
Khor Kalba
Zirku
Ras Ghanada
Huweilat
Hatta
Gharab
Samih
Al Hair
Shwayb
Sadiyat
Sueyhan
Qarn bint Saud
Dalma
Merawwah
Abu Dhabi
Al Ain
Buraimi
Abu Al Abyad
Sir Bani Yas
Remah
Oman
Al Khazna
Sila
Ain al Faydah
Jebel Dhanna
Tarif
Al Giathy
Medina Zayed
Al Wiggan
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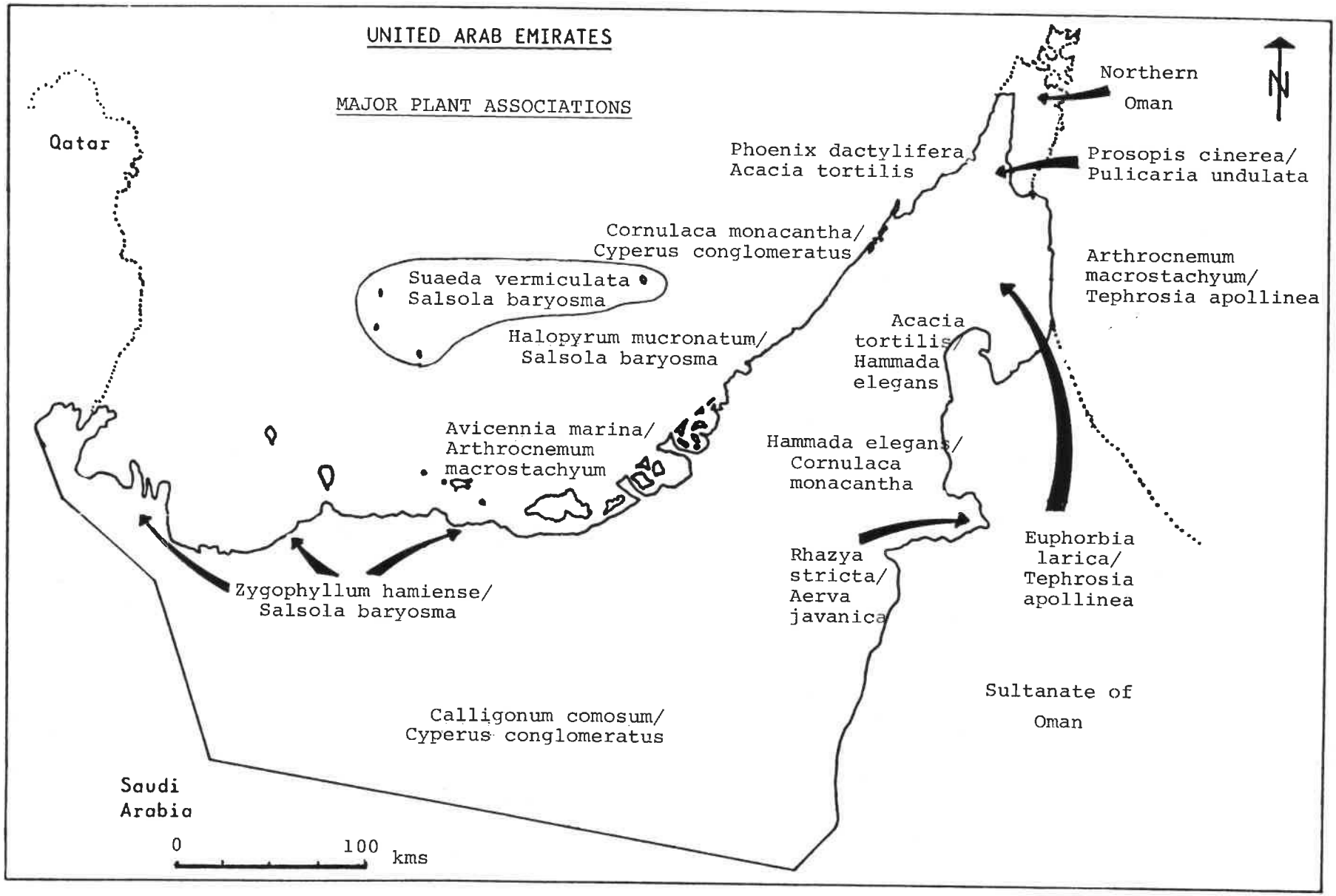
UNITED ARAB EMIRATES
MAJOR PLANT ASSOCIATIONS
Qatar
Northern
Oman
N
Phoenix dactylifera
Acacia tortilis
Prosopis cinerea/
Pulicaria undulata
Cornulaca monacantha/
Cyperus conglomeratus
Arthrocnemum
macrostachyum/
Tephrosia apollinea
Suaeda vermiculata
Salsola baryosma
Halopyrum mucronatum/
Salsola baryosma
Acacia
tortilis/
Hammada
elegans
Avicennia marina/
Arthrocnemum
macrostachyum
Hammada elegans/
Cornulaca
monacantha
Zygophyllum hamiense/
Salsola baryosma
Rhazya
stricta/
Aerva
javanica
Euphorbia
larica/
Tephrosia
apollinea
Sultanate of
Oman
Calligonum comosum/
Cyperus conglomeratus
Saudi
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Coast near Jebel Dhanna with thin vegetation cover of mostly halophytes.

Gharab Island near Abu Dhabi town. Note the degraded landscape largely grazed by camel herds.

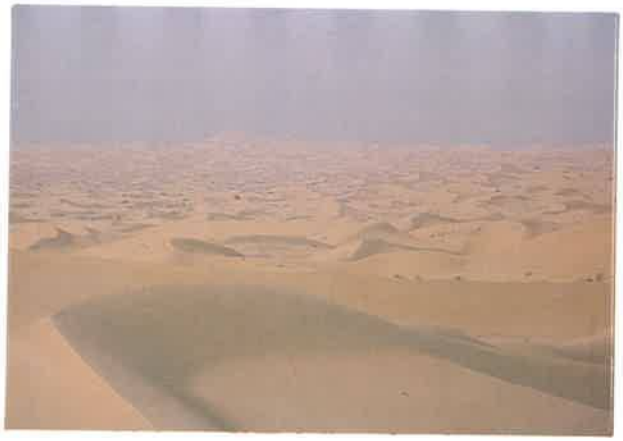
Wind-eroded sandstone in the desert foreland north of Al Liwa.

The desert beside the main Abu Dhabi–Dubai road, dominated by ***Cornulaca monacantha*** *and* ***Indigofera*** *spp.*

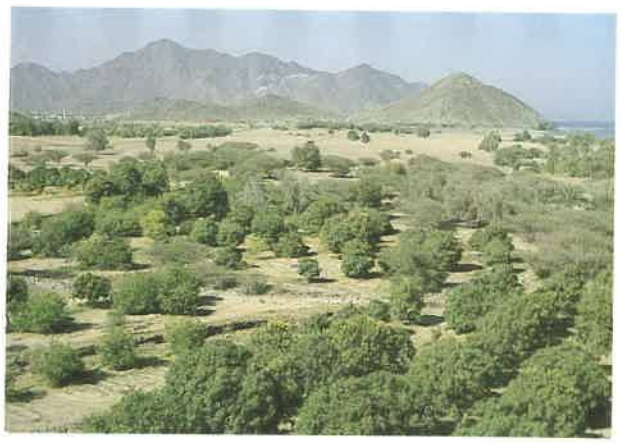
Salt-crusting beside a brackish pool inland of Tarif.

Degraded rangeland between Dubai and Sharjah, with ***Cyperus conglomeratus*** *and* ***Panicum turgidum.***

Savannah-type landscape fringing Ash-Sha'm north of Ras al Khaimah. The trees are mostly ***Acacia tortilis.***



The mobile dunes of the Western desert offer little stabilisation and hence vegetation is almost non-existent except in the dune hollows.



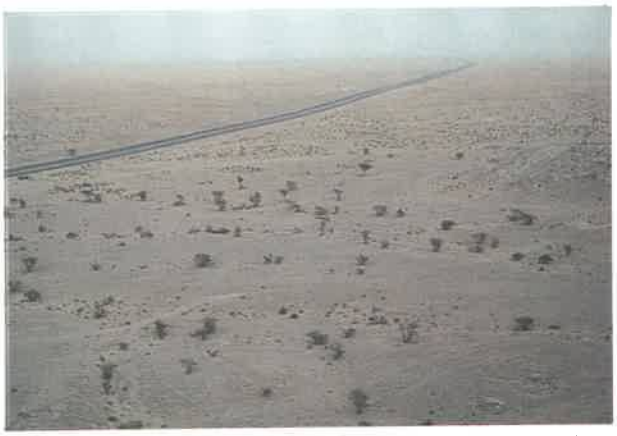
The East Coast north of Khor Fakkan, an area of intensive fruit production, including mangoes, guavas and dates.

North of Al Liwa the dunes are smaller and interspersed among large gravel flats. Vegetation is very reduced in size and scattered.

The Western Dune desert, Al Liwa. Note the palm trees against the dunes and the central depression containing halophytes.

The mobile dunes overwhelm all but the most tenacious species such as ***Cyperus conglomeratus,*** *which can survive almost complete burial.*

The central desert north of Al Ain, where small outcrops of the Hajjar range are almost covered by mobile dunes.



The central desert east of Jebel Ali towards Madam. Here the rangeland has been severely degraded through a combination of overgrazing and surface disturbance by vehicles.

A market farm near Al Hair, north of Al Ain. Massive water takeoff for such agricultural projects is rapidly lowering the water table.

The central desert facing east across Madam Plain towards the Hajjar range to the east. The sands are fairly settled and support a variety of perennials.

The central desert near Jebel Faiyah, supporting scrub Acacia tortilis and shrubs such as ***Crotalaria aegyptiaca*** *and* ***Lycium shawii.***

The desert south of Al Ain, an area of low dunes and gravel plains where ***Rhazya stricta*** *is the dominant species.*

A depression in the central desert near Sueyhan, supporting a mixed community of ***Limonium axillare, Halopeplis perfoliata*** *and* ***Zygophyllum hamiense.***

A market garden established at Shwayb. The dunes have been bulldozed level and a shelterbelt of Casuarina and Eucalyptus trees established to give protection from sand infiltration.

A sabkha depression near Sueyhan in the central desert. Wherever sand accumulates in low mounds, species such as ***Cornulaca monacantha*** *and* ***Salsola*** *can attain a foothold.*

Desert varnish overlying compact alluvium and conglomerates near Hatta. Note the very thin plant cover except in wadi courses.

The central desert near Al Hair, with a mixed stand of ***Prosopis cinerea*** *and* ***Acacia tortilis.*** *Shrubs in the background include* ***Leptadenia pyrotechnica*** *and* ***Calligonum comosum.***

Facing west from Jebel Hafit. In the foreground is the lighter alluvial soil and in the background the darker quarzite sands of the central desert.

Facing west across a section of the Dhaid Plain. In the foreground ***Euphorbia larica*** *shrubs indicate the proximity of the mountains.*

The upper reaches of the Ruus al Jibal, at about 5000 feet. The large shrub at lower right is ***Amygdalus arabica.*** *The bright green mounds are* ***Euphorbia larica.***

Alluvium north of Ras al Khaimah, near Rams, supporting large communities of ***Acacia tortilis*** *and an understorey of* ***Chrozophora oblongifolia, Lycium shawii,*** *and in lower depressions, halophytes.*

A typical dry wadi in the mountains between Hatta and Huwailat with a ***Zizyphus spina-christi*** *tree at left.*

Spring growth in the mountains near Hatta. ***Reseda aucheri*** *and* ***Euphorbia larica*** *are the larger shrubs while* ***Tephrosia apollinea*** *is prevalent in the foreground.*

Mountain vegetation in spring near Huwailat, with ***Acacia tortilis*** *trees to 3 metres and a variety of ephemerals in the foreground, including* ***Schweinfurthia papillionaceae,*** *and* ***Boerhavia elegans.***

Wadi Jeema, near Hatta. After spring rains the wadis flow for a few days but are soon reduced to a series of drying pools, leaving noticeable evaporation lines.

An old-established oasis in the Wadi Ham between Masafi and Fujeirah.

Falaj system in the mountains north east of Al Ain.

The oasis at Asimah in the mountains north west of Masafi.

Low mist in the mountains east of Dibba. In many parts of the UAE, in both desert and mountain regions, dew is a very important source of regular moisture.

The oasis at Uyaynat, near Dibba.

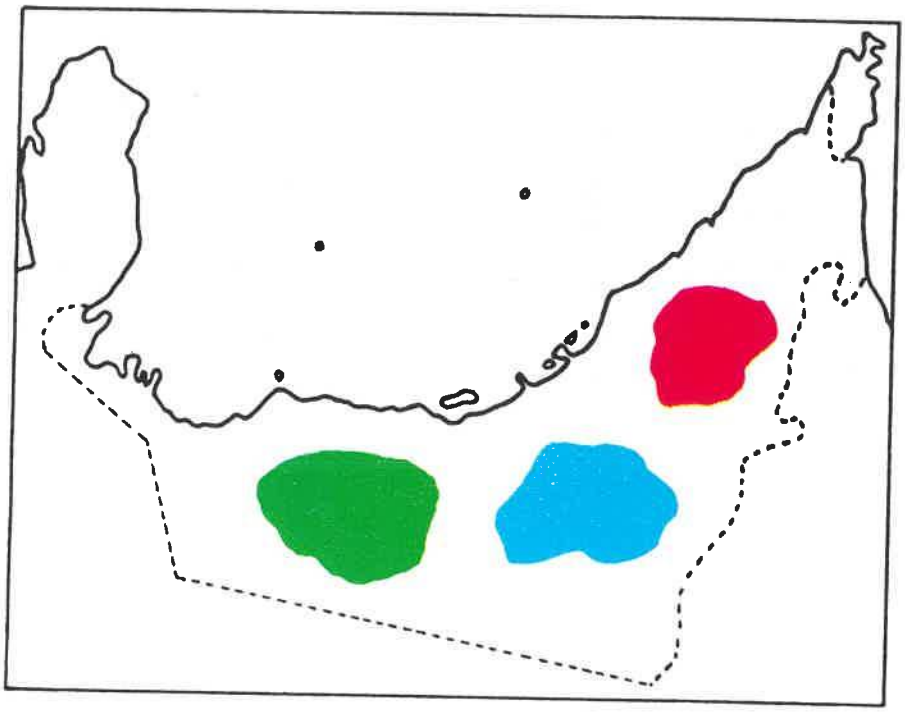
Wild and almost inaccessible mountain terrain between Masafi and the East Coast. This is an under-explored area as far as botany is concerned.

Cracked mud after heavy rainfall on the East Coast near Badiyah.

Spring annuals near the summit of Jebel Hafit in early May. Visible are ***Reseda aucheri, Rhanterium epapposum*** *and* ***Convolvulus virgatus.***

Dune profile in April, showing young growth of ephemerals near the dune base where most moisture remains. These annuals are ***Eremobium aegyptiacum.***

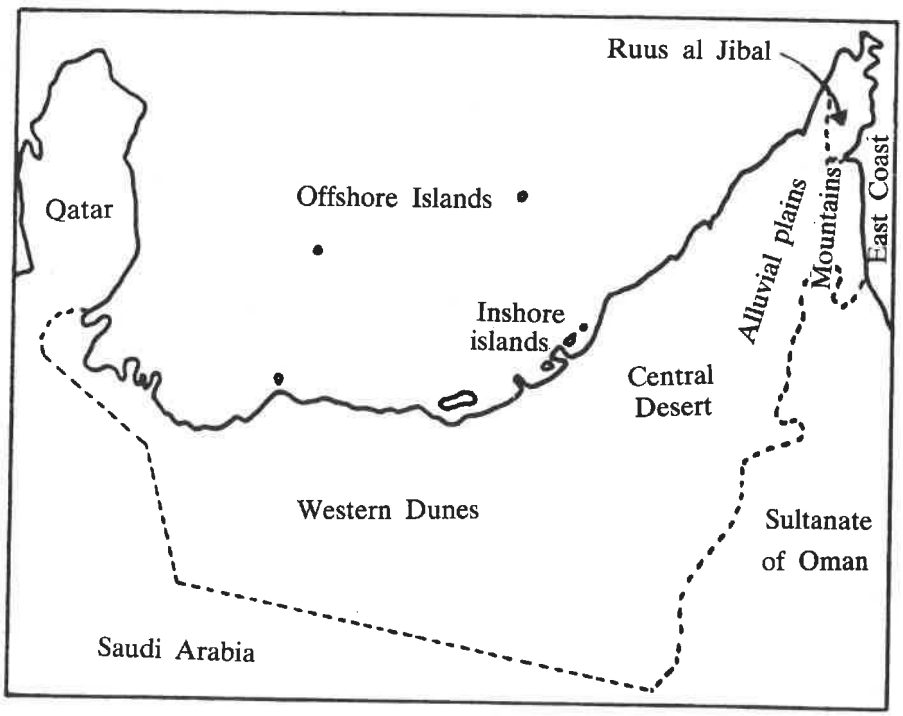
STATUS OF SPECIES



Common over a large area.

Uncommon, but less restricted than Rare. More widely spread, but not Common.

Rare, restricted to a small locality or a very few areas.



CLASS DICOTYLEDONAE

Adiantaceae — maidenhair fern family

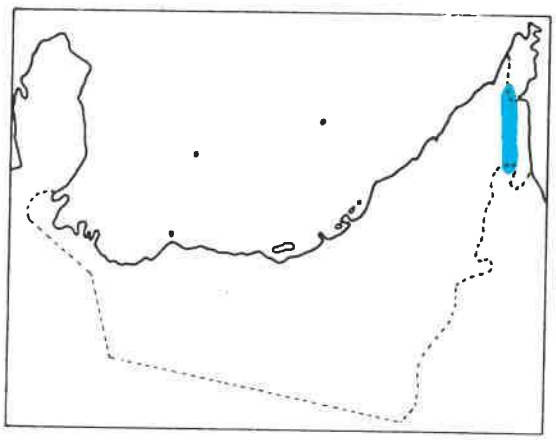
Small ferns growing from scaly rhizome with fronds broadly triangular in outline.

1. Adiantum capillus-veneris L.

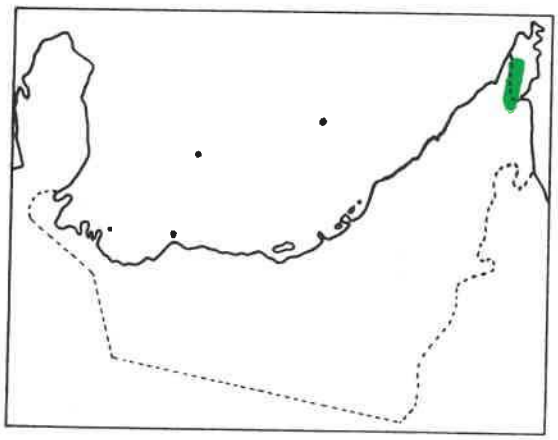
Creeping fern with fronds to 35 cm, half of which is leafless stalk. Stems green, sometimes darker, even blackish. Leaflets roughly rounded with 3-6 blunt-ended lobes, the whole 1-2 cm across. Leaflets smooth, green, often brown or brown-rimmed. Spores on undersides and on tiny flap-like structures at apex. In dense, matty clumps, often in wet and mossy habitats on vertical rock surfaces and sides of drainage channels.

Uncommon except locally, nearly always beside flowing water in mountain oases, especially in Fujeirah.

Adiantum capillus-veneris *beside stream at Uyaynat, 300 m.*



Onychium divaricatum *in Wadi Khabb, 20 km NE of Dibba, 500 m.*



2. **Onychium divaricatum** (Poir.) Austin

Annual fern to 20 cm with very slender stems and fronds, light green and lace-like. Lower stems naked. Branches very short, divided into branchlets with pinnate fronds, each less than 1 cm. Segments very narrow. Delicate, tending to shrivel at edges in strong sun.

Common after good spring rains on scree and mountain slopes around Masafi and north through Fujeirah hills into Ruus al Jibal. Usually in shade; Feb.-Apr.

Ephedraceae — ephedra family

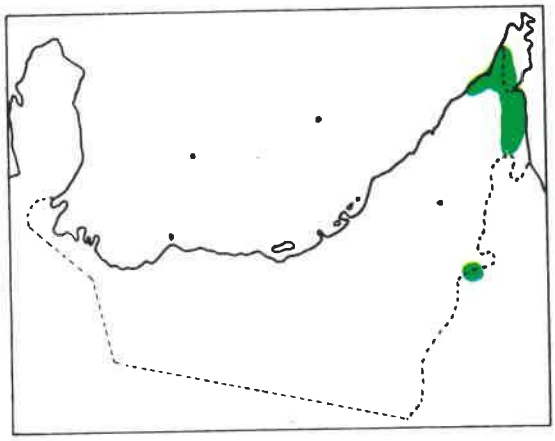
Single sp. in U.A.E. Much-branched shrub with thin, jointed stems and very reduced leaves, overall dirty grey-green. Flowers on small, non-woody cones. Fruit a small berry.

1. **Ephedra** cf. **foliata** C.A. Meyer

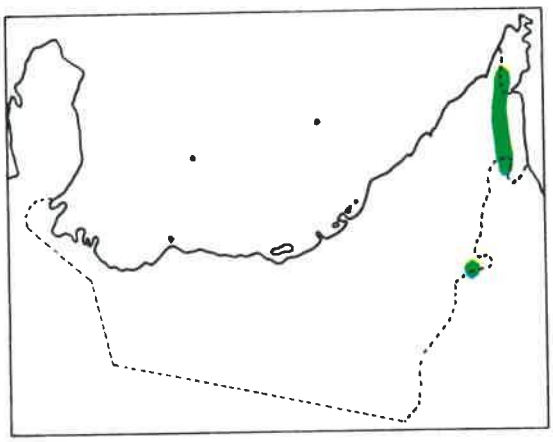
Perennial, either a straggling bush to 1 m or, often climbing to 2 m or more in trees and over fences. Branches slender, stiff but fragile, distinct from supple, twisting stems of other climbing spp. Leaves minute if present, half enclosed by sheath. Flowers in tiny spikes with white petals, developing into fleshy whitish berries or clusters of 3 dry pink and brown cones, less than 5 mm. Flowering Feb.-Jul.

Bushy form common at higher elevations, e.g. Jebel Hafit. Trailing form common on Acacia and Lycium scrub along Umm al Qawain and Ras al Khaimah coastline, and in east coast plantations.

***Ephedra foliata** in Kalba oasis, 5 m.*



***Forsskaolea tenacissima** just W of Asimah oasis, 200 m.*



Urticaceae — nettle family

Single sp. in U.A.E. Herb with broad leaves and covered with bristly hairs. Flowers small in dense clusters. Fruit a one-seeded capsule.

1. **Forsskaolea tenacissima** L.

Annual, resembling a short but stout stinging nettle, with orange or red roots, branching from base into several erect rough stems to 60 cm. Young stems often dark red. Leaves broadly ovate, serrated except at base, to 4 cm, grey-green above, lighter beneath. Inconspicuous white-yellow flowers crowded in axils, each cluster ringed with bracts. Flowering Mar.-Jun. Fruit minute, enclosed by bract.

Very common locally in mountains, especially along wadi sides near water or in damp rocky habitats. Prolific weed in east coast plantations. Never in open sand.

Moraceae — fig family

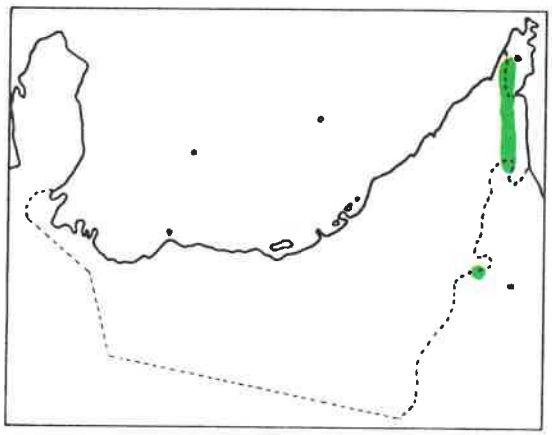
Trees with milky sap and alternate leaves. Flowers enclosed in sunken receptacle which expands to form fleshy fruit.

1. Ficus carica L.

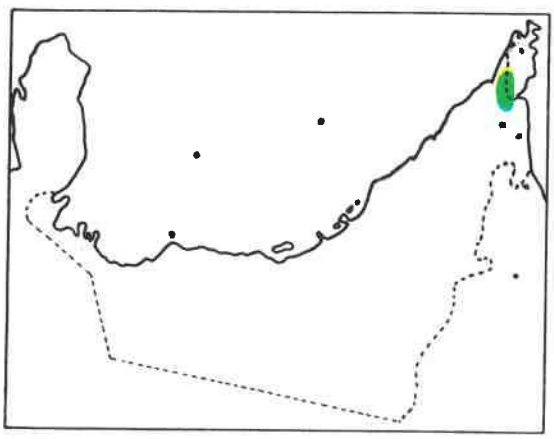
Small mountain tree to 6 m, with short, smooth, whitish bark, much branched. Young twigs soft and pithy, often mottled and knobbly. Leaves variable in shape and size, usually with 5 broadly-rounded or pointed lobes with ribs to each apex, slightly hairy beneath; to 15 cm, often toothed, much-reduced and very dense if constantly grazed. Leaf stalk to 10 cm. Flowers inconspicuous but mature edible fig easily recognised, from 1-3 cm across, green maturing to purple, variable throughout the year.

Common at higher elevations in Fujeirah and Ras al Khaimah, less frequent further south; occasional on Jebel Hafit.

***Ficus carica** in Wadi Bih, 15 km E of Ras al Khaimah town, 250 m.*



***Ficus salicifolia** near Tawyain, Ras al Khaimah, 350 m.*



2. Ficus salicifolia Vahl

Tree to 10 m, with stout trunk, much-branched above, spreading and dense with foliage. Leaves blue-green on long stems, reminiscent of Eucalyptus; glossy on upper surface, with long stems. Leaves to 14 x 3 cm with smooth margins, tapering to point, with clear midrib and veins very noticeable beneath. Fig smooth, pea-size and shape, green or buff, in clusters in axils, Jun.-Nov. but very variable.

In wadi beds in Fujeirah and southern Ruus al Jibal, occasional around Hatta. Evergreen and good shade provider.

Polygonaceae — buckwheat family

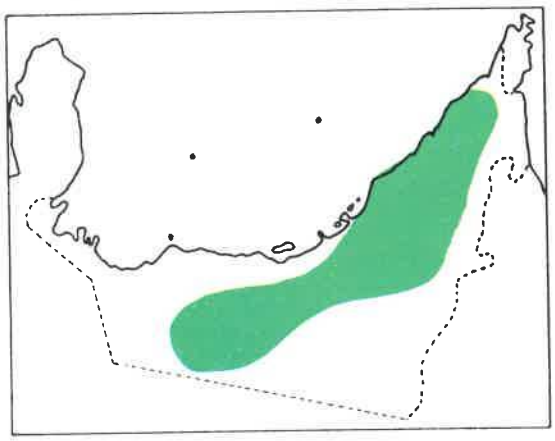
Woody shrubs and fleshy herbs, with jointed stems, papery leaf scales and swollen nodes. Leaves mostly alternate, variable in shape. Flowers very small, mostly white or greenish, without petals. Fruit a triangular nut, sometimes enclosed in a colourful veined wing.

1. Calligonum comosum L. 'Hérit (Syn. **C. polygonoides L. subsp. comosum** (L.'Hérit) Yu. D. Soskov

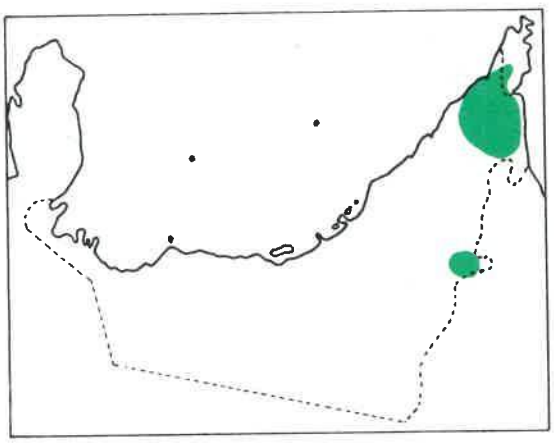
Virtually leafless shrub to 2.5 m, much-branched from thick woody rootstock. Main stems dark and rough, often with peeling bark; older branches white, less rough but angular and fragile. Parts of branches often lifeless. Twigs slender, dark green, from a distance like long trailing hairs. Flowers many, white with red-topped stamens, Dec.-Apr. Fruit a showy, bristly nut covered with rusty red or white furry hairs.

Dominant sp. in parts of western dune plains and major food source for camels; an indicator of sweet water. Most plants stunted. Also along littoral north of Abu Dhabi and on bluffs west of Tarif. Common locally on Dhaid Plain. Cultivated form tree-like and used for windbreaks around desert plantations.

***Calligonum comosum** in Wadi Lamhah, 10 km NW of Falaj al Moalla, 150 m.*



***Emex spinosus** at Digdaga, Ras al Khaimah, 100 m.*



2. Emex spinosus (L.) Campd.

Smooth-stemmed and fleshy annual herb, mostly prostrate and spreading, rarely ascending beyond 20 cm except in shady plantations. Stems reddish, especially above thick greenish base. Leaves bright green on short stalks, ovate or shovel-shaped, to 7 cm, rounded at tip, clasping at base. Flowers green in small, tight knotted clusters, terminal and axillary, Jan-Apr. In fruit perianth segments expand, red and shiny.

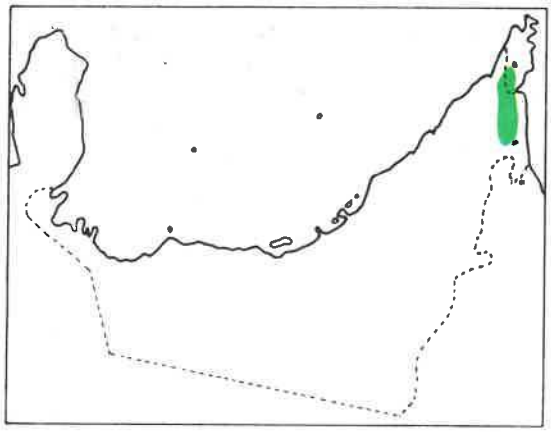
Fairly common on settled sand inland between Ajman and Ras al Khaimah; occasional at lower hill elevations around Masafi and Wadi Ham. Common weed in plantations except in western dune plains. Often associated with Rumex spp.

3. Pteropyrum scoparium Jaub. & Spach

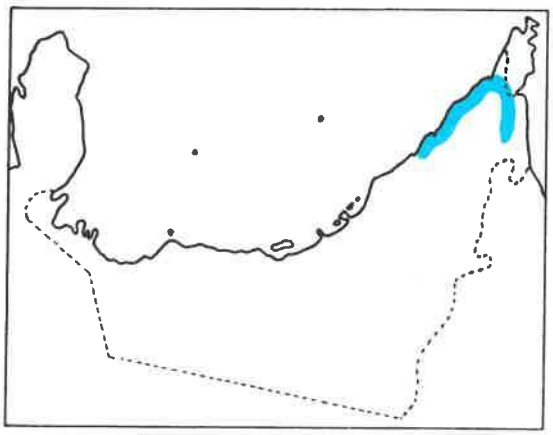
Much-branched, tough perennial with smooth grey or whitish stems dotted with tiny scales and warts, to 1.5 m. Leaves clustered 3-6, fleshy, club-like and shiny green, to 2 cm, crowding branches so that whole plant is densely green in new growth; many leaves deciduous. Flowers crowded in axils, with red-tipped stamens, Feb.-May. Fruit enclosed by distinctive pink or brown perianth wings that dry out with a papery effect, totally covering plant.

Common among boulders and gravels of lower wadis in foot-hills and alluvial plains close to mountains. Superficially similar to **Gaillonia aucheri,** but flowers darker and fruits not hairy.

Pteropyrum scoparium *near Tayyibah, Ras al Khaimah, 400 m.*



Rumex pictus *on ancient beach sand, Tell Abrak, Umm al Qawain, 20 m.*



4. Rumex pictus Forssk.

Small, hairless annual herb, often quite reddish, to 30 cm with several erect or spreading fleshy stems branching at ground level. Lower leaves narrow, to 4 cm, ragged with tiny uneven lobes. Flowers inconspicuous in leafless terminal clusters, Jan.-Apr. Fruiting perianth strikingly red-winged, but smaller than **R. vesicarius.**

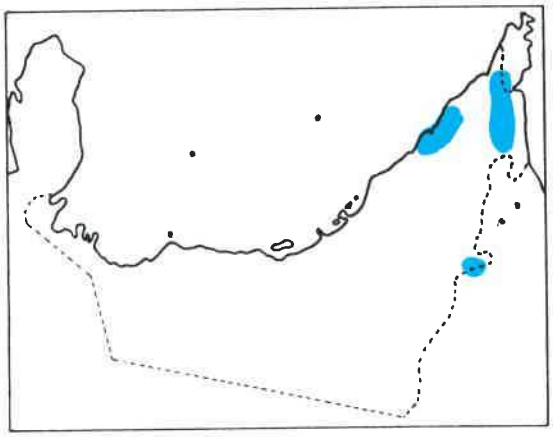
Distribution mostly restricted to Abu Dhabi — Ras al Khaimah littoral; locally common on sand inland of sabkha in Ajman and Umm al Qawain. Occasional at lower mountain elevations, especially in damp conditions near water.

5. Rumex vesicarius L.

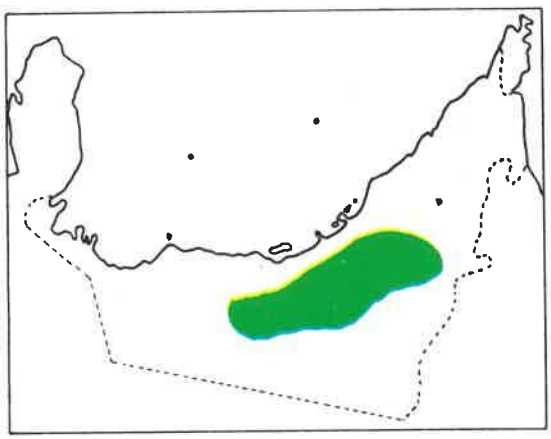
Small, hairless annual to 40 cm with several stems branching from base. Leaves roughly triangular with blunt tip and finlike extensions at base on either side of stalk, quite fleshy; leaves to 4 cm. Young leaves often more rounded, pink or orange, older ones light green. Flowers insignificant in leafless terminal clusters, Jan-May. Distinguished by large pink membranous perianth wings, usually strongly veined.

Common locally on rocky mountain slopes among other annuals, especially on damp soils after rains; also beside streams, and with **R. pictus** along Umm al Qawain littoral.

Rumex vesicarius *on Tell Abrak — Falaj al Moalla road, 50 m.*



Limeum arabicum *at Abu Samrah, Abu Dhabi–Al Ain Road, 80 m.*



Molluginaceae — mollugo family

Single sp. in U.A.E. Shrub with whorled leaves and clusters of tiny white flowers without petals. Fruit a small capsule.

1. Limeum arabicum Friedr.

Straggly perennial shrub to 80 cm, usually shorter, recognisable by very thin waxy-white angular stems and branches and tiny leaves. Branches gently zigzag at 3-5 cm intervals, often with straighter sections; at each joint there is a single leaf or opposite pair, green or yellowish, narrow, to 5 mm. Frequent side branches terminate in single leaf. Whole plant appears fragile. White flowers inconspicuous in axils.

Common locally in central desert, especially towards Al Ain and Sueyhan, but never dominant. Tendency to colonise patches in Eucalyptus plantations. Always in deeper sand away from coast. Lower leaves often encrusted with fine sand.

Aizoaceae — mesembryanthemum family

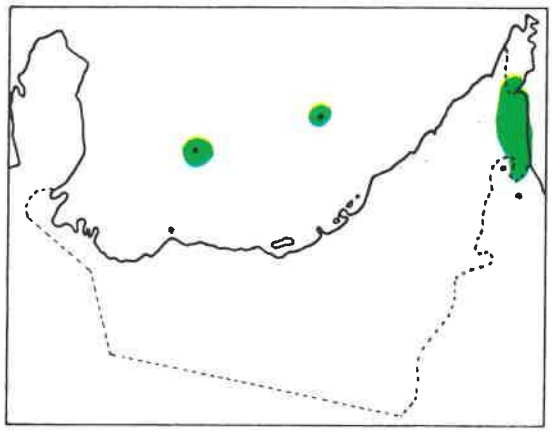
Low herbs with fleshy leaves, or twiggy shrubs. Leaves opposite or alternate. Flowers daisy-like though not always conspicuous. Fruit a small capsule. Well-represented in saline and inland alluvial habitats; occasional in mountains.

1. Aizoon canariense L.

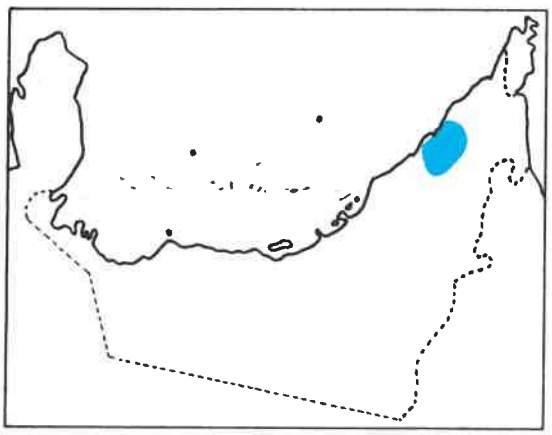
Annual, sometimes perennial prostrate plant with semi-woody branches zigzagging across ground, radiating from rootstock. Annual form just a few cm in diameter; perennial form to 15 cm across. Branches extend from zigzags. Leaves fleshy, alternate, light-green, like pointed spoons, to 1.5 cm on short stalks. Flowers in axils, yellowish-green surrounded by star of 5 triangular sepals which can be mistaken for glistening petals, Dec.-Jun. Tiny dark-brown seeds in woody capsules which remain on plant skeleton; this woody skeleton common in winter.

Fairly common. Annual form on offshore islands on sand, also on alluvial gravels against mountains. Perennial form along east coast on gravel inland of Kalba and Fujeirah; occasional around Hatta and south to Al Ain.

Aizoon canariense *near Masafi, 600 m.*



Gisekia pharnaceioides *20 km E of Tell Abrak, Umm al Qawain, 50 m.*



2. Gisekia pharnaceioides L.

Dwarf herb, semi-prostrate to 10 cm, with pink or violet stems branching from base. Leaves linear or partly ovate, bright green above, whitish beneath, to 1 cm, tapering towards short stalk. Flowers minute, in groups of up to 20, from short but stout axillary stalks, Jan.-Apr. Fruit purplish, star-shaped, just 2-4 mm across.

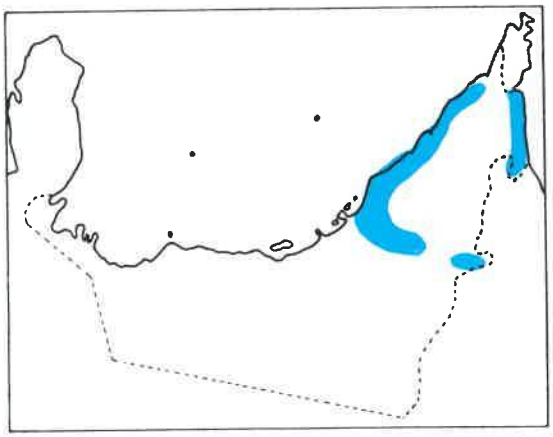
Not common except very locally, in consolidated sands and gravels inland of Umm al Qawain and Ras al Khaimah coastlines and on fringes of Jiri and Dhaid plains; occasional around Al Ain. In some years plants very reduced and difficult to recognise.

. Zaleya pentandra (L). Jeffrey

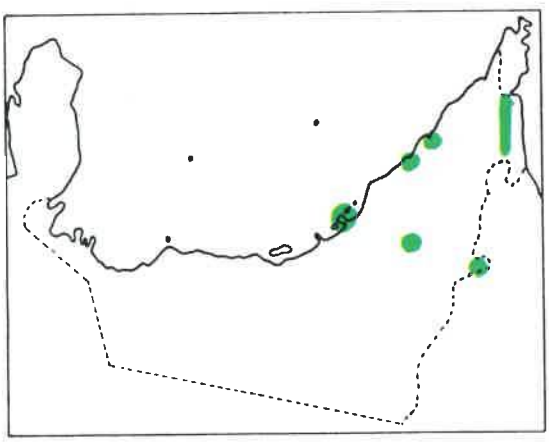
Low, bushy perennial to 30 cm, spreading with natty diameter to 1 m, and numerous intricate branches. Stem thick, woody at base, with leaves broadly-elongated, dark green with pronounced central rib. Numerous twigs spreading from main branches. Flowers purple in twig axils, Dec.-Jun. Fruit alf-flattened, black. As plant dies back, leaves turn reyish-black, sometimes with overall purple tinge.

On calcareous sand, especially in Arabian Gulf oast towns and inland plantations with brackish vater. Good specimens on farms between Abu Dhabi and Al Ain; occasional inland Dubai and on lantations in northern Emirates.

***Zaleya pentandra** in Abu Dhabi town, 10 m.*



***Portulaca oleracea** in mud, Abu Dhabi town, 1 m.*



Portulacaceae — purslane family

Single sp. in U.A.E. Semi-prostrate herb with fleshy, often glossy leaves in whorls. Flowers solitary, buttercup-like, with 5 free petals. Fruit a capsule. Common weed of marshy and saline habitats.

1. Portulaca oleracea L.

Annual, sometimes biennial, to 20 cm, often in extensive clumps with spreading green or purple succulent stems. Leaves numerous, green, virtually stalkless, to 2 cm with rounded apex and tapering at base, fleshy white beneath, shiny above. Flowers very conspicuous, in form of yellow star, in axillary groups of 2-4; flowers open only in early morning or in deep shade, variable throughout year. Fruit contains many minute, shiny black seeds.

Common in urban areas on damp, disturbed ground, a rapid coloniser. Close to sea-water plants often all purple, e.g. east side of Abu Dhabi Island. Also beside mountain streams and in oases. Cultivated form **sativa** is used as a salad.

Caryophyllaceae — carnation family

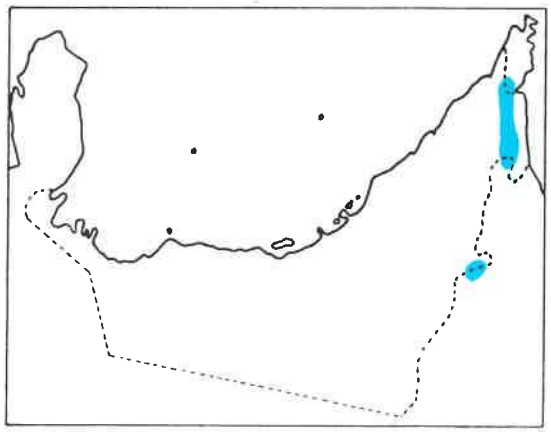
Annual and perennial herbs and shrubs with opposite pairs of narrow leaves, often fused at base and whorled, plus swollen nodes. Flowers spreading or solitary, mostly white. Fruit a many-seeded capsule. Well-represented in both coastal and mountain habitats.

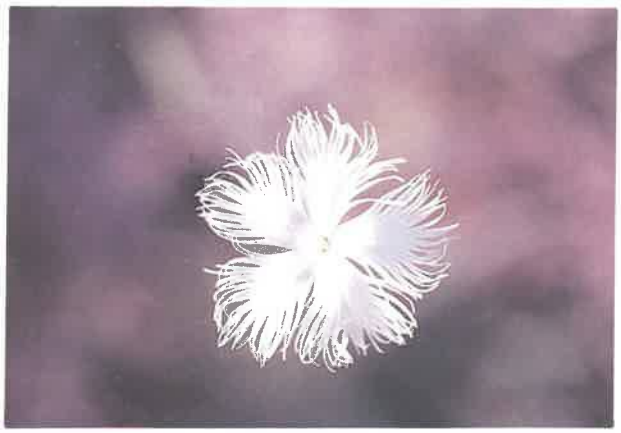
1. Cometes surattensis L.

Small annual herb, rarely above 10 cm with tough but tiny woody branches radiating just above ground. Often with a bristly collar around stem at base, a legacy from parent seed. Leaves dark green, about 2 x 1 cm, broadly ovate, pointed, on very short stalks. Flower stalks short, each with 3 tiny flowers, Feb.-May. Fruit covered with stiff hairs, gradually turning white to amber. In full fruit plant resembles a small pin-cushion.

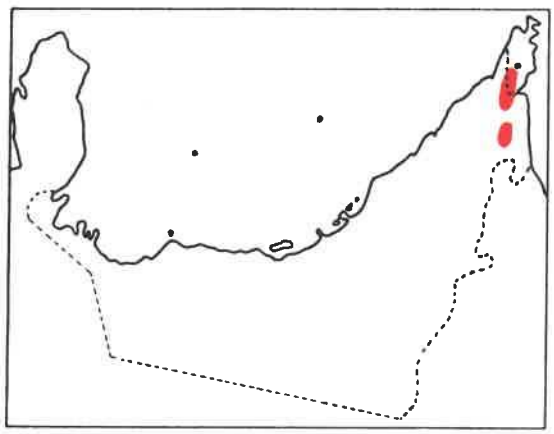
Prevalent on lower western slopes of Jebel Hafit and in Hatta foothills. Rare further north; occasional around Masafi and east coast hills.

Cometes surattensis *on Jebel Hafit, Al Ain, 400 m.*





Dianthus crinitus *in hills 15 km SW of Dibba, 800 m.*



2. Dianthus aff. **crinitus** Sm.

Perennial carnation to 30 cm with woody rootstock and 1-12 erect, smooth stems with nodes at 4-5 cm intervals. Leaves opposite, thin, blue-grey, sheathing the slender stems. Lower plant displays several paired leaves radiating from base; many are dead from previous years. Bracts to 4 cm with narrow parallel veins. Single terminal flowers with 5 petals, sometimes rounded and close, sometimes toothed with ragged tips, some with pink veins, Mar.-Jun.

A rare plant, so far recorded only over 1000 ft in hills east of Dibba, just north of Ghosan hamlet, and in hills just north of Masafi; also at 5000 ft near summit of Jebel Qahwah in Ruus al Jibal, Northern Oman.

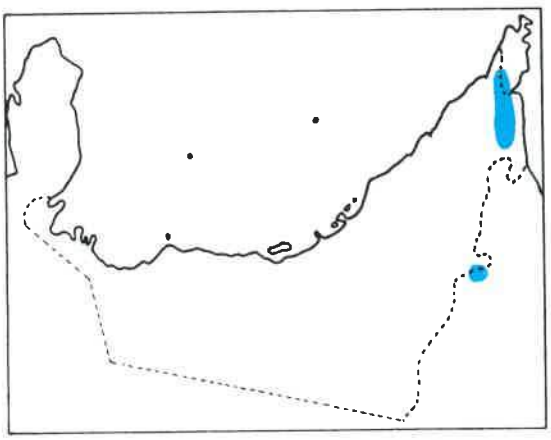
A small annual carnation, **Dianthus cyri** Fisch. & C.A. Meyer is a feature of east coast and some Al Ain plantations. This plant is roughly 25 cm with heads on 2-6 cm stalks, terminal and axillary. Petals are pink, Feb.-Apr.

3. Gymnocarpos decandrum Forssk.

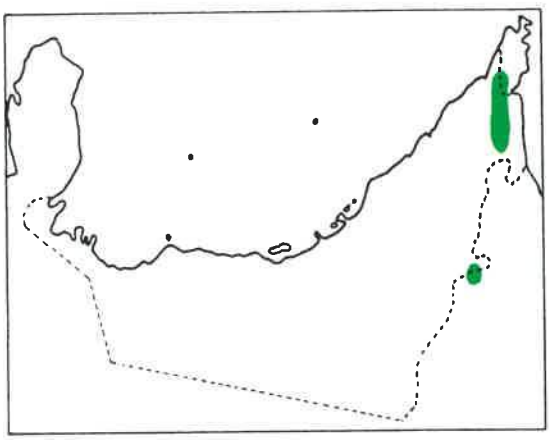
Small shrub to 45 cm, very slender in appearance but stiff and much-branched with brown and green aspect in fruit. Thin, angular stems waxy-white below, creamy green above. Leaves pale green, fleshy, cylindrical but narrow, to 1 cm, opposite, whorled in groups of 4-6. Flowers in small clusters on very short stalks with minute pale yellow stamens enclosed by brick-red sepals in many-pointed star formation, glistening. Petals absent. Flowers cover branches, both old and new, Feb.-May. Fruit covered with whitish hairs.

At higher mountain elevations on Jebel Hafit and in Fujeirah and Ras al Khaimah. Locally common.

Gymnocarpos decandrum *below Agebat, Ruus al Jibal, 1200 m.*



Gypsophila bellidifolia *near Bithnah, Fujeirah, 600 m.*



4. Gypsophila bellidifolia Boiss.

Small, very delicate annual to 20 cm, branching from base or, rarely, forming single erect stem. Leaves in basal rosette, each leaf 2-4 x 1-2 cm, bluntly-pointed; some leaves shorter, older ones brown. Hairlike stems continually rebranch at regular angles. Flowers in spreading panicles with tiny tubular corollas enclosed by veined bracts, Mar.-Jun. Capsule brown. From above it is difficult to distinguish branches through fruit clusters.

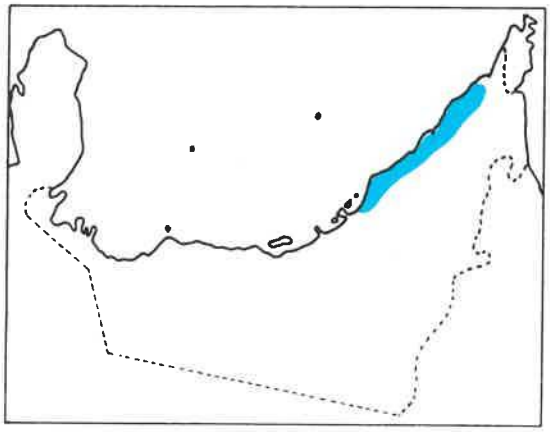
Fairly common among hills north of Hatta up to 3000 ft. Prefers rock-strewn to open slopes; often difficult to distinguish among dark multi-coloured rocks of Fujeirah and Ras al Khaimah.

5. Herniaria hemistemon J. Gay

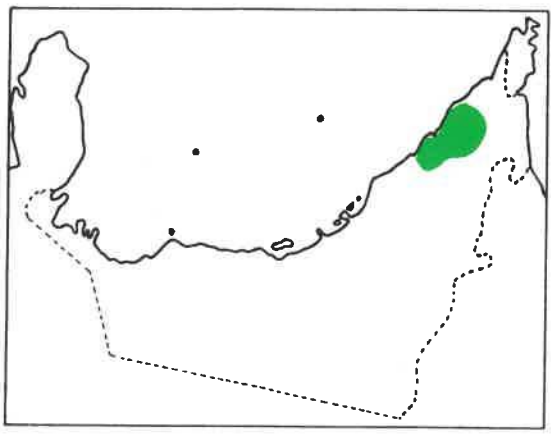
Small, prostrate perennial herb, rarely above 5 cm, and 6-12 cm across. Intricately-branched from woody base and minutely hairy. Leaves linear, crowded but minute, bunched all over and obscuring most branches. Flowers in tiny axillary clusters, greenish, easily confused with smaller leaves, Feb.-May. Capsule inconspicuous.

Fairly common on limestone outcrops along Arabian Gulf coast, especially inshore islands north of Abu Dhabi town; rare north of Umm al Qawain. Common name 'rupturewort' comes from fact it was once thought to be an aid in treatment of hernia.

Herniaria hemistemon *on sand and gravel near Jebel Ali, 15 m.*



Paronychia arabica *near Falaj al Moalla, 100 m.*



6. Paronychia arabica (L.) DC.

Dwarf, prostrate annual, branching from base into several spreading stems to 10 cm; 3-5 cm in vertical height. Leaves in threes at nodes, minute, linear, to 1 cm. Whole plant covered with clusters of silvery bracts about 5 mm broad, larger than insignificant flowers. Bracts papery in texture, pointed. Flowering Jan.-Apr. In flower and fruit resembles tiny straggling mat, with a conspicuous overall silvery appearance.

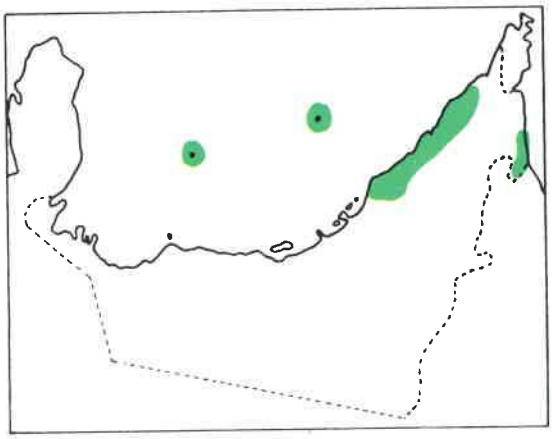
Common on settled sand inland and north of Ajman.

7. Polycarpaea repens (Forssk.) Aschers. & Schweinf.

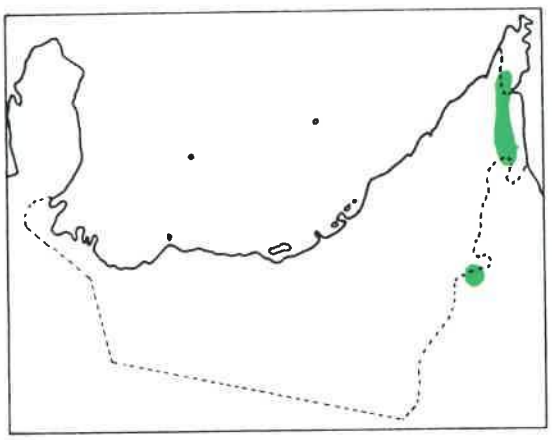
Low, delicate perennial with slightly curving stems and grey-green or silvery aspect, to 15 cm, usually shorter. Lower leaves opposite, upper ones clustered, tiny and pointed, clasping branches at regular 1 cm intervals; upper ones appear to be covered with furry down. Flowers minute, in dense terminal clusters on very short stalks, Feb.-May; sepals green with white margins. Capsule 3-valved, green maturing buff.

Fairly common on limestone and shallow sand along littoral north of Abu Dhabi town, and on offshore islands such as Qarneyn and Sir Bu Nuair; large colony on sand close to sea near mangroves at Khor Kalba. Clustered leaf groupings help in identification.

Polycarpea repens, *Abu Dhabi town, in silt, 10 m.*



Sclerocephalus arabicus, *W side of Jebel Hafit, 300 m.*



8. Sclerocephalus arabicus Boiss.

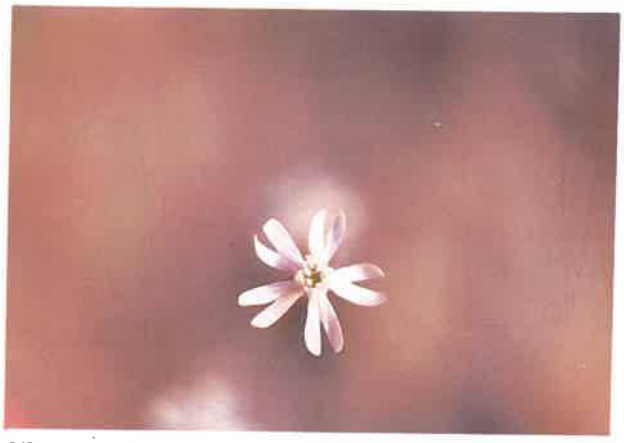
Small annual herb to 10 cm, spreading from woody stem and hugging ground. Leaves thin, pointed, fleshy, circular in cross-section, to 1.5 cm, light-green. Leaves surround bristly green knots that comprise flower-heads, about 1 cm across, without petals. Flowers surrounded by thistle-like pointed green bracts, Jan.-May. Difficult to differentiate between upper leaves and flower-heads but latter tipped with white.

Common in mountains throughout country but especially on limestone, to 3500 ft.

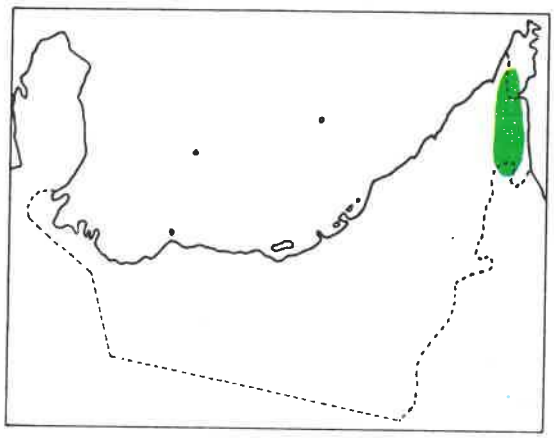
9. Silene linearis Decne.

Erect, apparently annual herb to 10 cm, with single thin but robust stem and ascending side branches, purple-tinged near base, lighter and greener above. Lower leaves linear, to 7 cm, clustered around nodes; upper ones shorter and in opposite pairs, especially at base of flower stalks. Flowers terminal in pairs, occasionally threes, consisting of fused tube extending to open corolla of 5 symetrical cleft petals, sometimes pink-tinged, Feb.-Jun. Open capsule toothed.

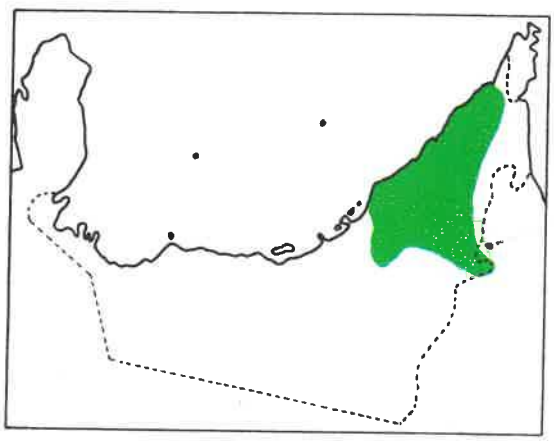
Common on open mountain slopes east and south of Dibba to Hatta; rare on Jebel Hafit.



***Silene linearis** in hills just W of Masafi, 500 m.*



***Silene villosa** in sand at Al Rafaa, Ras al Khaimah, 25 m.*



10. Silene villosa Forssk.

Annual herb with one or several stems to 25 cm., usually shorter. Leaves narrow, linear, rounded at tips, in pairs at 2-5 cm intervals; upper ones also bear a pair of tiny leaflets in axils. Flowers tubular on long, nodding stalks, and enclosed in soft green buff-veined calyx to 3 cm. Each of the 5 petals is cleft for half its length; outer petal edges often rolled inwards, Jan.-May. Capsule remains on stalk.

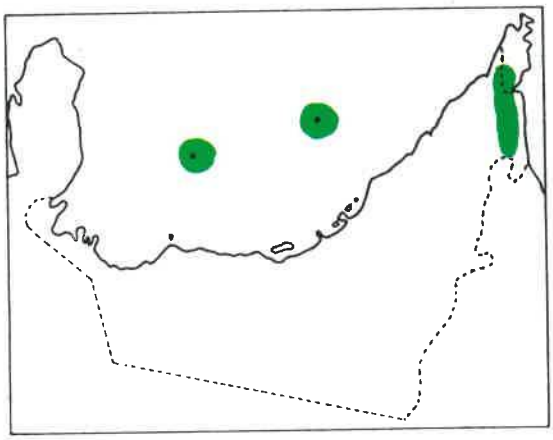
In wet springs may be very common throughout desert except western dunes; sometimes prolific along littoral between Abu Dhabi and Ras al Khaimah. Plant conspicuous because of relatively large flower; leaves often dusted with fine sand.

11. Spergula fallax (Löwe) Krause

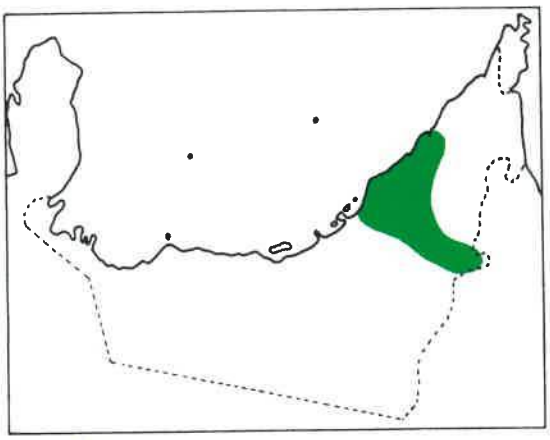
Small, delicate annual of variable size to 20 cm with thin, grey-green stem and angular branches forking from nodes at 1-3 cm intervals. Leaves like thick hairs to 4 cm, splayed out in regular groups of 4-10 around nodes. Flowers tiny, in dense terminal clusters with minute pointed white petals inside slightly larger sepals, which are green with white margins, Jan.-Apr. Fruit globular with minute black seeds, winged under magnification.

Common on undisturbed offshore islands and at lower mountain elevations north of Hatta to Ruus al Jibal, and along Ras al Khaimah coast north of Rams; locally common around Khatt and Jebel Ali.

Spergula fallax, *Wadi Khabb, NW of Dibba, 750 m.*



Spergularia marina *in plantation, Abu Dhabi town, 10 m.*



12. Spergularia marina (L.) Griseb.

Annual, easily confused with but larger than **S. fallax.** Lower stem dark, upper twigs light, to 50 cm. Branches fleshy, zigzag, especially lower ones, with internodes of 5 cm. Leaves very thin, grey-green, to 5 cm, thread-like. Sepals prominent, green and pointed. Flowers on long stalks, with 5 lilac-pointed petals, paler at centre; stamens yellow, Feb.-May. Fruit spherical, papery; seeds pale.

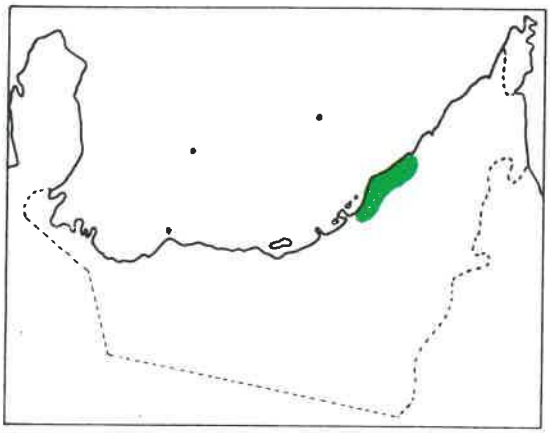
Common in disturbed ground in well-irrigated plantations, often in dense clumps, relying on surrounding vegetation for support, otherwise drooping. Masses of lilac petals make it conspicuous among grasses. Weed in afforested parks in towns.

13. Sphaerocoma aucheri Boiss.

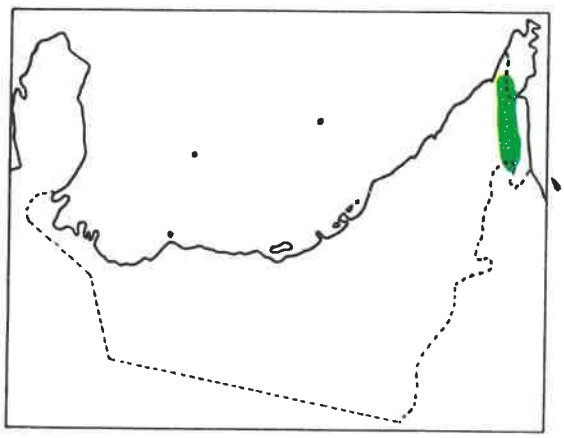
Stout perennial of variable appearance to well over 1 m but usually shorter, in bush form with thick woody stem. Branches dense, white, knotted; plant has distinct overall blue-green aspect. Leaves of young plants opposite, small, fleshy, dark green; older ones more fleshy and cylindrical in cross-section with rounded or pointed tips, to 5 cm, clustered around nodes. Flower-heads small, in spherical clusters, each about 1 cm across on short stalks; heads eventually turn rough and bristly, rusty brown or yellow, Mar.-Jun.

Common on coastal sands south of Dubai and Jebel Ali. Dwarf form on summit of Jebel Hafit.

Sphaerocoma aucheri *in open sand at Jebel Ali, 40 m.*



Boerhavia diffusa *in Wadi Uyaynat, 300 m.*



Nyctaginaceae — bougainvillea family

Herbs with woody base. Flowers without petals but often surrounded by colourful bracts. Fruit a one-seeded berry. Mostly in mountains.

1. Boerhavia diffusa L.

Perennial, either erect with branching stems to 60 cm or occasionally prostrate and straggling. Young stems slender, hairless, reddish-brown. Leaves clustered in basal rosette and round lower nodes, ovate to oblong or even triangular, with wavy margins and noticeable purple rib and veins; leaves thickish, usually curled at margins. Flowers on stalks from axils in small rays of 3-6, pink or purple with tiny white stamens, Mar.-Jul. or later. Fruit shaped like minute ribbed club.

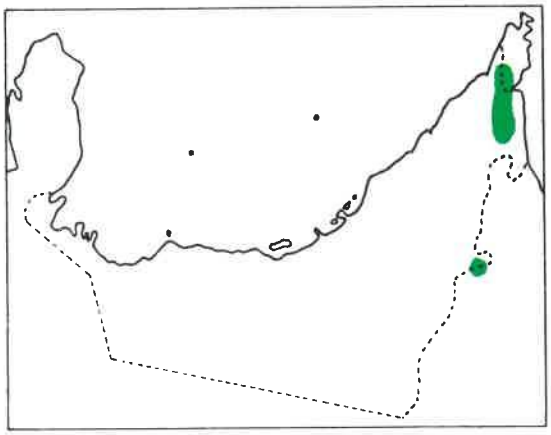
Fairly common in mountains from Hatta northwards, especially in vicinity of wadis, and fringing oases and gardens; sometimes dense colonies, as in east coast plantations.

2. Boerhavia elegans Choisy

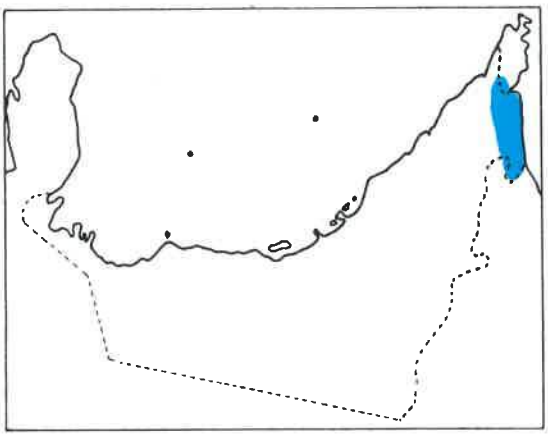
Erect perennial to 50 cm. Stems few but may be many-branched. Leaves all basal or at lowest nodes, elongated with smoothly-rounded apex to 5 cm, tapering towards base, and raised midrib on underside; upper surface glossy green, often with red margin (especially young plants); underside grey, soft, like well-cured leather. Stem and upper branches very slender, bright red when in flower. Flowers in numerous terminal rays of 3-5, same colour as stems, giving overall appearance of compact wisp of red smoke, Mar.-Jul.

Very common in mountains to 2500 ft. New growth recognised by basal rosette of margined leaves and sometimes remains of previous year's stems.

Boerhavia elegans *beside Masafi– Fujeirah road at Daftah, 600 m.*



Commicarpus helenae *at Lulayah, East Coast, 15 m.*



3. Commicarpus helenae (J.A. Schultes) Meikle

Climbing herb with narrowly-grooved white stems to 1 m or more. Stems fork continually into ever-narrowing slender, smooth branches. Leaves on short stalks, roughly triangular, bluntly-pointed at each corner, to 3 x 3 cm; leaf base flattish, tapering gently to stalk. Leaves slightly fleshy but cannot withstand great heat or aridity. Flowers small in terminal clusters on long stalks, pink or purple with white stamens, Mar.-Jun. Fruit hidden within bracts.

Infrequent, but widespread, recorded throughout east coast plantations, around Masafi in lower mountains, and amongst Acacia scrub on gravel plains around Khatt.

Chenopodiaceae — goosefoot family

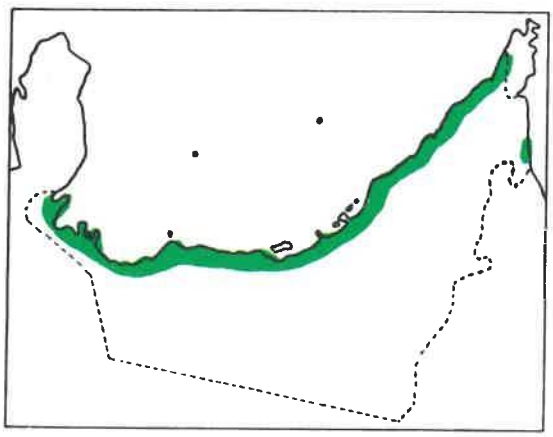
Fleshy annual and perennial herbs and shrubs, very variable in appearance, all halophytes, and sometimes referred to collectively as saltbush. Leaves where present mostly alternate and conspicuous. Stems usually jointed. Flowers tiny, yellow or greenish, mostly in summer/autumn. Fruit perianths sometimes clearly winged. Very well-represented in coastal regions; sometimes dominant inland.

1. Anabasis setifera Moq.

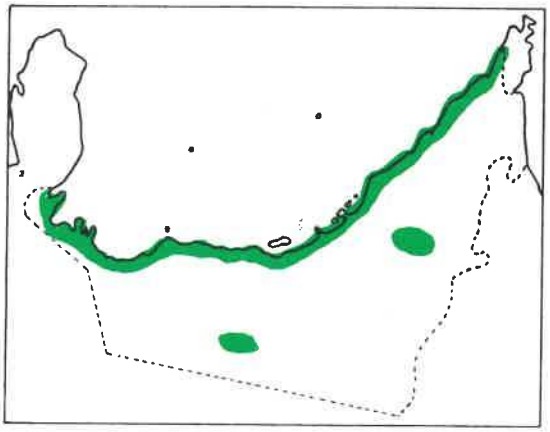
Robust, erect shrub to 70 cm, usually shorter, much-branched from woody stem, with conspicuous joints. Branches roughly square in cross-section, with a groove along centre of each side. Young shoots terminate in curved bristle. Stem colour variable, light green to orange to purple; some internodes buff. Leaves opposite, short, cylindrical, often drying yellowish. Flowers brownish with yellow stamens, in globular clusters in upper axils, Aug.-Dec. Fruit perianth with 5 papery wings and tiny flattened seeds.

Common in saline coastal habitats; on offshore islands; fringing depressions in central desert between Abu Dhabi and Al Ain/Al Hair; on east coast localised on marshes iust north of Fujeirah town and at Khor Kalba.

Arthrocnemum macrostachyum *on Gharab Island, 5 m.*



Anabasis setifera *in saline depression 20 km W of Sueyhan, 180 m.*



2. Arthrocnemum macrostachyum (Moric.) Moris & Delponte

Strong, much-branched perennial shrub to 1.25m. Main branches woody except when young, with cylindrical side twigs, short and bluntly-pointed. Virtually leafless but evergreen with dense, fleshy aspect. Older branch tips dry out brown and black. Flowers in minute clusters of 3, bunched in axils, yellow, Sep.-Dec., occasionally into the spring. Seeds dark, without wings.

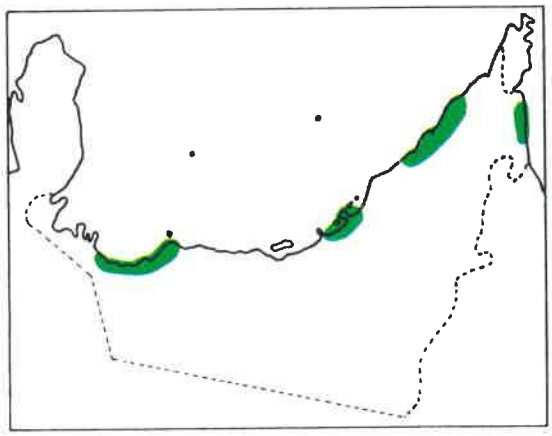
Common in intertidal zone in many sheltered lagoons on both coastlines, often dominant, e.g. on inland side of inshore islands around Abu Dhabi and along marshes north of Fujeirah town; also fringing inland depressions east of Abu Dhabi town.

3. Atriplex leucoclada Boiss.

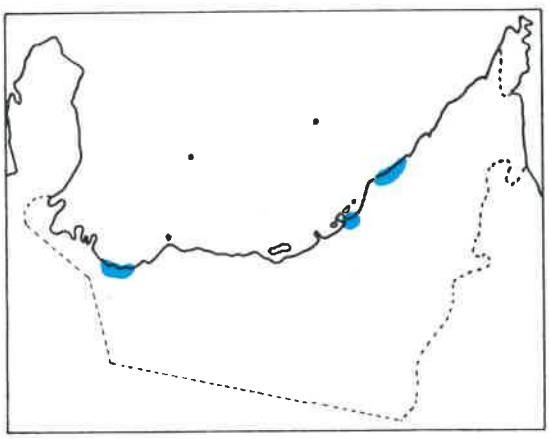
Perennial shrub, yellowy-green or silvery in appearance, to 70 cm. Main stem and branches unjointed, thin, pliant, white. Leaves triangular, flat, 2-4 cm, with wavy or crisped margins, sometimes covered with soft white encrustation; thickly clustered along branches. Flowers in terminal and axillary groups, Sep.-Nov, sometimes earlier. Fruit perianth shaped like a tiny bell with upper lobe larger than two side ones.

Locally common in saline habitats, abundant along old Ajman and Umm al Qawain coastline, corresponding roughly to line of modern road; also common on inshore islands, often in association with **Suaeda** and **Salsola** spp. Early coloniser of disturbed saline areas, e.g. through dredging.

Atriplex leucoclada *on Gharab Island, 5 m.*



Bienertia cycloptera *al Umm an Nar, Abu Dhabi, 5 m.*



4. Bienertia cycloptera Bge.

Tall, erect or spreading perennial shrub with whitish stems and branches, to 1 m. Rootstock often very thick and lower stem often blackened. Leaves fleshy, cylindrical but slightly flattened, to 3 cm, light green or yellowish, often thickly-grouped on lower side twigs. Flowers tiny, yellow, set in dense terminal and axillary globular clusters; globules squeezed together in lines or in compact groups, Oct.-Dec. Fruit like soft black berries with circular wings, in dense clusters.

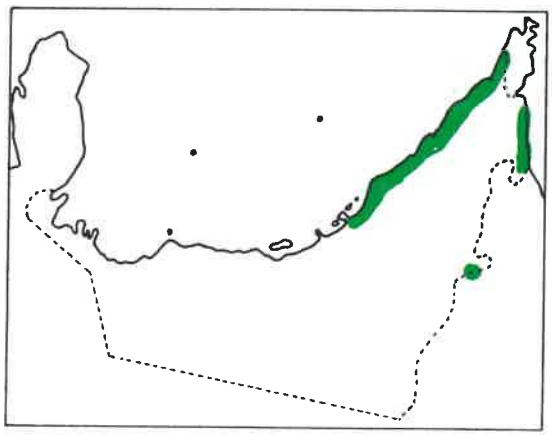
Locally common but colonises slowly. Once abundant clumps along Umm an Nar canal recovering very slowly from dredging operations. Small groups west of Jebel Dhanna and south of Jebel Ali, on coast. Not found inland.

5. Chenopodium album L.

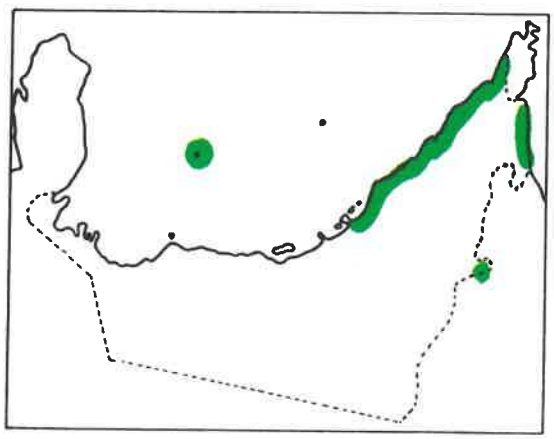
Pale green annual to 7 cm, often with branches spreading laterally from base. Stem and branches thin, unjointed, often reddish. Lower leaves shaped like smooth rounded triangles with a few ragged serrations, generally longer than broad, to 6 cm. Flowers densely clustered in knotted green heads on elongated terminal branches, Apr.-Nov., very variable. Fruit surrounded by narrow perianth segments joined at base.

A fairly common weed of damp urban habitats, plantations and oases throughout the country; less so in mountains.

Chenopodium album *near Eastern Lagoon, Abu Dhabi Island, 5 m.*



Chenopodium murale *at Qidfa, East Coast, 20 m.*



6. Chenopodium murale L.

Annual green herb with thick foliage, to 80 cm with solid reddish and often ridged lower stem and a few side branches. Lower leaves large, triangular, with ragged teeth all round, to 8 cm on long stalks. Flowers small, green, arranged in rich clusters on elongated spikes just above leaves, throughout year. Fruit enclosed by 5-segmented green perianth. Very similar in general appearance to **C.album.**

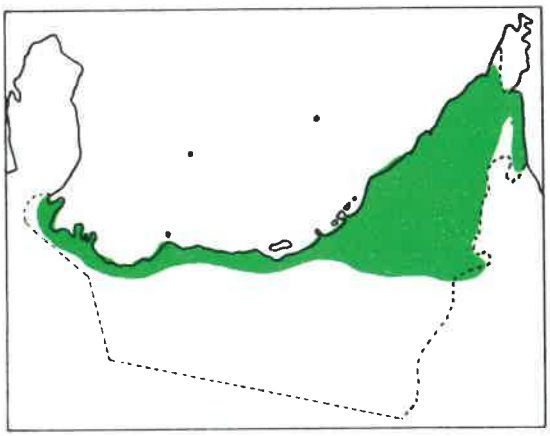
Very common in similar habitats to **C. album,** sometimes forming dense colonies in plantations and fields.

7. Cornulaca monacantha Del.

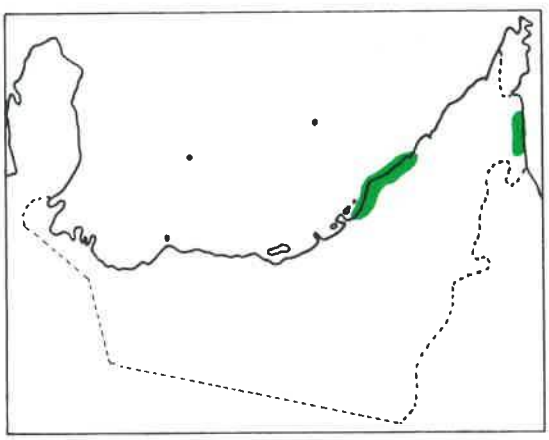
Much-branched sturdy perennial shrub of variable appearance, thin and straggling or dense and spreading, to 80 cm. Main stem very woody, gnarled and dark brown in old plants, green and fleshy when young. Plant may appear all green, brown, ashy-white, even grey-black, depending on age, season and locality. Leaves clasping at base, to 1 cm, tapering to a curved spine so that the plant has an overall very bristly appearance. Axils woolly; after flowering whole plant may be covered with apparent dirty cotton wool which collects windborne dust and flotsam. Flowers tiny, yellow, dotted along outer branches, often surrounded by woolly white tufts, in axillary knots, Sep.-Dec.

Ubiquitous in most desert areas but uncommon in lower mountains, and rare at higher elevations. Totally dominates landscape on parts of settled sandy foreland north of Ajman and is a major component along whole Arabian Gulf coast. Smaller communities not uncommon on inland alluvial plains. An indicator of degraded rangeland through overgrazing of other, more palatable, spp.

***Cornulaca monacantha** at Ad-Door, Umm al Qawain, 20 m.*



***Halocnemum strobilaceum** Jebel Ali, 15 m.*



8. Halocnemum strobilaceum (Pallas) M. Bieb.

Low, spreading, much-branched shrub with continuous stem, distinguished by masses of smooth green leaf tubercles along branches, to 40 cm. Overall yellowy-green or dark straw-brown, or combination. Leaves tiny, bud-like, green or brown. Flowers minute, yellow, in threes in small lateral and terminal spikes, Sep.-Dec. Fruit perianth wingless. Similar in general appearance to **A. macrostachyum,** but smaller. New growth produced Jan.-May.

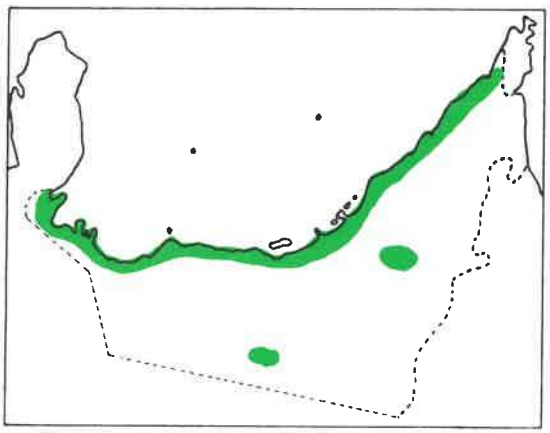
Fairly common locally along fringes of intertidal marshes between Abu Dhabi town and Dubai; also fringing some depressions around Sueyhan where the water table is high. Mixed with **A. macrostachyum** on Fujeirah marshes.

9. Halopeplis perfoliata (Forssk.) Bge.

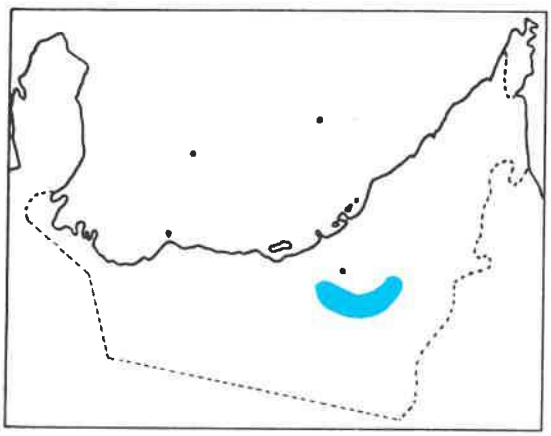
Much-branched shrub to 40 cm, usually shorter, with unjointed, gnarled, woody stem. Leaves modified to fleshy berry-like globules, often strung together like a necklace, variable in colour from yellow to green to deep shiny purple. An individual plant may comprise mostly uniform dark green branches with one seemingly out-of-place twig wine red. Flowers tiny, yellow, in threes along upper soft spiky branches, protruding between globule joints, Sep.-Jan. Fruit perianth a small inverted wingless cone.

Very common along length of Arabian Gulf coastline, mixed with **Limonium axillare** and **Zygophyllum hamiense.** Inland, fringing saline depressions. Reddest specimens appear to be in most saline habitats, e.g. on edge of sabkha in Ajman.

Halopeplis perfoliata *at Hamriya, Ajman, 20 m.*



Haloxylon persicum *beside Asab oilfield road, 40 km due S of Abu Dhabi town, 85 m.*



10. Haloxylon persicum Bge.

Shrub or tree to 3 m with a very extensive root system, from afar with the aspect of a weeping willow. Stem or trunk woody, thick; young branches fleshy, pliant, distinctly jointed, with each new shoot thinner at base than node it arises from. Tree-like form has these long shoots drooping over, not quite touching ground. Leaves rudimentary or non-existent. Flowers enclosed by bracts to 3 cm, on stalks from upper twigs; flowers yellow, bracts pink or shiny red, Mar.-May. Fruit remains within bracts, which dry out grey.

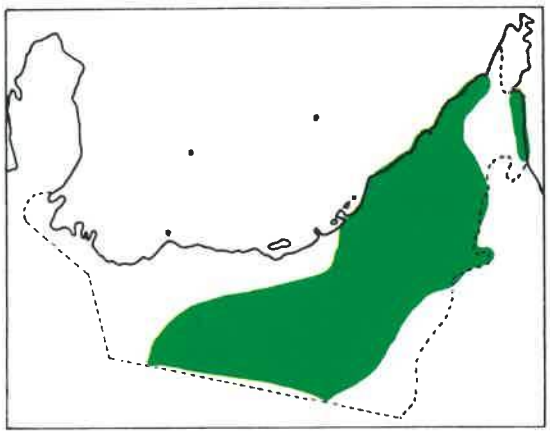
Localised to narrow belts from south of Al Ain westward towards north of Asab oil field.

11. Hammada elegans (Bge.) Botsch.

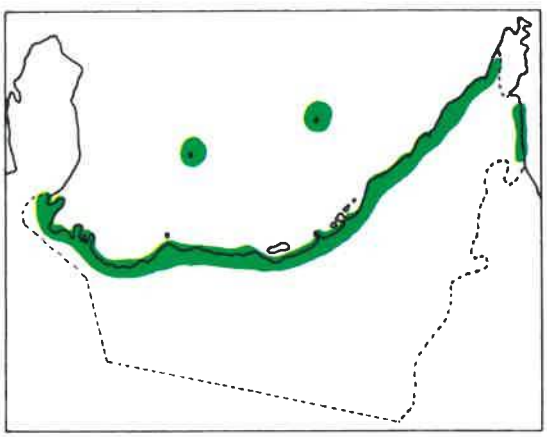
Large perennial, much-branched, to 1.5 m. Branches jointed, bluish-green and fleshy when young, gradually hardening dirty grey. Leaves opposite but rudimentary with woolly axils, in older plants often enlarged by gall-producing insects and turning pink or reddish. Flowers minute, yellow, thickly dotted along outer twigs, Sep.-Dec. Flowering and fruiting simultaneous. Recognisable by fruit perianths which clothe plant with conspicuous pink, brown or white enlarged papery wings.

Common and in places dominant in stable sand especially in central areas and on alluvial plains. Forms huge mounds northeast of Abu Dhabi town, where perianth wings are mostly white; on Dhaid and Madam plains they are mainly pink. Wings sought after by ants; shrub browsed by camels.

***Hammada elegans** at Al Khatim, Abu Dhabi–Al Ain road, 100 m.*



***Salsola baryosma** in saline silt at Ain al Faidah, Al Ain, 350 m.*



12. Salsola baryosma (Schult.) Dandy

Much-branched yellow-green perennial shrub to 50 cm with smell of rotten fish when rubbed. Branches unjointed and smooth; seedlings and young shoots red or purple. Leaves light green, mealy, knotted, fleshy, with minute bristles. Older plants lose red colour and turn grey-green and woody, often with part of plant apparently dead. Flowers tiny, yellow, protruding from knots, Jul.-Nov. Commonly in fruit and flower together. Fruit perianth a 4-partite transparent wing, to 1 cm across. In full fruit the plant glistens in sunlight; ants strongly attracted.

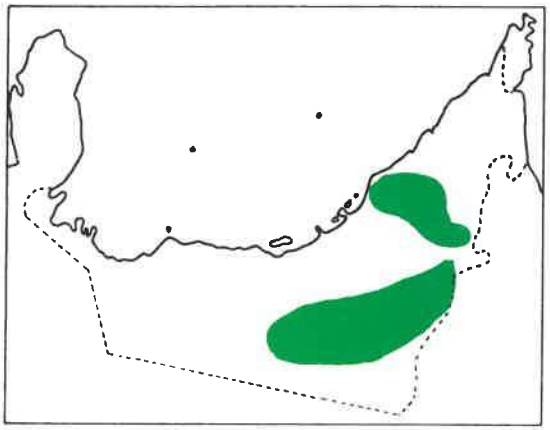
Common in saline habitats, abundant on offshore islands just above tideline on sand. Major component along coast from Qatar to Ajman, less frequent further north. Rare on east coast.

13. Salsola rubescens Franch.

Small perennial shrublet to 30 cm with thick woody stem and ascending branches, younger ones reddish and furry. Fork of each new twig marked by fleshy, straw-coloured leaf-like scale to 1.5 cm. Leaves thin, linear, in distinctive groups of 6-8 along twigs at 1-2 cm intervals; flowering twigs mostly leafless. Flowers minute, yellow, Sep.-Dec. Fruit perianth brightly-coloured red, yellow or combination, to 1 cm across. Wings remain on plant for long period.

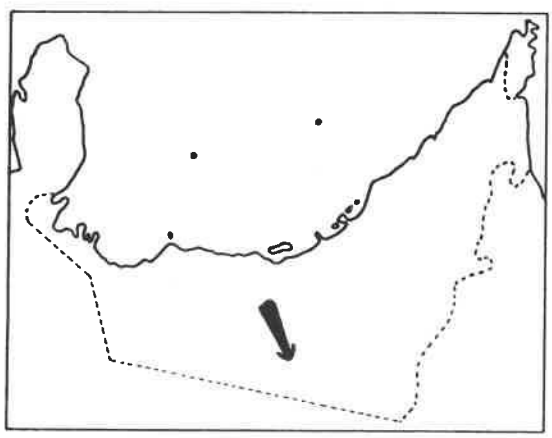
Fairly common on gravel plains south of Al Ain and east of Al Liwa where sand hummocks develop. Also in clefts on limestone Jebels as at Hafit and Faiya, where wings tend to be yellow maturing to a translucent brown.

Salsola rubescens *near Al Wigan, 30 km SSW of Al Ain, 300 m.*

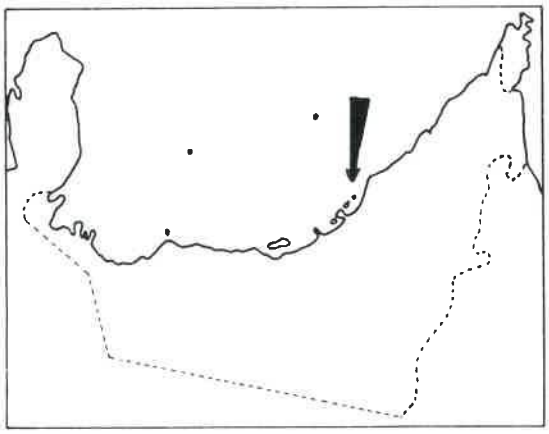


Seidlitzia rosmarinus (Ehrenb.) Bge.
Much-branched smooth-stemmed shrub with opposite branches to 60 cm. Stems waxy-white. Leaves fleshy, cylindrical to 2 cm, thicker at tip. Flowers in opposite axillary clusters of 3, half hidden by bracts, Sept.-Dec. Perianth winged, one wing bent. Uncommon between Qatar and Jebel Dhanna only.

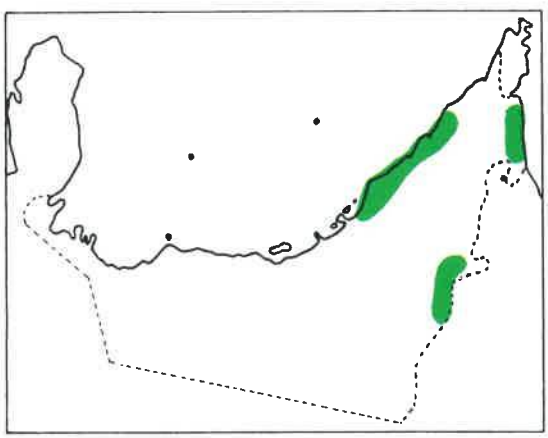
Typical **Chenopodiaceae** habitat, a gravel plain deep in the Liwa Crescent, dominated by **Halopeplis perfoliata, Hammada elegans** and **Salsola** spp. with interspersed stands of **Limonium axillare.**



A view of Gharab Island north of Abu Dhabi in April, showing young plants of **Chenopodiaceae,** including **Anabasis setifera, Halopeplis perfoliata** and **Cornulaca monacantha.** Note the damage made by a single set of tyres in a fragile environment.



Suaeda aegyptiaca *at Ain al Faidah, Al Ain, 350 m.*



14. Suaeda aegyptiaca (Hasselq.) Zohary

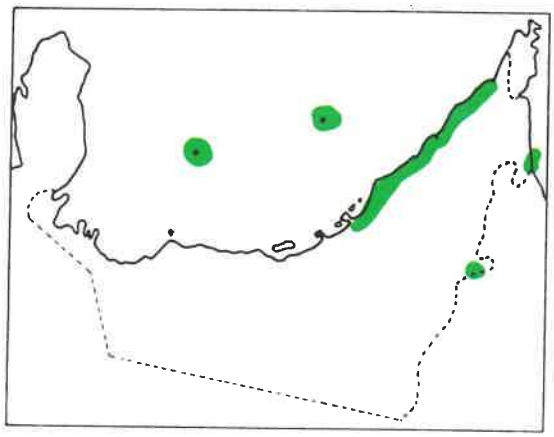
Very fleshy herb, much-branched and spreading, to 50 cm. Stems unjointed, sometimes brown or reddish. Whole plant dense with succulent cylindrical leaves, glossy-green and smooth, curving upwards, to 2 cm. Common in disturbed saline habitats such as East coast plantations, around Ain al Faidah near Al Ain, and scattered in Arabian Gulf towns.

15. Suaeda vermiculata Forssk. ex J.F. Gmel.

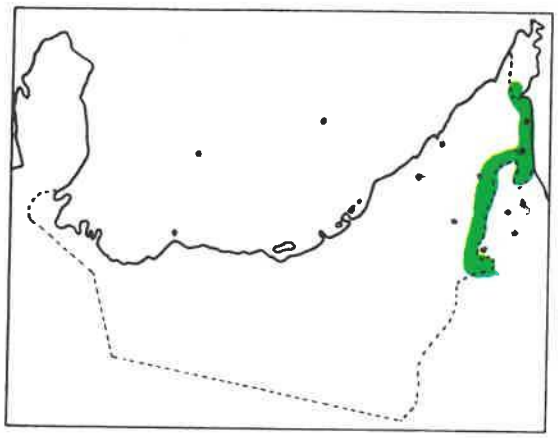
Large, intricately-branched shrub with non-jointed stems and whitish branches, to 1.5 m but often more squat and straggly. Leaves thin, cylindrical, succulent, to 3 cm; lower ones often longer and fatter, sometimes curved, drying out black; upper ones more globular, sometimes knotted and bunched. Plant variable in colour from glossy blue-green to dark grey and even black; occasionally shiny light-green. Flowers yellow, minute, clustered in axils, Aug.-Nov. (though have been recorded in Mar). Perianth wingless. Whole plant dies back in winter with leaves shrivelling to yellow, then grey.

Common on offshore islands, on edges of carbonate ledges overhanging sea. On mainland coast can be very shrubby and erect in sheltered habitats, especially fringing lagoons and marshes. Occasional on east coast.

***Suaeda vermiculata,** Abu Dhabi, Al-Bateen, 3 m.*



***Aerva javanica** beside Al Ain cement factory, 400 m.*



Amaranthaceae — cockscomb family

Annual herbs or perennial shrubs. Leaves green or reddish. Flowers mostly greenish-white, mealy, in uppper leaf axils. Fruit a capsule. Common weeds in towns and plantations.

1. Aerva javanica (Burm.f.) Juss.

Hairy perennial, 50-120 cm, easily recognised by dense woolly white flowers. Stem much-branched from base with erect, fairly straight furry branches. Leaves 1-4 cm, broadly elliptic, grey-green with clear rib and veins on underside, alternately in threes, central leaf smallest. Flowers in large axillary and terminal spikes to 10 x 5 cm. Flower parts dominate rest of plant, Dec.-May and beyond. Fruit enclosed in tiny bladder-like structure.

Common in rocky wadi systems, especially entering alluvial plains; also along east coast. Oftens forms extensive clumps.

2. Amaranthus graecizans L.

Smooth annual to 35 cm with both erect and, usually longer, lateral spreading stems, often quite red. Leaves broadly lanceolate to 2 cm, green or reddish with prominent nerves on underside and slightly wavy margins; leaves alternate but dense on side and erect branchlets. Flowers all axillary, like lines of clustered green or reddish knots covering much of branchlets to tips, surrounded and superseded by leaves, Feb.-Jul. Seeds many, black and glossy.

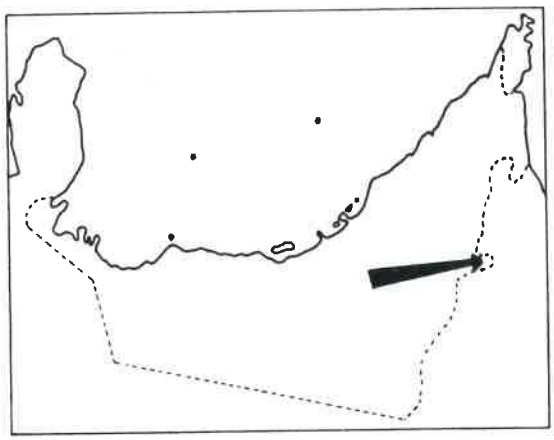
Common weed of damp urban habitats, parks, plantations and fields throughout the country, including industrialised offshore islands.

Amaranthus hybridus L.

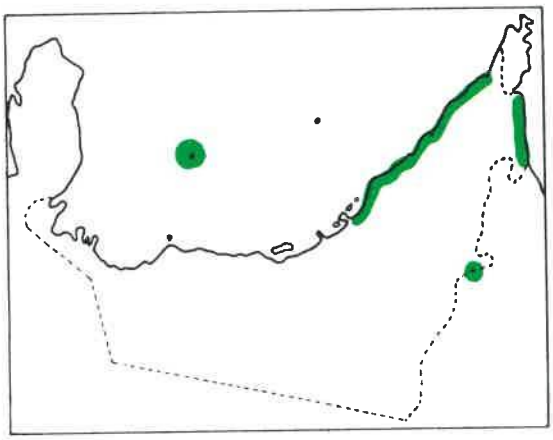
Resembling **Chenopodium album,** to 45 cm, overall light green. Leaves similar to **A. graecizans** but 2-3 times larger. Flowers in terminal and axillary ascending spikes, crowded towards tips, whitish-green and surrounded by leaves. Similar habitats to **A. graecizans.**

Amaranthus viridis L.

Similar to **A. hybridus** but taller, to 60 cm and with darker green leaves. Spikes longer and more terminal with fewer surrounding leaves. Similar habitats.

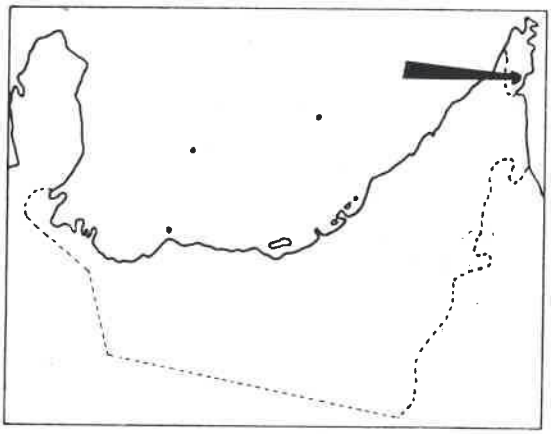


Amaranthus graecizans *on consolidated sand at Qurayya, East Coast, 15 m.*

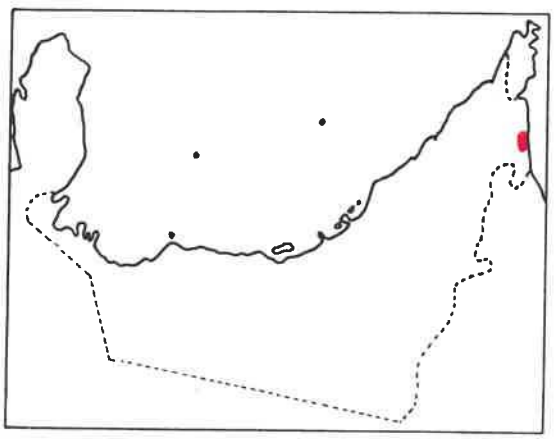


A typical stand of **Aerva javanica** in a dry wadi bed at the foot of Jebel Hafit, behind the Al Ain Cement Factory, April.

Cocculus pendulus festooning the cliff sides in Wadi Khabb gorge, north-west of Dibba. From a distance these clumps may be confused with hanging plants of **Capparis spinosa.**



Aristolochia bracteata *at Lulayah, East Coast, 15 m.*



Aristolochiaceae - aristolochia family

Single sp. in U.A.E. Trailing herb with alternate leaves and single axillary flowers without petals, on short stalks. Fruit a many seeded capsule.

1. Aristolochia bracteata Retz.

Perennial, with stems trailing to 1.5 m, rarely ascending more than a few cm above ground. Stems smooth, fleshy, pale green. Leaves to 6 cm, broadly cordate, pointed, with rounded lobes at base, undulating margins, veined with a clear midrib. Flowers on outer stems; expanded sepals resemble petals, tubular, U-shaped, narrow at base, to 3 cm, brownish with creamy white apex, Feb.- Apr. Capsule oblong, opening from below.

Rare, in plantations along east coast, usually in deep shade in neglected habitats. Poisonous.

Menispermaceae - curare family

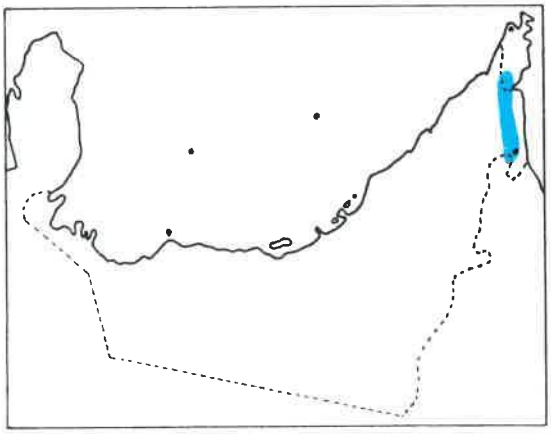
Single sp. in U.A.E. Woody climber with alternate leaves. Flowers tiny, greenish-white in clusters. Fruit a small, 1-seeded berry.

1. Cocculus pendulus (J.R. & G. Forst.) Diels

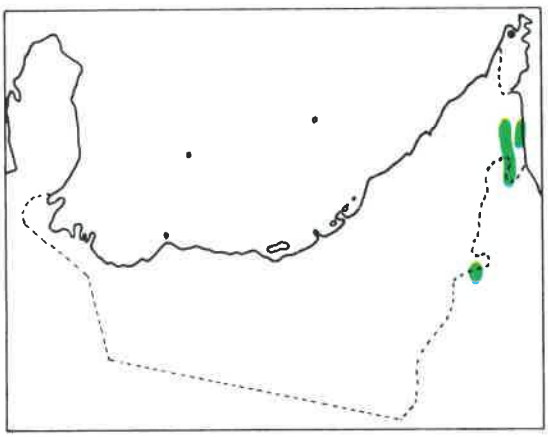
Shrub with slender, elongated, pliant branches, main ones finely-grooved, younger ones furry, to 8 m, climbing over trees or hanging in dense streamers from cliffs. Leaves variously elliptical or ovate with very rounded apex and raised midrib on underside; dark grey-green, to 2.5 cm on very short stalks. Flowers occasionally in pairs, rarely singly, Feb.-Apr. Berry red or orange.

Uncommon creeper, only in mountain wadis between Masafi and Dibba. Abundant in Northern Oman Ruus al Jibal.

***Cocculus pendulus** in Wadi Khabb, NW of Dibba, 600 m.*



***Capparis cartilaginea,** summit of Jebel Hafit, 1100 m.*



Capparaceae — caper family

Herbs, shrubs and trees. Leaves alternate, simple or divided. Some spp. spiny. Flowers clustered with many conspicuous stamens and white or yellow petals. Fruit mostly pod-like capsule or elongated, fleshy berry. Well-represented throughout mountains and some plains.

1. Capparis cartilaginea Decne.

Trailing or short, stocky shrub; former to 70 cm and 1-4 m across, latter erect to 50 cm. Rootstock thick. Branches whitish, stiff, slightly zigzag or crooked. Leaves ovate, to 5 x 4 cm, leathery, tipped with blunt spine, often light green or yellowish, usually scarred with insect tunnellings; plus short, recurved spine at base of leaf stalk. Flowers in upper axils on thick stalks, with 3 large white petals and long purple stamens; flowers open only in early morning, Jul.-Oct., and attract large numbers of flying insects. Fruit resembles short cucumber enlarged at tip, to 15 cm, green to reddish.

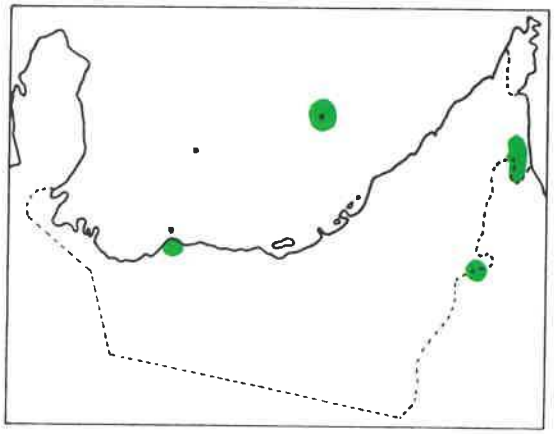
Common on limestone hills such as Jebels Hafit and Faiya, and in wadis around Masafi and Fujeirah; occasional on low bluffs overlooking east coast.

2. Capparis spinosa L.

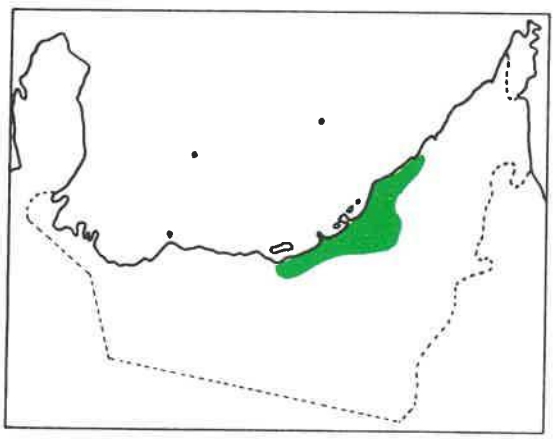
Superficially very similar to **C. cartilaginea**, also with 2 distinct forms, one an erect shrub to 50 cm, the other a hanging version, trailing to 3 m. Branches smooth, whitish, with orange thorns at leaf bases. Leaves ovate and pointed in shrubby form, smaller and narrower in trailing form; overall smaller and less leathery and robust than **C. cartilaginea.** Flowers with 4 white petals to 3 cm and longer pink stamens, very showy in early mornings only, Jul.-Sep. Fruit an elongated pear shape to 8 cm, pulpy with brown seeds, maturing red.

Common on some offshore islands, e.g. Sir Bu Nuair, and on Jebel Dhanna, with leaves thicker than inland versions. Uncommon on Hafit and around Hatta; rare on east coast. In Mediterranean countries the flower buds of this sp. are pickled as commercial capers.

Capparis spinosa *in Wadi Jeema, Hatta, 800 m.*



Cleome brachycarpa *near Umm an Nar, Abu Dhabi, 25 m.*



3. Cleome brachycarpa Vahl ex DC.

Stiffly erect perennial to 30 cm with thin woody branches ascending from base, and numerous short lateral stalks. New growth herbaceous. Leaves digitate, lower ones in threes, upper ones more clustered, dark green, broadly linear to ovate, to 2 cm. Older plants usually bear several leafless dead twigs. Flowers numerous, on stalks that branch out at regular angles from stems, with pale yellow petals folded back, revealing long yellow stamens, Feb.-Jun. Fruit pod-like to 1.5 cm, usually erect with short, thread-like tip. Seeds smooth, dark brown.

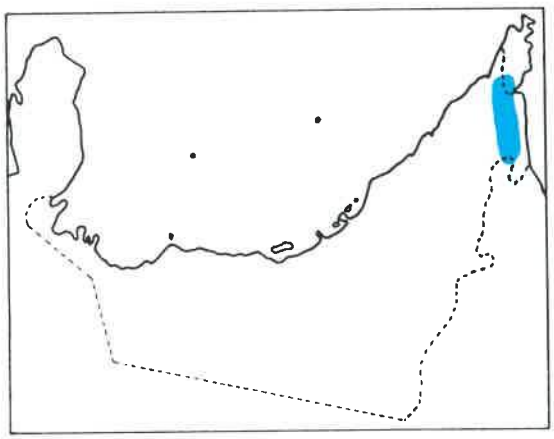
Common on limestone bluffs along parts of Arabian Gulf coast; occasional inland on low plateaux fringing depressions. Not found in sand.

4. Cleome aff. **dolichostyla** Jafri

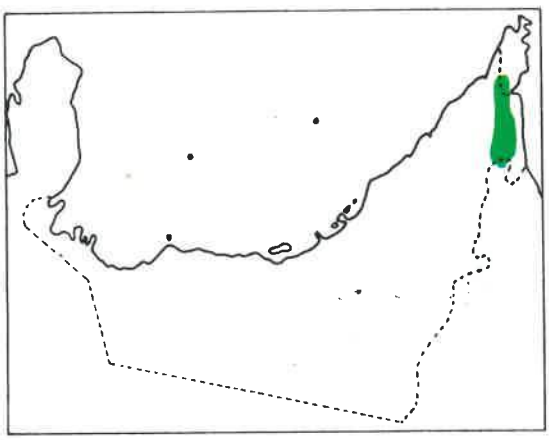
Annual, occasionally biennial herb with strong, rather sickly odour, to 45 cm. Generally 1-3 long straight central stems and 2-6 shorter lateral ones curving out and upwards from base, fleshy green, covered with dense sticky hairs. Leaves broadly ovate, dark green, to 5 cm, forming sticky basal rosette; older leaves dry out straw-coloured. Flowers yellow in pairs on stalks above leaves; yellow stamens longer than petals, Apr.-Aug. Fruit pod-like on stalk, horizontal or erect, to 5 cm, terminating in thread-like point.

Common around Hatta on steep mountain slopes and flat shoulders above wadis; uncommon to rare further north.

***Cleome** cf. **dolichostyla** in Wadi Jeema, Hatta, 800 m.*



***Cleome rupicola** beside Dhaid–Masafi road, 10 km W of Masafi, 400 m.*



5. Cleome rupicola Vicary

Perennial, to 70 cm, with several erect and semi-ascending stiff stems, without side branches; stems rough to touch. Base woody. Leaves mostly at base and lower stems, broadly spatulate on short stalks often with leaflet in stalk-stem axil; leaves nerved, dark green. Head a terminal raceme of distinctive orange and yellow flowers, each on a 2-3 cm stalk, with nerved petals and showy stamens, Feb.-Apr. Fruit pod-like, 4-7 cm, compressed, numerous along upper stems, hanging vertically on short stalks; often many pods below flowering part of stem.

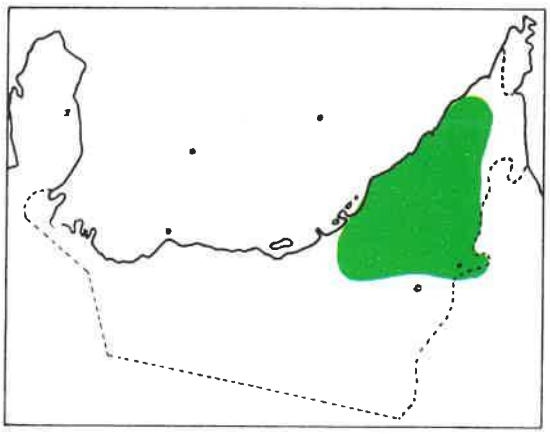
Conspicuous on lower mountain slopes and beside wadis in Fujeirah and Ras al Khaimah; prolific in foothills around Masafi.

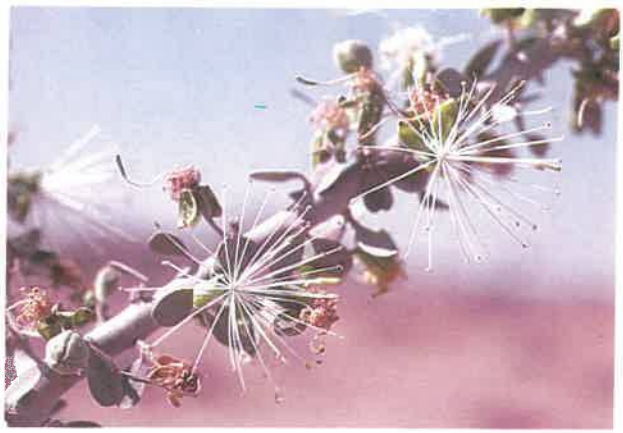
6. Dipterygium glaucum Decne.

Perennial shrub but often flowering and fruiting in first year, much-branched from base, to 80 cm. Above rootstock branches thin, smooth and pliable. Leaves grey-green, narrowly linear to oblong, about 1.5 cm, tending to be deciduous; sometimes thickly covered in knots. Basal leaves of young plants longer and broader. Flowers small with 4 crucifer-like yellow petals (occasionally whitish), dotted along outer branches from old leaf axils; variable throughout year. Fruit a small, wrinkled, green nutlet surrounded by circular, flat green wing.

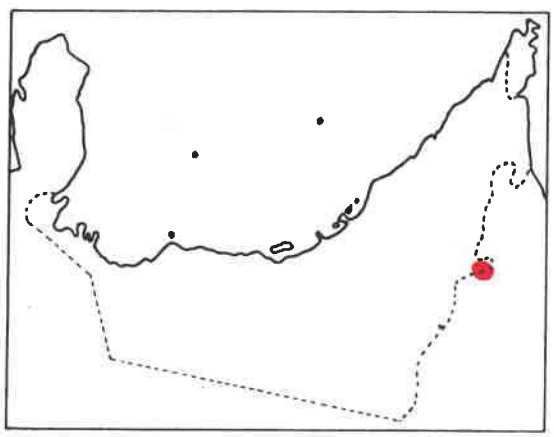
Very common along Arabian Gulf coast, often very close to beachline; also on saline sand inland. Much grazed and often very stunted.

Dipterygium glaucum *10 km E of new Abu Dhabi airport, 45 m.*





Maerua crassifolia *on plain 12 km NE of Buraimi, 450 m.*



7. Maerua crassifolia Forssk.

Tree or shrub with thick woody stem, widely-branched, to 4 m. Some branchlets pointed. Leaves narrowly linear to 3 cm; most specimens heavily grazed, with lower leaves consequently much reduced and rounded. Flowers similar to caper, with numerous long white, yellow-tipped stamens, but without petals, dotted along outer twigs, Feb.-Apr. Fruit small, cylindrical.

Rare, on gravel plains north of Hili near Al Ain; all plants stunted, smaller ones spinescent and covered with minute leaves; larger trees umbrella-like, with normal foliage only above reach of camels.

Cruciferae — cress family

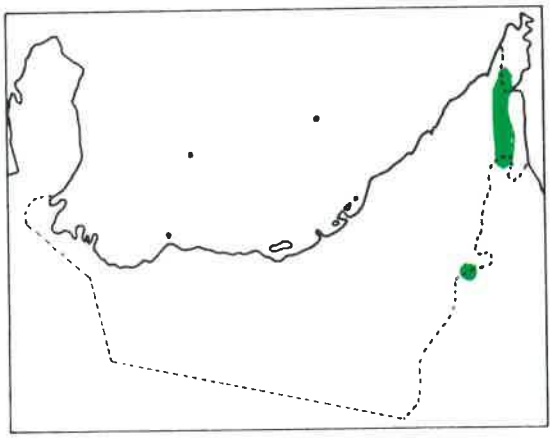
Mostly herbs with flowers easily recognised by the 4 sepals, 4 free petals arranged in a cross, and 6 stamens. Fruit a long or short pod. Well-represented both in natural plant communities and as weeds.

1. Anastatica hierochuntica L.

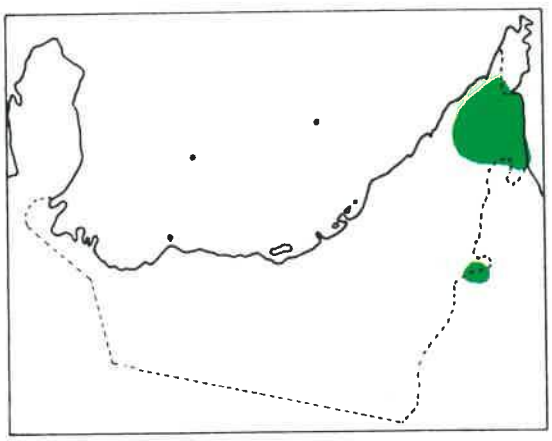
Dwarf annual, overall grey with covering of furry hairs, branching out and upwards from base to 10 cm. Leaves small, shovel-shaped to 1.5 cm at ends of branchlets, deciduous. Flowers in clusters in branch forks, often dirty with blown sand and dust, surrounded and dominated by leaves. Petals minute, white, Feb.-May. After flowering all branches harden and bend inwards to enclose fruit in tight basket-like cover; this unfurls in next seasonal rains and brown seeds cast around.

Common on gravels and compact alluvium at base of mountains. Known both as 'Rose of Jericho' and 'Hand of Miriam.' In early spring parent plants surrounded by vast number of seedlings, but only a few survive to maturity.

Anastatica hierochuntica *in foothills 15 km SW of Dibba, 200 m.*



Diplotaxis harra *in Wadi Khabb, 25 km NW of Dibba, 800 m.*



2. Diplotaxis harra (Forssk.) Boiss.

Normally perennial but also annual in U.A.E., erect, branching from base, with covering of short sparse hairs, especially below, to 40 cm. Young plants with basal rosette of broad, serrated, fleshy leaves, less obvious in mature plants. Flowers in small terminal clusters with sulphur-yellow petals to 1 cm, Feb.-Jun. Pods to 2 cm on splayed stalks, narrow, greyish, compressing 2 rows of seeds. Somewhat similar to **Haplophyllum tuberculatum** but lacks odour of latter and is generally shorter with less obvious leaves.

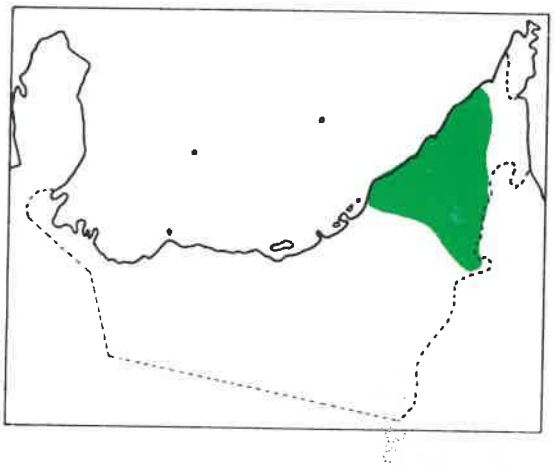
Common on lower mountain slopes and in rocky wadis, also on compacted sandy gravels, especially in Fujeirah, Ras al Khaimah and around Falaj al Moalla. In some years a locally dominant annual.

3. Eremobium aegyptiacum (Spreng.) Asch. in Boiss.

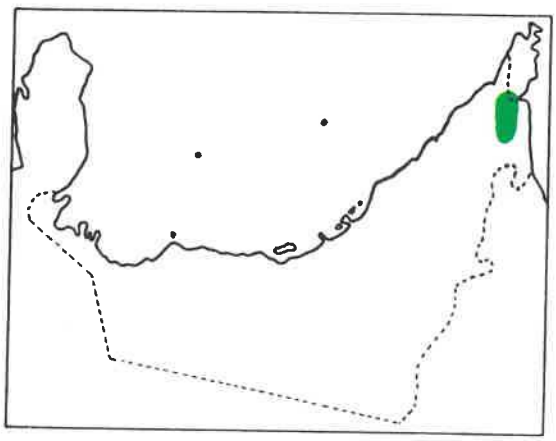
Small, greyish-green annual to 35 cm, usually shorter with several thin stems branching prostrately or ascending from base. Young stems usually waxy white but can be reddish. Leaves narrowly linear, pointed, partly folded up at midrib, 2-4 cm. Flowers in terminal clusters on long lateral twigs, with creamy white petals, Feb.-Apr. Pod narrow, to 1.5 cm, cylindrical, slightly compressed; seeds minute, reddish.

Very common inland of coastal sands north of Abu Dhabi to Ras al Khaimah and in central desert areas. Thrives in deep sand and forms huge colonies each year.

Eremobium aegyptiacum *at Shwayb, 450 m.*



Erucaria crassifolia *in hills 10 km N of Masafi, 600 m.*



4. Erucaria crassifolia (Forssk.) Del.

Smooth, erect, annual herb to 50 cm, often shorter, branching above base into 3 several thin, fleshy stems. Leaves deeply lobed with many segments, outer ones often broadest, several cm long and up to 1 cm wide; leaves paired at right angles to spreading branches. Flowers pink, mauve or darker purple, with petals to nearly 1 cm, Feb.-Apr. Fruit to 1.5 cm on very short stalks, tapering gently to blunt tip, sometimes curved towards end; strongly nerved and stiff, in two joints, upper one longer.

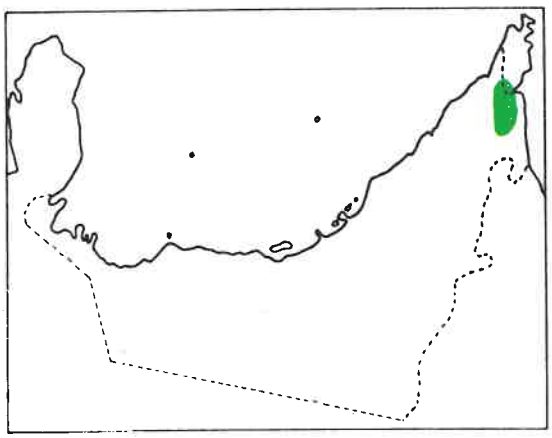
Fairly common in foothills further north; less common in lowland plantations. Often grazed before maturity.

5. Erucaria hispanica (L.) Druce

Smooth, annual to 50 m with tall, slender stems, often very spreading with outer stems slightly drooping. Leaves narrowly-segmented, each lobe thinly-linear or more oblong and broader, especially lower ones. Flowers in terminal groups and scattered singly or in pairs along upper branches; paler than in **E. crassifolia** and with longer petals, veined, Feb.-May. Fruit stiff, narrowly-tapering and straight, to 1.5 cm with short beak, usually pressed close to stem or branch; pod two-jointed, upper one shorter, overall shiny green.

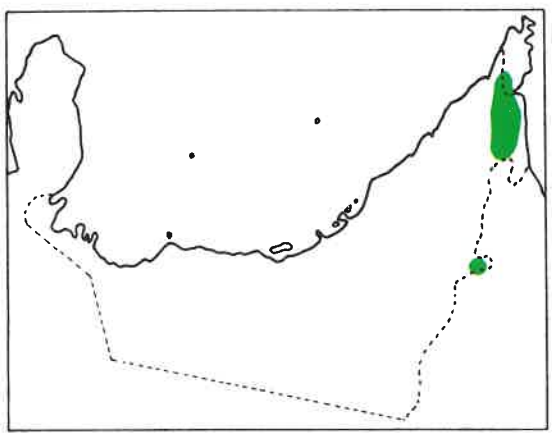
Fairly common in foothills up to 1000 feet and similar habitats to **E. crassifolia.**

Erucaria hispanica *in hills N of Masafi, among scree, 600 m.*



Erratum: This photo shows farsetia linearis, described on p. 63

Farsetia aegyptia *behind Al Ain Zoo, 650 m.*



6. Farsetia aegyptia Turra

Weak-looking perennial to 45 cm, with scarred, woody base and thin ascending stems, grey-white with furry hairs, and few side branches. Leaves narrowly linear to 3 cm, mostly at base, sometimes dense. Flowers on terminal and upper lateral stalks, with pink or yellow-pink petals opening from long thin tube, Mar.-Jun. Pod distinctive, grey-green and flattened, oblong but rounded at ends, to 2.5 cm on short stalk. Seeds brownish, each with broad, translucent wing, compressed in 2 rows either side of white rib.

Fairly common on lower mountain slopes, e.g. base of spurs extending to Al Ain; also around Hatta and Siji; occasional on east coast.

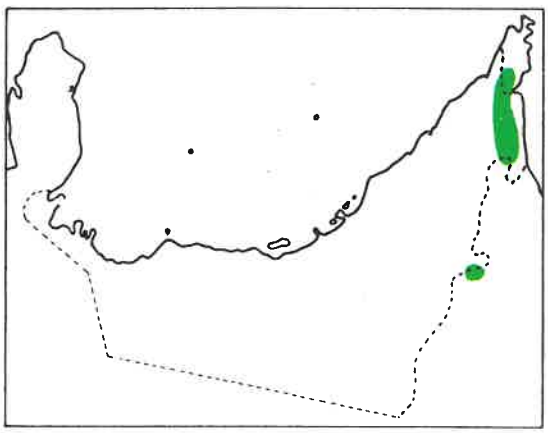
Erratum: This photo shows Farsetia aegyptia, described on p62.

Farsetia linearis *on west flank of Jebel Hafit, 800 m.*

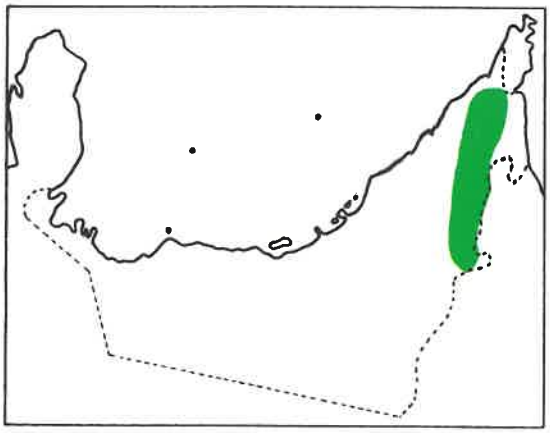
7. Farsetia linearis Decne.

Greyish, slightly furry perennial, woody at base, with several stiffly erect stems to 50 cm. Lower leaves narrowly linear, upper ones more variable in alternate small pairs, sometimes clustered 3-6, without stalks. Flowers dotted close to or at ends of branch tips, with off-white or yellowish petals extending from a 1.5-2 cm thin brownish tube, Jan.-Apr. Pod narrow to 4 cm, containing single row of flat, compressed, winged seeds. Translucent pods remain on plant after seed dispersal.

Commonest of U.A.E. Farsetias, throughout mountain elevations. Often found along wadi banks and periodically half swept away, leaving plants ragged and trailing.



Morettia parviflora *beside Wadi Ham, below Bithnah, Fujeirah, 400 m.*



8. Morettia parviflora Boiss.

Semi-prostrate perennial with woody base and a few low spreading stems, furry white or grey, to 15 cm tall by 25 cm across. Branches thin, fleshy, curving upwards from stems. Leaves on stalks, ovate but pointed, lower ones to 2 cm, upper ones slightly smaller, hairy. Flowers axillary on outer branchlets, usually grouped 2-5, with tiny pink petals surrounded by leaves, Feb.-May. Pod green, curved, barely 1 cm.

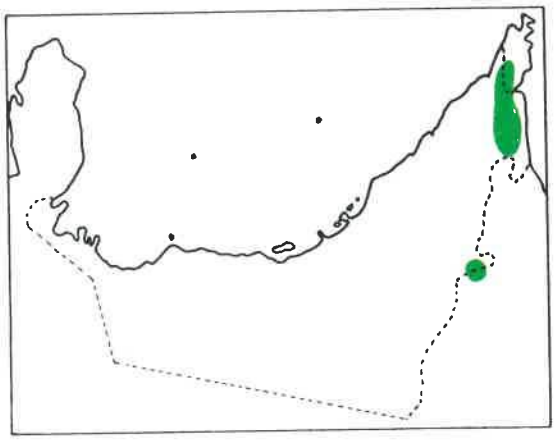
Fairly common on piedmont slopes, along mountain wadi banks and in rocky oases and gardens. Occasional on northern alluvial plains.

9. Physorrhynchus chamaerapistrum (Boiss.) Boiss.

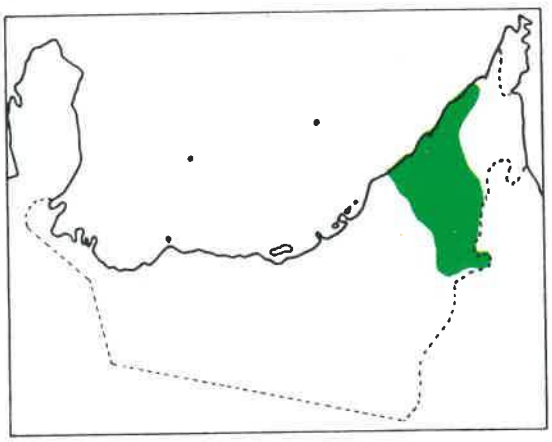
Tough perennial to 2 m with erect woody stems. Basal leaves of young plants cabbage-like, ovate, dark-green and leathery with thick midrib, to 20 x 12 cm. Upper leaves smaller and narrower on long stalks. Upper half of stem almost leafless and green compared with buff lower aspect. Flowers terminal and lateral on upper branches with pink, violet or sometimes white petals, clearly-veined, Feb.-Jul. Pod a 2-valved cone to 1 cm on short stalk. After fruiting leaves are deciduous and branches become brittle, easily breaking off; these dead, straw-coloured branches, still retaining fruits, tend to clog gullies and wadi pools.

Very common in mountains up to about 3000 ft, sometimes hanging from clefts; especially around Hatta and throughout Fujeirah; also in east coast and Ras al Khaimah plantations; present but uncommon on Jebel Hafit.

Physorrhynchus chamaerapistrum *in Wadi Khabb, 45 km NW of Dibba, 1000 m.*



Savigyna parviflora *at Al Samha, Abu Dhabi–Dubai road, 40 m.*



10. Savigyna parviflora (Del.) Webb

Annual herb to 35 cm with 1-2 slender stems dividing into 3-5 thinner branchlets. Leaves mostly basal, similar to oak leaf in shape, 2-3 cm long and half as wide, green to brown, on stalks. Flowers on 3 cm hair-like stalks standing out at right angles from upper branchlets; also terminal. Petals white or pale rose, rarely darker, Jan.-May. Pod a flat, regular, pointed ovoid containing 2 rows of compressed brown seeds. The pod shape and angle makes plant easily recognisable in fruit; empty pods remain on plant after leaves have gone.

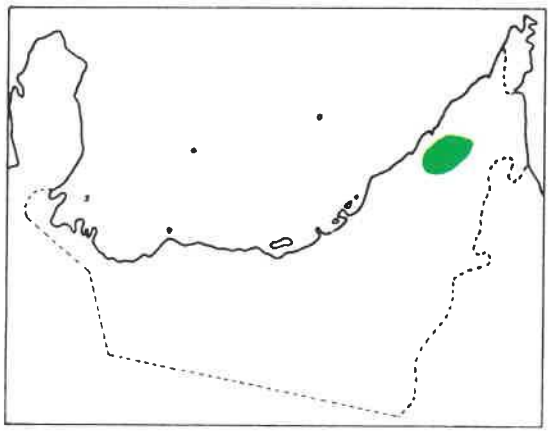
Very common on compact sand along littoral north of Abu Dhabi and Dubai and inland on all alluvial plains; less frequent close to mountains; rare west of Abu Dhabi.

11. Schimpera arabica Hochst. & Steud.

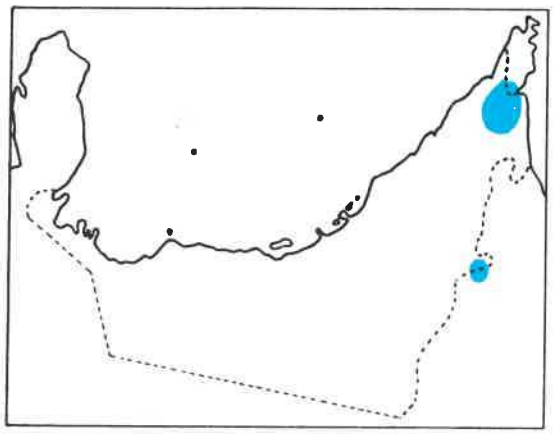
Erect annual, 10-40 cm, yellowish green with fairly thick whitish stem and short, angular, mostly ascending side branches. Basal leaves pinnate, slightly fleshy; upper leaves simple, to 6 cm, gently rounded and tapering at base, without stalks. Also several tiny linear leaflets alternating along flowering branchlets at 1-2 cm intervals. Flowers clustered in dense terminal heads to 1 cm across, with minute yellow petals, Jan.-Apr. Pod tiny with flat beak, barely 1 cm.

Common in hinterland of Ajman and Umm al Qawain on stable sand; usually surrounded by variety of other annual spp.

Schimpera arabica *on Falaj al Moalla road, 20 km E of Tell Abrak, 80 m.*



Sisymbrium erysimoides *at Digdaga, Ras al Khaimah, 100 m.*



12. Sisymbrium erysimoides Desf.

Erect annual to 70 cm, sparingly-branched with slightly zigzag stems, circular in cross-section. Lower leaves to 10 cm with 3-4 separate oblong and pointed lobes, some toothed; upper ones also lobed but smaller, on short stalks. Flowers in dense clusters along branches on leafless stalks, with small yellow petals, Jan.-May. Pod narrow, horizontal or semi-erect to 4 cm, stiff, with short point and separate seed cells. Opened pod remains on plant as leaves die off.

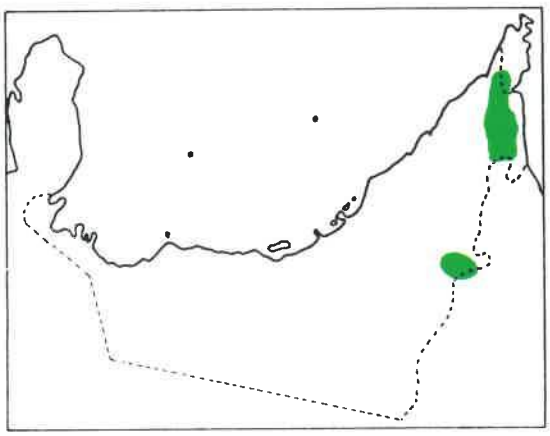
Not common except locally in semi-abandoned plantations and fields in Ras al Khaimah and in shade, e.g. around Digdaga and Khatt.

13. Zilla spinosa (Turra) Prantl

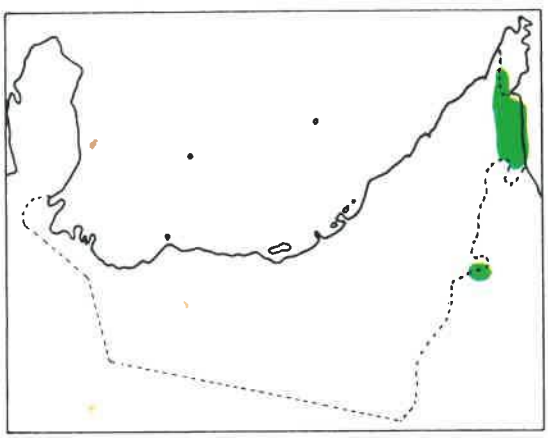
Tough, grey-green perennial, intricately-branched, to 1 m. Herbaceous in first year with large, fleshy lower leaves but later develops into woody shrub with spinescent branches. Upper leaves few, linear, tapering to base, faintly-nerved. Flowers dense along outer branches all over plant with pale lilac or sometimes whitish petals with darker veins, Dec.-Apr. Easily identified by flower shape, spiny appearance and the fruits, hard conical warts about 1 cm long and broad, rather like chick peas, with short, pointed beak, containing 2 seeds.

Fairly common on compact soil in pockets in mountains and plantations on alluvial plains. Abundant in plantations southwest of Al Ain; easily destroyed by waterlogging after rains.

Zilla spinosa *on W outskirts of Al Ain, 550 m.*



Ochradenus arabicus *on East Coast at Khor Fakkan, 80 m.*



Resedaceae — mignonette family

Mostly perennial herbs and shrubs with alternate leaves. Flowers in spikes with numerous stamens. Fruit a berry or capsule. Fairly well-represented, mostly in or near mountains.

1. Ochradenus arabicus Chaudary, Hillcoat & Miller

Large perennial to 1m, densely and intricately-branched, very bushy and spreading. Stems and branches smooth, silvery-green, spinescent, with alternate twigs standing out stiffly at regular angles. Flowers bright yellow on 3-8 cm spikes, terminating most twigs so plant is as much yellow as green when in flower, Jan.-May. Fruit an ovoid green pea-like berry, maturing to waxy white, usually clustered in elongated knots.

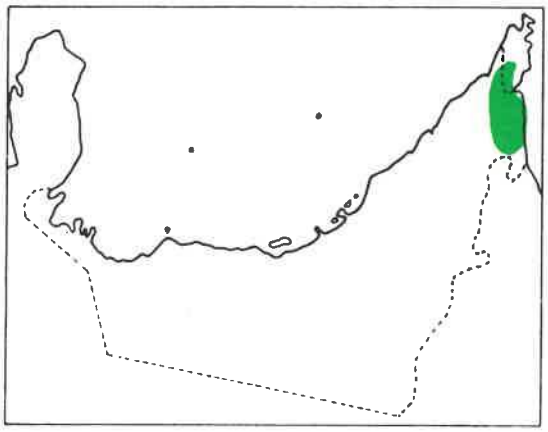
Very common in foothills and alluvial plains of east and north. Rarer in open sand, though recorded in plantations around Al Liwa. Common on slopes overlooking east coast.

2. Ochradenus aucheri Boiss. subsp. **aucheri**

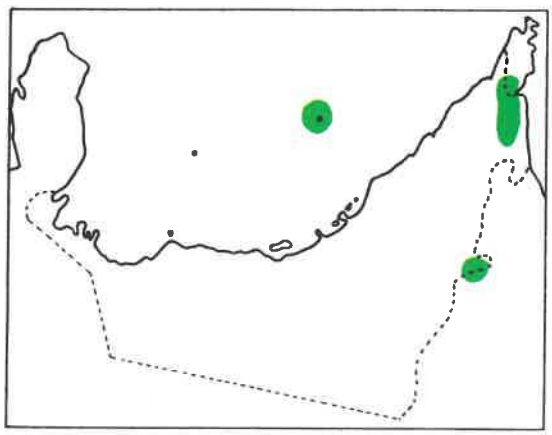
Shrub to 1 m, much-branched from base with numerous ascending stems, thin and whip-like; young ones green, older ones whitish or combination. Virtually leafless. Flowers yellow in dense, narrow and elongated spikes with swollen green bracts and protruding white stamens, Feb.-Jun.; spikes to 20 cm. Fruit a capsule to 1 cm, thin with idented tip, buff when mature, on very short stalk. After flowering, stems become rigid and when shaken around in wind, seeds are cast out.

Very common throughout mountains at lower elevations and on alluvial gravels in northern Emirates. Rapidly colonises new roadsides, e.g. around Hatta and Huweilat.

Ochradenus aucheri *at junction of Hatta–Sohar and Hatta–Huweilat roads, 700 m.*



Reseda aucheri *on Jebel Hafit north summit, 900 m.*



3. Reseda aucheri Boiss.

Annual or biennial herb to 60 cm, usually shorter, branching from woody base into 3-many slightly rough green stems. Lateral branchlets dense near base. Leaves either ovate, to 6 x 4 cm with smooth margins and rounded tips, or linear, to 5 x 1 cm with undulating margins and pointed tips; leaves on long stalks extending into distinct white midrib; upper leaves smaller. Flowers tiny, forming dense, narrow but elongated spikes terminating stems well above leaves; petals white, yellow or combination, Jan.-Jun. Capsule buff, containing many seeds.

Common throughout mountains and on piedmont gravels; also on some offshore islands, e.g. Sir Bu Nuair.

Rosaceae — rose family

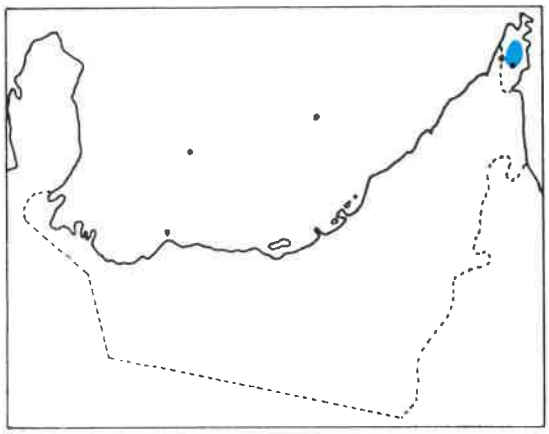
Small family of shrubs or prostrate herbs with alternate leaves. Flowers white, sometimes pink-tipped, with 5 petals and numerous stamens. Shrubs only in mountains, herbs in lowland desert.

1. Amygdalus arabicus Oliv.

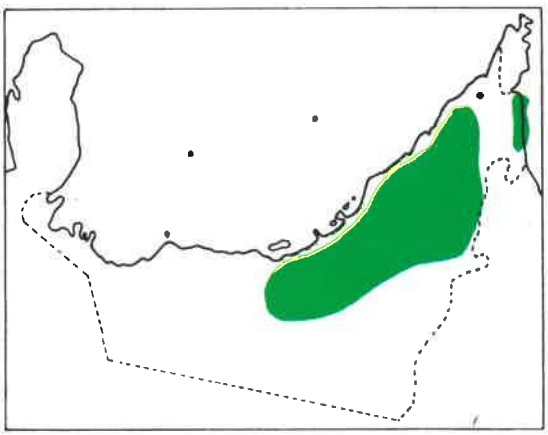
Large perennial to 4 m, with aspect of an overgrown broom bush, often tree-like, with erect, smooth, unbranched twigs. Leaves sparse, to 3 cm, very narrow and pointed, almost without stalks. Flowers solitary along thin, pliant twigs, with free petals and reddish centre, Feb.-Mar. Fruit a small oval nut containing edible almond-like seed about 1 cm long, brown.

Common on summit plateaux in the Ruus al Jibal above 3000 ft; a few above Ash Sha'm in Ras al Khaimah. Once cultivated on mountain farms but now neglected; large tree-like version often with masses of drooping fronds, reminiscent of weeping willow.

Amygdalus arabicus *near Agebat, Ruus al Jibal, 1600 m.*



Neurada procumbens *at Al-Hair, on Al Ain–Dubai road, 350 m.*



2. Neurada procumbens L.

Annual with numerous prostrate branches radiating to 20 cm from root. Leaves to 2.5 cm, relatively thick with clear midrib, wavy margins (semi-lobed) and bluntly-rounded tip on a 1 cm stalk. Flowers to 1 cm diameter, solitary in leaf axils with small petals, Jan.-May. Fruit a distinctive disc 1-1.5 cm across, rough and spiny above, smooth beneath; this usually remains as collar around base stem of new plants.

Very common throughout alluvial plains, along east coast, and in parts of central desert; infrequent along Gulf coast littoral, though recorded west of Jebel Dhanna and occasionally in plantations in Al Liwa.

Leguminosae — pea family

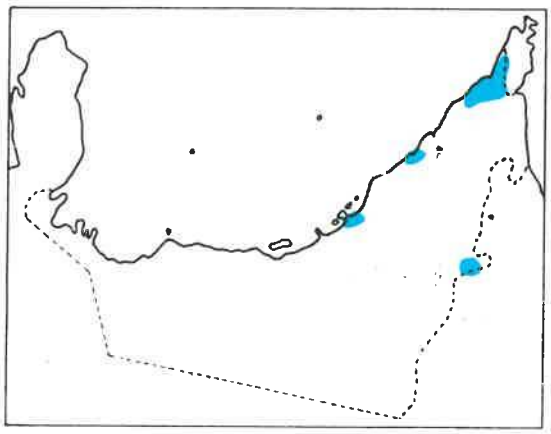
Very large family of trees, shrubs and herbs. Leaves pinnate or trifoliate, sometimes modified into tendrils or spines. Flowers very variable in colour but often with characteristic papilionate petal arrangement with one upright standard, two side wings and a two-partite fused keel. Fruit a many-seeded pod, mostly elongated. Well-represented except in western dunes, where rare.

1. Acacia arabica (Lam.) Willd.

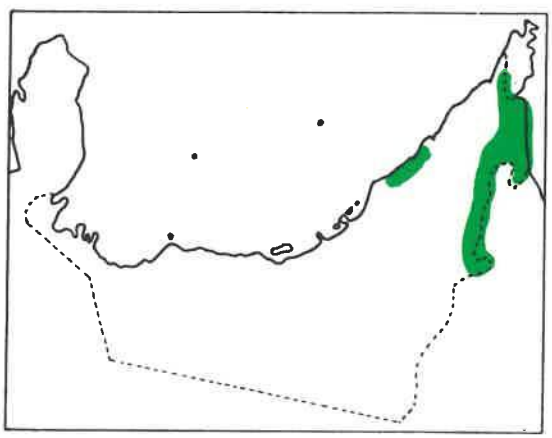
Tree to 8 m with dark, grooved bark, branching 1-2 m above ground. Branches bear rigid spines in divergent pairs, each to 6 cm, at base of leaf stalks. Leaves numerous, with 10-20 pairs of leaflets, each to 1 cm with rounded tip. Many spherical flower-heads to 1.5 cm diameter with bright yellow furry florets, Nov.-Apr. Pod usually straight, sometimes a little twisted, with many regular rounded lobes, to 12 cm, grey-green, constricting seeds.

Common introduced sp. to afforested areas and plantation borders, as windbreak and ornamental. In natural state on alluvium north of Ras al Khaimah town, usually mixed with **A. tortilis.**

Acacia arabica in plantation, Abu Dhabi Island, 10 m.



Acacia tortilis near Sueyhan, 300 m.



2. Acacia tortilis (Forssk.) Hayne

Shrub or small tree to 6 m, often branching from base. In desert areas sand often forms hummocks that conceal base, leaving separate ascending stems. In outline a characteristic umbrella profile with flat top. Young branches reddish, often oozing thick tarry substance which stains lower parts and ground beneath. Spines in pairs, one usually longer, white or dark-tipped, to 6 cm, very hard. Leaflets in 6-8 pairs, slightly hairy. Flower-heads on 2-4 cm leafless stalks, spherical, 1 cm across with yellow florets, Mar.-Jul. Pod to 8 cms, reddish-brown, twisted into 2-3 coils, constricting seeds.

Commonest Acacia in U.A.E., found throughout except western dunes. Rare along coastlines, but occurs as scrub near Jebel Ali and in Ras al Khaimah; on mountain summits around Hatta and Masafi. In open desert often very shrubby. Very large stands on Dibba plain.

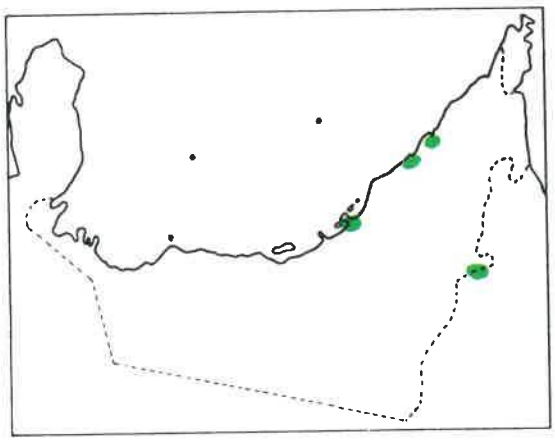
beware confusion w/ A. ehrenbergiana

3. Alhagi maurorum Medic.

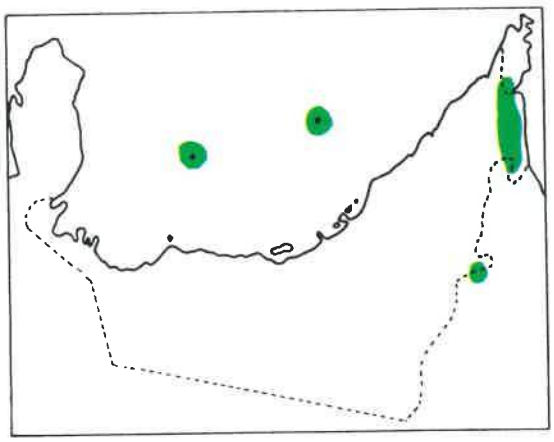
Dense, intricately-branched perennial with rigid spiny twigs, to 40 cm, spreading. Leaves to 1 cm, linear with rounded tips and clear midrib; a leaf present at base of each side twig. Leaves deciduous when in fruit. Flowers solitary in axils and along twigs with deep red papilionate petals exceeding brown scales, Apr.-Jul. Pod 2-3 cm, straight or curved, dark brown, constricting 3-6 smooth brown seeds. After fruiting the plant dies back an overall grey-black colour and is reduced to rootstock until following year's bright green growth.

Common in disturbed urban sites especially along Arabian Gulf coast, less frequent inland. Often dominant in summer.

Alhagi maurorum, *Abu Dhabi town, 10 m.*



Argyrolobium roseum *below west flank of Jebel Hafit, 350 m.*



4. Argyrolobium roseum (Camb.) Jaub. & Spach

Small, prostrate perennial herb to 15 cm, with thin woody base branching into a few slightly hairy trailing stems, wire-like, sometimes reddish. Leaves trifoliate in axils of dividing stems, each leaflet a teardrop shape on a stalk, about 1 cm, usually dark green. Flowers grouped 2-5 on longer stalks with or without leaves, surrounded by green, pointed bracts. Petals white, sometimes pink-tinged, very small, lowest ones with distinct dark veins, Feb-May. Pods mostly in pairs, horizontal or erect to 2 cm, brown with tiny beak and 8-10 constricted seeds. Bracts remain at base of pod.

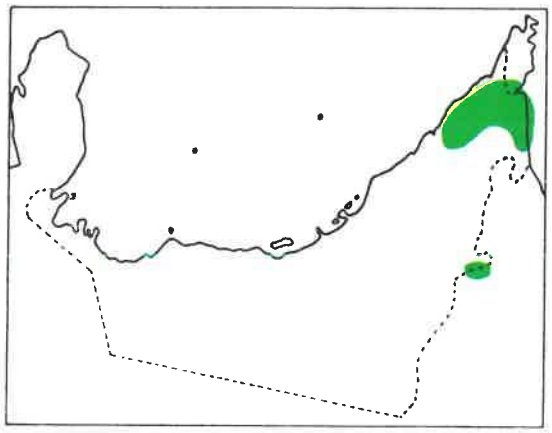
Common at low to mid-mountain elevations; also on offshore islands of Qarneyn and Sir Bu Nuair.

5. Astragalus annularis Forssk.

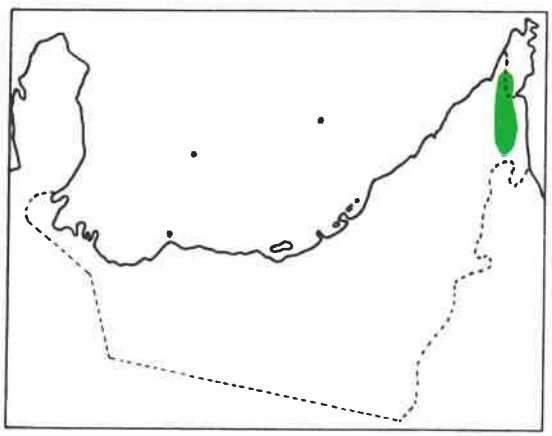
Small, semi-prostrate annual to 20 cm, grey-green with thin cover of furry hairs, often with short, erect central stem and 2 opposite prostrate ones. Leaflets in 2-4 pairs, each leaflet to 1.5 cm, pear-shaped or more rounded. Flowers solitary, grouped 2-4 on long stalks. Calyx black and white hairy; petals pink or purple, Feb.-May. Pod hairy, like erect semicircle, 3-6 cm long, mottled with red or darker spots and tiny streaks on straw background. The only Astragalus with such pod markings.

Fairly common in inland desert areas between Ajman and Ras al Khaimah; also at west foot of Jebel Hafit and on slopes overlooking east coast.

Astragalus annularis *on coast near Jezirat al Hamra, Ras al Khaimah, 20 m.*



Astragalus fasciculifolius *in Wadi Uyaynat, 400 m.*



6. Astragalus fasciculifolius Boiss.

Tough, spiny perennial to 80 cm, branching from base and above. Older bark grey, younger branches white, all covered with alternate spines to 5 cm. Young shoots bear oblong or pear-shaped leaves to 1 cm, tapering at base; usually 2 pairs of leaflets on upper side of young spines. Flowers solitary on short stalks with white, pink-tinged papilionate petals; sometimes quite red in Fujeirah foot-hills, Jan.-Apr. After flowering the inflated calyx has aspect of a small pink or white membranous gooseberry. Pod less ovoid, yellowish and hairy with short pointed beak.

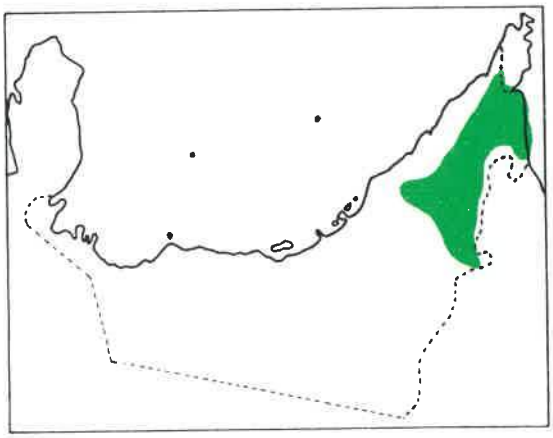
Common throughout Ras al Khaimah and Fujeirah mountains but rare further south; occasional around Hatta.

7. Cassia italica (Mill.) F.W. Andr.

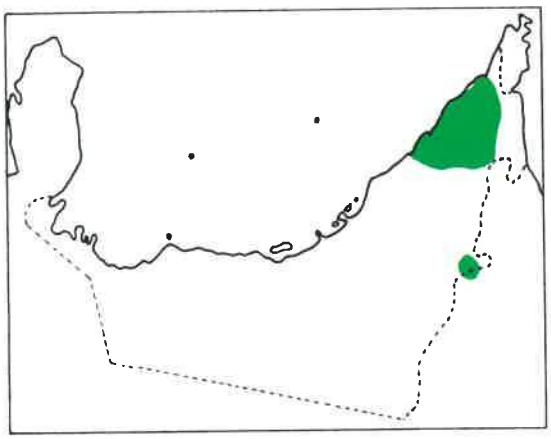
Perennial herb to 50 cm with young branches soft and green, older ones hard and buff, often quite bushy. Leaflets in 5-6 pairs with no terminal one, elliptical, tapering at base, 1 cm with midrib and veins, overall glossy green. Flowers axillary and terminal, clustered with bright yellow, large papilionate petals marked with violet veins, Feb.-Oct., very variable. Easily recognised by flat, curved pods, broadly rounded at both ends, roughly 4-7 x 2-4 cm, soft and green maturing brittle grey-black, with crested midrib and transverse veins. Seeds constricted.

Very common throughout foothills and locally on alluvial plains and along east coast. Not found south of a line between Dubai and Al Ain, except very rarely in plantations.

Cassia italica *at Hili, Al Ain, 350 m.*



Crotalaria aegyptiaca *on sand in foothills at Ghayl, Ras al Khaimah, 250 m.*



8. Crotalaria aegyptiaca Benth.

Erect perennial shrub to 1 m with undivided or branched stems, grey-green, slightly hairy. Branches stiffly ascending or short and pointed. Leaves absent or much reduced below. Flowers single, dotted at regular 1-2 cm intervals along upper branches on very short stalks, with distinct brown calyx; petals vary from yellow to light mauve, usually with reddish veins, Feb.-May. Pod ovoid to 5mm with a curved, pointed beak as long again, brown or grey.

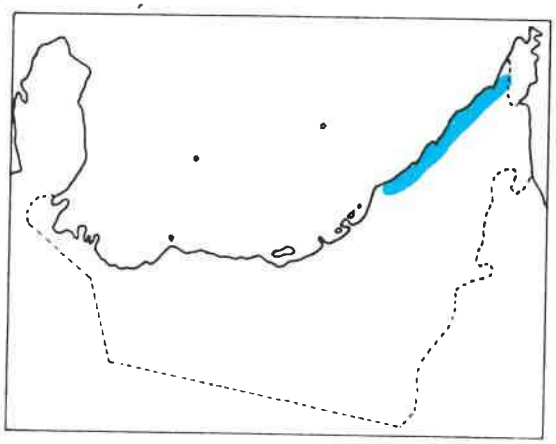
Common in deserts from Dubai to Ras al Khaimah and across the country to the mountains. Less common further south apart from pockets around Jebel Ali and Al Ain. Last community on Abu Dhabi Island destroyed by new housing construction in 1983.

9. Crotalaria persica (Burm.f.) Merrill

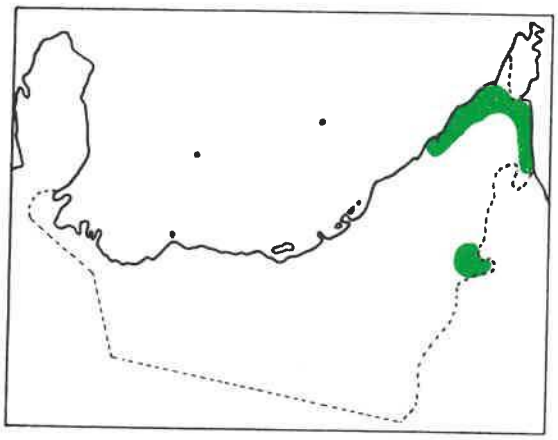
Small, dark perennial to 40 cm, branching from base into short, interwoven angular twigs, often roughly spinescent. Main stems brown or green with mottled streaks; young branchlets green to 8 cm. Leaves absent and plant may appear dead. Flowers single, dotted along upper twigs, less numerous than on **C.aegyptiaca,** with darker petals, often deep red or orange, Feb.-May. Pod very similar to **C.aegyptiaca.**

Occasional between Abu Dhabi and Ras al Khaimah in sand, never far inland; locally very common around Jebel Ali and Jumeirah.

Crotalaria persica *at Jumeirah, Dubai 20 m.*



Hippocrepis bicontorta *along ancient beach line, Ajman, 25 m.*



10. Hippocrepis bicontorta Loisel.

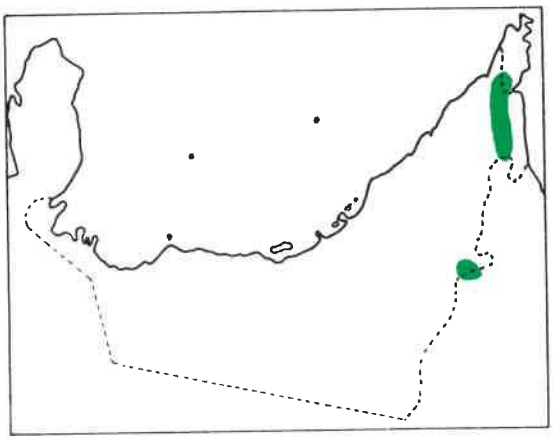
Semi-prostrate annual herb to 15 cm, branching from base into slender green stems, slightly zigzag, trailing, of unequal length. Leaflets in 4-6 pairs, lower stalks longest; each leaflet to 1.5 cm, rounded, with terminal cleft. Flowers terminal and axillary on long stalks, grouped 2-5; petals papilionate, bright yellow to 1 cm, Feb.-May. After flowering stalk lengthens. Pod distinctively coiled into 2-3 rings with successive horseshoe-shaped indentations, each less than 5mm across, linked by tiny straight sections, light brown.

Very common inland between Ajman and Ras al Khaimah; in gravelly plantations around Al Ain and in lower mountains along east coast. Apparently does not occur south of Jebel Ali.

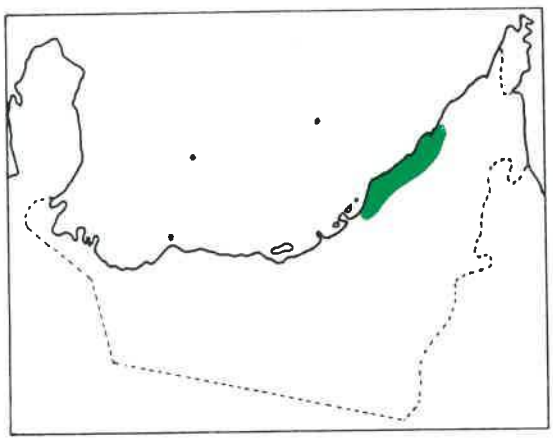
11. Hippocrepis constricta Kunze

Similar to **H. bicontorta** but mostly prostrate. Pods to 3 cm in opposite pairs, straight with several linked horseshoe segments.

Hippocrepis constricta *near Ain al Faidah, Al Ain, 350 m.*



Indigofera argentea *near Jebel Ali, 30 m.*



12. Indigofera argentea L.

Tough desert shrub to 80 cm, overall greyish, branching from base and covered with small pinnate leaves. Branches spread laterally and plant can measure 2m across. Leaflets in 4-6 pairs plus a terminal one, rounded, often dusted with sand particles; usually folded up from midrib. Flowers many, papilionate, blood-red, in short axillary clusters and solitary, about same size as leaflets, Feb.-Jul. Pods in 3-5 opposite pairs in flat plane on thin stalk, dark brown, to 2.5 cm, bent back towards twig; seeds 3-4, constricted.

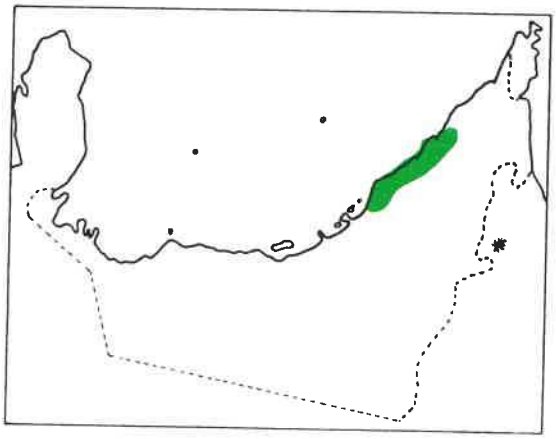
Extremely common in coastal desert north of Abu Dhabi town to Dubai border, especially in deeper sand; also in desert east of Abu Dhabi airport; less abundant further north, always among low dunes.

13. Indigofera articulata Gouan

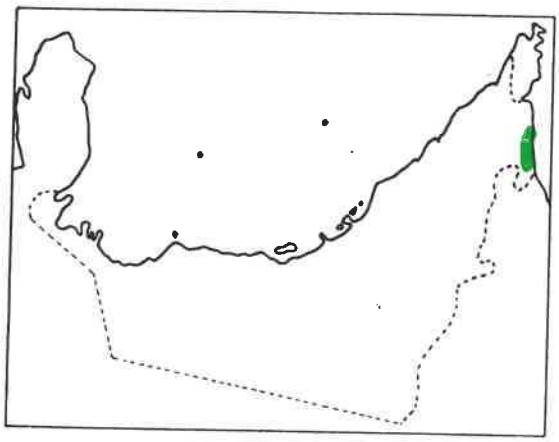
Tough, silvery-grey undershrub to 60 cm, usually shorter and stunted because of grazing, much-branched, angular, rigid. Side branches may be spiny at tips. Stems and branches light grey-green, younger ones more silvery. Leaflets in 2-4 pairs, each 2-3 mm, rounded. Flowers solitary in upper axils with tiny blood-red papilionate petals, Nov.-May. Pods clustered 4-12, often on spiny stalks; pods hang stiffly towards their branch, longer and smoother than in **I. argentea,** with short beaks.

Very common in desert foreland north of Abu Dhabi, often closely associated with **I. argentea,** usually in deep sand. Overgrazed plants very spiny.

Indigofera articulata *near Jebel Ali, 30 m.*



Indigofera oblongifolia *in Lulayah Plantation, East Coast, 30 m.*



14. Indigofera oblongifolia Forssk.

Perennial shrub to 1.25 m, very dense and straggling, spreading 2-4m. Stems much-branched, woody, unarmed; older ones brown and rough, younger ones silky smooth, grey but rigid, tending to zigzag slightly; main branches rounded, young ones often flattened. Leaves usually in groups of 3, lanceolate, 2 x 1 cm or smaller, on short stalks; some much thinner but all with prominent midrib, with upward folding blade. Flowers blood-red or paler in narrow terminal 3-6 cm spikes; flower stalks usually subtended by 3 leaflets. Flowering Jan.-May. Pod narrow, woody.

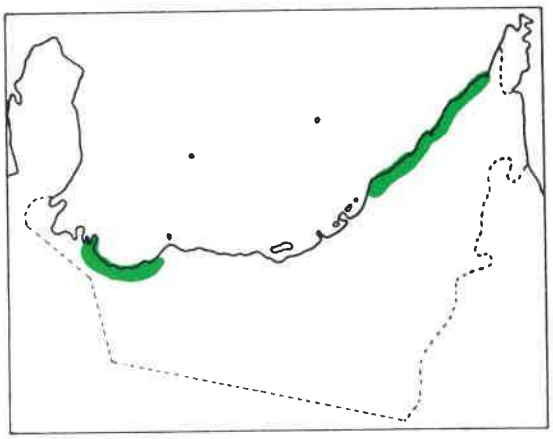
Common fringing plantations and oases along east coast where it rapidly colonises neglected fields.

15. Lotus garcinii DC.

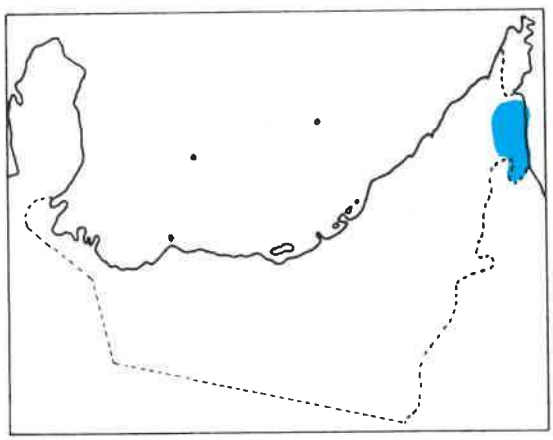
Perennial shrublet to 50 cm with slender, tapering stems and branches, ascending and often bending in towards centre, occasionally overlapping to ground, grey-green and slightly furry. Leaflets minute, paired at regular 1.5 to 2.5 cm intervals. Flowers numerous, small, without stalks, usually solitary in leaf axils, petals white tinged with pink or brown, Mar.-Jul. Pod to 1 cm with short, stubby beak, dark brown.

Very common in coastal hollows between Abu Dhabi and Ras al Khaimah; less frequent further west but pockets occur near Tarif and west of Jebel Dhanna; rare on east coast.

Lotus garcinii *near Muraykhah, Abu Dhabi–Dubai road, 40 m.*



Lotus schimperi *on Gharab Island, Abu Dhabi, 5 m.*



16. Lotus glinoides Del. (syn **L. schimperi** Steud.)

Small prostrate annual or biennial with many trailing stems extending to 40 cm. Stems and short side branches yellow-green, thin, curving slightly between nodes. Leaves trifoliate, each dark green leaflet to 1 cm; occasionally opposite pairs. Flowers without stalks, 2-3 together in leaf axils with tiny white petals mostly hidden by persistent green calyx, Feb.-Apr. Pods clustered densely along branches, light brown, to 1 cm, cylindrical with constricted seeds. When mature, pod splits lengthwise and each half twists on itself.

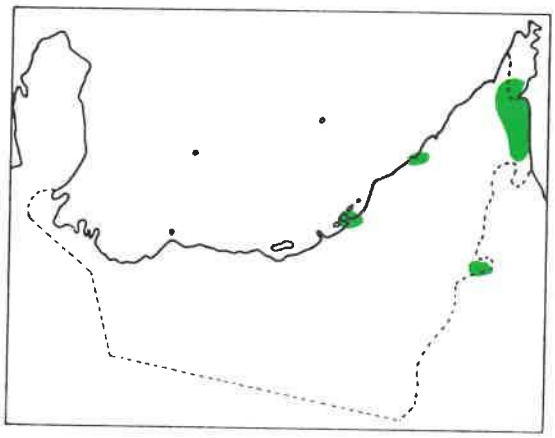
Less common than **L. garcinii,** in disturbed and well-irrigated parks and gardens, mostly in lower mountain regions.

17. Medicago laciniata (L.) Mill.

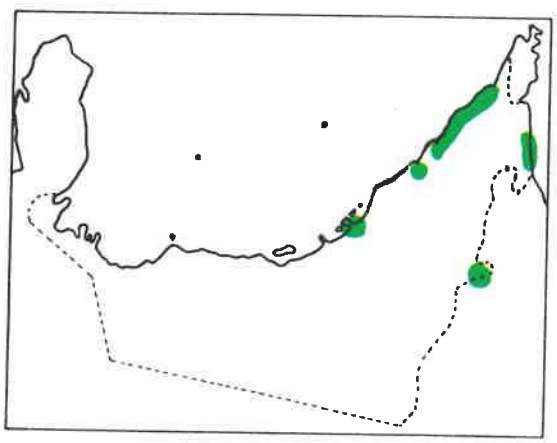
Small, smooth annual to 30 cm but usually shorter, semi-ascending or prostrate. Leaves trifoliate, tips finely serrated. Flower stalks very thin and hairy, to 2.5 cm, bearing up to 3 flowers with tiny but bright papilionate yellow petals, Dec.-Apr. Pod roughly spherical in 2-3 spiral coils, densely covered with minute thin prickles that intermesh with those of adjoining pods; barely 1 cm across, light green to dark brown.

Common in marshy ground and shady parks and plantations; also reduced, prostrate form at all mountain elevations, especially north of Masafi. Larger specimens may support themselves on adjacent vegetation.

Medicago laciniata *in Eastern Lagoon, Abu Dhabi Island, 10 m.*



Melilotus indicus *in plantation at Sueyhan, 100 m.*



18. Melilotus indicus (L.) All.

Erect, smooth, often much-branched bushy annual to 50 cm with green young stems and buff older ones. Leaves trifoliate; leaflets elongated, rounded, toothed along outer half, to 3 cm. Lower leaf stalks to 4 cm, upper ones shorter. Leaves of young plants bear vivid brown or red midrib on upper side. Flowers clustered spike-like on short equal stems and branches, with pale yellow or white petals, sometimes a combination; spikes to 5 cm but individual florets minute, Jan.-May. Pod like tiny wrinkled nut. After fruiting, plant dies back buff all over but often remains rigid for several weeks before withering completely.

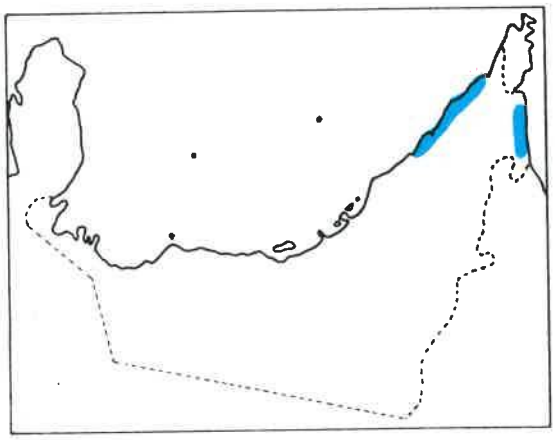
Very common weed in gardens, parks and plantations at all lowland elevations.

19. Ononis serrata Forssk.

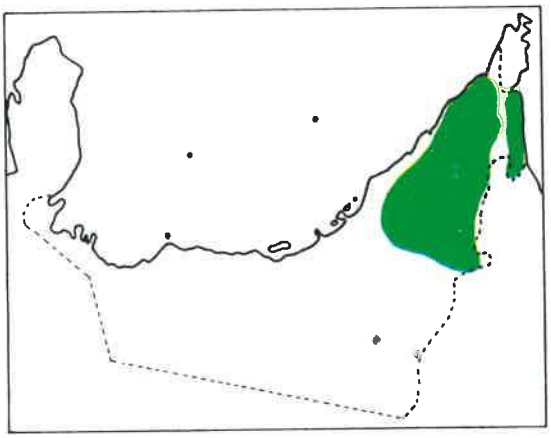
Small, semi-prostrate annual to 20 cm, sometimes with 2-3 ascending stems, sticky and usually covered with sand grains. Leaves all dark green, trifoliate on short stalks, oblong from tapering base, with veins terminating in serrated margins, 1-1.5 cm; terminal leaflets a little longer. Flowers in dense terminal clusters with pink or bluish petals partly enclosed by greyish calyx, Jan.-Apr. Pod to 5mm, oblong, with tiny brown seeds.

Fairly common along Ajman to Ras al Khaimah littoral, on lower slopes along east coast and fringing alluvial plains; also in lower wadis and associated terrain throughout Fujeirah.

Ononis serrata *along Umm al Qawain littoral, N of Ad-Door, 30m.*



Prosopis cinerea *on Madam Plain at Mileiha, 420 m.*



20. Prosopis cinerea (L.) Druce

Largest desert tree of region, to 12 m, with thick, striated trunk and smooth branches, some with prickles. Leaves bipinnate in 10-16 pairs without terminal leaflet, on long slender stalks. Flowers in narrow drooping spikes to 5 cm, axillary and terminal, pale yellow, Feb.-May. Pod to 20 cm and about 1 cm thick, roughly cylindrical, sometimes curved, pointed, yellow to dark brown. Sp. easily recognised by its single stem, dense foliage with drooping outer branches and rounded outline; often with umbrella profile as it is extensively browsed by camels to limit of their reach.

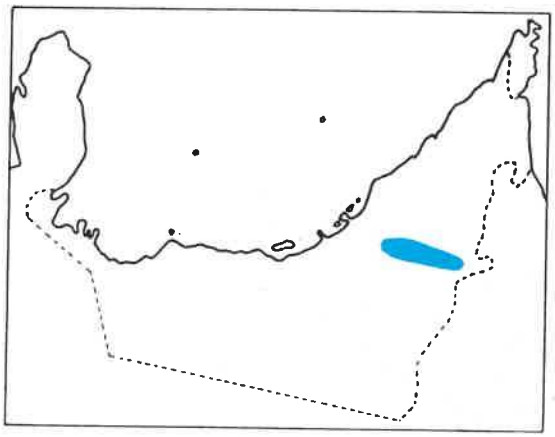
Common singly and in small clumps in central desert sands and mountain foreland, often associated with Acacia sp. Single trees noticeable along Abu Dhabi — Al Ain road, clumps and relict forest along Jebel Ali — Madam road.

21. Prosopis farcta (Banks & Sol.) MacBride

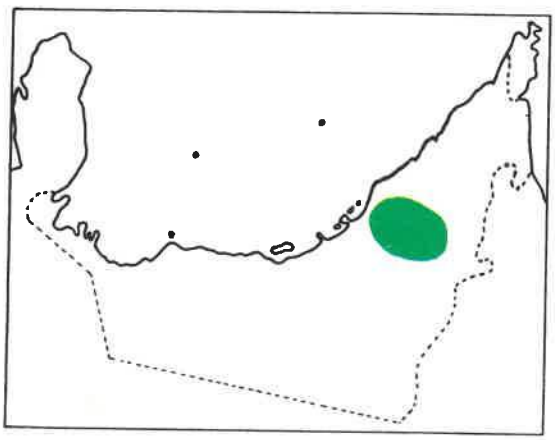
Straggling perennial to 50 cm with many intricate, stiff spiny branches; older ones smooth and rigid with greyish bark, younger ones slender; whitish, somewhat hairy and with many scattered 5mm thorns, single and paired. Leaflets tiny in 10-12 pairs. Flowers in spikes to 5 cm with waxy-white or yellowish florets, Apr.-Jul. Pod a distinctive black kidney shape, roughly cylindrical, about 4 x 2 cm with groove along either side. Seeds 4, like apple pips.

Uncommon, in plantations along Abu Dhabi-Al Ain road, e.g. Al Khazna; occasionally similar habitats in Al Ain.

Prosopis farcta *in farm at Al-Khazna, Abu Dhabi–Al Ain road, 60 m.*



Rhynchosia schimperi *Jebel Ali, 45 m.*



22. Rhynchosia schimperi Hochst. ex Boiss.

Perennial shrub to 50 cm with long trailing side branches. Stem and branches furry grey. Leaves trifoliate on very short stalks with rounded or heart-shaped leaflets to 1 cm diameter. Flowers solitary, axillary on side branches, one side only with yellow petals, Apr.-Aug. Pod oblong to 2.5 cm, tapering and curved at base with short, curved beak, flattish, furry, grey-green and mottled with black. 2 seeds, spherical, black.

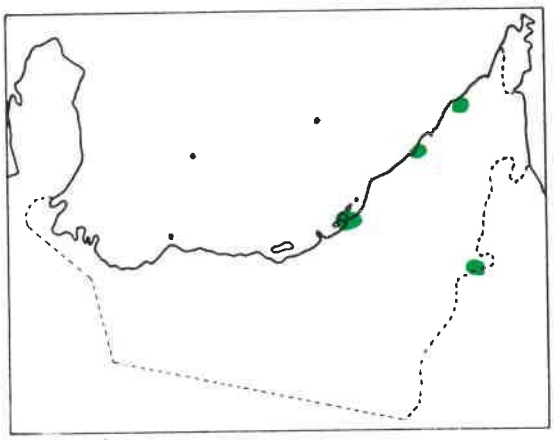
Common in Jebel Ali hinterland and across central desert towards Shwayb; will grow much larger in protected areas.

23. Scorpiurus muricatus L.

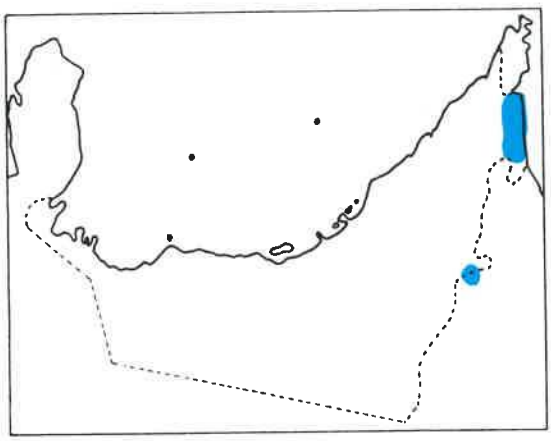
Attractive annual herb to 25 cm, erect or sprawling with angular stems often greyish below. Leaves to 8 cm, 2 cm at widest, gradually tapering to a 3 cm pseudo-stalk; pointed and bright green with 4-5 linear veins. Flower stalks exceed leaves. Petals 4 in flat cruciform arrangement, yellow and red-tinged. Pod distinctive, intricately-coiled with conspicuous longitudinal ribs and minute recurved prickles; seeds constricted.

Fairly common in urban parks and gardens; not found in open desert or mountains.

Scorpiurus muricatus *in park, Abu Dhabi town, 10 m.*



Taverniera cuneifolia *between Hatta and Masfut, 600 m.*



24. Taverniera cuneifolia (Roth) Arn.

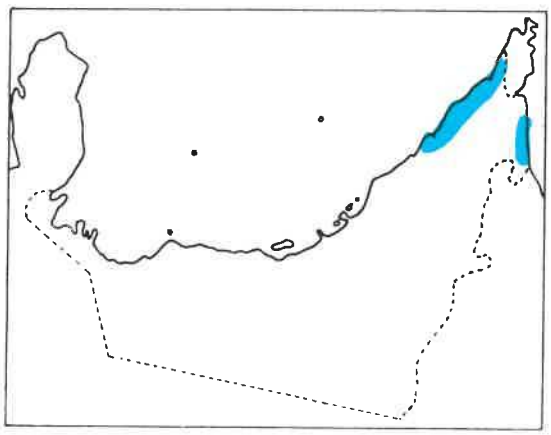
Perennial shrub to 70 cm with erect slender stems, varying in colour from grey-green to almost yellow. Leaves rounded with midrib extended to form very small point, darker beneath, to 1 cm in diameter but usually smaller; some leaves trifoliate. Flowers axillary on 1-3 cm stalks with showy pink and white petals and dark veins, Mar.-Jun. Pod compressed, bristly, in two segments, brown.

Fairly common in mountains, especially from Hatta north; also on Jebel Hafit and overlooking east coast mostly north of Khor Fakkan.

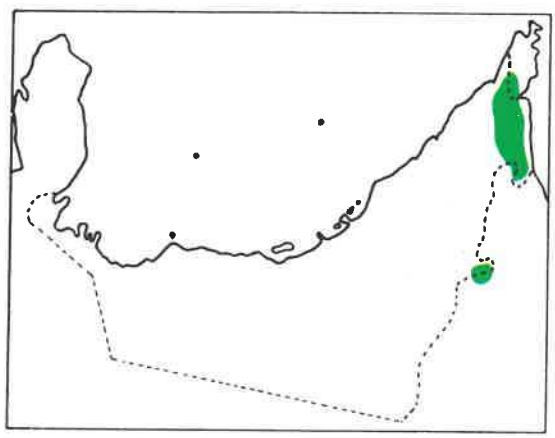
25. Taverniera spartea (Burm.f.) DC.

Similar to **T. cuneifolia** but to 1 m, fewer leaves, upper ones very reduced. Flowers with bluish tinge, small. Inland of Jebel Ali; occasional along Ras al Khaimah coast.

Taverniera spartea *at Badiyah, East Coast, 30 m.*



Tephrosia apollinea *on Jebel Mileiha, Sharjah, 450 m.*



26. Tephrosia apollinea (Del.) DC.

Very bushy, densely leafy erect perennial to 70 cm with tough woody rootstock. Lateral branches extending to 40 cm. Leaflets in 2-3 pairs plus terminal one, oblong but gently rounded to 4 cm on long stalks; each leaflet with clear midrib and parallel side veins; leaflets sometimes bent along midrib, margins up. Flowers in elongated terminal clusters with many deep red or purple papilionate petals, variable Dec.-Jun. and even beyond. Pod straight to 6 cm, thin and flattened, curved at tip, slightly compressed between seeds, maturing to dark brown.

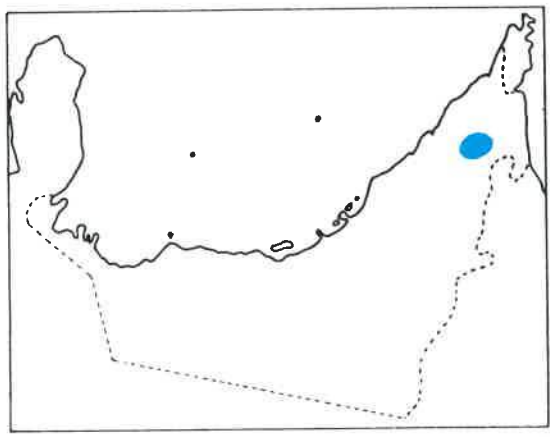
Extremely common in all foothills to 3000 ft plus, along mountain wadis and on rough alluvial plains on both sides of Hajjar Mountains. Locally dominant.

27. Tephrosia nubica (Boiss.) Baker

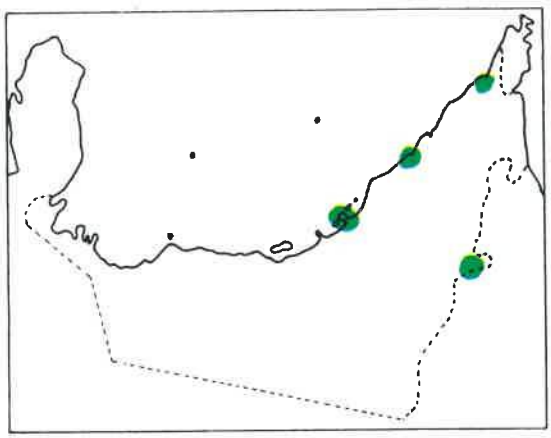
Erect, compact perennial to 1.25 cm, much-branched with pale slightly hairy stems and leaf stalks. Leaves trifoliate, comprising an equal pair and a longer central one 2-3mm further along stalk, linear with rounded margins, often folded up at midrib, to 5 cm. Flowers clustered on outer leafless branches with showy pink, veined petals to 1 cm, Jan.-May. Pod to 1.5 cm, densely but softly hairy, yellowish-green, flattened, with short terminal thread.

Uncommon, on alluvial plains usually away from mountains. Taller than **T. apollinea** and with different pod shape. May be confused with Taverniera spp.

Tephrosia nubica *beside road at Manama, Ras al Khaimah, 400 m.*



Trifolium resupinatum *in park, Abu Dhabi town, 10 m.*



28. Trifolium resupinatum L.

Semi-erect or prostrate trailing annual to 20 cm. Branches many, smooth, often weakly ascending. Lower leaves on longer stalks than upper ones. Leaves trifoliate, about 1.5 cm across, rounded and serrated at apex with clear midrib; leaflets attractive to leaf-cutting ants which eat out neat semicircles. Flower-heads clover-like with pink or lilac (not blue) petals, Mar.-May, after which head becomes globular in fruit. Pod minute, ovoid, enclosed by inflated calyx.

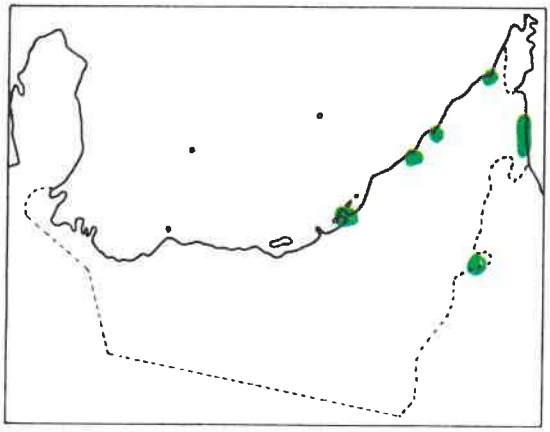
Fairly common weed of gardens, parks and plantations at lower levels.

29. Trigonella hamosa L.

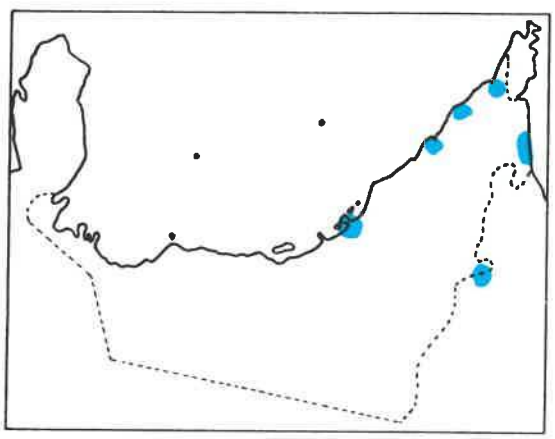
Small annual herb to 15 cm or taller when supported by surrounding vegetation, otherwise prostrate, branching from base. Leaves trifoliate; leaflets elliptical with narrow base and serrated apex where narrowly-parallel veins from midrib meet margin; apex flattened. Central leaflet largest, to 1.5 x 1 cm. Flowers numerous, clustered 6-12 on long stalks with bright yellow petals; several florets drooping, others erect, Feb.-Apr. Pod elongated, slightly curved with terminal hook, to 2 cm; pods opposite in distinctive groups of 6-12 in flat plane.

Very common in gardens, parks and plantations; not in mountains.

Trigonella hamosa, *grounds of Jebel Ali Hotel, 30 m.*



Vicia monantha *in camel stable, Abu Dhabi town, 10 m.*



30. Vicia monantha Retz.

Semi-ascending annual vetch to 30 cm with several lower branches and tendrils. Stems weak with small ridges, green or yellowish. Leaflets in 4-7 pairs on stalk terminating in tendril, sometimes branched; leaflets linear-oblong with blunt apices and thin point, to 2.5 cm. Flowers axillary on stalks in groups of 2-4 with violet or purple petals, Feb.-Apr. Pod similar to that of sweet pea but flattened and yellowish, to 2.5 cm on short stalk; with 4-6 spherical seeds.

Not common; in urban parks and gardens; occasionally in desert north and east of Ajman; also recorded in remote fields above 4000 ft in Ruus al Jibal.

Moringaceae — moringa family

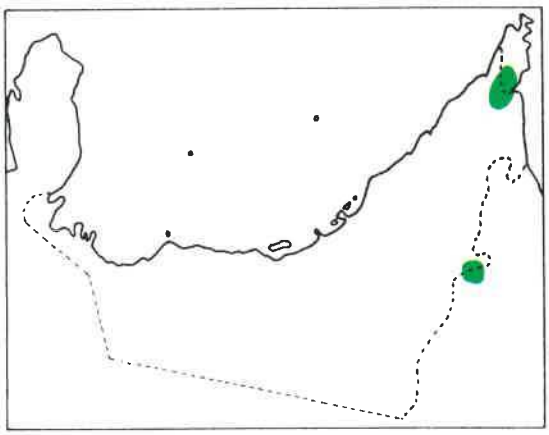
Single sp. in U.A.E. Deciduous tree with pale bark and drooping branches. Leaves alternate, divided into 2-3 pairs leaflets. Flowers in conspicuous panicles. Fruit a very long pod, grey or brown, roughly triangular in cross-section. Mountains only.

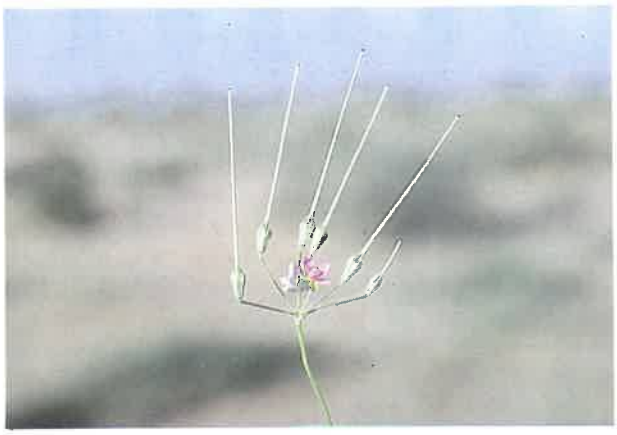
1. Moringa peregrina (Forssk.) Fiori

Tree to 12m but often shorter, with numerous branches and willowy appearance. Leaves few, tiny, oblong on outer branches which droop in needle-like fronds. Flowers tend to appear before leaves, clustered on long axillary stalks, with white petals heavily tinged with purple near centre, Feb.-Apr. Woody pod to 25 cm, striated but fairly smooth, containing up to 20 large nut-like seeds, white, each the size of a small bean.

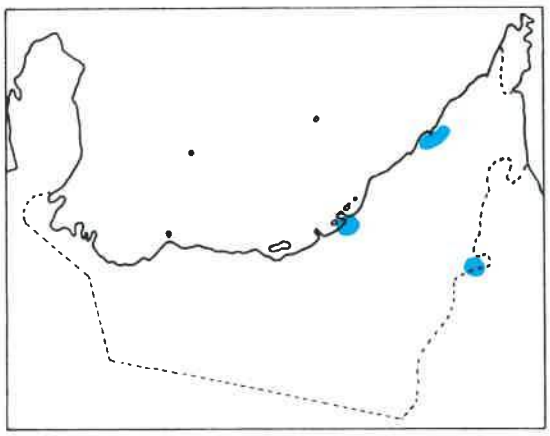
Very common at low to intermediate elevations especially in Ruus al Jibal where it is dominant tree on steep slopes; also scattered throughout Fujeirah at higher altitudes, and on upper flanks of Jebel Hafit.

Moringa peregrina *in Wadi Khabb, 30 km NW of Dibba, 500 m.*





Erodium malacoides *at Al Saad, 25 km W of Al Ain, 270 m.*



Geraniaceae — geranium family

Small herbs with reddish roots and lobed or divided leaves. Flowers showy with 5 free petals, mostly lilac or yellow. Several spp. with fruit extending to pointed beak.

1. Erodium malacoides (L.) L'Hérit.

Green, hairy annual to 20 cm with short branches. Main leaves from basal rosette on long stalks. Leaves very varied, from ovate and smooth-margined to lobed and serrated; upper ones more deeply-lobed. Flowers in terminal rays of 4-6 with lilac petals partly enclosed by pointed sepals, Feb.-Apr. Fruit soft, green to brown, with spirally-twisted 5-6 cm needle-like beak.

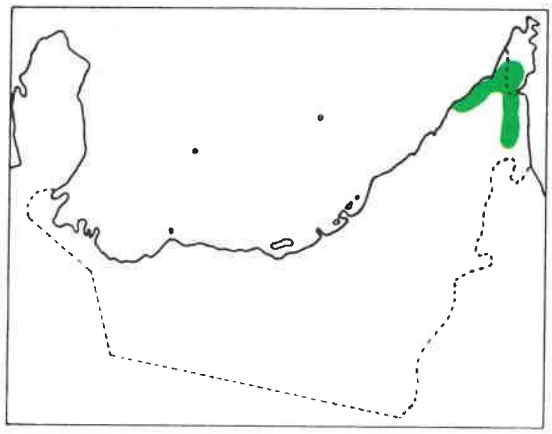
Mostly in irrigated urban areas, especially on well-manured waste ground.

2. Erodium neuradifolium Del. ex Godr.

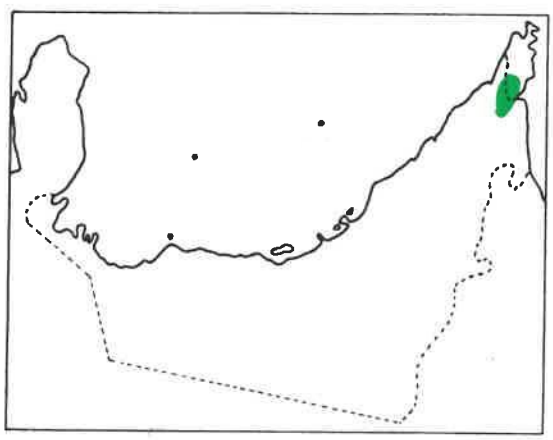
Erect annual to 25 cm, usually with one main stem and several long-stalked leaves with aspect of side branches. Stem slightly hairy with thinly-grooved internodes. Leaves roughly palmate with large, bluntly-pointed terminal lobes and serrated edges, to 6 cm on thin stalks which are longer than leaves; in pairs at nodes, where there is a thickening of the stem. Flowers in small rays on long stalks from upper nodes, with lilac petals, Jan.-Apr. Fruit extends to needle-like 2-6 cm beak. Occ'l red leaves

Common in mountains at all elevations; occasional along east coast slopes, and along desert littoral between Ajman and Ras al Khaimah. In some years profuse in mountains.

***Erodium neuradifolium** in Wadi Khabb, Ruus al Jibal, 500 m.*



***Geranium mascatense** in Wadi Khabb, NW of Dibba, 800 m.*



3. Geranium mascatense Boiss.

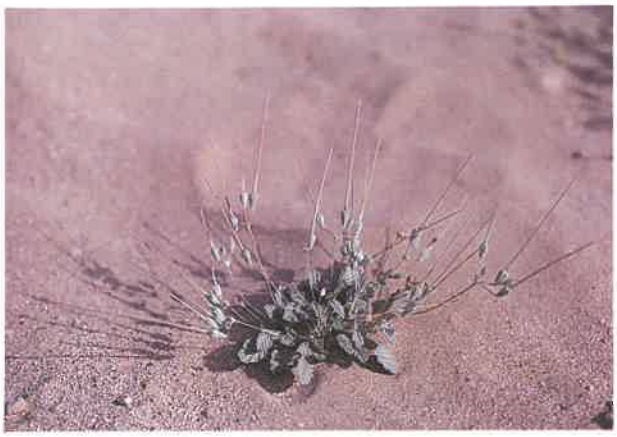
Annual herb to 25 cm, often shorter, spreading with several branching stems, young ones sometimes reddish. Leaves large and palmate with cleft lobes and deeper cleft at base; vivid green, clearly veined along each lobe. Flowers on short stalks in groups of 2–4 at branch tips and at upper nodes, with deep magenta petals and noticeable circular black centre; petals to 1 cm, separate, Mar.-May. Fruit extending to 1 cm pointed beak.

Fairly common in showy clumps in higher mountains especially in Ruus al Jibal, mostly in partial shade in gorges and steeper valleys. Often in association with **Erodium neuradifolium.**

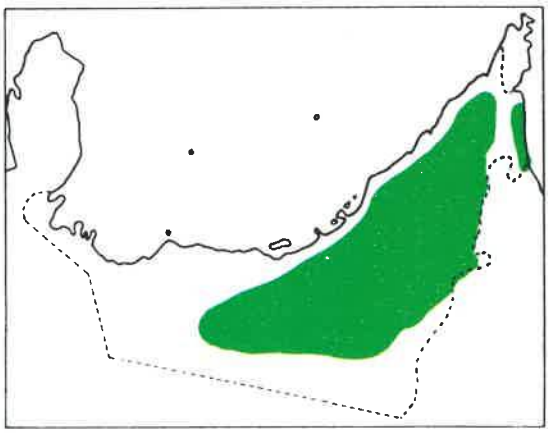
4. Monsonia nivea (Decne.) Decne. ex Webb

Small perennial to 25 cm, of glossy, silvery-green appearance and short stems; occasionally to 45 cm with woody, hairy lower stems and branches. Leaves rosetted around base on short, stiff stalks, broadly ovate or linear with regular wavy margin and deeply-veined, to 5 cm. Flower stalks to 12 cm, terminating in ray of 3-6 flowers with lilac petals, Mar.-May, occasionally later. Fruit small with thread-like stiff beak to 7 cm.

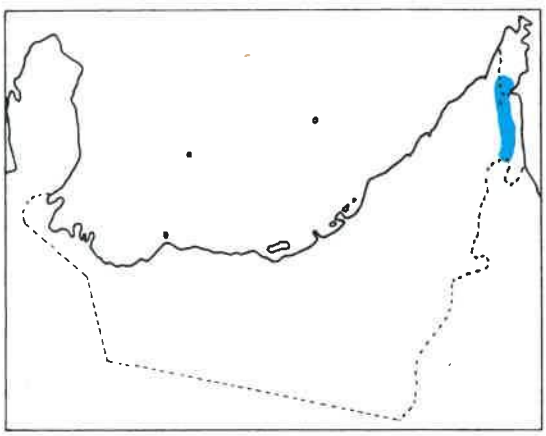
Extremely common in all sand and gravel areas including western dunes and fringing sabkha depressions, less common around foothills.



Monsonia nivea *at Habshan, Abu Dhabi Western Region, 100 m.*



Oxalis corniculata, *Al Ain oasis, 300 m.*



5. Oxalis corniculata L.

Perennial creeping herb, spreading matlike with thin, hairy stems, often rooting at nodes. Though only a few cm high, it may extend over several square m. Leaves alternate, trifoliate like clover, with central cleft in each lobe, green, sometimes tinged red or orange around margins; each lobe to 1.5 cm; leaves on 4-6 cm stalks. Flowers in rays on several long stalks radiating from same upper axil with bright yellow pointed petals, Mar.-May. Fruit cylindrical to 1.5 cm, hairy, with compressed seeds.

Fairly common locally in mountain oases close to permanent water, e.g. irrigation channels and regularly-flooded date groves.

Zygophyllaceae — caltrop family

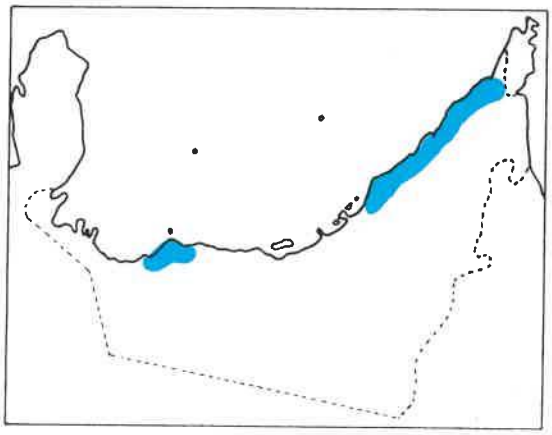
Herbs and shrubs with jointed branches and divided or alternate leaves, sometimes spiny. Flowers solitary or clustered, white or yellow. Fruit a capsule. Mostly family of xerophytes and halophytes. Well-represented throughout country.

1. Fagonia bruguieri DC.

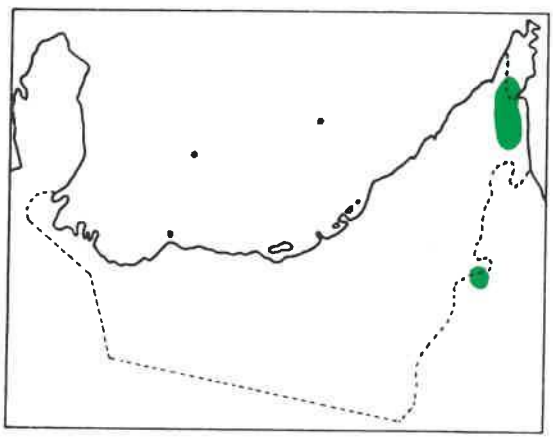
Compact perennial shrub to 35 cm, much-branched from base; occasionally in semi-prostrate form. Stem and branches rigid, angular, slightly zigzag with short joints, distinctly-grooved, dark green or often purplish. Leaves on very short stalks, lower ones small, trifoliate, upper ones more solitary and ovate. Each node has 3-4 spines to 1.5 cm pointing out at angles, longer than leaves. Flowers solitary on short stalks, small, with 5 separate pink petals and pale yellow stamens, Dec.-May. Fruit a tiny pyramid divided into 5 segments with a short spiny tip.

Common on low rocky bluffs along Arabian Gulf coast, further inland in Ras al Khaimah. Tolerates very exposed habitats, and is rapid coloniser of roadsides in northern Emirates in its purple form.

Fagonia bruguieri *near Jebel Dhanna, on isolated outcrop, 60 m.*



Fagonia indica *in foothills about 5 km S of Dibba, 70 m.*



2. Fagonia indica Burm.f.

Perennial shrub to 80 cm, much-branched with smooth but slender stems, mostly ascending, circular in cross-section with short, grooved internodes and swollen joints. Each node bears 3-5 unequal spines, 5mm to 2 cm, at angles. Leaves linear with rounded tips to 1 cm on short stalks. Flowers to 1.25 cm across with pale pink petals, often folded back, and yellow stamens protruding, Feb.-Jun. Fruit a small 5-segmented pyramid with short spiny tip.

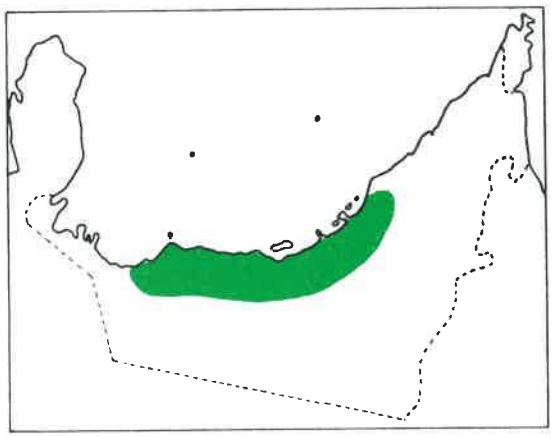
Dominant Fagonia sp. of mountains.

3. Fagonia ovalifolia Hadidi

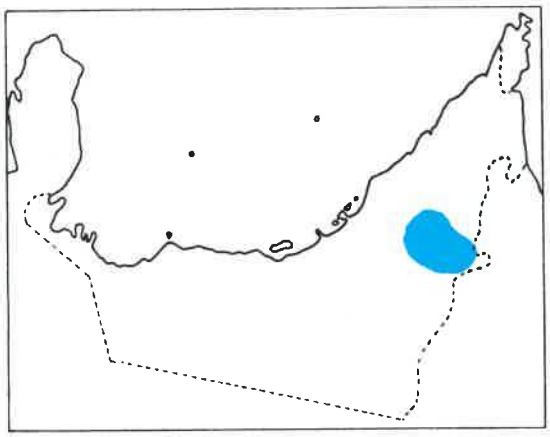
Much-branched perennial shrub to 70 cm with smooth stems and generally longer internodes than in other local Fagonias, but joints barely swollen. Nodes bear 3-4 spines to 8mm, more or less equal in star formation. Leaves linear, slightly pointed, tapering at base, to 1.5 cm. Flowers solitary with separate pink or rose petals and less conspicuous stamens, Feb.-May. Fruit a typical pyramidal capsule with spiny tip.

Overlaps in habitat with **F. bruguieri** but is more abundant and generally in deeper sand, e.g. inland of sabkha between Qatar and Dubai.

Fagonia ovalifolia *in deep sand and limestone pavement, along Asab oil field road, 100 m.*



Seetzenia lanata *at Sueyhan village, 100 m.*



4. Seetzenia lanata (Willd.) Bullock

Prostrate perennial herb branching into smooth, short-jointed stems to 15 cm. Leaves trifoliate to 8mm on short stalks; leaflets kite-shaped, tapering at base. Flowers minute in leaf axils, with pale stamens but no petals, Feb.-Apr. Capsule distinctive, spherical to 1 cm across, 5-valved with green and brown stripes.

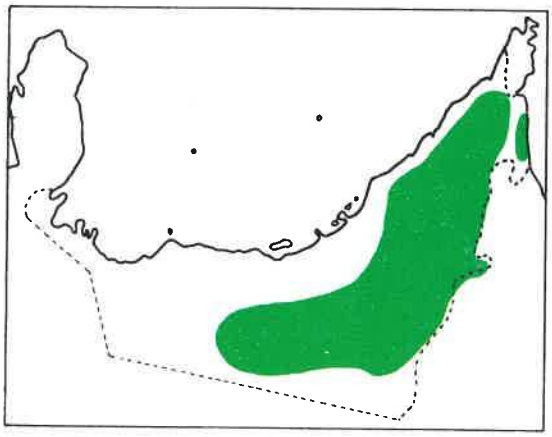
Fairly common on gravel plains in central desert area, e.g. around Sueyhan, on wadi detritus around Hatta and on shallow sand around west Hafit; less abundant further north.

5. Tribulus omanense Hosni ex Hadidi

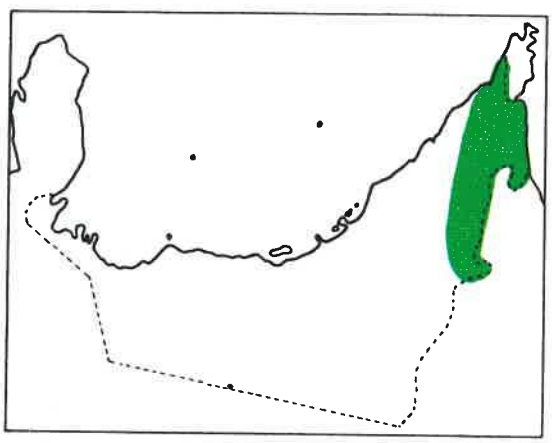
Perennial herb of variable aspect, sometimes small and prostrate, sometimes shrubby and scrambling to 1 m. Stems and branches slightly flattened and covered with soft white hairs. Leaves paired, one smaller than the other, in 4-7 pairs of leaflets. Flowers solitary on 5mm to 4 cm stalks from leaf axils with 5 buttercup-type petals, lemon-yellow to 2 cm diameter but variable in size and compactness, Mar.-Jun. Fruit soft and hairy, roughly spherical to 1.5 cm diameter, with a serrate wing along edge of each of the 5 segments, which separate at maturity; without spines.

Probably commonest of local Tribulus spp. and found in every Emirate from deep sands in Al Liwa to fans and lower foothills of Ras al Khaimah. Scrambling plants common in May and Jun. along fences on Abu Dhabi-Al Ain road. As with all local Tribulus, seeds germinate rapidly after summer showers.

***Tribulus omanense** in foothills E of Fujeirah town, 70 m.*



***Tribulus terrestris** at Tayyibah, between Masafi and Dibba, 500 m.*



6. Tribulus terrestris L.

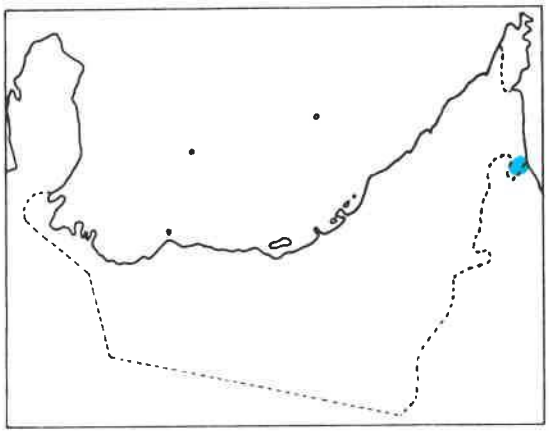
Perennial grey-green herb, mostly prostrate, virtually hairless with spreading branches to 50 cm. Leaves unequal with 4-7 pairs of tiny pinnate leaflets, paler on undersides. Flowers solitary from leaf axils on short stalks with yellow petals to 1.5 cm across, Feb.-Jul. Distinguished from other Tribulus spp. mainly by presence of 4 curved spines on each of the 5 capsule segments; fruit size and spine length variable.

Less common than **T. omanense,** though overlaps in foothills and in desert foreland between Ajman and Ras al Khaimah; also on Madam and Jiri plains, and on east coast. Prefers rocky and gravelly habitats.

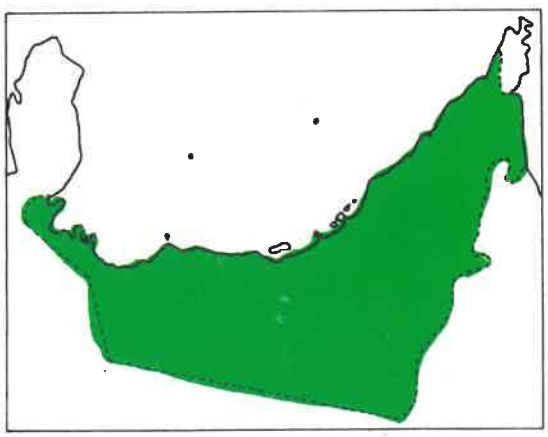
7. Tribulus parvispinus Presl

Very similar to **T. terrestris** in all aspects but very much smaller and prostrate with an overall silvery aspect. East coast only, especially on rough soils close to beach at Kalba.

Tribulus parvispinus *in depression at Khor Kalba.*



Zygophyllum hamiense *in semi-saline sand at Jebel Dhanna, 15 m.*



8. Zygophyllum hamiense Schweinf.

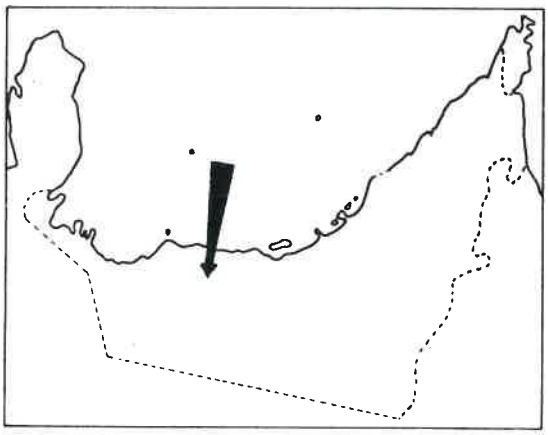
Much-branched erect perennial to 80 cm, bush-like and compact. Internodes 4-5 cm below, 3-4 cm above, slightly swollen at joint. Leaves very fleshy and swollen, cylindrical, to 2 cm on fleshy stalk, light or dark green, sometimes yellow, glossy. Flowers solitary on long stalks on outer nodes with small open white petals and protruding stamens, Sep.-Mar. but very variable. Fruit soft, tubular, to 2 cm, leaf-like, angled when mature, splitting into 2 and drying whitish.

Very widespread; abundant along Arabian Gulf coast, throughout western dunes and plains, across central desert and into mountains. Common on higher offshore islands, e.g. Sir Bu Nuair.

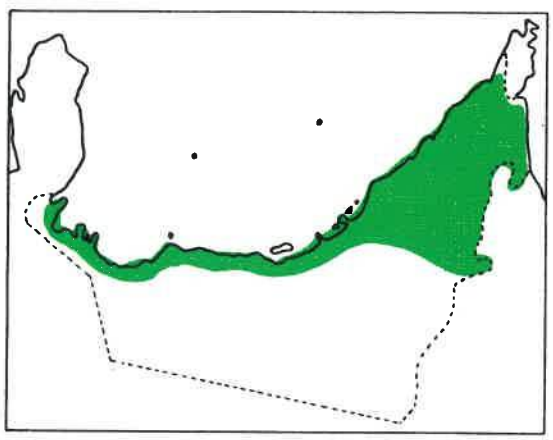
Zygophyllum qatarense Hadidi

Very similar to **Z. hamiense** in general aspect but leaflets shorter and ovoid rather than cylindrical. Flower stalks much shorter. Recorded on coast west of Jebel Dhanna.

Zygophyllum hamiense, showing leaf and flower details. Though found in mountains, e.g. on the summit of Jebel Hafit, this form tends to be smaller and more gnarled than the plains form, with fewer leaves.



Zygophyllum simplex *on gravel at Sueyhan, 100 m.*



9. Zygophyllum simplex L.

Small, succulent annual, branching from base and forming prostrate mat, sometimes circular or oval in outline with branches to 20 cm but usually shorter; branches sometimes red. Young plants with aspect of squat inverted pyramids on short stem. Leaves fleshy, cylindrical, usually grouped in 3-5 pairs of decreasing size at branchlet tips, often quite yellowish, very glossy. Flowers axillary, solitary or paired with tiny open yellow petals, Mar.-Jun., occasionally autumn; plant may appear yellow-spangled all over. Fruit pod-like, 5-angled and soft.

Common on limestone along Arabian Gulf littoral, in central desert areas and along east coast as well as foothills. Rare in deep sand; rapidly colonises gypseous soils and locally dominant annual west of Jebel Dhanna.

Euphorbiaceae — spurge family

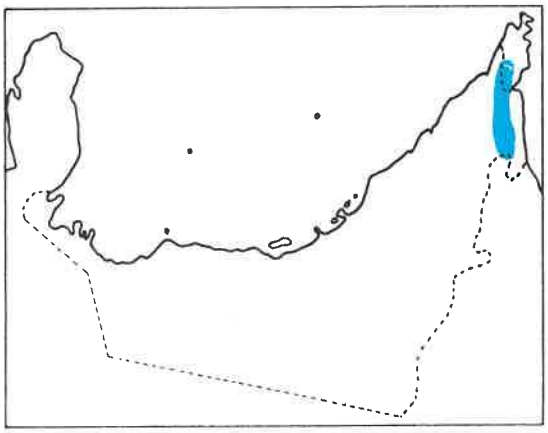
Large family of mostly small, sometimes prostrate herbs and some larger shrubs, with milky sap. Leaves mostly alternate, simple. Flowers on stalks, small, yellow or greenish, sometimes surrounded by sparkling yellow glands. Fruit a small capsule. Well-represented except in western dunes.

1. Andrachne telephioides L.

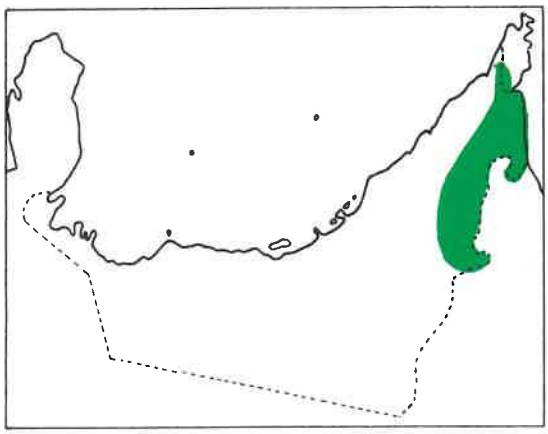
Delicate, prostrate perennial herb with thin, sometimes quite woody base and numerous stems, mostly branched and very variable in length to 25 cm. Leaves dense, tiny, rounded with a slight point, tapering towards base. Flowers solitary or in small clusters in leaf axils, to 2 mm diameter, greenish-white, Feb.-Apr. Seeds minute, rounded.

An easily overlooked sp. because of its diminutive size and scattered nature amongst thicker vegetation in mountains in Fujeirah and Ras al Khaimah.

***Andrachne telephioides** among boulders at Uyaynat, Fujeirah, 300 m.*



***Chrozophora oblongifolia** at Badiyah on East Coast, among silt and pebbles, 25 m.*

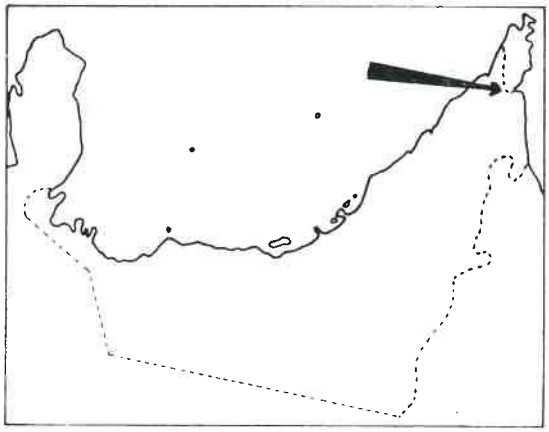


2. Chrozophora oblongifolia (Del.) A. Juss. ex Spreng.

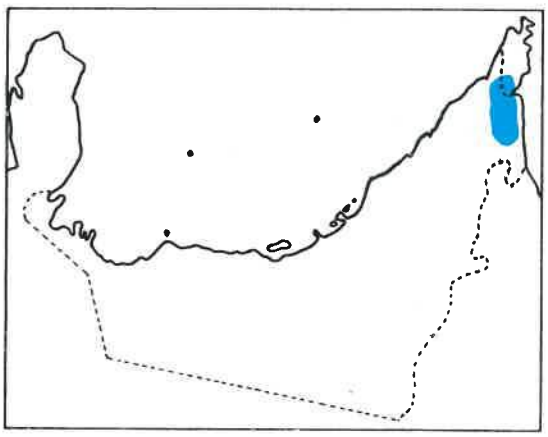
Perennial bristly herb to 40 cm with stiffly erect stem, sometimes quite woody at base, and short side branches and thickened leaf stalks. Leaves broadly ovate or longer and pointed, with irregular serrated margins, to 10 cm, covered with short stiff hairs and usually a white dust that causes itching. Flowers in terminal spikes with yellow petals, Mar.-Jul. Capsule a distinctive dark green 3-segmented wart covered with minute scales.

Common in lower mountains, alluvial gravels and occasionally in open deep sand, as at Shwayb; also frequently fringing oases on east coast, where largest specimens found. Not recorded on Arabian Gulf coast.

Detail of **Euphorbia larica,** showing reddish, globular, segmented fruits and green glistening flowers. White scars at branch tips show where old fruits once developed.



Euphorbia arabica *among rocks in tributary of Wadi Ham, just S of Bithnah, 400 m.*



3. Euphorbia arabica (Hochst. & Steud.) Boiss.

Smooth, very slender herb to 30 cm with 1-2 thread-like branches forking from thin erect stem, red or purple; rootstock thin but woody. Leaves tiny, 1-2 cm, very narrow and pointed, red or brown. Flowers minute, yellowish-green in small axillary clusters on short stalks, Jan.-Apr. Seeds minute reddish nutlets.

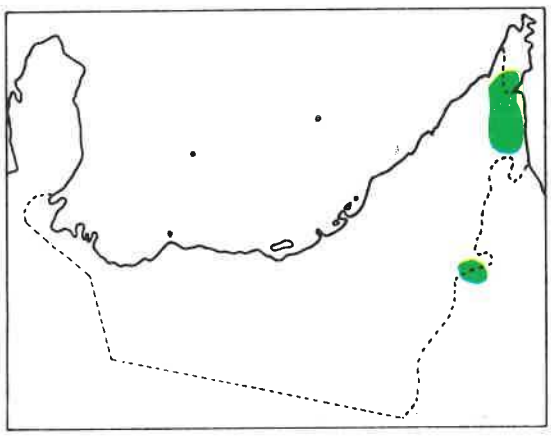
In silty and gravelly soils in shallow wadi systems in Fujeirah mountains. Often difficult to spot as its colouring blends with rocks.

4. Euphorbia larica Boiss.

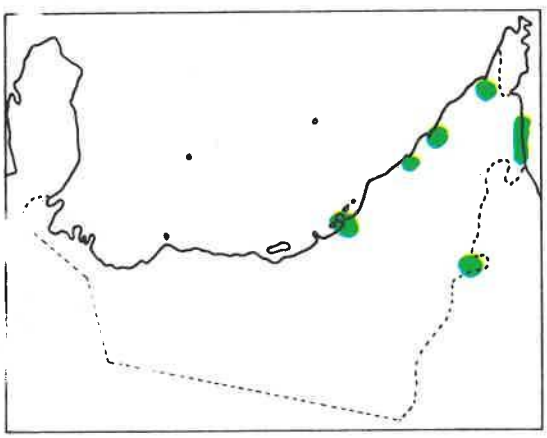
Perennial evergreen shrub with numerous erect stems rising close together from base to 1.5 m. Lower stems very woody, often brown and smooth; new growth light green, some lower branching. At first may be confused with cactus family with mass of thin, erect stems. Leaves reduced, linear. Flowers in terminal and upper lateral spikes with clusters of pale yellow stamens surrounded by glistening greenish glands, less than 1 cm across, Nov.-Apr., very variable. Fruit a spherical brown nutlet barely 1 cm across with tiny beak, of 6 segments, each containing 2 seeds.

Dominant perennial of mountains. Dead plants often straw-brown and flattened as if squashed with stems radiating in flat circle from root.

Euphorbia larica *on W flank of Jebel Hafit, 700 m.*



Euphorbia serpens *on waste ground in Al Ain, 300 m.*



5. Euphorbia serpens Kunth

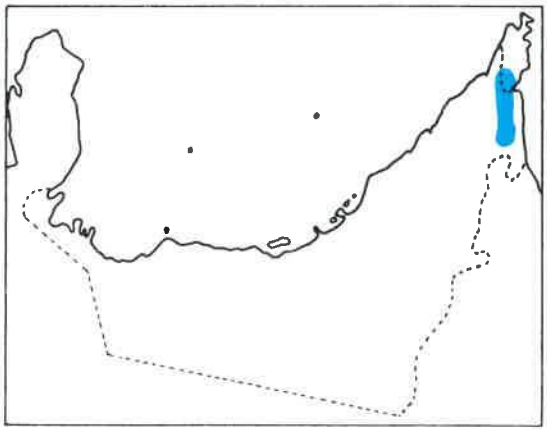
Small, prostrate annual with thin branching stems, less than 3 cm high but spreading to form large dense mats. Leaves minute, paired, pointed or with cleft tips, very numerous, mostly green but odd ones quite red or orange. Flowers whitish on upper lateral branchlets, in numerous tiny groups, Mar.-Jun. but also at other times. Capsule minute, yellow-green.

Very common weed of lawns and gardens especially in urban areas wherever there is constant dampness, e.g. beneath A/C outlets.

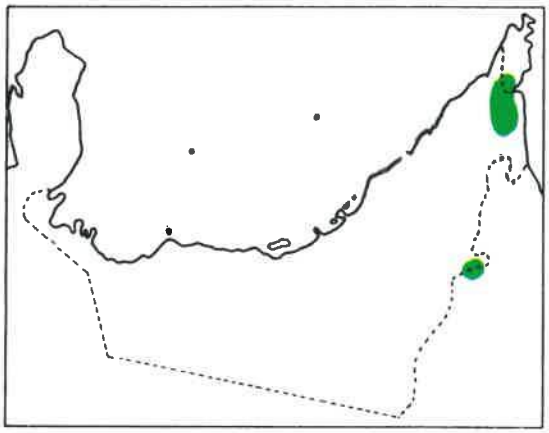
6. Euphorbia granulata Forssk.

Very similar to **E. serpens** but generally much darker and less spreading. Only at intermediate to upper mountain elevations among rocks on open slopes.

Euphorbia granulata *among rock detritus at Asimah, Ras al Khaimah, 400 m.*



Haplophyllum tuberculatum *near Ain al Faidah, Al Ain, 350 m.*



Rutaceae — rue family

Introduced citrus spp. widespread in plantations in northern Emirates, but natural plant community represented by single sp., a perennial herb with strong but not unpleasant scent, opposite leaves and yellow flowers.

1. Haplophyllum tuberculatum (Forssk.) A.Juss.

Plant with woody base to 70 cm, branching into few or many erect stems, yellowish-green and rough with myriads of minute dark warts. Lower leaves largest to 4 x 1 cm, pointed, tapering at base and covered with tiny translucent tubercles, margins thick and wavy. Flowers form flat-topped terminal cluster from many dividing stalks with petals to 5mm, Feb.-May. Capsule small, 5-celled with many dark seeds. When in flower the scent is pervasive several metres away.

Common in foothills and alluvial fans, oases and plantations throughout northern Emirates, often in extensive clumps.

Polygalaceae — milkwort family

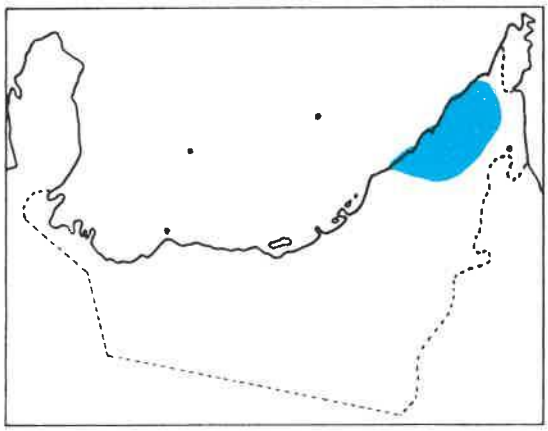
Delicate herbs with alternate leaves. Flowers in terminal and axillary clusters, superficially resembling small pea flowers.

1. Polygala erioptera DC.

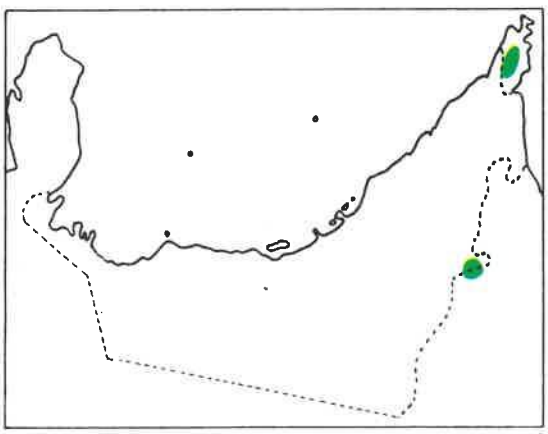
Slender annual to 35 cm. Stems thin, smooth, erect. Leaves narrowly linear, lower ones to 4 cm, upper ones shorter but denser. Flowers in groups of 3-5, enclosed by larger wing-like sepals, very pale with thin green midrib; sepals stand out stiffly, often at right angles with flowers apparently drooping, Jan.-Apr. Fruit small, flattened and winged.

Locally common along dunes forming sabkha edge in Umm al Qawain and Ras al Khaimah; also in hills west of Dibba and in some plantations in central desert and Madam plain.

Polygala erioptera *in hills about 10 km W of Masafi, 400 m.*



Dodonaea angustifolia *on summit of Jebel Hafit, 1100 m.*



Sapindaceae — soapberry family

Single sp. in U.A.E. Woody shrub with alternate and glossy leaves. Flowers small, yellow. Fruit a capsule with broad wings. At highest mountain elevations.

1. Dodonaea angustifolia L.f. (syn. **D. viscosa** auct.)

Much-branched perennial to 2.5 m with dark brown, smooth, angular branches, sometimes sticky. Leaves oblong, gently rounded, tapering at base with clear midrib and veins, shiny green. Flowers in terminal and axillary clusters, Feb.–Apr. Fruit 2-valved, each with wide brown or mottled pink wing, to 2.5 cm.

Common on summit of Jebel Hafit and on Ruus al Jibal, always lining runnels and shallow wadi courses. Also cultivated as a hedging ornamental in cities.

Salvadoraceae — salvadora family

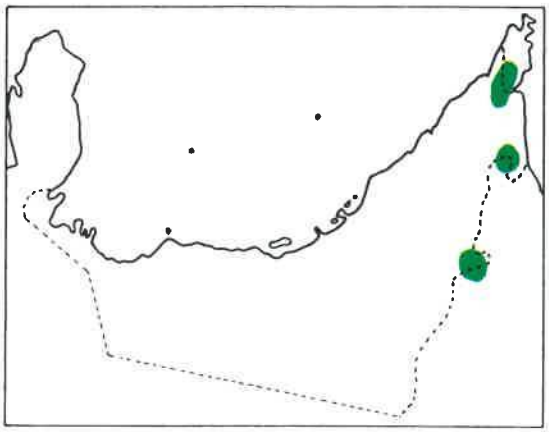
Single sp. in U.A.E. Climbing shrub with thick, tree-like stems, opposite leaves and clustered flowers. Fruit a red berry.

1. Salvadora persica L.

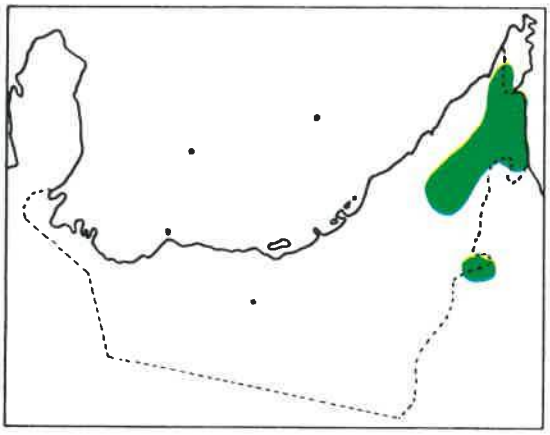
Large shrub tree-like itself, often climbing into **Prosopis cinerea** trees, with whitish branches, to 10 m, and sometimes exceeding host; or spreading bush to 2 m. Leaves to 6 × 1.5 cm, oblong or ovate, pointed, on short stalks, blue-green, usually lighter than host tree foliage. Flowers creamy green with coffee-like odour, in terminal and axillary panicles, Feb.–Apr. Berry small, red or orange, edible.

Uncommon climber between Sueyhan and Madam plain and around Al Ain; in bush form especially overhanging wadis around Hatta and Huweilat. Widely cultivated in western dunes as windbreak and on highway central reservations. Twigs and roots still used and on sale in city souks as toothbrushes.

Salvadora persica, *showing fruits, near Al Hair, Abu Dhabi, 300 m.*



Zizyphus spina-christi *in small wadi inland from Lulayah, East Coast, 100 m.*



Rhamnaceae — buckthorn family

Tall, spreading trees with spines and simple leaves. Flowers numerous, small, yellowish, sweet-scented. Fruit a berry.

1. Zizyphus spina-christi (L.) Willd.

Large tree to 10m with thick, rough trunk, much-branched, and opposite pairs of spines, one long and straight, the other shorter and recurved, at base of leaf stalks. Leaves rounded to ovate, blunt-pointed, to 4 cm, dark green with 3 clear veins. Flowers clustered in axils, Dec.-Apr. Berry yellowish, to 2 cm diameter, edible.

Common component of mountain vegetation; abundant common in lower wadis and rocky foothills, also along each coast. Berries still collected in remote communities. Cultivated form without spines common ornamental and shade-provider in cities.

Tiliaceae — linden family

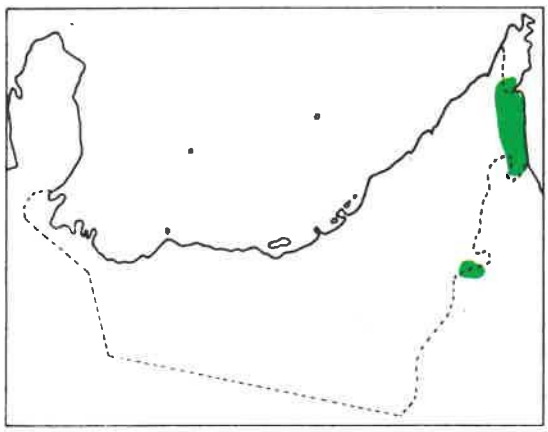
Large shrubs or prostrate, woody perennials with alternate, simple leaves. Flowers clustered with 5 yellow or white petals and many stamens. Fruit a capsule or berry. Mostly in or near mountains.

1. Corchorus depressus (L.) Stocks

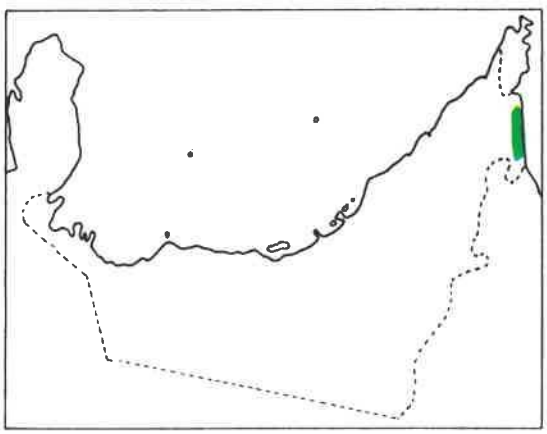
Prostrate plant with rigid, crooked branches hugging ground, often showing bare, broken and twisted beyond leaves, forming tough mat 1–2 cm high and up to 40 cm across. Leaves broadly elliptical, prominently-nerved, crinkly, with serrated margins, to 1.5 cm on long stalks. Flowers paired opposite outer, not necessarily terminal, leaves; petals yellow, to 5 mm, Dec.–May. Capsule oblong to 1.5 cm, curved with tiny beak.

Fairly common on stony ground in foothills and on detritus in lower wadis. Never in deep sand.

Corchorus depressus *in dried up pond at Siji, 20 km SW of Masafi, 250 m.*



Corchorus trilocularis *in plantation at Lulayah, East Coast, 30 m.*



2. Corchorus trilocularis L.

Annual to 40 cm with single stem or much-branched from base, slightly furry; stems often very dark brown. Leaves 1–4 cm, lanceolate or more ovate with regular small serrations along margins, clearly-nerved, on short stalks, glossy green, sometimes partly folded up along midrib. Flowers terminal and axillary, with free yellow petals, spatulate, Feb.–May. Capsule triangular in cross-section, 4–6 cm, often slightly curved, with 10 minute ribs and short, thick beak. Fruit single or in pairs, jutting out stiffly above horizontal. Seeds brown or darker.

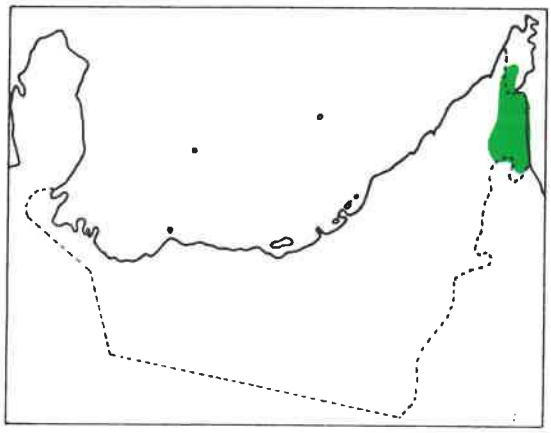
Common weed in moist plantations and along side ditches, especially on east coast.

3. Grewia erythraea Schweinf.

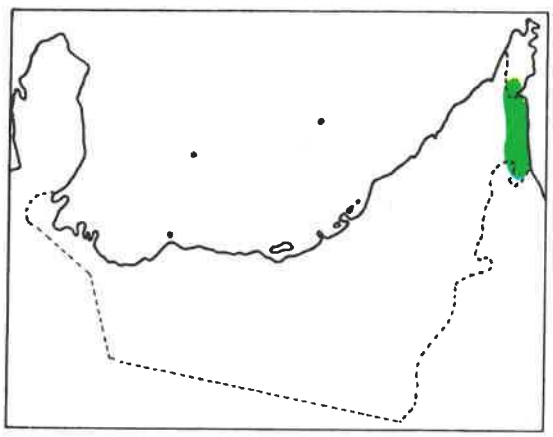
Very compact shrub wherever grazed, or with long, open branches if protected, to 1.5 m, much-branched. Leaves single or in pairs, ovate to rounded with serrated margins and 3 prominent veins, to 1.5 cm on very short stalks. Flowers single or in pairs, opposite upper leaves; petals small, white, with protruding stamens and long open calyx, Mar.–Jun. Fruit an orange berry, fused cruciform in fours, each about 5 mm across.

Fairly common in lower wadis especially around Hatta, Wadi Ham and lower outcrops of Jebel Faiya; very common on flanks of Ruus al Jibal on open plateaux.

Grewia erythraea *in stunted bush form at Jebel Faiya, near Mileiha, 400 m.*



Abutilon pannosum *on rocky spur extending out to sea near Khor Fakkan, 250 m.*



Malvaceae — mallow family

Shrubs and herbs with fibrous stems, often hairy, with alternate, lobed leaves. Flowers arranged as broad trumpet with 5 white or yellow petals and many stamens. Fruit a dry capsule. Most spp. restricted to mountain habitats, but **Malva** on the coast.

1. Abutilon pannosum (Forst.f.) Schlecht

Yellowy-green, erect perennial to 2 m, woolly with hairy stems and leaves. Plant may comprise single tall stem or several shorter branching ones. Leaves broadly heart-shaped with definite point, cleft where attached to thick, 3.4 cm stalk; margins roughly but not deeply-toothed; leaf diameter to 8 cm. Flowers solitary, terminal and axillary, higher ones usually clustered with orange or yellow petals, to 3 cm across, Apr.–Jul. Fruit a distinctive tight circular ring containing up to 30 seeds, brown and furry when mature; 1.5–3 cm in diameter.

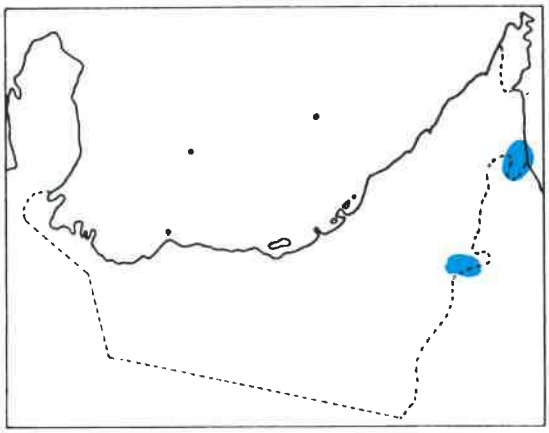
Very common locally along east coast, both in plantations and on open slopes facing the sea, and in odd wadis in Fujeirah and Ras al Khaimah, often fringing oases.

2. Hibiscus cf. **micranthus** L.f.

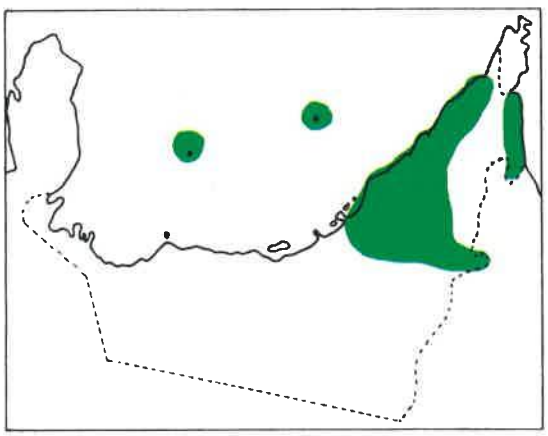
Perennial shrub to 70 cm, branching from base with few or many erect, slender stems. Leaves rounded with serrated margins, dark green, softly covered, with thin veneer of hairs; lower ones on long side stalks, upper ones single or paired on shorter stalks. Flowers axillary on upper branches, occasionally grouped, with white petals, pink or light brown in bud, Dec.–Apr. Fruit 5-valved with white base, containing many cottony seeds.

Uncommon except very locally in hills and shallow wadi systems in Fujeirah, around Hatta, on Jebel Hafit and in border foothills north of Al Ain.

***Hibiscus** cf. **micranthus** near Bithnah, Wadi Ham, 450 m.*



***Malva parviflora** in silt on Abu Dhabi Island, 10 m.*



3. Malva parviflora L.

Bright green annual to 40 cm, erect, much-branched from base with slightly furry stems. Leaves to 8 cm across with smoothly-serrated margins and up to 7 broadly-rounded lobes with prominent veins to each lobe tip; on long stalks. Flowers tightly clustered deep in axils of leaf stalks, with small white petals, sometimes pink-tinged, partly enclosed by green calyx, Jan.–May. After flowering the 5-pointed calyx expands to accommodate the very visible circular fruit, smooth or wrinkled, green maturing brown.

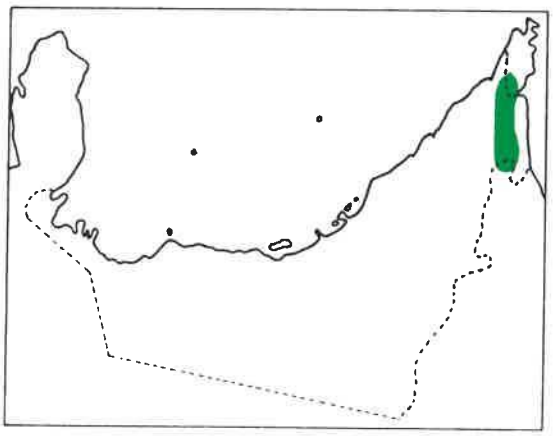
Common in damp habitats, e.g. gardens, around fields in Ras al Khaimah and in plantations along east coast and north of Al Ain. Dwarf form, usually with single stem to 15 cm recorded on offshore islands on sand just above tide line.

4. Sida urens L.

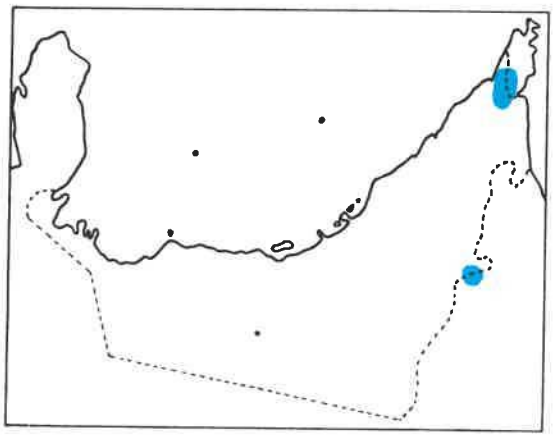
Prostrate, straggling perennial with several very thin slightly zigzag stems and short side branches trailing across ground to 1 m. Leaves heart-shaped and regularly-toothed, sometimes with tapering point, to 3 cm across. Main stem and leaf stalks bear long white silky hairs. Flowers on 2–8 cm stalks from leaf axils, also terminal; yellow petals overlap to form neat circle with orange centre, 1–1.5 cm across, Apr.–Sep. Tiny white capsule breaks into segments containing minute grey-black seeds.

Common weed in damp, shady areas of mountain oases at lower levels; often beneath date palms.

Sida urens *in Al Ain oasis, near flowing water, 350 m.*



Helianthemum kahiricum, *Jebel Hafit, 500 m.*



Cistaceae — rockrose family

Single genus in U.A.E. Shrublets with twisted, woody stems and opposite leaves. Flowers numerous, small but showy, yellow, with 5 open petals. Fruit a 3-valved capsule. Open desert and mountains.

1. Helianthemum kahiricum Del.

Somewhat hairy perennial to 35 cm, branching from base. Lower stem woody and dark; young branches and twigs more fleshy and lighter brown. Leaves greyish, linear, pointed with rolled margins and prominent midrib on underside, to 1.5 cm. Flowers on individual short stalks; petals often turned down umbrella-like around top of stalk, revealing numerous yellow stamens, Mar.–Jun. Seeds minute, yellowish.

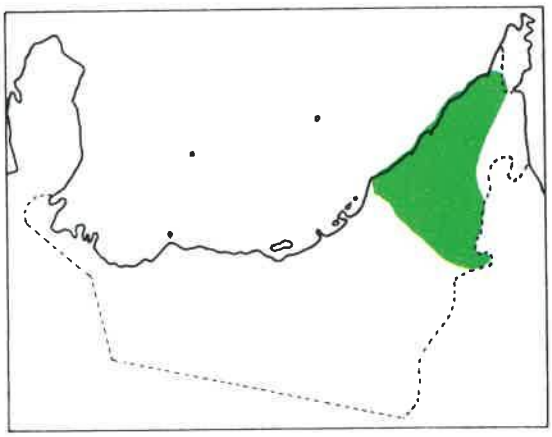
Uncommon, with a fairly restricted distribution on rough mountain limestone. Main concentrations recorded on Jebel Hafit and in Ras al Khaimah.

2. Helianthemum lippii (L.) Dum.–Cours.

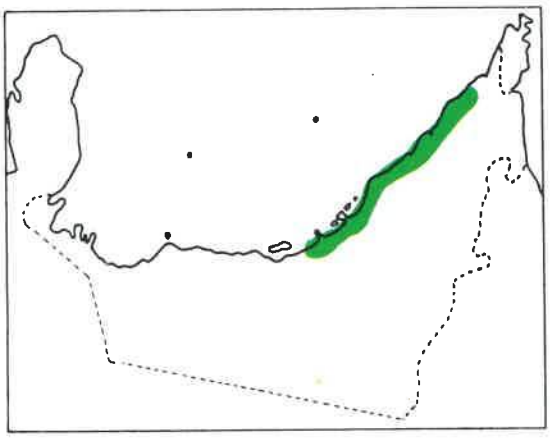
Perennial to 40 cm with whitish, slightly hairy stems branching intricately from base. Leaves dark green to 1.5 cm with distinct midrib and veins on upper surface and rolled down margins. Flowers form more of a spike than in **H. kahiricum,** in 4–5 pairs, without stalks, Feb.–May. After flowering, some leaves deciduous, leaving several twiglets almost spinescent. Fruit ovoid, containing minute yellow seeds.

Much more widely distributed than **H. kahiricum.** Abundant on broken limestone pavement inland of Ajman–Ras al Khaimah road where it is associated with small truffles; according to local tradition these need the presence of **H. lippii** roots to stimulate growth after rain. Also at higher elevations in Ruus al Jibal.

Helianthemum lippii *on limestone near Abu Dhabi border with Dubai at Sih Shwayb, 40 m.*



Tamarix arabica *at Mussafah, just off Abu Dhabi Island, 10 m.*



Tamaricaceae — tamarix family

Trees and shrubs of saline habitats with slender, often drooping branches, alternate leaves and flowers in large open spikes, with 4 free petals. Fruit a capsule with many tufted seeds.

1. Tamarix arabica (Ehrenb.) Bge.

Shrub or tree to 5 m, overall grey or blue-green with thick main stem and numerous slender, pliable branches that ascend and droop in needle-like fronds. Stems mostly smooth, occasionally rough to touch. Leaves small, ovate and pointed, clasping at base, sometimes glistening with secreted salts, occasionally dull and grey with dust. Flowers on short stalks in large, loose clusters to 20 cm with mostly pink or pale petals, Feb.–Jun. Tiny capsule 3-valved.

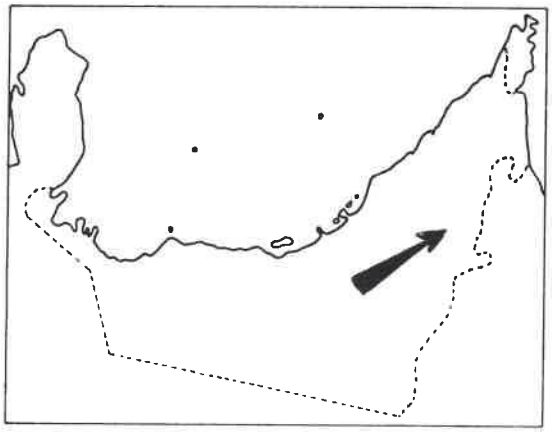
In sand and semi-sabkha along Arabian Gulf coast and towns wherever water table is revealed; rapidly colonises drainage ditches.

2. Tamarix aucherana (Decne.) Baum

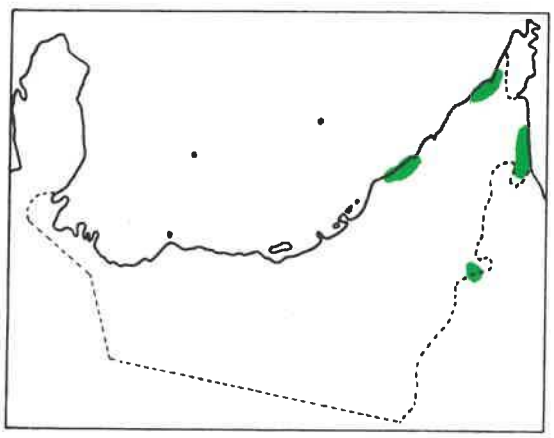
Similar to **T. arabica** but with reddish-brown bark. Flower clusters to 12 × 2–4 cm; petals pink with 11–12 stamens. In saline and sandy habitats often further inland, especially in association with **Haloxylon persicum;** occasional as cultivated windbreak in inland plantations and along roadsides.

Picture shows **Tamarix** sp. with adventitious roots in a very brackish pool near Sueyhan. Branch tips are often browsed by camels.

Adventitious roots of ***T. aucherana.***



Frankenia pulverulenta *on farm at Khatt, Ras al Khaimah, indicating increasing salinity, 100 m.*



Frankeniaceae — frankenia family

Single sp. in U.A.E. Annual herb with small, opposite leaves and many pink flowers in groups with free petals. Fruit a tiny capsule splitting lengthwise. Salt-tolerant.

1. Frankenia pulverulenta L.

Small slender plant to 30 cm, sometimes semi-prostate, branching at base with thin pink or reddish stems, smooth. Leaves clustered, some rounded, some linear, rarely more than 5 mm. Flowers tubular, in axillary and occasionally terminal clusters with pale petals (rarely much darker) and 6 central pale yellow stamens, Feb.–May. Capsule minute, rounded.

Common locally in coastal habitats. Large colonies in Kalba oases, indicating increased salinity in well-water used for irrigation. Also abundant in fields around Khatt and Digdaga. Plants smallest where fully exposed, e.g. on rocky islets north of Abu Dhabi Island.

Violaceae — violet family

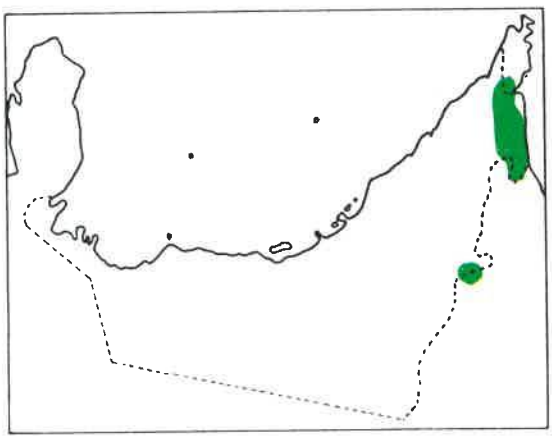
Single sp. in U.A.E. Small annual herb with alternative leaves and solitary flowers in leaf axils; with 5 sepals, 5 petals and 5 stamens. Fruit a valved capsule. Mountains only.

1. Viola cinerea Boiss.

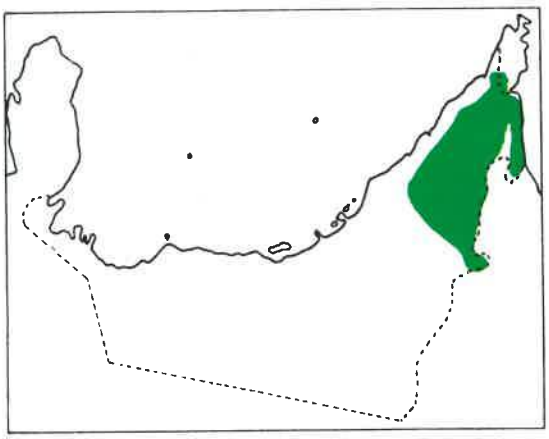
Delicate plant to 10 cm with several thin white stems branching from base. Leaves tiny, ovate, terminating in prickle-like point, tapering at base, to 1 cm. Flowers on stalks that extend just beyond leaves; petals of unequal size, pale or off-white, Mar.–May. Fruit in 3 segments fused at base but pointing in opposite directions.

Fairly common at all elevations especially in northern Emirates, mostly in rocky crevices; occasional longer trailing specimens recorded.

Viola cinerea in Ruus al Jibal, 1500 m.



Citrullus colocynthis among dunes near Al Haba, on Dubai–Hatta road, 150 m.



Cucurbitaceae — gourd family

Spreading, trailing plants with tendrils and alternate palmate and veined leaves, crinkled at margins. Flowers conspicuous, yellow or orange with 5 petals. Fruit a gourd, smooth or prickly, maturing yellow.

1. Citrullus colocynthis (L.) Schrad.

Prostrate perennial, rough to touch with covering of short, stiff hairs, and branches trailing to 5.m, ending in tendrils. New growth at any time, after rains. Leaves on 3–6 cm stalks, like elongated triangles with 3–7 pointed lobes separated by rounded notches; to 12 cm. Flowers solitary, facing upwards, with pale yellow petals and darker centre of stamens, variable throughout year. Fruit globular to 10 cm diameter with green and yellow vertical stripes, turning lemon yellow, glossy. Seeds in spongy pulp.

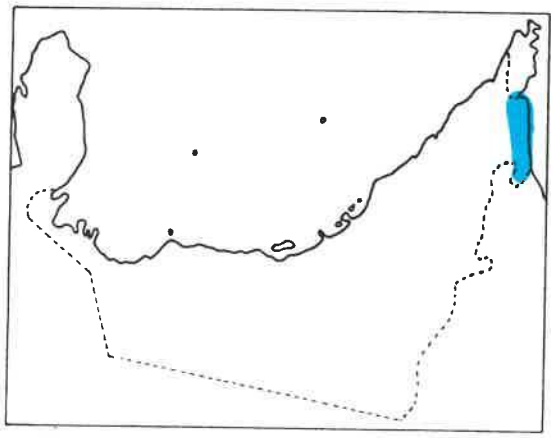
Common in central desert and alluvial plains after rain; also along east coast. Occasional in towns. Fruit apparently eaten only by small rodents. Gourds eventually dry out and become detached.

2. Cucumis prophetarum Jusl. ap. L.

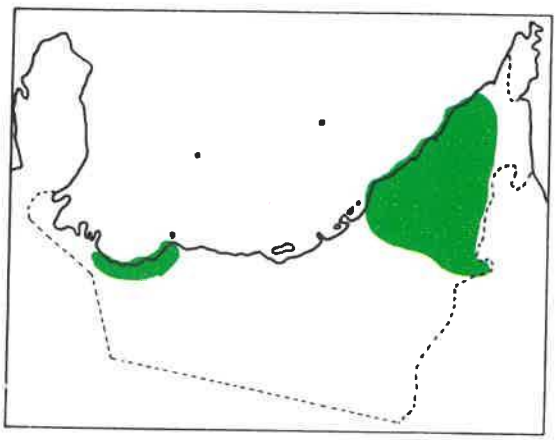
Stiffly hairy prostrate perennial with few slender, much-branched trailing stems to 1.5 m, with tendrils. Stems light green, grooved, diverging at joints. Leaves with 3–5 crisped lobes, veined, on 2–4 cm stalks, at base of which are short, light brown tendrils. Flowers orange, Feb.–Jul. Fruit plum-sized, at first with green and white stripes, covered with small but robust prickles, maturing bright yellow.

Less common than **C. colocynthis,** and in mountains only, especially fringing oases and plantations; occasionally on stony wadi banks; has been recorded on rocks at edge of sea at Khor Fakkan.

Cucumis prophetarum in abandoned oasis at Wadi Jeema, Hatta, 800 m.



Cynomorium coccineum *on limestone pavement at Jebel Ali, 40 m.*



Cynomoriaceae family

Single sp. in U.A.E. A striking parasite with long, swollen underground rhizomes; without chlorophyll, therefore no green parts. Leaves absent. Flowers minute, dark red. Fruit nut-like with one seed.

1. Cynomorium coccineum L.

Very fleshy perennial herb to 25 cm, parasitic on roots of **Chenopodiaceae** and **Zygophyllaceae,** easily recognised by deep red or black phallic appearance. Stem a single short scaly stalk to 5 cm, topped by thicker club-like spike covered with many red or purple protruding stamens, variable throughout year but mostly Apr.–Aug. Usually in clumps; old specimens often withered black or grey and dusted with sand.

Fairly common in compacted sands and coastal sandstone pavements, especially along Arabian Gulf coast; also inland in oases and plantations bordering depressions. Around Al Ain still collected and used by families for dye-making.

Umbelliferae — carrot family

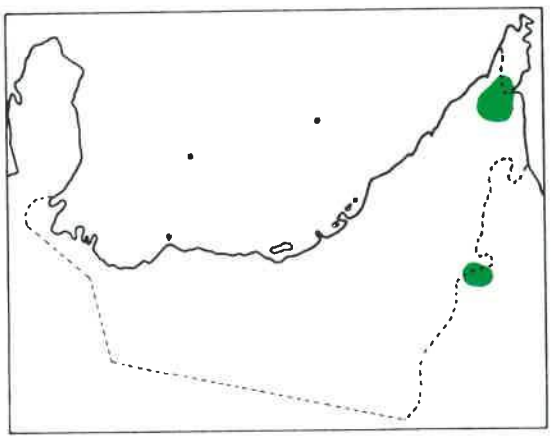
Annual and perennial herbs with grooved stems, hollow inter-nodes and alternate leaves, divided or dissected, lower parts sheathed. Flowers in umbrella-like clusters, sometimes flat-topped, white or yellow. Flat or ovoid fruit usually splits into half.

1. Ammi majus L.

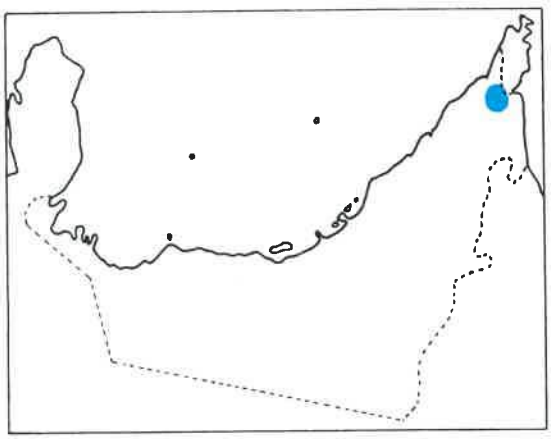
Annual, smooth herb with erect stems to 80 cm, much-branched above with fleshy, angular branches, pale green, maturing brown. Lower leaves divided into linear segments on long stalks; upper ones less divided, with serrated segments. Flowers white with rays to 10 cm in diameter on very long stalks and hairs like leafy scales at base, Mar.–May. Fruit ovoid with 5 ribs.

Locally common weed especially in farms in Ras al Khaimah; occasional in plantations and gardens elsewhere; rare in towns.

Ammi majus in abandoned fields at Digdaga, Ras al Khaimah, 100 m.



Anethum graveolens in field at Khatt, Ras al Khaimah, 100 m.



2. Anethum graveolens L.

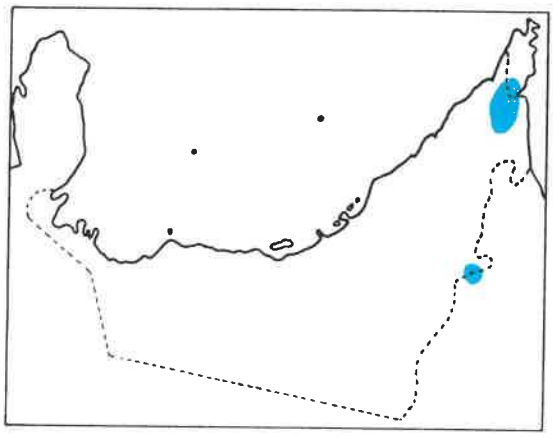
Annual, aromatic herb to 50 cm. Leaves dissected into long lobes with sheaths up to 10 cm. Flowers yellow in 20–25 small umbels, generally flat-topped, Mar.–May. Fruit with 5 winged ribs. Cultivated around Khatt and Digdaga as a salad and is found as an escape in nearby fields. The only yellow-flowered umbellifer in U.A.E.

3. Ducrosia anethifolia (DC.) Boiss.

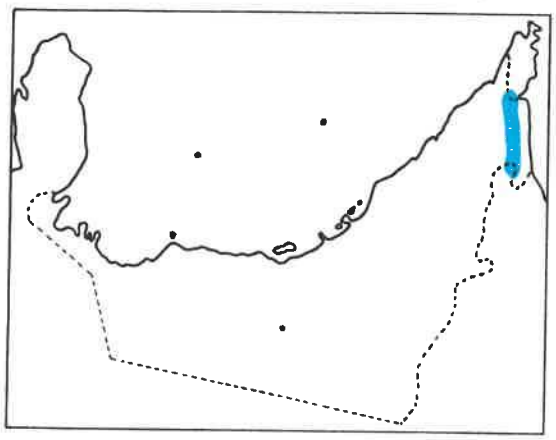
Small perennial to 20 cm with short, smooth stems branching erectly from woody base, with noticeable odour; stems with only 1–2 internodes. Leaves thinly-dissected on long stalks, with individual segments to 1 cm. Flowers tiny, ~~white~~ yellow, in rays on long stalks forming umbel to 6 cm across, Feb.–Apr. Fruit ovoid, flattened, oat-like but smaller, brown with lighter margins. At maturity lower leaves whitish and dry.

Uncommon in lower wadi sands and gravels at base of mountains and on some alluvial fans especially around Jebels Hafit and Faiya.

Ducrosia anethifolia *at west base of Jebel Hafit, 400 m.*



Pimpinella aff. puberula *in Al Ain oasis, 350 m.*



4. Pimpinella aff. puberula (DC.) Boiss.

Small, delicate annual, somewhat like a miniature **Ammi majus,** to 40 cm. Stems thin and angular with few branches. Leaves mostly divided into 3 segments, lower ones on longer stalks; each segment rounded with toothed margins except along concave base; leaves delicately-veined and gradually mature whitish; upper ones much smaller, sometimes with just 2 segments. Flowers with white petals in small rays 3–4 cm across, Mar.–Jun. Fruit disc hairy.

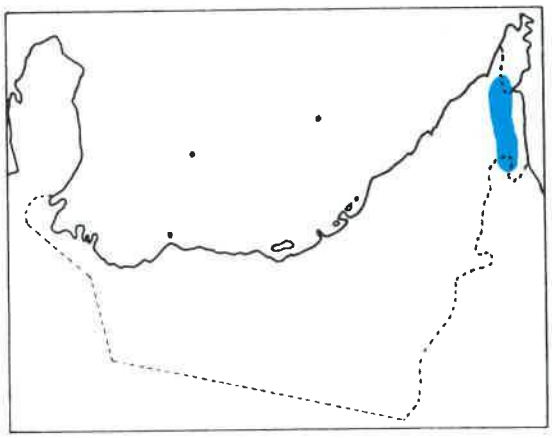
Weed of damp mountain oases and plantations only. Thrives on shady soil beneath regularly-watered trees.

5. Pycnocycla caespitosa Boiss. & Hausskn. ex Boiss.

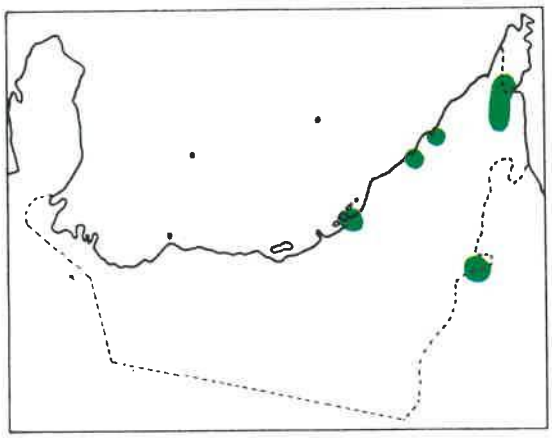
Small, shrubby, rigid perennial to 30 cm, much-branched, smooth, very thinly-grooved, silvery-green, whitish at nodes. Lower leaves slightly hairy, divided into 2–3 segment pairs to 5 mm; upper leaves spine-like to 7 cm. Flowers in compact heads on very long stalks up to 7 cm above rest of plant; flowers purplish above, green beneath, Mar.–Jul. Fruit resembles tiny woollen cone.

Only at higher mountain elevations around Hatta and east of Khatt, where it is an extensive component of summit vegetation.

Pycnocycla caespitosa *in mountains near Tawyain, Ras al Khaimah, 800 m.*



Anagallis arvensis *in plantation at Shwayb, 350 m.*



Primulaceae — primrose family

Single sp. in U.A.E. Small, delicate annual pimpernel, prostrate or scrambling, with opposite leaves and 5 stamens attached to corolla tube with 5 petals. Fruit a capsule.

1. Anagallis arvensis L.

Low, spreading plant with thin, often thread-like stems just a few cms tall, or higher when scrambling into surrounding vegetation. Either single-stemmed or much-branched. Leaves to 2 x 1 cm, pointed, bright green, upper ones narrower and shorter; older leaves often with red or brownish tinge. Flowers solitary in axils on stalks with dark blue petals in a star and red or pink centre, Feb.–May. Capsule spherical, brown.

Fairly common weed of gardens and plantations especially in northern Emirates; also extensive in lower mountains on rocky slopes.

Plumbaginaceae — leadwort family

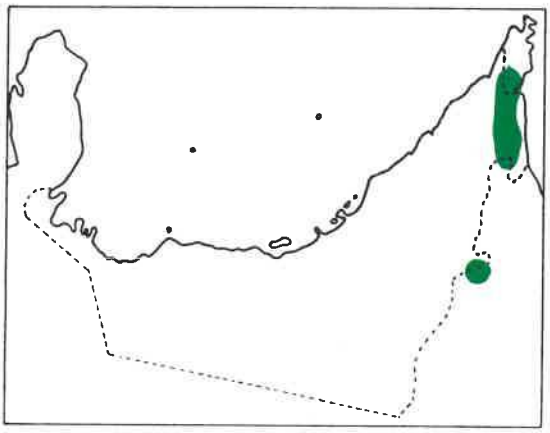
Perennial shrubs with leaves in basal rosettes or whorled on branches. Flowers in showy terminal spikes or panicles. There are 5 sepals, 5 petals, 5 stamens and 5 styles. Fruit enclosed by calyx. In both coastal and mountain habitats.

1. Dyerophtum indicum (Gibs. ex Wight) O. Kuntze

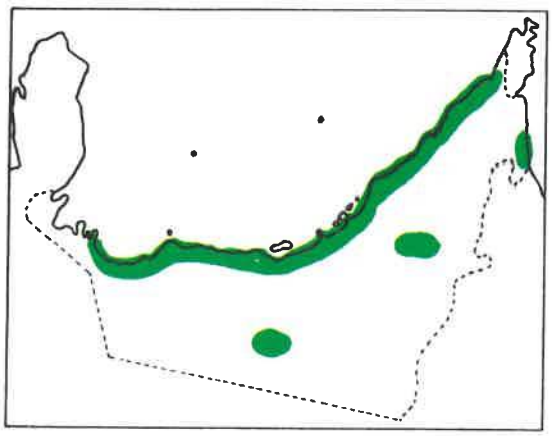
Tree-like shrub to 3m, much-branched, though often of smaller bush-like proportions. Older branches rough and grey, young ones shiny, bright green or reddish. Leaves broad and wavy with crinkly margins, clasping at base; very young ones with clear midrib, older ones brown or grey with reddish tinge and usually covered with sticky powdery grey bloom, like thick dust. Flowers on long, thin, branching stalks, yellow and reddish, mostly at branch tips; petals orange-yellow from a whitish calyx, Jan.–May, occasionally much later.

Common along wadi sides throughout mountains (except isolated Jabel Faiya range) at lower elevations, especially along wadi sides. Upper branches often heavily grazed by goats though older leaves of bloom avoided.

***Dyerophytum indicum** in Wadi Hatta, 600 m.*



***Limonium axillare** at Umm an Nar, off Abu Dhabi Island, 40 m.*



2. Limonium axillare (Forssk.) O. Kuntze

Compact shrub to 70 cm with tough, woody rootstock and many ascending branches, older ones gnarled and rough, younger ones smooth, thin, green or orange. Leaves mostly clustered at base, though groups of smaller ones above; like elongated spatula, 6 x 1 cm. Leaves and stem often glistening with salt excretions. Flowers on leafless stems to 60 mm in large flat clusters in triangular profile, to 12 x 20 cm, petals purple and white, distinctive from a distance, Oct.–Apr. Flowers die on plant and become stiffly white, artificial-looking.

Very common and often locally dominant at sabkha edge along both coasts; also fringing depressions inland, in association with **Halopeplis perfoliata** and **Zygophyllum hamiense.**

Gentianaceae —gentian family

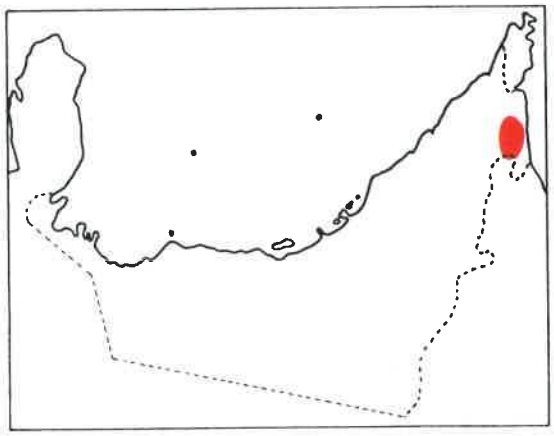
Single sp. in U.A.E. Small, glabrous herb with opposite leaves and solitary or clustered flowers with 5 petals and stamens. Fruit a capsule. Uncommon, in mountains.

1. Centaurium pulchellum (Sw.) Druce

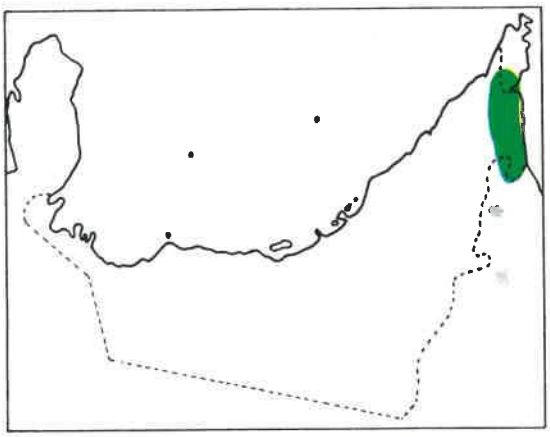
Smooth annual to 18 cm with stiffly-erect stems and branches. Basal leaves form rosette of opposite pairs, each leave to 3 cm, glossy green, pointed, with clear midrib; upper leaves longer and narrower, wherever there is branching. Flowers terminal on long stalks mostly in small groups, with free, pointed pink petals and yellow stamens, Mar.–Jul. Lower leaves die back brown.

Occasional, in small clumps alongside irrigation ditches and oasis pools in mountains between Hatta and Siji.

Centaurium pulchellum *in small oasis S of Siji, 500 m.*



Nerium mascatense *in Wadi Jeema, Hatta, 800 m.*



Apocynaceae — dogbane family

Perennial evergreen shrubs with milky juice. Leaves long, narrow and pointed, leathery. Flowers showy in terminal clusters with 5 petals fused at base; petals twisted in bud. All parts poisonous and avoided by herbivores. Fruits resemble twin pods. During summer and in drought many leaves turn brown from tip inwards.

1. Nerium mascatense DC. (syn. **N. oleander** L).

To 2.5 m with numerous erect side branches and oleander-type flowers. Leaves to 12 cm with prominent midrib and veins. Flowers vary from white to deep rose; petals to 3 cm, Feb.–Oct. Fruits straight, to 14 cm, containing many feathery seeds.

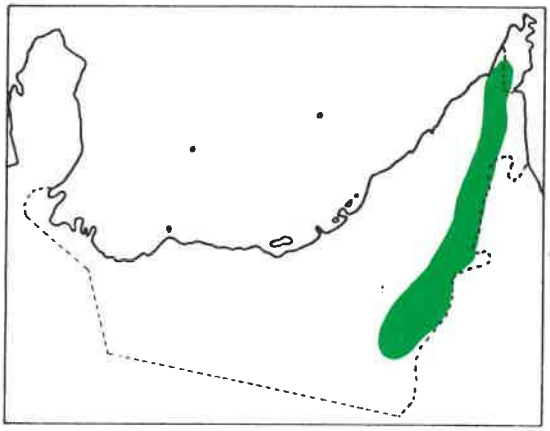
Common in lower mountain wadis with water present on surface or just below; dense stands around Hatta, Masafi and in Fujeirah mountains. Widely introduced as ornamental in parks and along roads, e.g. Abu Dhabi–Al Ain.

2. Rhazya stricta Decne.

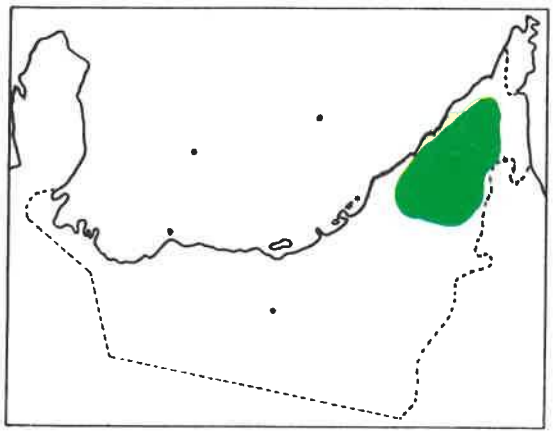
Shrub with smooth central stem and dense semi-erect branches to 1 m but generally shorter, 50–70 cm. Branches covered with erect leaves to 12 cm on short stalks, with prominent midrib. Flowers with white petals to 2 cm, Feb.–Jun. Fruits cylindrical in erect groups of pairs, green maturing chocolate brown, to 8 cm.

Very common on alluvial plains around Al Ain and on gravels east and west of Hajjar Mountains; sometimes in extensive clumps in wide lower wadis. e.g. Wadi Bih in Ras al Khaimah. Widespread south of Al Ain towards Al Liwa on gravels, where is it locally dominant.

Rhazya stricta *on gravel S of Al Ain, 300 m.*



Calotropis procera *in central desert near Madam, 250 m.*



Asclepiadaceae — milkweed family

Small trees, woody climbers, shrubs and herbs, sometimes very succulent, usually with copious milky sap. Leaves opposite or whorled, variable in shape, or reduced or obsolete. Flowers clustered, usually with 5 fused petals. Fruit a pair of pod-like follicles, one often larger than the other.

1. Calotropis procera (Ait.) Ait. f.

Small desert tree to 5 m, usually smaller, with rough, cork-like bark which is loose, patchy or missing in some older branches. Young branches smooth, white, fleshy, older ones often hollow. Leaves broadly ovate to 18 cm, waxy-green, younger ones with downy white hair. Flowers from leaf axils and terminal, whitish-green outside with pink patches inside; petals form a star. Fruit a large inflated spongy pod to 15 cm, splitting lengthwise. Flowering and fruiting at same time, Mar.–Sep.

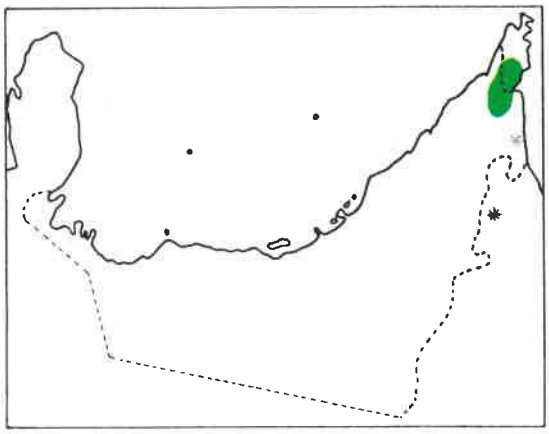
Common in central desert plains, especially further north and on Jiri and Dhaid plains; poor specimens near coast except for sheltered habitats on east coast. Ignored by camels. Dense foliage makes it a good shade tree. Wood once used for charcoal.

2. Caralluma cf. arabica N.E. Brown

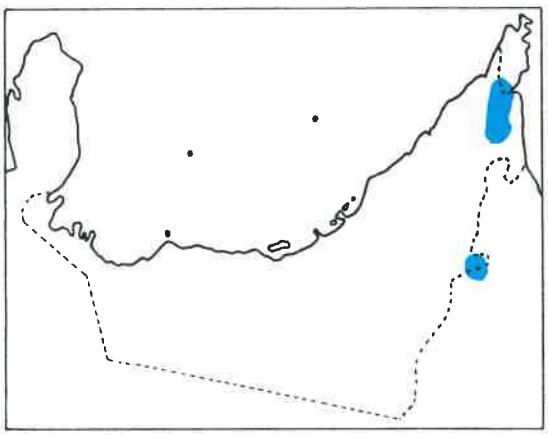
Leafless succulent with knobbly grey-green stems with angular, sometimes square cross-section, to 30 cm, single or in large clumps of up to 80 stems; resembles group of uneven, blotchy candles. Flowers terminal, dark red, purple or black and emit fetid smell close up which attracts flies; crowded on globular heads, to 3 cm in diameter, Jan.–Jun. Follicles erect to 10 cm, grey-green, rising from blunt stem tips like symmetrical pointed horns, full of pappus-like hairs.

Common locally in mountains at higher elevations throughout country, especially on ledges and open slopes; largest specimens in mountains west of Dibba.

***Caralluma** cf. **arabica** in hills 10 km N of Masafi, 500 m.*



***Glossonema varians** at base of Jebel Hafit, 350 m.*



3. Glossonema varians (Stocks) Benth. (syn. *G. edulis* R. Br.)

Perennial semi-prostrate herb with stiff greenish-white stem and branches, spreading, to 35 cm, often with overall woolly appearance. Leaves opposite, grey-green, rounded with wavy margins, hairy beneath, on short stalks. Flowers small, pale yellow, in leaf axils, Feb.–May. Easily recognised by swollen ovate fruits, white, smooth with curved tip and covered with soft curved prickles; fruits bear central lengthwise groove. Seeds small, rounded with hairy tufts.

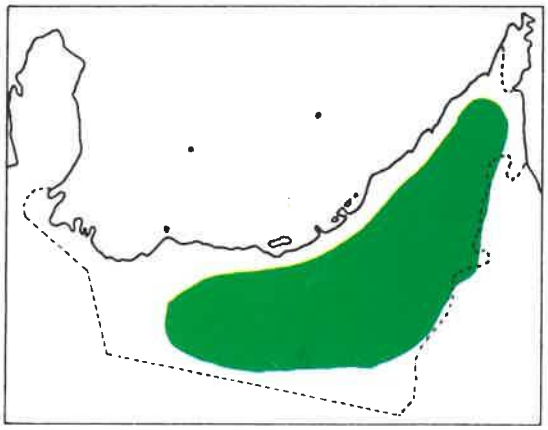
Uncommon, in lower mountain wadis and associated terrain, e.g. lower flanks of Jebel Hafit; occasional around Hatta and further north.

4. Leptadenia pyrotechnica (Forssk.) Decne.

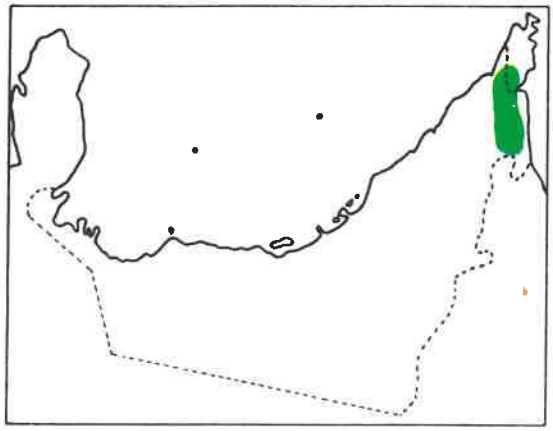
Tall, erect perennial to 4 m with smooth, cylindrical whip-like stems spreading and drooping, much-branched. Leaves very reduced. Flowers small but numerous and conspicuous, pale yellow, spaced along branches to give spangled appearance, Jan.–Jun. Follicles to 12 cm, green maturing to brown, standing out at a stiff angle from stem. Seeds in two rows, tufted. Sometimes secondary flowering late summer.

Common shrub of central desert and western dune areas, mostly in deep sand; locally abundant around Shwayb and Falaj al Moalla; occasional closer to coast, e.g. near Abu Dhabi Airport. Once planted to retard dune movement in Al Liwa. Much browsed by camels.

***Leptadenia pyrotechnica** in Al Liwa, Western Region, 200 m.*



***Pentatropis spiralis** in flower in Lulayah plantation, East Coast, 30 m.*



nivalis

5. Pentatropis ~~spiralis~~ (Forssk.) Decne.

Densely-twining perennial herb, usually found climbing into and over Acacia trees and scrub, sometimes carpeting trees. Stem and branches wire-like, green or white. Leaves to 3 cm, less than 1 cm wide, pointed with rounded margins, in pairs at nodes or in whorls of 4. Flowers on 1–2 cm stalks from leaf axils, tiny but noticeable, greenish-yellow, pointed in bud; each petal elongated to narrow point, Mar.–Sep. Fruit tiny with rough protuberances.

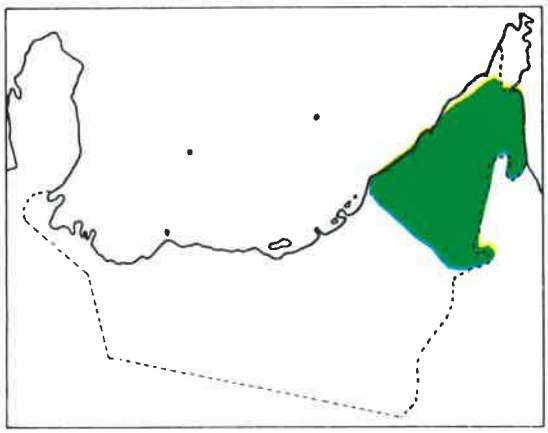
Common throughout lower mountain zone, especially in Fujeirah and around Masafi; rarer south of Hatta. Sometimes whole clumps of Acacia affected.

6. Pergularia tomentosa L.

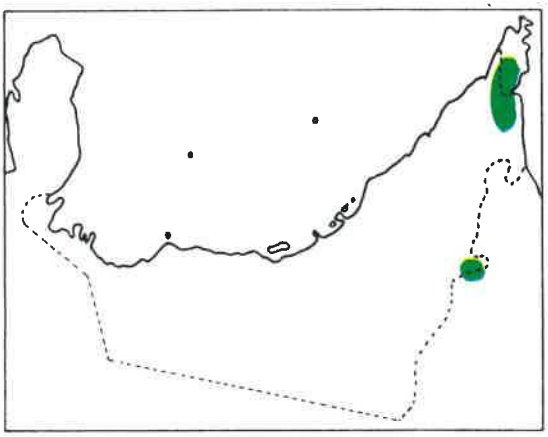
Grey-green perennial shrub to 1.5 m, younger branches twining up and over older ones. Stem and branches thin and smooth. Leaves heart-shaped, to 3 x 3 cm with clear midrib. Flowers in rays on long drooping stalks with pink or brown bracts and separate white petals, Oct.–Apr., usually in flower and fruit together. Follicle tapers to soft recurving tip, covered with soft pointed tubercles, to 7 cm; pear-shaped.

Fairly common as individuals along coastal lowlands north of Abu Dhabi island but overgrazed and stunted. Common in lower mountains and along east coast; abundant in plantations north of Khor Fakkan.

Pergularia tomentosa, *showing fruit, at Badiyah, East Coast, 35 m.*



Periploca aphylla *on Jebel Hafit, 500 m.*



7. Periploca aphylla Decne.

Shrub to 3 m with long, thin, whip-like branches, almost leafless; leaflets 2–3 mm, stalkless, deciduous as plant matures. Branches fairly stiff and tough and rarely broken off completely by grazing goats; older branches with black spots and scars. Flowers in tight groups on short stalks; head purple, globular, 1.5 cm across, with short thread-like growths and thick white hairs, Dec.–May. Flies strongly attracted. Follicles horizontally-divergent, each to 8 cm, widest in middle and tapering at both ends.

Common mountain shrub in wadis and crevices; locally abundant on Jebel Hafit and west of Dibba.

Rubiaceae — bedstraw family

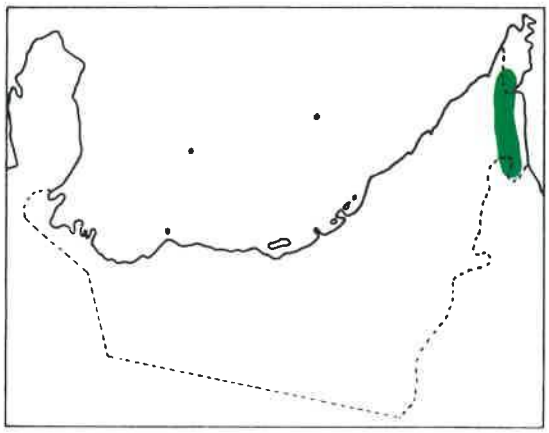
Shrubs and fragile herbs with opposite or whorled leaves and tiny congested flowers comprising 4–5 fused petals. Fruit a nut or capsule.

1. Callipeltis cucullaria (L.) Rothm.

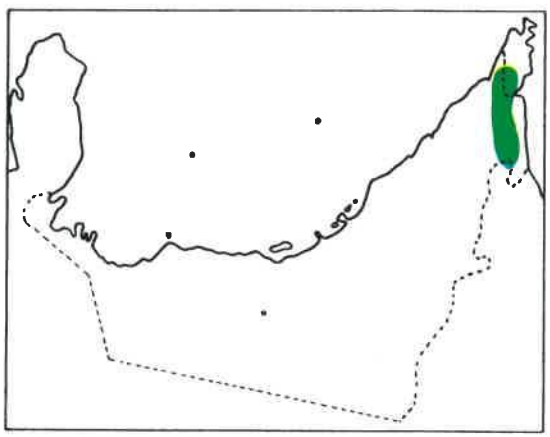
Small annnual herb of variable size up to 20 cm but often much smaller, sometimes trailing, with very thin stems and tiny branchlets, extremely delicate. Leaves opposite, less than 1 cm, rounded or elliptic, virtually without stalks. Flowers hanging in small groups, opening from apex of stem first, yellowish, Feb.–Jun. Fruit bracts distinctive, sessile, broadly-rounded with veins, green maturing white, like miniature hanging paper lanterns along upper part of stems. Bracts envelop minute nutlet.

Common in crevices, rocks and amongst other vegetation throughout the mountains, especially at higher elevations.

Callipeltis cucullaria *in typical rocky habitat, 10 km N of Masafi, 500 m.*



Gaillonia aucheri *in mountains S of Dibba, 600 m.*



2. Gaillonia aucheri (Guill.) Aschers. & Schweinf. (syn. **Jaubertia aucheri** Guill.)

Tough perennial shrub, much-branched but fairly compact with thick woody base, to 1 m. Side twigs pointed, almost spinescent. Leaves opposite or in threes, needle-like, dark green, to 1.5 cm. Flowers axillary and terminal with 5 tiny pointed white petals, Feb.–Jun. Tiny fruits surrounded by long feather-like hairs and whole plant then covered with fleecy blanket effect.

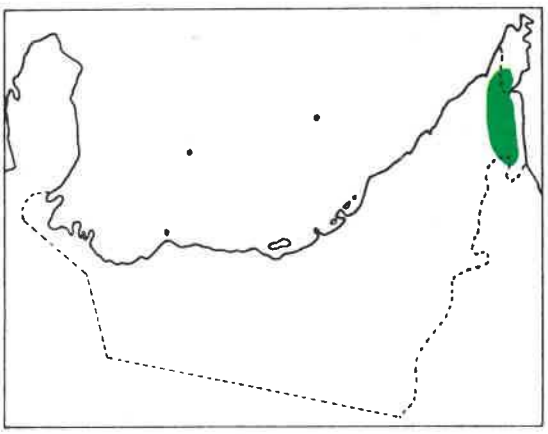
Very common throughout mountains except at highest elevations, especially in association with **Pteropyrum scoparium** (which has a similar shrubby aspect) in broad beds of lower wadis, sometimes in dense stands.

3. Galium setaceum Lam.

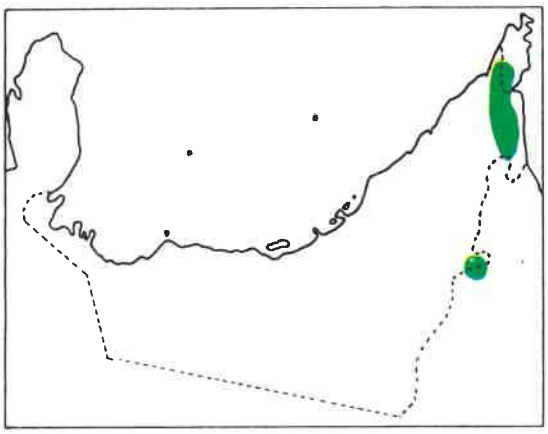
Tiny, very delicate annual herb, more or less erect, to 15 cm or less, branching from base. Stems very slender, angled at nodes. Leaves in splayed whorls of 6–8, narrowly linear to 1.5 cm, upper ones smallest. Flowers minute, purplish, axillary and terminal, Mar.–May. In flower and fruit with aspect of intricate dotted lacework, gradually turning straw-coloured or darker.

Common among rocks and in crevices at all mountain elevations.

Galium setaceum *in mountains above Asimah, 500 m.*



Pseudogaillonia hymenostephana *on Jebel Hafit, 450 m.*



4. Pseudogaillonia hymenostephana (Jaub. & Spach) Lincz.

Small, compact perennial herb to 35 cm, much-branched with slightly hairy pale stems, thin but rigid. Leaves in pairs, occasionally in groups of 3–4 but with only 2 dominant, to 1.5 cm, very narrow and pointed. Flowers axillary and terminal with pale star-shaped petals on long stalks, Feb.–May. Tiny elongated seeds clustered along underside of flower-like pink or white expanded membraneous perianth, narrowly-veined. In fruit conspicuous against rocky background.

Fairly common at lower mountain elevations up to 1000 m. Prolific on north summit of Jebel Hafit and around Hatta.

Convolvulaceae — convolvulus family

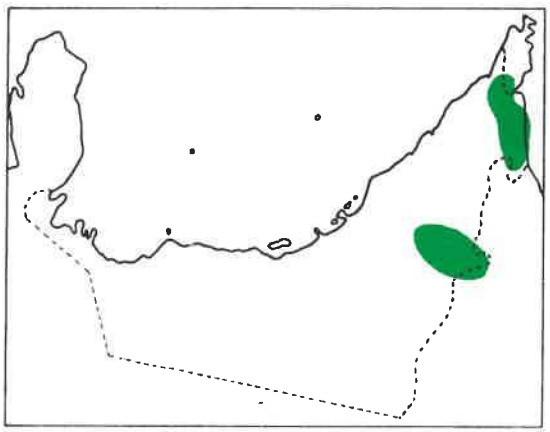
Herbaceous and woody prostrate or climbing plants with alternate leaves and conspicuous white or pink funnel-shaped flowers comprising 5 fused petals. Bracts brown, covered with soft downy hairs. Fruit a small segmented capsule containing 4 seeds. Well-represented throughout country except in western dunes, where rare.

1. Convolvulus arvensis L.

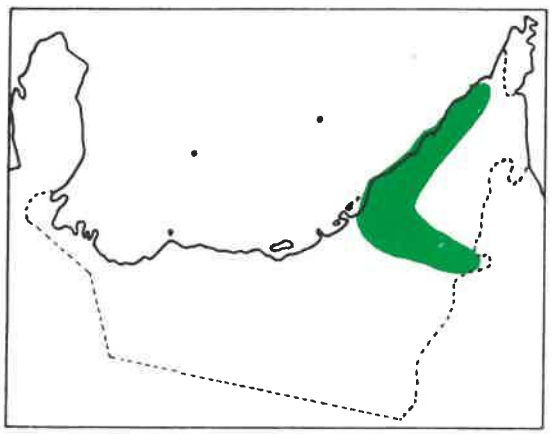
Generally prostrate or scrambling, twining perennial with long, thin, very smooth pliable branches trailing to 2.5 m or more. Leaves variable, mostly flat with outline of a pointed bell, sometimes longer and narrower, with base lobes triangular or oval, sometimes cleft; leaf stalk 1–2 cm; leaves either single or paired with flowers, with flower stalks longer than leaf stalks. Open corolla waxy white or pale pink with red or purple stripes on outside, to 3 cm, Feb.–Jul. but variable. Seeds black, flat.

Common bindweed of farms and plantations in lower desert areas; also parks and gardens.

Convolvulus arvensis in farm at Digdaga, Ras al Khaimah, 100 m.



***Convolvulus cephalopodus** near Al Rafaa, Ras al Khaimah, 50 m.*



2. Convolvulus cephalodopus Boiss.

Tough perennial herb, branching from base into several furry grey-green stems, usually ascending, to 70 cm but sometimes prostrate, often with profile of an inverted cone. Upper leaves very small, ovate or narrower, less than 5 mm, pointed with midrib; lower ones fewer but larger. Heads axillary along upper stems on long stalks, single or in groups. Corolla white with darker centre, about 2 cm long with outer diameter of 3–4 cm and hairy bands on outside; Jan.–May. Capsule hairless.

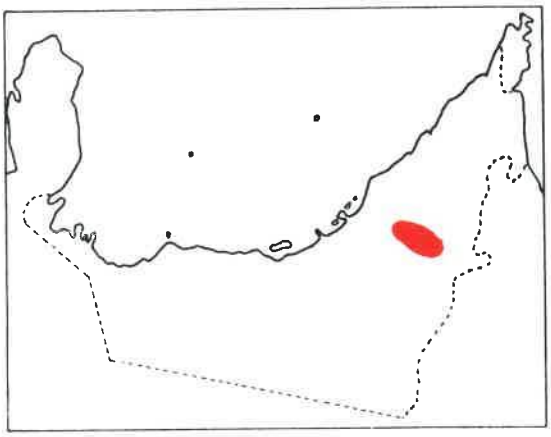
Very common along Abu Dhabi–Ras al Khaimah littoral on raised sand and low dunes inland of sabkha; also in plantations further east and north, always in sand.

3. Convolvulus pilosellifolius Desr.

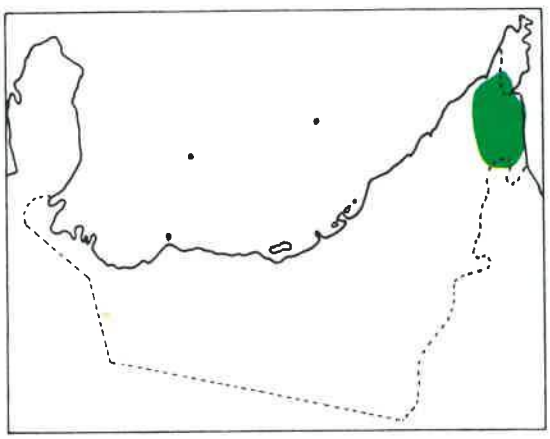
Thinly straggling perennial to 1 m, branching from base into few very thin, weak stems, often bent over. Leaves pale green, slightly hairy, lanceolate, upper ones to 2 cm, lower ones longer with occasional wavy margins. Heads grouped 1–3 in axils of lateral branches on upper half of plant. The only clear pink convolvulus in U.A.E. with whitish inside petals and yellow centre, on long stalks; flowers to 1 cm, smaller than other local convolvulus, Mar.–May. Fruit hairless.

Uncommon except locally in plantations in central desert and around Al Ain, in sandy and calcareous soils.

Convolvulus pilosellifolius *on farm at Al Khazna, Abu Dhabi–Al Ain road, 100 m.*



Convolvulus prostratus *among Acacia scrub near Khor Fakkan, 40 m.*



4. Convolvulus prostratus Forssk.

Tough perennial, branching from base into several greenish-brown stems to 60 m, taller if plant can twine into surrounding vegetation. Leaves hairy on both sides, oblong and slightly pointed with a clear midrib on underside, less than 2 cm, hanging. Flowers clustered 2-3 at upper stem nodes, with leaf at base of each flower stalk. Corolla white with pale yellow centre and slightly ragged petal margins, about 2 cm across, Mar.-Aug. Capsule smooth.

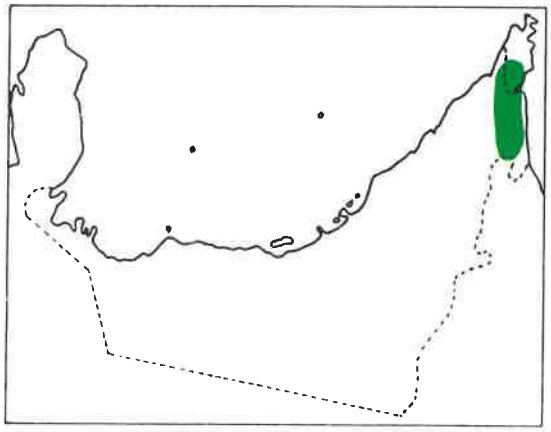
Very common in mountains at lower elevations, especially from Hatta north. A longer, straggling form prevalent along east coast where one specimen measured 3.6 m high in Acacia scrub at Badiyah (Jun.1983).

5. Convolvulus virgatus Boiss.

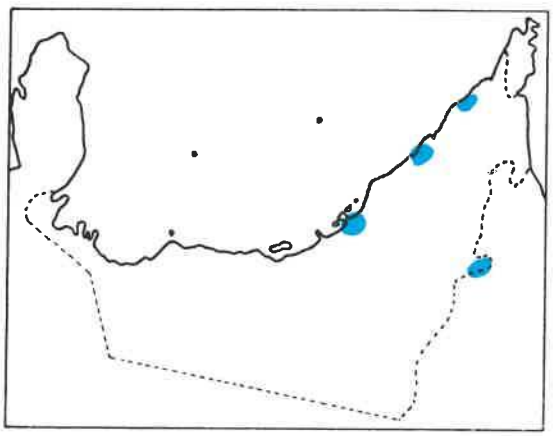
The only spinescent convolvulus in U.A.E. Tough, woody shrub, much-branched from base with dense, intricate stems forming compact bush to 60 cm. Lower leaves grey-green, oblong, thin, less than 2 cm; upper ones smaller and narrower. Many flowers borne singly on axilliary stalks all over outside of bush. Corolla white, to 3 cm across, Mar.-Jun.

Common at higher mountain elevations only, with large colonies locally between Dibba and Ras al Khaimah. Wherever extensively grazed, develops squat, very spiny form.

Convolvulus virgatus in mountains 20 km E of Dibba, 450 m.



Cressa cretica in damp plantation, Abu Dhabi Island, 10 m.



6. Cressa cretica L.

Small but dense shrublet, much-branched and greyish, to 25 cm, herbaceous in appearance. Erect branches not stiff apart from woody rootstock and rise alternately from stems; in larger plants, stems bend over. Tiny leaves without stalks and sharply pointed, to 5 mm. Flowers in dense spikes at ends of branchlets, with reduced leaf at base of each head. Corolla white or slightly lilac, to 5 mm with protruding white stamens which lend a spangled effect, Mar.-Jun. Ovoid capsule to 2 mm.

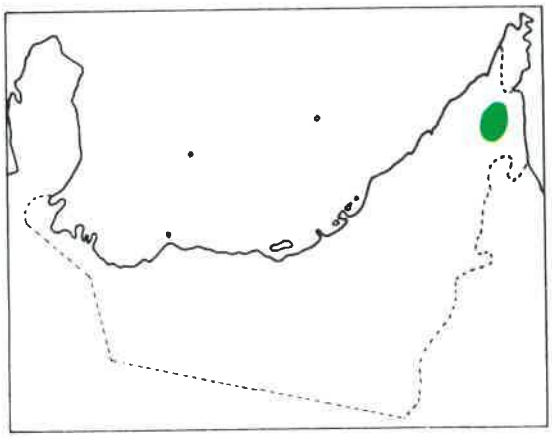
Uncommon, in disturbed, damp ground especially in urban habitats and plantations; occasional along coast north of Abu Dhabi island. Can tolerate high salinity.

7. Cuscuta planiflora Tenore

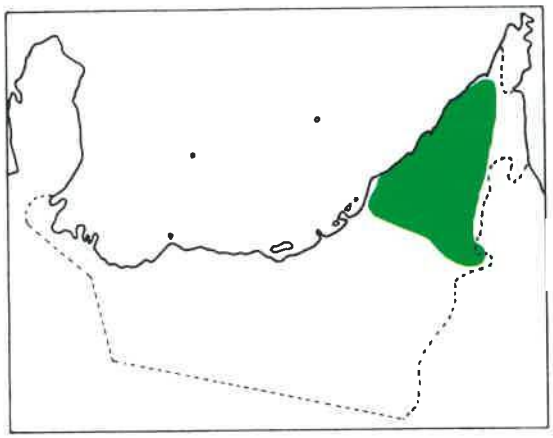
A threadlike, twining parasite without leaves and with pale stems, usually close to ground. Flowers in small globular clusters about 5 mm wide, with minute ball-shaped white corollas, Feb.-Apr. Parasitic on a variety of low herbs and shrubs, often almost completely choking host plant with intermeshing stems. Fruit a small capsule.

Locally common dodder in lower foothills of Northern Emirates especially between Masafi and Dibba. Recorded hosting on **Tribulus terrestris, Schweinfurthia papilionacea** and **Erucaria crassifolia.**

Cuscuta planiflora *on* ***Fagonia indica*** *in hills 15 km N of Masafi, 500 m.*



Arnebia hispidissima *on sandy gravel near Ad-Door, Umm al Qawain, 40 m.*



Boraginaceae — borage family

Shrubs or annuals, often with rough hairy stems and leaves. Leaves mostly alternate, usually very dark green. Flowers usually on outward curving branch tips, opening progressively along curve. Fruit 4-seeded nutlets.

1. Arnebia hispidissima (Lehm.) DC.

Small annual, sometimes biennial herb to 25 cm but generally shorter. Annual form single-stemmed, biennial multi-stemmed and may form compact clump. Usually a few cm of red-brown stem and root below foliage. Leaves narrowly linear to 8 cm, densely covered with hairy white bristles; upper leaves smaller. Flowers in terminal clusters with small but prominent trumpet-like lemon petals expanding into star; tube throat paler, Jan.-May.

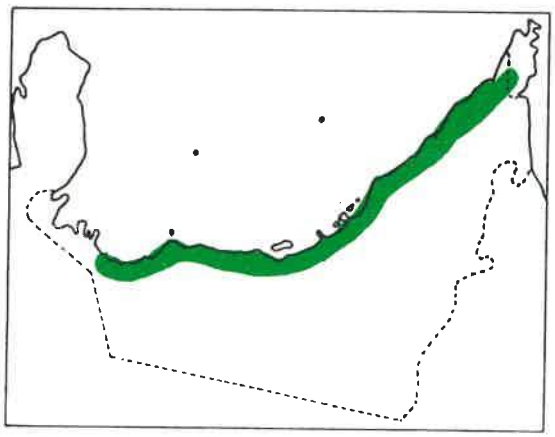
Very common in some years, forming extensive carpets along Arabian Gulf coast and in central desert across to alluvial plains; in other years hardly a specimen to be seen, except the occasional biennial.

2. Echiochilon kotschyi (Boiss. et Hohen.) I.M. Johnst.

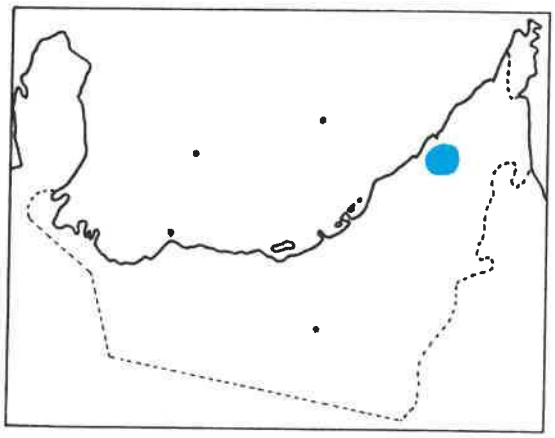
Small perennial herb, intricately-branched from base to 25 cm, dull grey. Stem and branches lighter than leaves, slightly furry, rigid and angular, spreading from point about 5-6 cm above ground. Leaves very dark, to 1 cm, very narrow, rough, recurved. Flowers tiny, white with pale orange or yellow centres, from leaf axils, usually facing upwards, Mar.-May. Nutlets brown.

Common locally on compacted saline sands and gravels inland of sabkha along Arabian Gulf coast, including bluffs west of Jebel Dhanna.

Echiochilon kotschyi *on gravel inland of Jebel Ali, 60 m.*



Gastroctyle hispida *in deep sand 20 km SE of Umm al Qawain, 50 m.*



3. Gastroctyle hispida (Forssk.) Bge.

Tough annual herb, prostrate but with one or two stiffly ascending stems to 30 cm. Branches and leaves bristly. Leaves narrowly-linear with wavy, prickly margins and raised rib on underside, to 8 cm; lower leaves with stalks. Flowers in axils on short stalks, with bright blue petals, Feb.-Apr. Nutlets with minute beak.

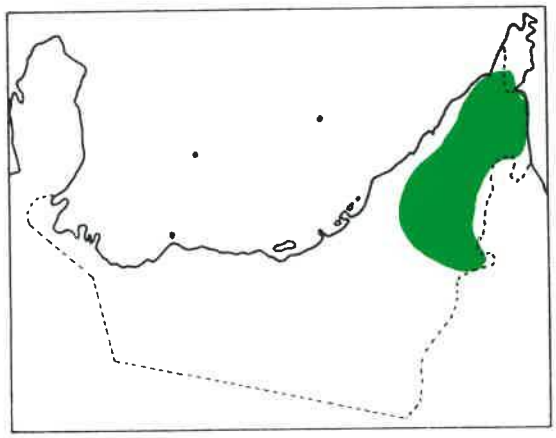
Uncommon except locally on rolling but stable dunes inland of Umm al Qawain; especially in hollows; rare elsewhere. Habitat includes dense cover of annuals and perennials.

4. Heliotropium calcareum Stocks

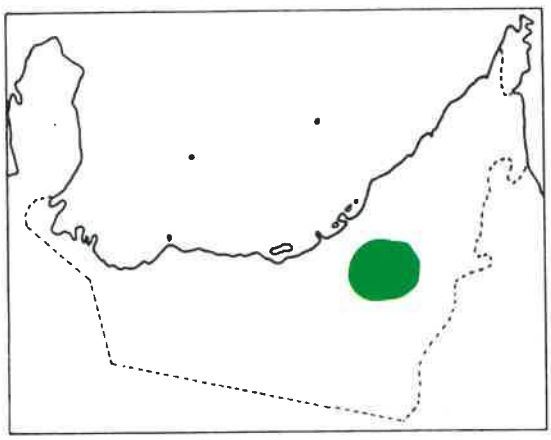
Annual, sometimes biennial to 50 cm, less erect or rigid than **H. kotschyi.** Stem and branches smooth, pliant, slightly hairy, often grooved. Leaves grey-green, elliptical with wavy margins and rounded tips, markedly ribbed and veined on underside. Whole plant sparingly-leafed; lower ones largest to 6 cm. Tiny white flowers clustered along upper side of 10-15 cm leafless stem often divided into 2, curving over like tails of sea horses, Dec.-Aug., variable. Nutlets pointed.

Common in plantations in central desert and alluvial plains, where plant is sometimes very fleshy; also lower mountains where it is thinner but ofter taller with longer flowering stems.

Heliotropium calcareum *among rock scree at Hatta, 600 m.*



Heliotropium digynum *in deep sand near Abu Samra, Abu Dhabi–Al Ain road, 200 m.*



5. Heliotropium digynum (Forssk.) Aschers. ex C. Christ.

Densely-branched dark green shrub to 60 cm with thin white stems, somewhat furry, above a thick woody rootstock. Small plants erect, older ones with branches spreading outwards. Leaves mint-like to 2.5 cm, often crinkled with raised midrib and veins on underside; older plants often with black leaf tips in summer. Flowers in small groups with green bracts more conspicuous than yellow-white petals; salver-shaped, sharply pointed, Feb.-May. Nutlets hairy, to 5 mm.

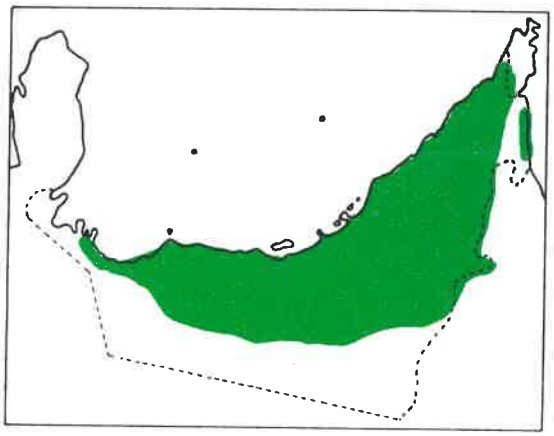
Fairly common in deep sand in central deserts; also in shade of Eucalyptus plantations; concentrations around Sueyhan, Al Saad and Al Hair. May be confused with **Limeum arabicum** when not in flower, but leaves alternate (not in pairs), larger and more numerous.

6. Heliotropium kotschyi (Bge.) Gurke

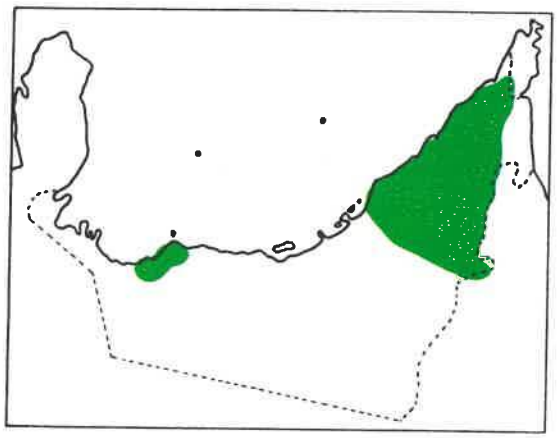
Stiff, hairy shrub to 50 cm with very rough branches and curved leaves covered with grey bristles; bush-like, erect, intricately-branched. Leaves 1-1.5 cm, narrowly pointed. New growth noticeable Feb.-Apr. Heads in dense terminal clusters, half-coiled outwards with a double row of tiny white flowers, each row to 5 cm or shorter; petals rounded with dark green centre, Oct.-Mar and later. Nutlets yellow-brown, in two linked pairs.

By far the most common heliotrope in U.A.E., abundant in all zones except steeper and higher mountains. Thrives in semi-saline flats and alluvial gravels, though not found in deep mobile sands. Along with **Cornulaca monacantha** very extensive in desert north and east of Dubai.

Heliotropium kotschyi *just inland of Abu Dhabi new Airport, 60 m.*



Moltkiopsis ciliata *in deep sand just N of Falaj al Moalla, 120 m.*



7. Moltkiopsis ciliata (Forssk.) I.M. Johnston

Small perennial herb to 25 cm with white younger branches, very smooth, and dark brown bark on older plants. Root-stock often thick. Leaves narrow, short, less than 2 cm, bristly along margins; shorter prickles also cover leaf blades and stalks. Flowers in terminal clusters on leafy branchlets; petals narrow, pink or bluish funnels with darker blue tips, Dec.-Jun. Nutlets triangular, brown and shiny.

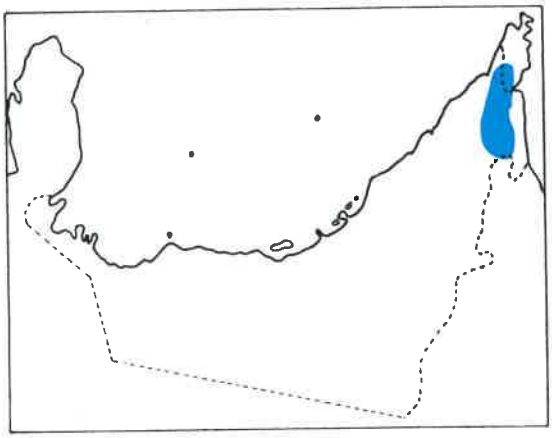
Very common on coastal sands north and inland of Abu Dhabi, especially along margins of depressions; thrives in loose sand around Dubai, Sharjah and further north.

8. Trichodesma africana (L.) R. Br.

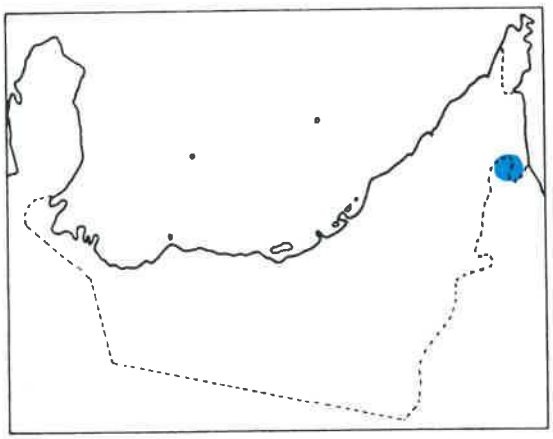
Erect annual shrub to 50 cm, khaki-green with 3-20 main stems and numerous short branches standing out rigidly at right angles or more erect; covered with short, spiny bristles. Leaves opposite, lower ones broadly ovate on long stalks, upper ones more lanceolate, all stiff and bristly hairy especially along margins. Flowers small but numerous in upper axils and terminal on short but very hairy stalks surrounded by large green calyx the same colour as leaves and stems; petals bluish, Feb.-Apr. Nutlets triangular and very prominent, spreading star-like, each to nearly 1 cm.

Fairly common in lower mountain wadis and outwash fans after rains. Usually found in silted habitats among boulders.

Trichodesma africana *in small wadi 15 km W of Masafi, 350 m.*



Tecomella undulata *in abandoned orchard at Jeema, Hatta, 800 m.*



Bignoniaceae — catalpa family

Single sp. in U.A.E. Small tree with opposite leaves and bell-shaped flowers with 5 fused petals. Fruit pod-like, splitting into two. Mostly lower mountains.

1. Tecomella undulata (Roxb.) Seem.

Tree to 5 m with thick, gnarled stem and short, rigid branches with numerous twigs. Leaves bright green and shiny, thin, to 6 cm with clear midrib, in pairs or sometimes grouped 3-5 together. Flowers very large and conspicuous, bright orange, to 12 cm with rounded petals, Jan-Apr. Fruit narrow, curving sword-like, to 20 cm. Seeds flattened, with narrow wings.

Only in odd wadis around Hatta and Masfut; cultivated in past and now largely neglected on site of abandoned villages. Introduced **Bignoniaceae** in parks and city gardens include **Jacaranda** and **Catalpa.**

Verbenaceae — verbena family

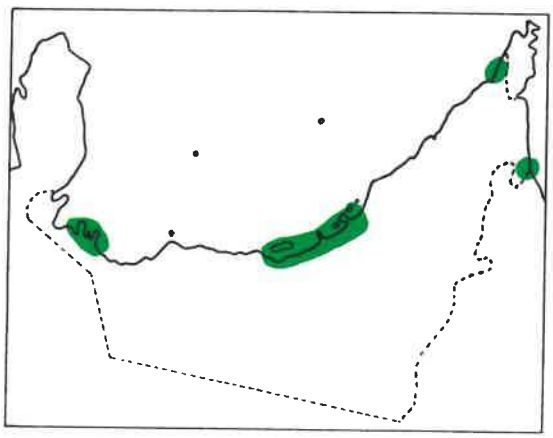
Prostrate herbs or trees with opposite leaves and small flowers in ascending clusters; corolla tubular. Fruit a small berry. Near water.

1. Avicennia marina (Forssk.) Vierh.

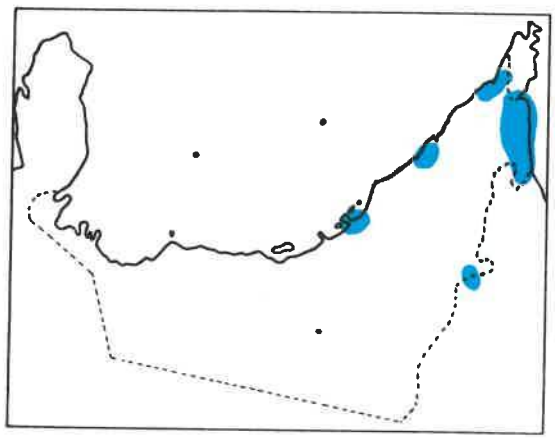
Mangrove tree to 5 m with smooth grey stems and branches. Sends up numerous rubber-like pointed air shoots (pneumatophores) through mud at frequent intervals along lateral root systems; hence tree surrounded by radiating lines of stalks to 30 cm, often encrusted with small gastropods. Trunk and lower branches similarly covered. Leaves elliptical with clear midrib, dark green above, grey beneath, to 6 cm. Flowers terminal and axillary with 4 yellow pointed petals, Apr.-Jul. Fruit remains on tree until Oct./Nov.

Dominant as thickets in some tidal lagoons between Tarif and north of Abu Dhabi Island; near Rams; tallest and most extensive groves at Khor Kalba. Appears to tolerate some oil pollution, provided pneumatophores not totally covered.

Avicennia marina *in lagoon area E of Abu Dhabi Island.*



Lippia nodiflora *near outfall of Abu Dhabi old sewage farm, 1m.*



2. Lippia (Phyla) nodiflora (L.) Greene

Perennial herb, rooting at nodes, with angular branches and forming dense carpet several cm thick, hugging ground contours for several square m. Leaves to 2.5 x 1.5 cm with rounded, serrated tip and tapering to short stalk; slightly hairy with prominent midrib, bright green. Flowers in cone-like spikes to 1.5 cm with minute pink or white petals, variable throughout year but especially Sep.-Feb. Drupe minute, yellow.

Locally common if soil permanently moist, e.g. irrigated date plantations, sewage outlets and beneath dripping A/C units; less common in mountains, where it may at first be confused with **Bacopa monnieri.**

Labiatae — mint family

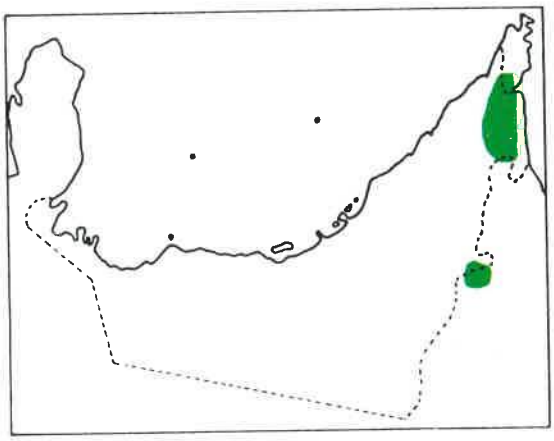
Herbs and shrubs with square cross-sectional stems and opposite leaves; often with aromatic scent. Flowers in spikes or whorls in opposite axils. Corolla tubular, mostly 2-lipped, lower one larger for insects to alight on. Fruit of 4 one-seeded nutlets. Mostly mountain habitats.

1. Lavandula subnuda Benth.

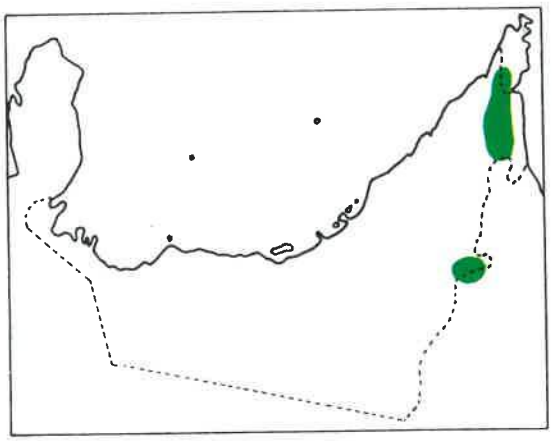
Erect perennial to 1 m with light green, narrowly-grooved stems and pairs of equal branches at intervals, each ascending pair shorter than the one beneath. Almost leafless except young plants which display vigorous basal growth, each leaf to 3 cm with 2-3 deeply cleft, serrated and pointed lobes; upper leaves very reduced, narrow. Flowers on elongated leafless spikes at branch tips, lower flowers opening first; petals in thin blue or pink tubes, Feb.-Jun. Leafless, brown flowering branches common sight in late summer.

Extensive range throughout mountains, forming thick clumps on ledges and slopes.

Lavandula subnuda *in mountains between Hatta and Huweilat, 500 m.*



Leucas inflata *at Daftah, just S of Masafi, 600 m.*



2. Leucas inflata Benth.

Distinctive perennial with woody rootstock and numerous erect, equal branches forming a compact, regular shrub to 40 cm. Stems thin, grooved; older ones grey and smooth, younger ones green and slightly hairy. Leaves both opposite and whorled at regular intervals of 1-3 cm along stems; paired leaves rounded with serrated tips, whorled ones smaller. Flowers clustered from swollen woolly bracts at paired leaf nodes; white petals open from tube, cleft at tip, Mar.-Jun. Regular spacing of leaf and flower arrangement makes this sp. easy to recognise.

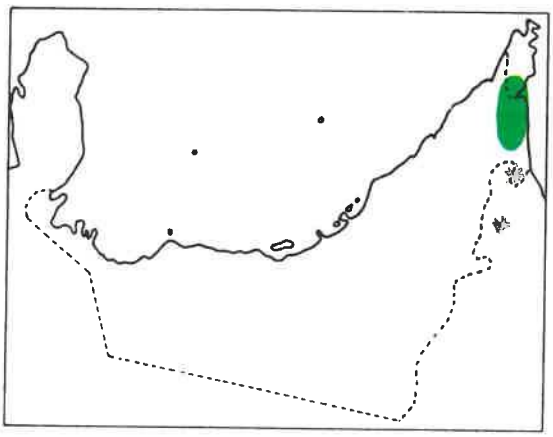
Common in lower mountains, occasionally on rocky alluvial plains.

3. Salvia aegyptiaca L.

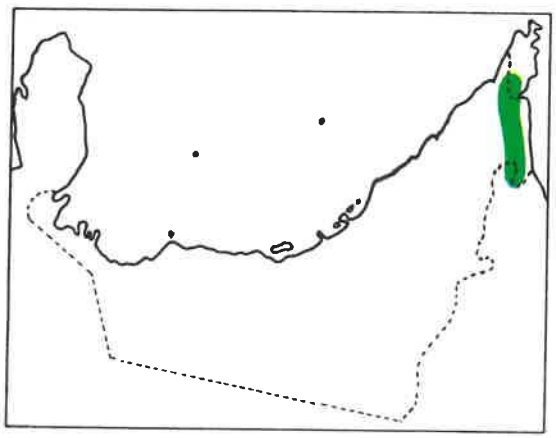
Small shrub to 30 cm, usually with single erect stem and very short branches in pairs or threes at regular intervals of 5-10 cm. Base often woody. Leaves mint-like in outline, 6 × 3 cm, toothed, with a dark green spongy surface, fleshy. Flowers on very short stalks from upper stem, in whorls of 2-4; flowers with two distinct lips, lower one spreading with three lobes, mauve to light pink, Feb.-May. Faintly aromatic.

Fairly common in higher mountians, especially in Ruus al Jibal, usually among rocks and boulders.

Salvia aegyptiaca *in Ruus al Jibal, 1800 m.*



Salvia macilenta *in tributary of Wadi Ham, 15 km NW of Fujeirah, 250 m.*



4. Salvia macilenta Boiss.

Small perennial herb with tough woody rootstock and many rigid, ascending branchlets to 30 cm. Old branches grey, new growth dark green. Leaves sparse apart from reduced pairs along upper branches, green maturing yellowish. Flowers in open spikes on stalks above branches, with attractive lilac petals from a thin tube, enclosed by many long hairs, Jan.-May.

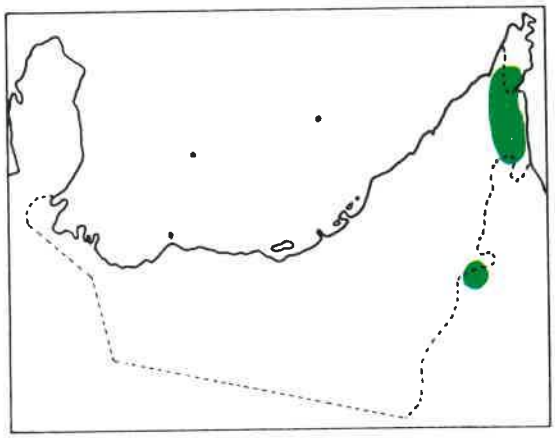
Fairly common in Fujeirah mountains and abundant along east coast.

5. Teucrium stocksianum Boiss. **subsp. stocksianum**

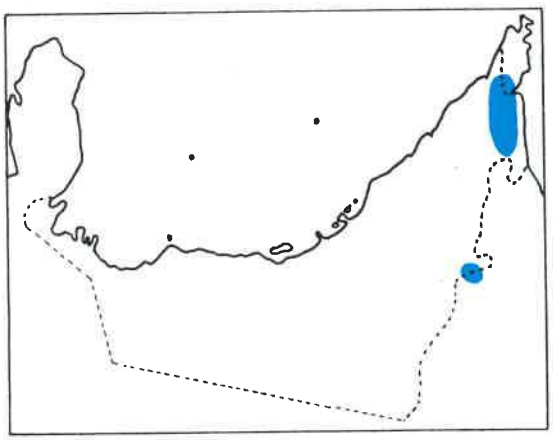
Dense, compact perennial, hemispherical in outline to 30 cm high and across. Rootstock woody, with many erect white furry stems. Lower half of inside branches usually leafless; leaves to 1 cm, in pairs with serrated margins and distinct midribs; occasionally groups of smaller leaves on side stalks. Flower heads mostly terminal on very long stalks, sometimes lateral from upper side twigs; petals white at first, later giving plant a characteristic dotted green and brown appearance; upper lip absent, Feb.-Jun.

Fairly widespread at upper mountain elevations in small groups; also recorded in desert plantations at Shwayb.

Teucrium stocksianum *in typical scree habitat on Jebel Hafit, 450 m.*



Hyosycamus muticus *beside wadi at Khulaybiyah, S of Dibba, 250 m.*



Solanaceae — nightshade family

Mostly perennial shrubs and herbs with alternate leaves in a variety of shapes. Flowers in groups, corolla often tubular with spreading lobes, mostly with 5 sepals and 5 fused petals. Fruit usually a berry. Well-represented both in natural plant community and as weeds.

1. Hyosycamus muticus L.

Stout, light-green herb to 50 cm, much-branched with stiff, hairy and yellowish fleshy stems. Leaves also fleshy, ovate or diamond-shaped, pointed and toothed, to 9 cm; lower ones on long stalks, upper ones without stalks. Flowers funnel-shaped in long terminal clusters along one side of stem; petals white or pink-tinged with distinct mauve spots; outer lobes to 5 cm diameter; stamens exceed corolla by 3-6 cm, Dec.-May. Fruit a capsule with lid.

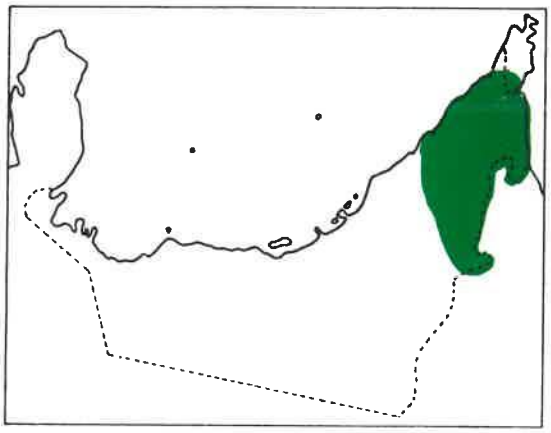
Uncommon, beside lower mountain wadis and sometimes fringing oases, e.g. around Hatta.

2. Lycium shawii Roem.& Schult.

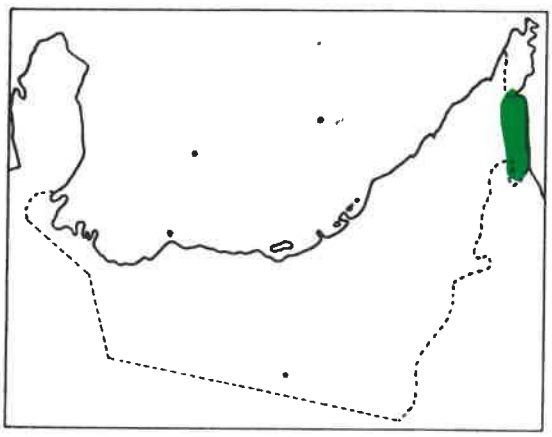
Thorny shrub, very rigid, to 3 m. Stems erect with alternate spines, each 1-1.5 cm, at 2 cm intervals with leaves bunched at base of each. Leaves thinly spatulate to 1 cm, tapering at base. Flowers small, narrowly tubular, on stalks from leaf axils with white petals exceeded by stamens, Dec.-Apr. Berry spherical, orange, edible, smaller than pea.

Very common in variety of habitats, often in association with **Acacia tortilis** and **Prosopis cinerea** trees, under which growth may be extensive, especially inland Ajman and Umm al Qawain; also in mountains to 4000 ft., often in association with **Grewia erythraea;** on alluvial plains; cultivated in nurseries in Western Region of Abu Dhabi for distribution as a windbreak and sand stabiliser.

Lycium shawii *on outcrop just S of Al Hair on Al Ain–Dubai road, 350 m.*



Solanum incanum *in depression at Rams, Ras al Khaimah, 50 m.*



3. Solanum incanum L.

Bushy shrub to 1 m, greyish. Younger branches fleshy green, older ones brown and rigid; all stems and branches covered with sharp, slightly recurved prickles, less than 1 cm. Young leaves large, ovate to lanceolate and pointed with undulating margins, to 10 x 6 cm; older ones shorter, and many deciduous after flowering; young leaves also with 2-3 long sharp prickles on underside midrib. Flowers solitary and in pairs in upper leaf axils on stalks; petals pointed, purple with yellow centre, conspicuous, Feb.-May. Berry plum-sized, yellow maturing brown and turning very hard and wrinkled, eventually shrinking.

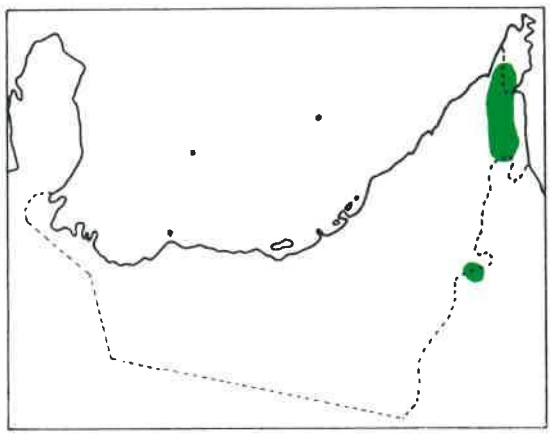
Common in disturbed ground in mountains, especially around settlements and fields; abundant in east coast plantations.

4. Solanum nigrum L.s.l.

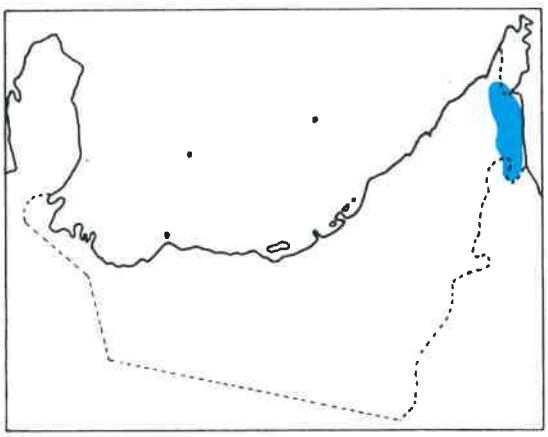
Annual nightshade of diverse aspect to 60 cm with smooth, fleshy stems branching from base; branches usually ridged. Leaves dark glossy green, ovate or diamond-shaped, sharply toothed and pointed on long stalks. Flowers clustered 3-6, to 2 cm; corolla small and white, petals star-shaped with 4 yellow stamens from centre, Feb.-May. Berry green, red or black, drooping.

Common weed on disturbed ground in both coastal and mountain plantations, in city parks, in fields along east coast and in mountain wadis.

Solanum nigrum *in Al Ain oasis, 350 m.*



Withania somnifera *at Ghalilah, Ras al Khaimah, in old plantation, 50 m.*



5. Withania somnifera (L.) Dun.

Shrubby perennial covered with dense but short white hairs giving woolly aspect, to 1 m, much-branched from base. Upper branches waxy white, zigzag, showing clearly because leaves are bunched at intervals. Leaves to 10 cm, pointed, upper ones more paired. Flowers small, on short stalks, clustered in leaf axils; petals greenish-yellow, Mar.-May. Berry small, bright red maturing yellow or brown, fruit enclosed in persistent paper-like membrane; these clusters just below terminal leaves make the plant easily recognisable.

Uncommon, in clumps in mountain oases and settlements especially in the border area around Hatta and Masfut.

Scrophulariaceae — figwort family

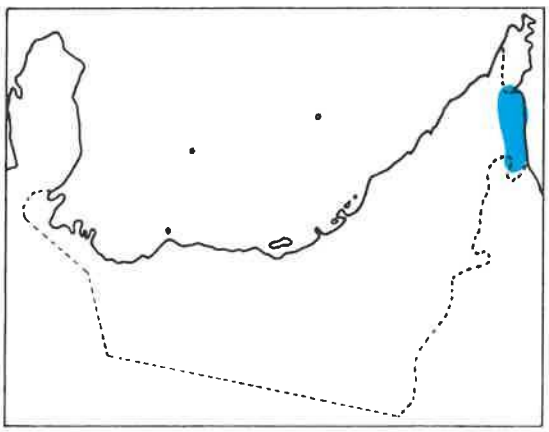
Annual and perennial herbs with opposite leaves, occasionally whorled, often serrated. Flowers clustered, mostly with 5 fused petals and 4-5 stamens, variable in shape with long or short tubes. Fruit a dry capsule. Well-represented, especially in northern Emirates.

1. Bacopa monnieri (L.) Pennell

Smooth-branched, creeping herb with long stems rooting at nodes, forming dense mat a few cm high. Leaves sometimes in threes, spatula-shaped, to 2.5 cm, dark glossy green and slightly fleshy, very smooth along margins. Flowers solitary, axillary on long erect stalks; corolla bell-shaped, white, Mar.-May. Capsule small, pointed.

Fairly common fringing mountain pools and some wadis, if the water supply is continuous; often colonises small irrigated fields beneath date palms. Should not be confused with **Phyla nodiflora,** also a creeping plant but with spiky purple heads.

Bacopa monnieri *in dried out wadi bed at Siji, 300 m.*

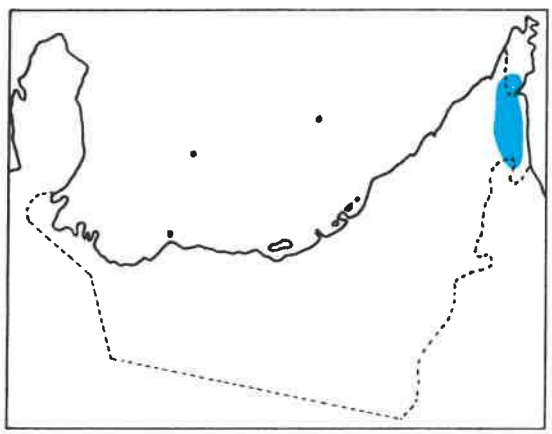


Kickxia ramosissima *at Qidfa, East Coast, 50 m.*

2. Kickxia ramosissima (Wall.) Janchen

Delicate annual with few very thin stems and thread-like branches, to 30 cm. Leaves sparse, very narrow and pointed, to 2 cm with divergent base giving spear-like profile. Flowers solitary on hair-like stalks to 5 cm from leaf axils; corolla minute, with pale yellow petals, Mar.-May. Capsule light brown containing many black seeds like pepper grains.

Fairly common scattered throughout lower mountains and gravel plains in Ras al Khaimah and Fujeirah; prefers shady habitats beneath overhangs or behind and under boulders.

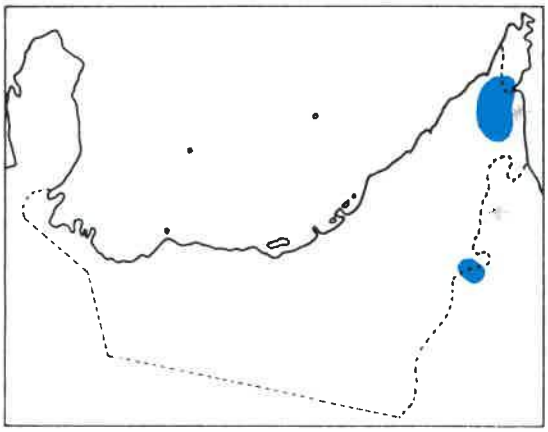


3. Lindenbergia aff. **fruticosa** Benth.

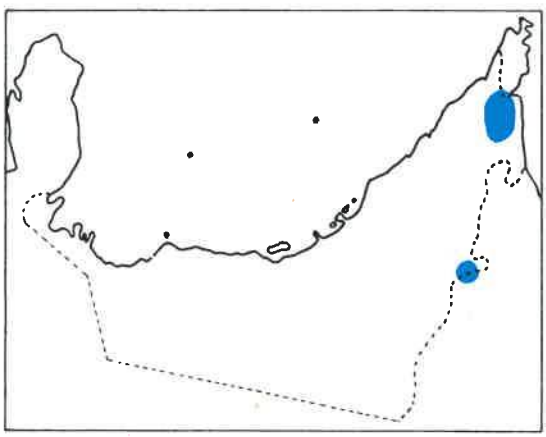
Leafy annual to 30 cm with 1-4 main stems, sparingly-branched, sticky to touch with cover of short, dense hairs. Leaves broadly ovate with regular serrated margins, pointed, somewhat resembling small nettle leaves, upper ones smaller. Flowers single or paired on very short stalks from upper leaf axils; corolla to 2 cm, surrounded by red or brown bracts, opening out into deep yellow petals with 2 lips, Feb.-May. Capsule splits down centre.

Common only very locally on Jebel Hafit and in hills north of Hatta and east of Khatt. Usually recorded in shady habitats in rocky clefts after spring rains.

***Lindenbergia** aff. **fruticosa** on west flank of Jebel Hafit, 500 m.*



***Misopates orontium** in mountains N of Masafi, 600 m.*



4. Misopates orontium (L.) Rafin.

Smooth annual herb to 40 cm, often much smaller, usually with one or few slender erect stems; side branches short and semi-erect. Leaves entire, narrowly-lanceolate to 5 cm; usually with 1 long and 3-5 short ones together. Flowers on long stalks from leaf axils, with leaves along stalk; usually 4-5 leaflets at base of flower head. Petals closed with 2 lips, from a tube, 1-1.5 cm, pink with darker veins and 4 stamens, Feb.-May. Capsule rounded, containing many wingless seeds.

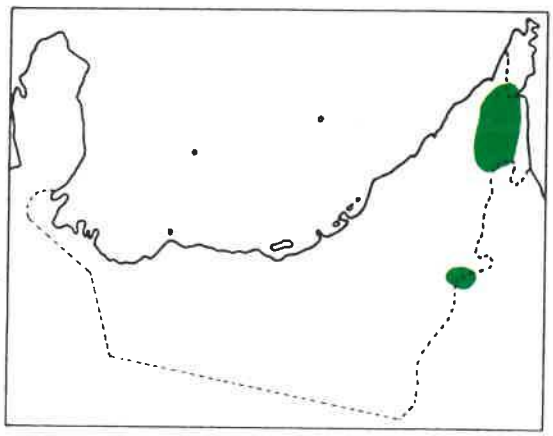
Uncommon, mostly among boulders and dense annual cover in lower mountains between Masafi and Dibba.

5. Schweinfurthia papilionacea (Burm. f.) Boiss.

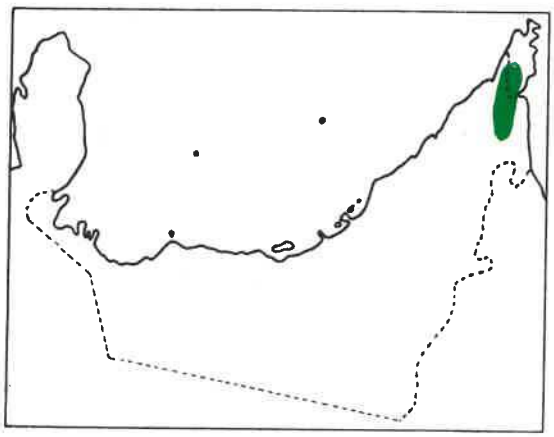
Stiff annual to 60 cm, with a fleshy aspect, in both erect and semi-prostrate forms; sometimes single-stemmed but often branched from base. Leaves broadly shovel-shaped to 4 x 4 cm, pointed, on very short stalks; on young plants especially, leaf bases tend to clasp stems. Flowers solitary in leaf axils, with large tubular corolla and double lip, superficially resembling papilionate arrangement; petals pale pink or rose and yellow, with fine veins, offsetting waxy green foliage, Jan.-May. Capsules globular, buff, conspicuous.

Very common on alluvial plains and wadi outwashes in Fujeirah and Ras al Khaimah; locally abundant along Dibba - Masafi road; occasionally around Al Ain. Sometimes forms dominant but small local communities.

Schweinfurthia papilionacea *beside main Masafi–Dibba road near Uyaynat, 150 m.*



Scrophularia arguta *in mountains N of Masafi, 600 m.*



6. Scrophularia arguta Soland. ex Ait.

Annual herb to 60 cm resembling **Forsskaolea tenacissima** in general aspect but lighter when mature and without bristles. Young growth dark but older leaves very light green. Stem grooved, with minute hairs, velvety smooth. Leaves nettle-like, roughly triangular, to 5 x 5 cm, evenly serrated. Inflorescence a panicle on short stalks from upper leaf axils, also terminal panicles decrease in size towards tip of plant. Small but conspicuous deep red petals extend from tube surrounded by green bracts, Feb.-May. Capsule pear-shaped, khaki-green.

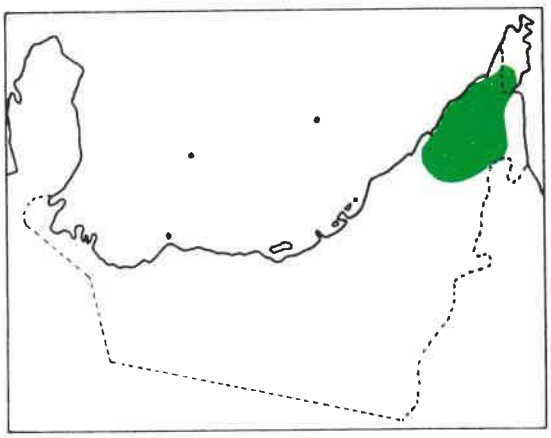
Locally common at low to intermediate mountain elevations, especially from Masafi north.

7. Scrophularia deserti Del.

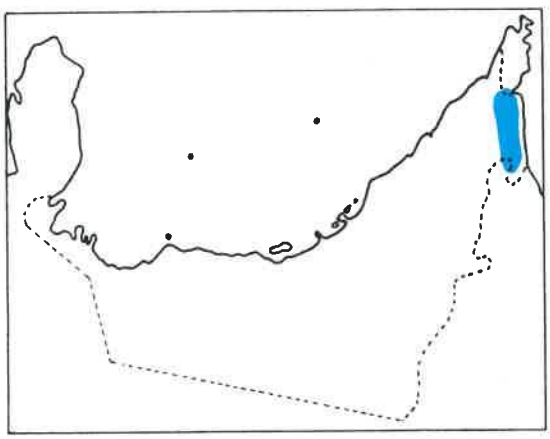
Shrubby perennial to 60 cm branching from base with erect smooth stems, very thin. Leaves sparse and only around base; ovate, serrated with white-margined lobes. Flowers arranged in groups of 6-10 along naked side twigs that often branch out at right angles; petals minute, red or mauve, emerging from tiny inflated tube, Feb.-Jun. Capsule small, spherical.

Fairly common in lower mountain habitats, including alluvial fans around Khatt and Idhn and along the Jebel Ali — Ras al Khaimah littoral, on gravel but not in deep sand. Often difficult to spot because of its thin, naked branch profile.

Scrophularia deserti *in Wadi Hatta, 750 m.*



Verbascum omanense *in abandoned plantation beside Wadi Jeema, Hatta, 800 m.*



8. Verbascum omanense Hub.-Mor.

Large, woolly perennial, usually much-branched from base with long, slender, pliant stems to 2 m. Basal leaves ovate or broadly lanceolate, to 7 x 4 cm with distinct midrib; woolly, grey-green, upper ones very reduced. Flowers numerous, solitary, along outer branches and twigs. Corolla rounded, to 2 cm across with orange or yellow crinkly petals and 5 red stamens, Mar.-Aug. Capsule rounded.

Uncommon, only in mountain oases and plantations. Requires dampness and shade and frequently seen against old walls.

Acanthaceae — acanthus family

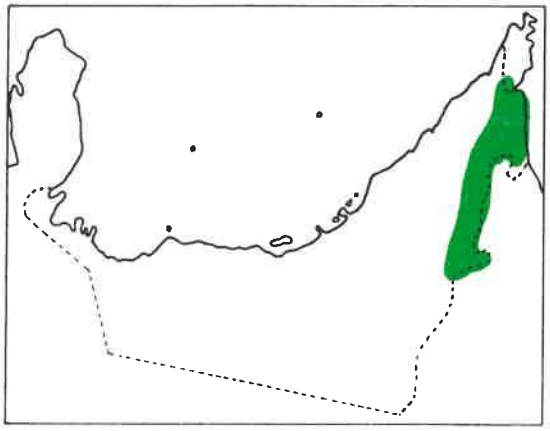
Single sp. in U.A.E. Perennial herb with opposite leaves and brightly coloured bracts. Seeds in dry capsule. Throughout mountains at low to intermediate elevations.

1. Blepharis ciliaris (L.) B.L.Burtt

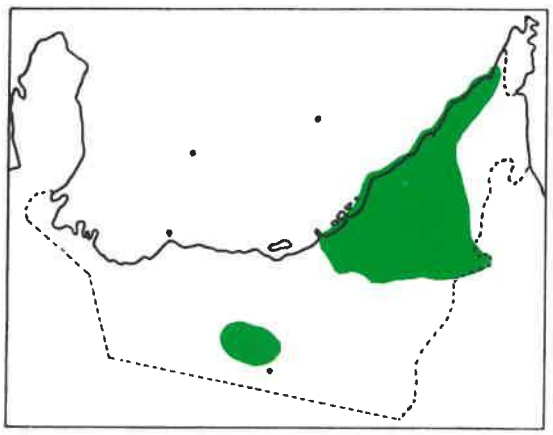
Small shrub to 30 cm, usually smaller, of light-green, silvery aspect. Stem and branches thin, stiff, white. Leaves also stiff, narrow and elongated, usually with 1 terminal and 2 pairs side spines, to 3 cm, thistle-like. Corolla a short, slightly bulbous tube extending to large 3-lobed curving lip, blue to light mauve with darker veins; petals to 2 cm, well protected within network of leaf and bract spines, Mar.-Aug., very variable. Leaves gradually die back white. Capsule flattened, to 1 cm.

Common in mountains between Al Ain and Ras al Khaimah; also in rocky foothills and higher gravel plains; rare in open sand.

Blepharis ciliaris *in rocky gully just north of Hili, Al Ain, 350 m.*



Cistanche tubulosa *at water's edge, Umm an Nar, Abu Dhabi.*



Orobanchaceae — broomrape family

Parasitic plants lacking chlorophyll, therefore no green parts. Leaves reduced to scales. Flowers in large showy spike with 5 fused petals, 2 long and 2 short stamens. Fruit a 2-valved capsule containing many seeds.

1. Cistanche tubulosa (Schenk) Wight

Branchless perennial to 1 m, usually shorter, with single (rarely 2-3) stem to 4 cm thick and overlapping brown or paler scales 2-3 cm long and pointing upwards, more or less clasping; stem whitish. Flower spikes to half the length of plant with broad bracts. Corolla trumpet-like to 5 cm; petals bright yellow, orange or almost white, sometimes with strong purple tinge, with rolled-out margins, Dec.-Mar; flower tube curved at base. Capsule black, pea-like; majority of seeds apparently turn rotten in capsule on plant.

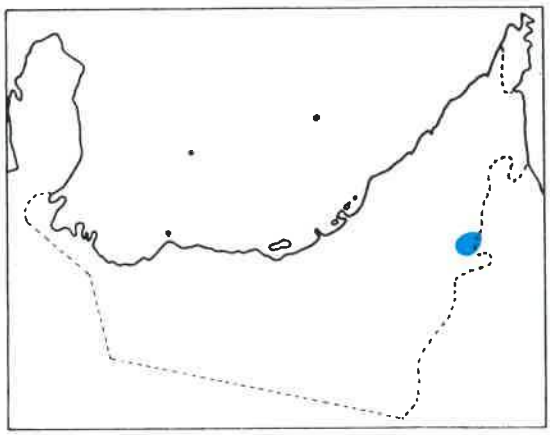
Very common along coastlines and inland saline depressions, including Al Liwa. Host plants mostly halophytes. Earlier name **C.phelypaea** (L.) Cout.

2. Orobanche cernua Loefl.

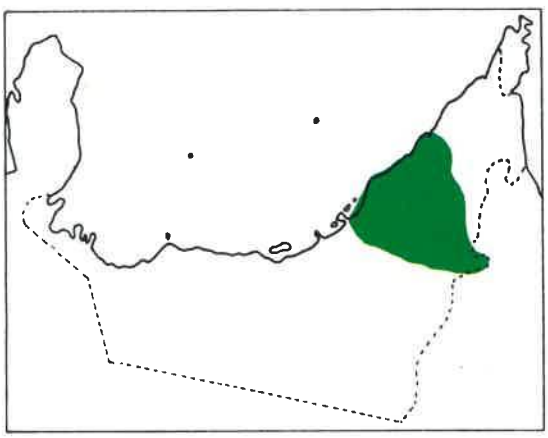
Perennial, 15-50 cm with single scaly leafless stem, thick or thin, blackish. Roots non-extensive, and plants sometimes top-heavy and leaning. Flowers terminal in 10-30 cm cylindrical spike; corolla comprises 5 fused blue petals, white inside tube, 1-1.5 cm with upper lip bilobed. Flowers generally smaller than in **Cistanche** but just as conspicuous; corolla turns glossy when dry. Bracts ovate, pointed, at least half length of petals. Flowering Jan.-Apr. Capsule with valve at both ends.

Apparently hosting only on tomato plants, hence on farms and in market gardens, especially around Al Ain and Shwayb.

Orobanche cernua, *a parasite of tomato plants, at Shwayb plantation, Abu Dhabi, 350 m.*



Plantago boissieri *beside coastal highway in Ajman, 50 m.*



Plantaginaceae — plantain family

Annual herbs, mostly with leaves in basal rosettes, and parallel veins. Flowers minute, tubular, on stubby terminal spikes; petals papery, exceeded by 4 white or yellow stamens. Fruit a transverse-splitting capsule. Well-represented in central desert and mountains.

1. Plantago boissieri Hausskn. & Bornm.

Small herb to 20 cm branching from base with most flower heads well above rest of plant. Leaves lanceolate to 12 cm, silvery green, festooned with silky white hairs except at tips, which are browner; leaves sometimes curve gently along complete length, or only near tip like a shepherd's crook. Spikes longest of local **Plantago,** 6-10 cm, oblong to cylindrical, sometimes interrupted, on thin, slightly hairy stalks; petals whitish surrounded by brownish bracts covered with white hairs, Jan.-Apr.

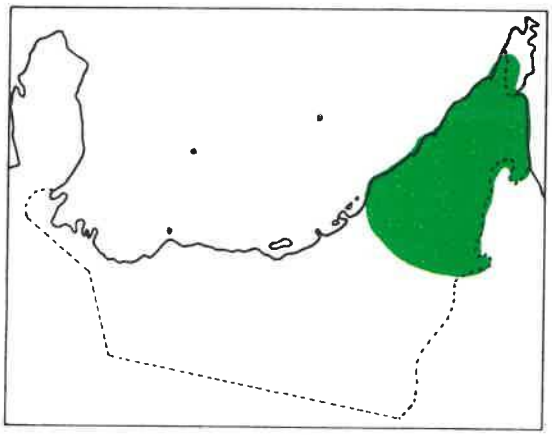
Very common inland Ajman and Umm al Qawain on stable sand; also plantations and occasionally open ground in central desert and around Al Ain; rare along east coast.

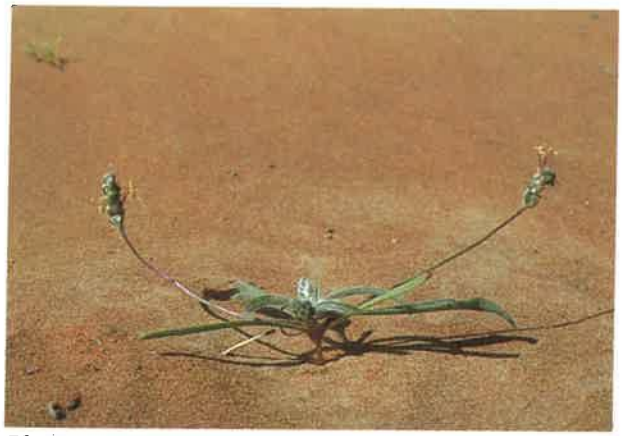
2. Plantago ciliata Desf.

Small herb to 18 cm, densely-covered with short, silky-white hairs. Stems generally quite short. Leaves broader than in other local **Plantago,** 6-8 cm long by 1.5-2 cm wide at centre, tapering at both ends and hairy along margins, glossy green to rusty brown, sometimes rather twisted. Flower stalks mostly just exceed leaves, also hairy. Spikes 1-2 cm, oblong or ovoid, brown or buff, fringed with hairs. Petals inconspicuous, pale among bracts with a few dark hairs protruding, Feb.-Apr.

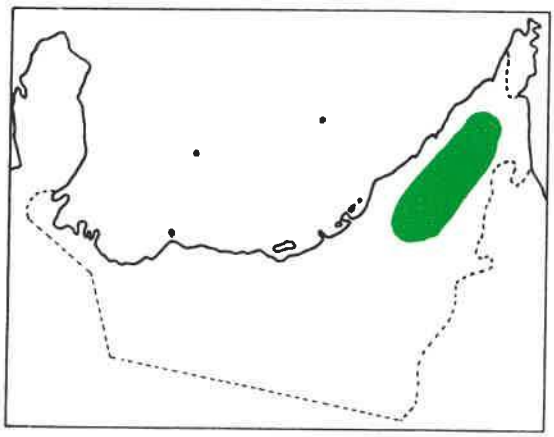
Common throughout desert north of a line from Abu Dhabi to Al Ain; occasionally in foothills.

Plantago ciliata *on outskirts of Al Ain, in sand, 325 m.*





Plantago ovata *in sand near Manama, Ras al Khaimah, 250 m.*



3. Plantago ovata Forssk.

Small plantain to 15 cm, branching at ground level into 2-7 curving and ascending stems. Leaves radiating at base to 10 cm, lanceolate, slightly toothed and tapering at base, silkily grey and swollen at centre. Flower stalks mostly exceeding leaves. Spikes 1-2 cm, oblong to ovoid, with light brown bracts and tiny yellow petals to 3 mm, standing out from spike.

Fairly common in sandy habitats on alluvial plains especially among low dune fields; abundant between Dhaid and Idhn and around Falaj al Moalla. More likely than other local **Plantago** to be found in open sand.

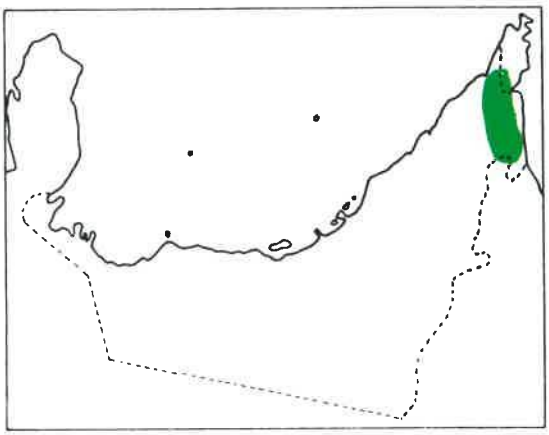
4. Plantago afra L.

Small herb to 15 cm with 1 erect and 1-3 lateral stems from base and opposite, ascending branchlets. Leaves to 2.5 cm x only 1 mm. Spikes numerous, ovoid, to 1 cm on 2-3 cm ascending stalks from upper axils, Feb.-Apr. Bracts shorter than spike. Common in higher mountains of Ras al Khaimah and Fujeirah; also recorded adjacent to Hatta dam.

Plantago amplexicaulis Cav.

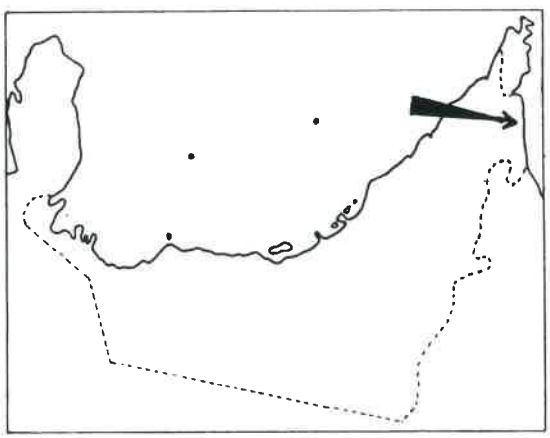
Herb to 20 cm, stemless or with short stems and conspicuous linear and pointed leaves. Spikes smooth and glossy, ovate or cylindrical, 1-2cm. Mostly mountain habitats, often with **P.afra.**

***Plantago afra** in the Ruus al Jibal.*



Spring annuals in the hills some 10 km north of Masafi, March.

Composites form a major proportion of mountain annuals, particularly **Launaea** spp.



Compositae — daisy family

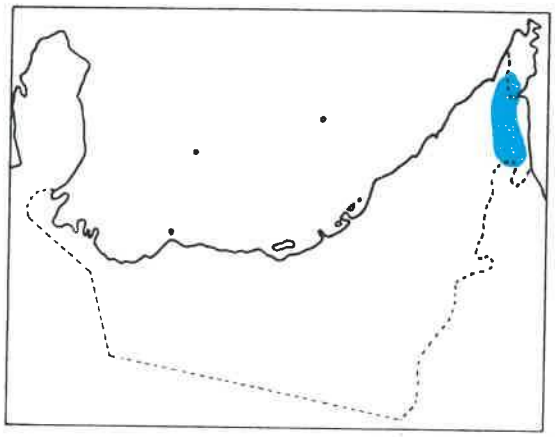
Large family of mostly herbaceous but some woody plants with opposite or alternate leaves, usually distinctly-veined. Heads characteristic with numerous florets surrounded by bracts. Seeds typically with tuft of silky white hairs (pappus). Well-represented throughout U.A.E.

1. Artemesia herba-alba Asso.

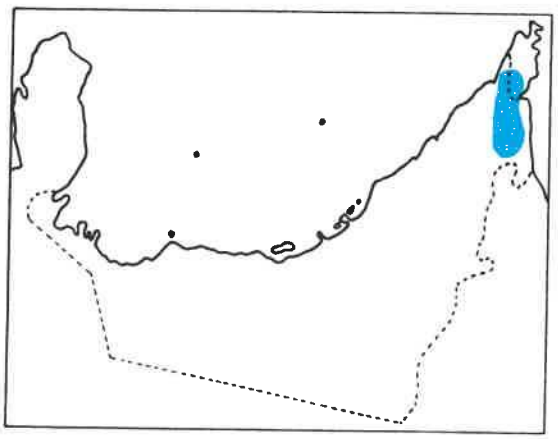
Perennial greyish-green shrub to 50 cm with numerous stems, much-branched from a woody, often thickened base. Rootstock very rough and fibrous; upper stems white-woolly, thin but stiffly erect. Leaves greyish, very finely-dissected into narrow lobes, rounded at tips and very crowded; upper leaves decreasing in size. Heads brownish, rounded in a tightly-clustered erect panicle, without stalks; disc florets minute, Mar.-Jun. Pappus absent. Plant has thyme-like scent, especially when rubbed.

Uncommon, among spurs extending west around Ghayl and Idhn; very common above 3500 ft in Northern Oman.

Artemesia herba-alba *in Ruus al Jibal at 1800 m, in association with annual composites.*



Atractylis cancellata *in hills N of Masafi, 500 m.*



2. Atractylis cancellata L.

An annual dwarf thistle, only a few cm high in U.A.E. with slender stems branching from base; basal stems woolly-white. Leaves narrowly-linear to 2 cm with each of the numerous serrations extending to a sharp prickle; leaves extend up to and beyond heads, which are all approximately on same level in tight group just a few cm across. Heads to 1.5 cm with waxy-green bracts; florets tubular, purple. Pappus level with or just exceeding upper leaves around head. Whole plant very squat and covered with spiny teeth.

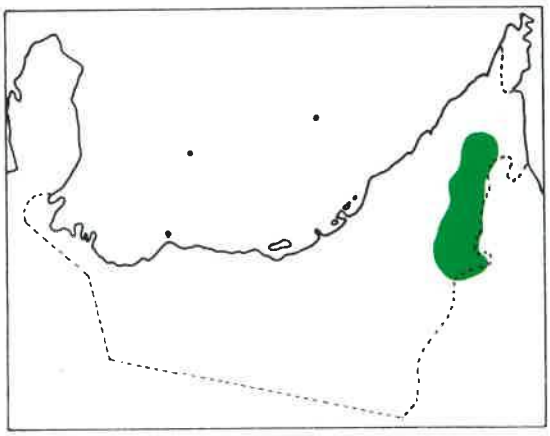
Uncommon except locally in lower to mid mountain zones especially from Hatta north.

3. Carthamus oxycantha M. Bieb.

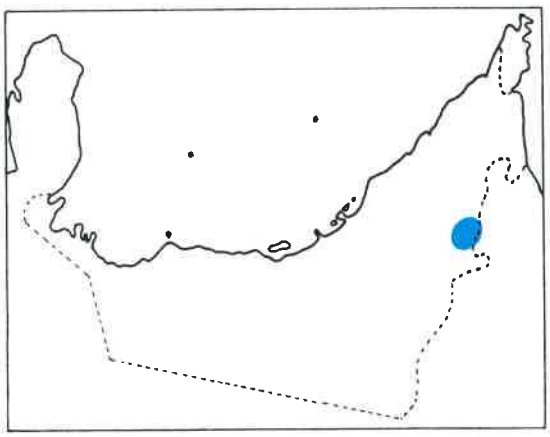
Large annual, thistle-like, to 90 cm with intricate branches. Leaves numerous, dark green and very glossy, with spiny lobes like elongated holly leaves; spines 8-12, long, yellow, around margins. Flower heads appear to be supported by clusters of leaves, with many spines. Florets tubular, bright yellow, above several tiers of green bracts, outer ones spiny, Mar.-Jun. After maturity, leaves die back to gold, then dull straw colour.

Fairly common in desert plantations where damp conditions exist. Recorded around Al Ain, Fili and Dhaid. Superficially similar to **Centaurea pseudosinaica,** which is mostly smaller with less spiny leaves.

Carthamus oxycantha *at Fili, near Madam, on farm, 350 m.*



Carthamus tinctorius *in Shwayb plantation, 350 m.*



4. Carthamus tinctorius L.

Annual safflower to 1 m with woody, erect and very smooth main stem. Branches arise from different points but reach to approx. same height, giving a flat-topped profile. Leaves lanceolate to 7 x 2 cm, slightly prickly, clasping at stem. Heads thistle-like, surrounded by prickly-pointed whorl of smaller leaves. Flowers orange-red, large, terminal and all alike, Feb.-Apr. After flowering, plant dies back overall waxy whitish. Pappus scales unequal.

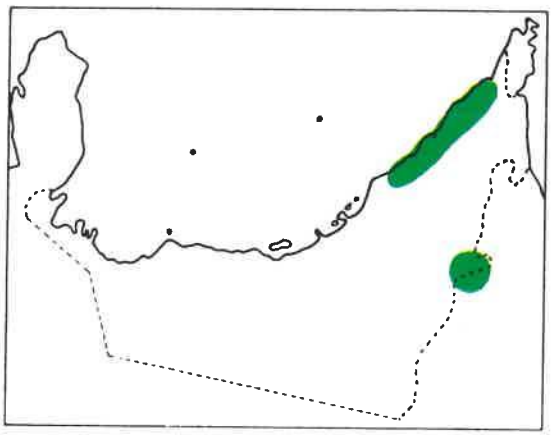
Once cultivated, now a showy escape in plantations around Al Ain and Shwayb.

5. Centaurea pseudosinaica Czerep.

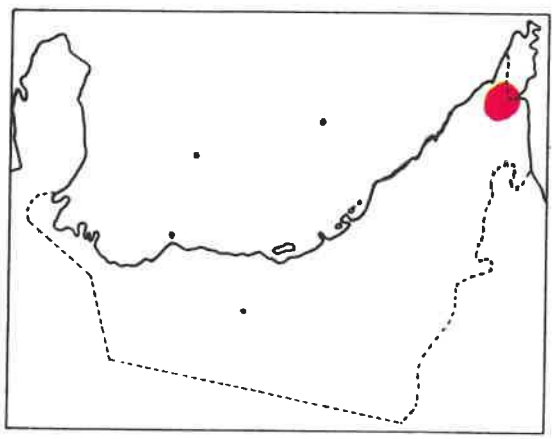
Perennial to 70 cm, erect or branching and spreading, flowering in first year. Branches often divided into two sections of more or less equal length, one terminating in larger flower head. Basal leaves narrowly-lanceolate and clasping, without stalks, with 2-4 cm free tips and minutely toothed extending to sharp yellow prickles; upper ones smaller and freer. Heads terminal or in forks, partly surrounded by upper leaves. Florets tubular, yellow, above globular head of green bracts which is to 2.5 cm thick, bearing 9-18 spines to 3 cm, Feb.-May. Pappus thistle-like.

Fairly common in plantations and locally in stable desert in Umm al Qawain and Ras al Khaimah but rare near coast; also around Al Ain. Previously referred to as **C.sinaica** DC. in error.

***Centaurea pseudosinaica** at Ad-Door, Umm al Qawain, 50 m.*



***Cichorium intybus** in abandoned field at Digdaga, Ras al Khaimah, 100 m.*



6. Cichorium intybus L.

Stiff annual herb to 50 cm with smooth semi-hollow stems, milky sap and short, rigidly-angular branches, often standing out at right angles. Basal leaves dentate, upper ones smaller, lanceolate, hairy beneath. Flower heads clustered in branch forks, without stalks, or at ends of higher branches. Corolla a large blue trumpet with strap-like, blunt-ended florets to 3.5 cm, Mar.-Jun. Capsule 5-angled and containing 1 seed only; after fruiting, stem and branches turn dark brown with grey streaks.

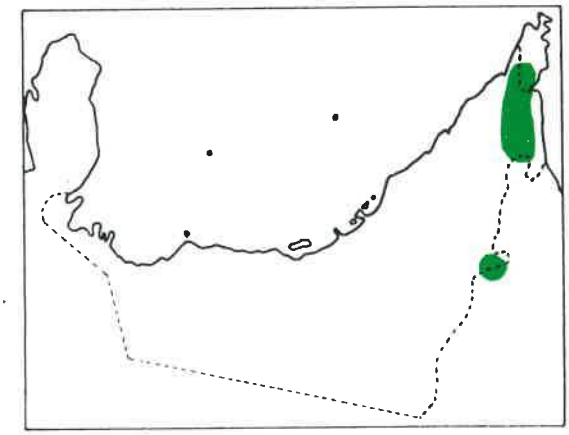
Uncommon except locally in Ras al Khaimah, in abandoned fields around Digdaga and Khatt. Branches browsed by sheep and goats.

7. Echinops sp. (poss. **spinosissima** Turra)

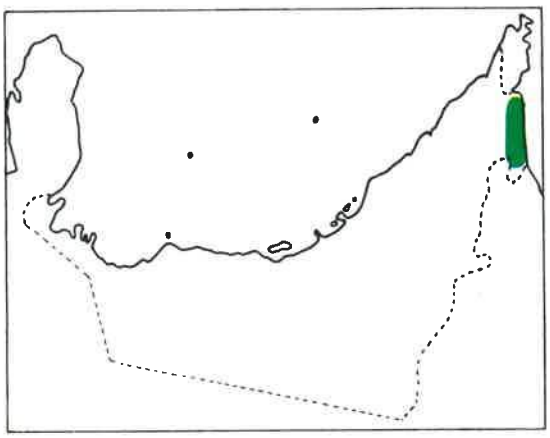
Tall perennial herb to 2 m, thistle-like with thin, rigid grooved stems, usually buff-coloured but sometimes much darker, with hairy bristles. Side branches very short, often at right angles. Leaves in dense basal cluster, with individuals to 15 cm, divided along both sides of midrib, each lobe terminating in long, stiff spine; also smaller single leaves at intervals along stem. Heads to 6 cm in diameter and covered with tiny bracts; there are downward-pointing spines around stems just below heads. Florets tubular, white or bluish, Mar.-Jun. From a distance heads are like fluffy tennis balls on sticks. Stem remains standing after fruiting.

Very common in large clumps on slopes throughout mountains to 4000 ft.

***Echinops sp.** in ravine between Hatta and Huweilat, 650 m.*



***Eclipta prostrata** in plantation at Badiyah, East Coast, 30 m.*



8. Eclipta prostrata L. [syn. **E. alba** (L.) Hassk.]

Annual herb to 1 m with thin stems, much-branched. Leaves opposite, dark green, to 4 x 1 cm, pointed and with distinct midrib, covered with rough short hairs. Heads on long stalks from leaf axils, often in pairs with one usually longer than the other; also terminal in groups of 4-5; petals white, sometimes with lilac tinge, very small, Mar.-Jul. Seeds numerous, tiny, brown.

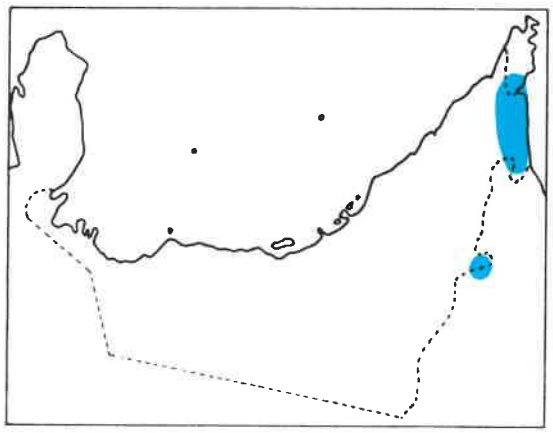
Common in well-irrigated and shady plantations along east coast and in mountain oases in Fujeirah.

9. Filago desertorum Pomel

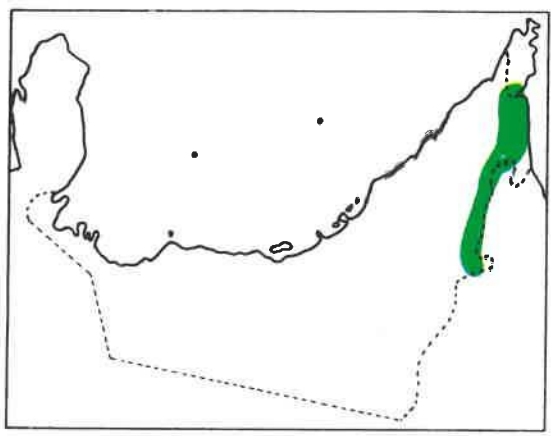
Dwarf grey annual to 12 cm, semi-prostrate and much-branched. Leaves alternate and very narrow, to 1.5 cm, silvery-green, tapering at base. Globular heads to 1 cm in diameter in axillary and terminal clusters, very woolly and surrounded by leaves, some of which are larger than heads; petals minute, yellow, Feb.-May.

Uncommon, in small clumps in stony limestone habitats at higher elevations, including summit of Jebel Hafit.

Filago desertorum *on summit of Jebel Hafit, 1100 m.*



Flaveria trinervia *in oasis NE of Buraimi, 450 m.*



10. Flaveria trinervia (Spreng.) Mohr.

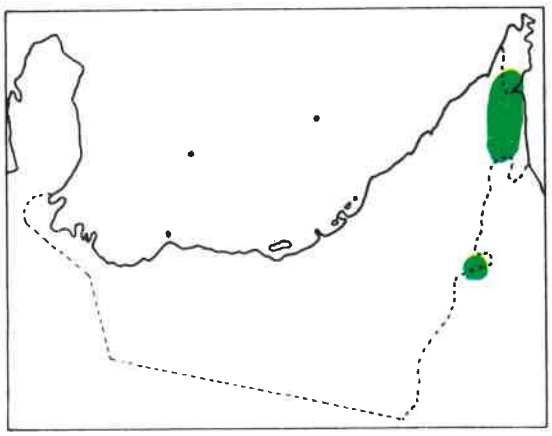
Annual to 50 cm, branching and rebranching into equal parts with slightly flattened stems. Branches sparingly hairy, green or reddish-tinged and swollen at nodes. Leaves opposite and pointed, with regular serrations and 3 parallel veins beneath; one margin curved towards base, the other towards tip; underside lighter green. Heads on single stalk from each node, rather like scaly warts; flowers comprise dense group of yellow tubular florets, terminal ones surrounded by 4-5 bracts, Mar.-Aug.

Common on fringes of mountain oases and plantations, occasionally on alluvial plains. Sometimes ornamental in urban gardens from where seeds escape and establish small colonies on waste ground.

11. Helichrysum makranicum (Rech.f. & Esfand.) Rech. f.

Perennial herb to 25 cm with woody base and usually 1 long and 1-4 short stems, all trailing, often curving up only towards tip; stems rarely branched, but if so secondary ones short. Stem whitish, covered in very short white furry hairs. Leaves alternate, silvery-green, long and thin to 3.5 cm with margins rolled inwards. Outer stems naked except for occasional solitary leaf. Heads large and clustered, comprising tight groups of pink-tipped florets enclosed by small silvery bracts, Jan.-May.

Helichrysum makranicum *on Jebel Hafit, 600 m.*

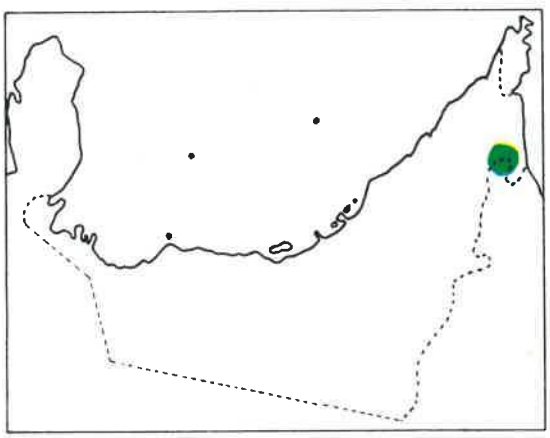


Hochstetteria schimperi *in mountains N of Hatta, 800 m.*

12. Hochstetteria schimperi DC.

Rigidly erect perennial to 60 cm with thin, smooth stems marked with parallel grooves. Leaves alternate, lanceolate with prominent midrib; lower ones more ovate, narrowly-toothed, upper ones smaller with final short pair just below lowest flower head. Heads towards stem tips on forked branches with pink and white-tinged florets in a semicircle in flat-topped clusters enclosed by glossy bracts, Mar.-Jun.

Fairly common on rough mountain slopes at lower elevations between Hatta and Masafi; not found on Jebel Hafit nor along east coast.

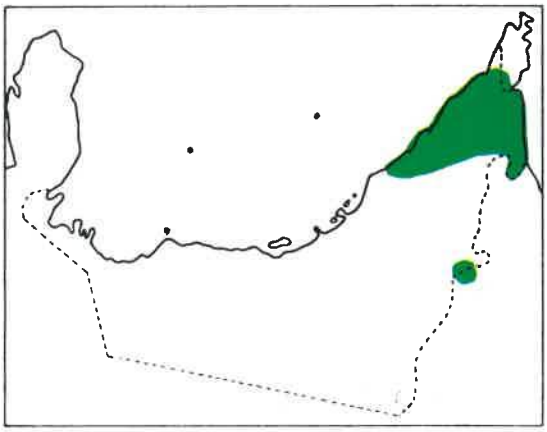


13. Ifloga spicata (Forssk.) Sch.-Bip.

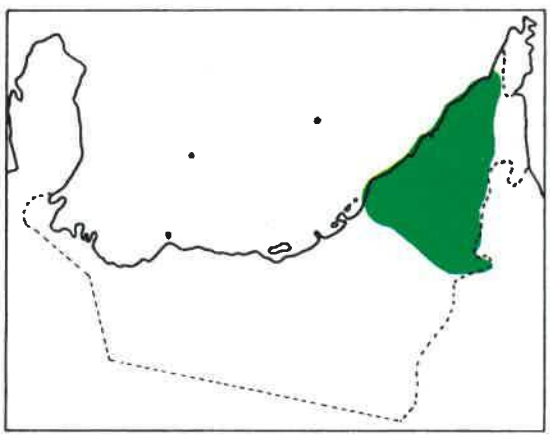
Annual herb to 10 cm with 1 or several stems branching from base, each forming narrow, leafy cylindrical spike 2-9 cm. Leaves very small and narrow, to 1 cm, protruding from spine-like threads along stem. Heads on spikes in minute clusters, like flattened silvery scales, Feb.-May. Bracts translucent. After flowering, plant turns dull brown. May at first be confused with miniature but thickened and squashed **Plantago.**

Abundant on thin sand and gravel inland and north of Abu Dhabi island, especially towards Dubai; also on mountain slopes, including summit of Jebel Hafit.

Ifloga spicata *in rough alluvial sand near Jebel Faiya, 250 m.*



Launaea capitata *in desert at Al Samha on Abu Dhabi–Dubai road, 50 m.*



14. Launaea capitata (Spreng.) Dandy

Annual or biennial hairless herb of variable size to 15 cm. Stem leafless, solitary or forked. Leaves in basal rosette, flattened against ground, broadly-linear to 14 cm and divided into numerous triangular toothed lobes, terminal one largest; older leaves often red or purple. Heads short and thick, terminal ones grouped near end of stem, side ones solitary. Flowers resemble small dandelions with radiating yellow florets in a broad disc 2-3 cm across, dense at centre, Jan.-Jun.

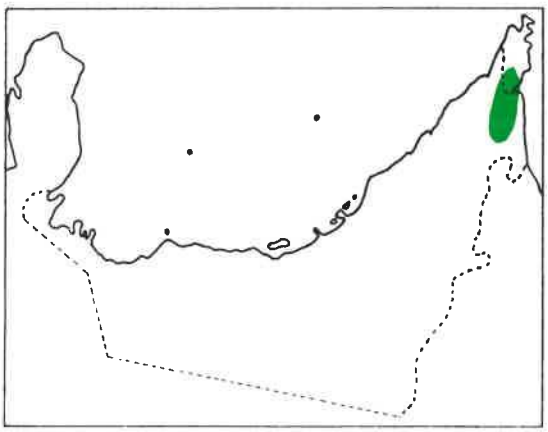
Common in sand especially over limestone, as in foreland desert along Arabian Gulf coast; also in deeper sand in central desert. Often difficult to differentiate among **Launaea** spp. in U.A.E.

15. Launaea massauensis (Fres.) Chiov.

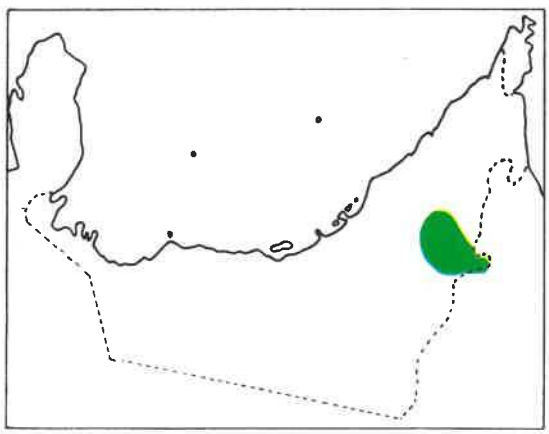
Delicate herb to 75 cm, hairless with slender, erect stems and many ascending, fleshy side-branches. Leaves in rosette at base, deeply serrated into irregular lobed segments, some leaves almost cruciform with distinct midrib; leaves to 18 x 10 cm at widest. Flower heads numerous on outer and upper twigs in spreading panicles, almost cylindrical, about 5 mm in diameter; petals pale yellow, Mar.-May. Pappus remains on plant.

Common in higher mountains and especially in Ruus al Jibal. Not recorded on Jebel Hafit.

Launaea massauensis *in Ruus al Jibal, 1500 m.*



Launaea *aff.* ***mucronata*** *in sand at Al Selimat, near Al Ain, 250 m.*



16. Launaea aff. **mucronata** (Forssk.) Müschler

Erect perennial herb to 50 cm, branching more or less into equal lengths. Lower leaves dandelion-like to 14 cm with blunt lobes each terminating in a point; stem leaves smaller, very ragged and clasping at 2-5 cm intervals, especially where stem and branch fork. Heads many, terminal in divided branches on long stalks; bracts white-margined, outer ones ending in small prickle. Florets bright yellow; flower discs to 3 cm diameter, Feb.-Jun.

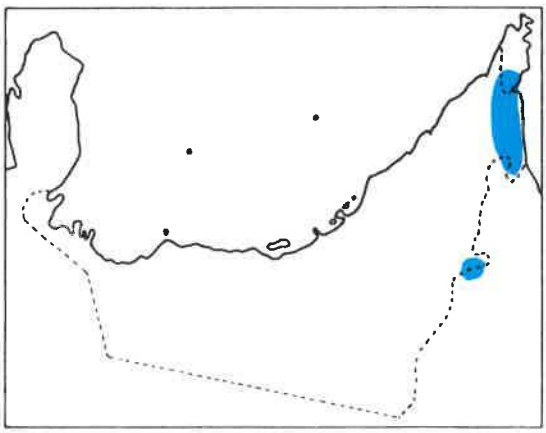
Fairly common in disturbed sandy areas, especially in plantations, along roadside verges and in gardens; mostly central desert and around Al Ain.

17. Launaea nudicaulis (L.) Hook.f.

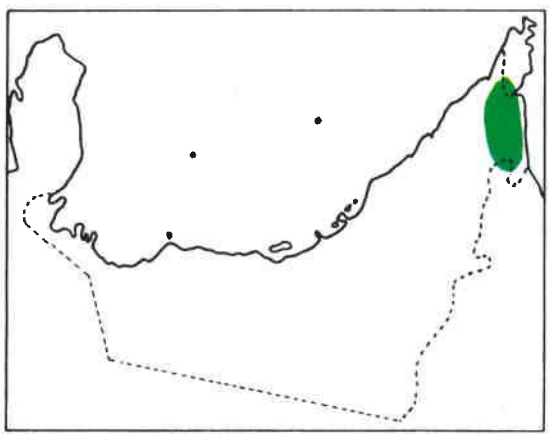
Tall perennial herb to 1 m with thin stems and equal branches; tallest forms supported by surrounding vegetation. Basal leaves rosetted with triangular, toothed lobes of very variable size. Upper stems with few leaves, if any; internodes to 15 cm. Heads axillary and terminal, cylindrical with few flowers on very short stalks; bracts white-margined, outer ones pointed; florets yellow with discs to 2 cm in diameter, Feb.-May.

Not common, in plantations and parks; very occasionally in fields in Ras al Khaimah. One specimen in Hatta Fort Hotel garden measured 1.26 m tall, supported by lower branches of an **Acacia arabica** tree (Apr. 1984).

Launaea nudicaulis *in Shwayb plantation, 350 m.*



Launaea procumbens *on bank of Hatta lake, 500 m.*



18. Launaea procumbens (Roxb.) Ramayya & Rajagopal

Perennial herb to 30 cm with basal leaves in rosette. Leaves to 8 cm, serrated along outer half, tapering smoothly towards base with prominent midrib. Stems thin and smooth, leafless except for reduced pairs in lower forks. Heads lateral and terminal with a few flowers on short stalks; bracts broadly white-margined. Discs to 2.5 cm across, Feb.-May; petal tips flat, not pointed.

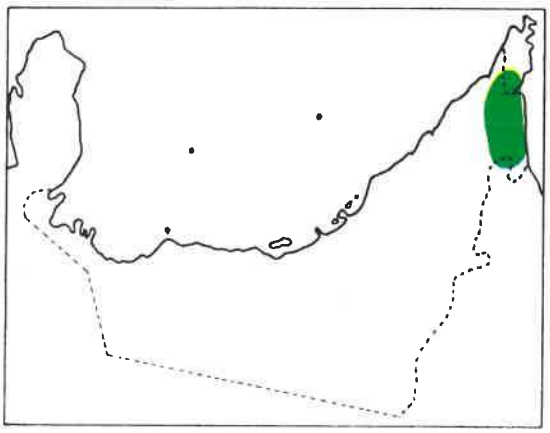
Fairly common on damp ground bordering pools and streams, especially where water level has recently receded; almost exclusively in or adjoining mountains.

19. Launaea spinosa (Forssk.) Sch.-Bip.

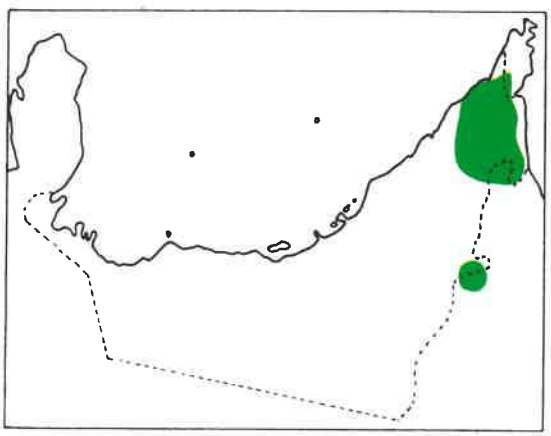
Intricately-branched perennial shrub to 60 cm, spreading and spiny. Young stems and branches fleshy green, older ones woody, often whitish. Leaves small and narrow, blue-green, soon deciduous; density of branching twigs may resemble foliage. Heads terminal, scattered all over plant from ground level up; flowers with 12-13 petals, pale yellow, slightly cleft at blunt tips with darker yellow protruding stamens; disc to 2 cm across, Mar.-Jul.

Common on upper mountain slopes only, notably along east coast and north of Masafi to Ras al Khaimah.

Launaea spinosa *in hills W of Dibba, 100 m.*



Pulicaria glutinosa *on hills near Khor Fakkan, 400 m.*



20. Pulicaria glutinosa Jaub. & Spach

Showy, evergreen perennial to 80 cm and spreading even wider, much-branched from a thick woody rootstock. Stem and branches rough with tiny tubercles but hairless. Leaves needle-like, light or dark green, dense on all branches, to 4 cm. Heads hemispherical, numerous, terminal on stalks exceeding outer leaves, with a whorl of linear overlapping bracts; to 1 cm across with orange or yellow florets, Jan.-Jun. After seeds have dispersed, bracts remain on plant until following year's growth.

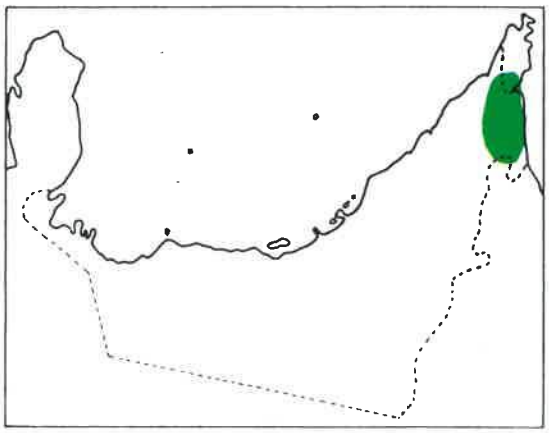
Very common along lower wadi beds and over mountain slopes at lower elevations; also on piedmont fans throughout hill zones. Older plants often with a few dead, leafless branches.

21. Pulicaria undulata (L.) C.A.Meyer [syn. **P.crispa** (Forssk.) Ben ex Oliv.]

Very bushy perennial herb to 60 cm with aromatic scent, much-branched but densely straggling, branches often equally divided. Leaves woolly with crisped or serrated margins, partly clasping, to 5 cm; older ones often straw-coloured. Heads terminal, 15-20 cm across with long orange florets; individual heads hemispherical with buff-coloured bracts, less than 1 cm across, Mar.-Aug. Sometimes confused with **Rhanterium epapposum,** but is much leafier.

Common in lowland habitats near mountains, especially in Fujeirah and Ras al Khaimah. Rapidly colonises abandoned fields and is a common weed fringing cultivated plantations.

Pulicaria undulata *near Ras al Khaimah Airport, 100 m.*

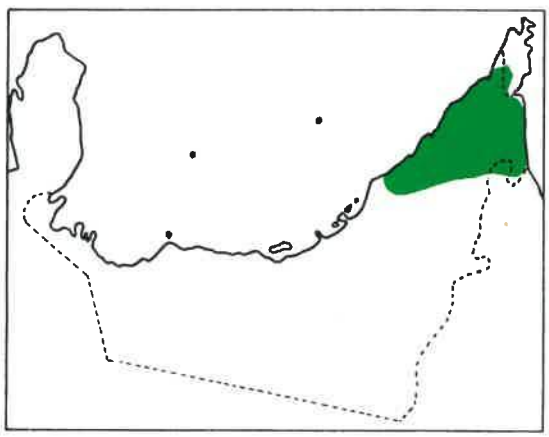


Reichardia tingitana *in hills 15 km N of Masafi, 600 m.*

22. Reichardia tingitana (L.) Roth

Annual herb to 25 cm but usually shorter, superficially similar to **Launaea** spp. but less branched and often very squat with distinct blue-green leaves. Stem often hugs ground for part of its length and then rises to flower head. Leaves of various shape, generally deeply-toothed with prickly lobes, to 8 cm, mostly in basal rosette. Heads to 2 cm across with yellow to orange florets, with red or darker centre, on stout but fleshy stalks, Jan.-Apr.

Fairly common on lower mountain slopes and beside rocky wadi systems; also inland of Ajman and Umm al Qawain on compacted sand.

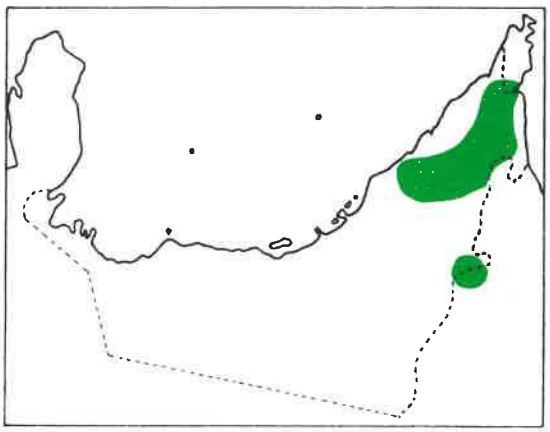


23. Rhanterium epapposum Oliv.

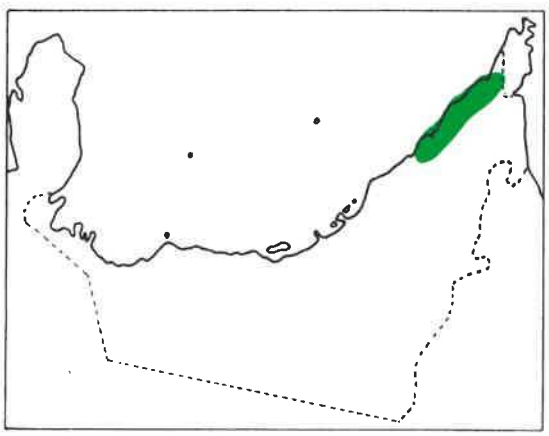
Rigid perennial to 70 cm with slender fleecy-white stems and branches terminating in fine points or clusters of tiny leaves. Lower leaves narrowly lanceolate, toothed, to 5 cm; upper ones smaller. Heads numerous, terminal, spherical, about 1 cm across with orange florets, Jan.-May or later. Distinguished from similar composites by white stems, general lack of upper leaves plus overall hemispherical profile.

The literature implies that this was once a dominant rangeland sp. of the central desert and alluvial plains. Now restricted to pockets on Jiri and Dhaid plains, and inland Jebel Ali towards Madam; locally abundant near Idhn and Ghayl. Recorded in flower on summit of Jebel Hafit in May.

***Rhanterium epapposum** on summit of Jebel Hafit, 1000 m.*



***Senecio glaucus** in sand at Al Riffa, Ras al Khaimah, 50 m.*



24. Senecio glaucus L.

Erect annual herb to 35 cm with green or reddish-purple smooth stems and short ascending branches. Leaves very slightly fleshy, lanceolate with irregular toothed segments; lower ones tapering to short stalk, upper ones half clasping; all leaves very close to stem. Flowers on 8-12 cm terminal thread-like erect stalks with distinct green bracts when in bud. Open flower head consists of small orange dome surrouded by drooping disc of thin yellow petals, 1-1.5 cm across, Jan.-Apr.

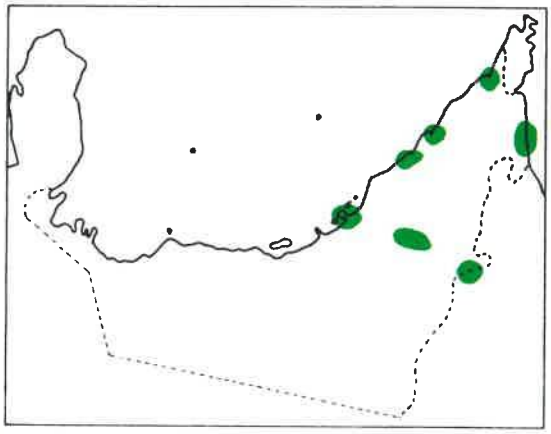
Very common along Umm al Qawain — Ras al Khaimah littoral; also abundant on waste ground in Ras al Khaimah town. Uncommon to rare elsewhere, though present in Al Ain.

25. Sonchus oleraceus (L.)

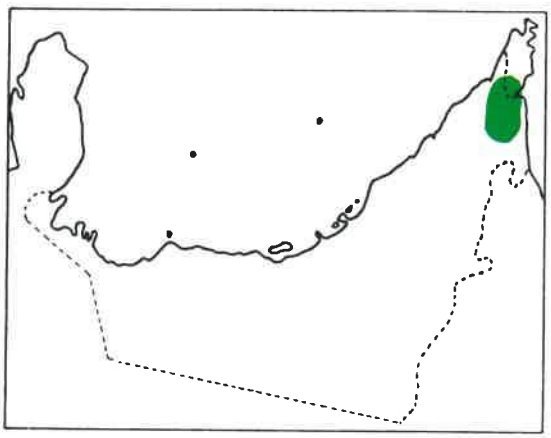
Annual, occasionally biennial, to 80 cm, very erect and smooth-stemmed, when young resembling **Launaea** spp. Immature stems hollow with milky sap. Leaves alternate, upper ones narrow and clasping; each leaf also with distinct pairs of toothed and pointed leaflets branching at right angles from fleshy midrib. Heads larger than most **Launaea** spp., to 3 cm across, in terminal clusters on upper branches. Florets strap-like, yellow, surrounded by dark green bracts, Feb.-May. Pappus hairs to 1 cm.

Very common weed of damp habitats in towns, plantations and oases, including industrialised offshore islands. Often in association with grass spp. such as **Sporobolus spicatus** and **Echinochloa colona.**

Sonchus oleraceus *beside Abu Dhabi old sewage farm, 1 m.*



Urospermum picroides *in Ruus al Jibal, 1800 m.*



26. Urospermum picroides (L.) F.W. Schmidt

Small annual to 15 cm, superficially like a **Launaea** with 3-8 soft green stems, slightly hairy. Leaves in basal rosette, clasping, spatula-shaped or with distinct lobes, some toothed; terminal ones mostly rounded and smoother; some leaves more lanceolate. Heads conical in bud, to 2 cm, grey green; florets strap-like, bright yellow, with disc 1.5 cm in diameter, Feb.-Apr. Seed with tiny beak.

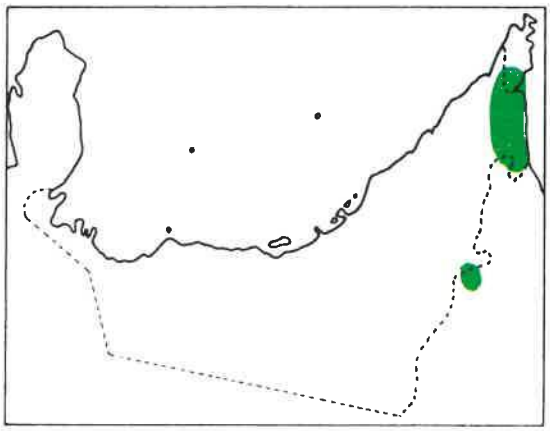
Mostly in mountains at lower altitudes; requires shade and usually found under boulders and in denser vegetation on sheltered slopes.

27. Vernonia arabica F.G. Davies

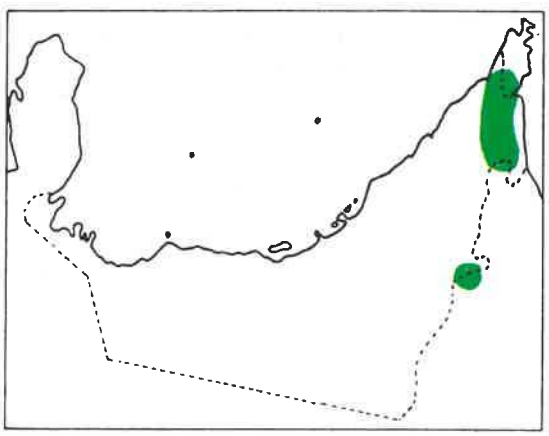
Small, stiffly erect perennial to 25 cm with woody stem and several branches dividing from 1-3 central grey stems, faintly furry or rougher in mature plants. Leaves alternate, ovate, to 1 cm, dull green, occasionally with a pair of small points on either margin. Heads to 1 cm across, single on long stalks; whole plant has hemispherical outline. Florets tubular, reddish-purple with pointed green outer bracts, Mar.-May.

Common throughout mountains, but scattered, usually on open slopes.

Vernonia arabica *in plantation at Badiyah, 30 m.*



Vicoa pentanema *on slopes above Ash Sha'm, Ras al Khaimah, 500 m.*



28. Vicoa pentanema Aitch. & Hemsl. (syn. **Pentanema divaricatum**) Cass.

Small, silky-hairy annual to 30 cm, branching from base into slender, purple stems. Leaves thin, oblong, almost translucent, lower ones tapering towards base, upper ones more rounded, with raised veins on underside. Heads numerous, axillary and terminal, globular on leafless stalks, all covered with thicker silky hairs than rest of plant; heads 1 cm in diameter with bright yellow or orange florets, Feb.-Jun. (to Aug. at higher levels). Pappus hairs stiff.

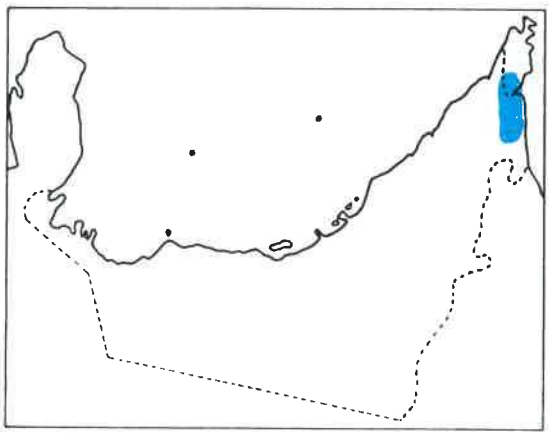
Common in abandoned fields in foothills of Fujeirah and Ras al Khaimah; also at highest elevations in Ruus al Jibal, where it has dwarf form to 8 cm.

29. Zoegea purpurea Fresen.

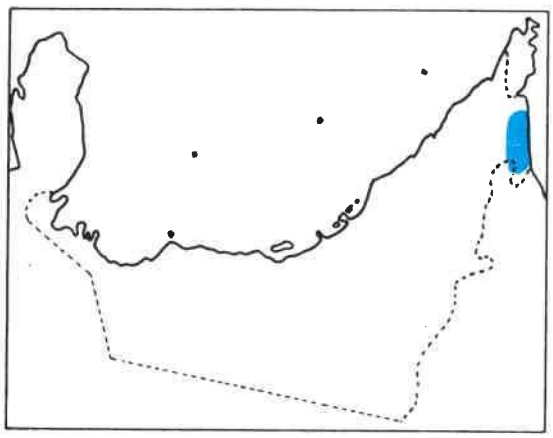
Annual herb to 25 cm, slender, usually with single erect stem, forked. Lower leaves largest, lanceolate, entire or with rounded irregular lobes, tapering into long stalks, the whole 5-10 cm; upper leaves thinner, without lobes, sometimes paired. Heads small, terminal, solitary, rounded on long, very slender stalks. Florets pale rose in colour, exceeded by long red bristle-like awns; outer scales yellow, Feb.-Apr. Pappus comprises outer rows of simple hairs and interior crown of shorter ones.

Fairly common but scattered singly or in small clumps at higher mountain elevations around Masafi and north to Ruus al Jibal, amongst rock detritus.

Zoegea purpurea in hills S of Dibba, 500 m.



Aloe aff. vera in abandoned date grove at Dhadnah, East Coast, 30 m.



CLASS MONOCOTYLEDONAE

Liliaceae — **lily** family

Mostly herbaceous plants growing from bulbs or corms with basal leaves, or evergreen succulents. Flowers often conspicuous, solitary or in spikes, with 6 stamens. Extensive range from near-sabkha to mountain summits.

1. Aloe aff. **vera** L.

Fleshy perennial to 1.5 m with single erect stem. Leaves very large, to 40 cm, thick and succulent, tapering to point with spiny-toothed margins, waxy green, in basal rosette. Flowers numerous on long thin terminal spike atop stem, with tubular petals to 3 cm, rose-coloured or darker with orange and yellow tints, Jan.-Apr. Flowers open from base of spike first. Fruit capsule smooth and rounded, roughly shape of young acorn.

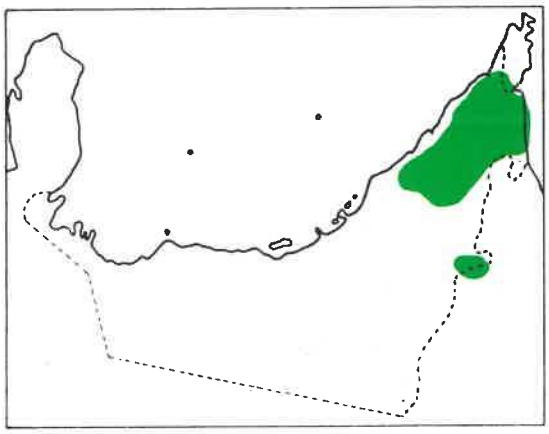
In or close to mountains only, where it was planted in the past in graveyards. Also an ornamental in towns.

2. Asphodelus tenuifolius Cav.

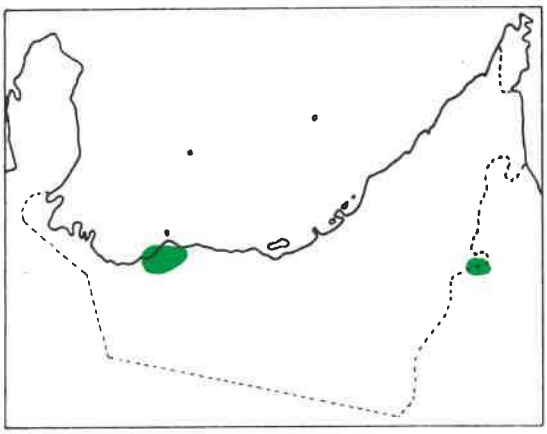
Small, delicate herb to 60 cm, though 20-40 cm more usual, with roots of clustered fibres. Stems one or several, erect, hollow but flesy, pale green. Leaves many in dense basal rosette, onion-like, ascending to halfway up stem, narrow with margins curved around stem. Flowers clustered along tops of stems in short, jointed spikes; petals small, white with orange or bluish tint, Jan.-Mar. Capsule tiny, globular.

Very common spring annual throughout northern Emirates across the country from Arabian Gulf coast to mountain summits; also around Hatta and Masafi, below Jebel Hafit and occasionally in central deserts; often in very extensive clumps. In dry years, individuals tend to be shorter.

Asphodelus tenuifolius *on outskirts of Ash-Sha'm, Ras al Khaimah, 50 m.*



Dipcadi erythraeum *on outcrop at Jebel Dhanna, 70 m.*



3. Dipcadi erythraeum Webb & Berth.

Perennial herb to 20 cm growing from small grey bulb. Leaves fleshy, often an opposite pair prostrate on ground, narrowly linear to 15 cm. Flowering stems mostly single, occasionally 2-5. Flowers 6-12, clustered at stem tips with greenish-brown petals to 1 cm, Mar.-Apr. Capsule bears 3 cup-like valves each containing several flat, onion-like seeds; capsule remains on plant after stem has turned brown and hardened, its rigidity flicking out seeds in wind. Seedlings comprise black seed raised 3-4 cm off ground with thin shoot into soil.

Very common west of Jebel Dhanna on bluffs and sand raised above sabkha; less common on stony ground east of Al Ain and in mountains around Masafi.

Iridaceae — **iris** family

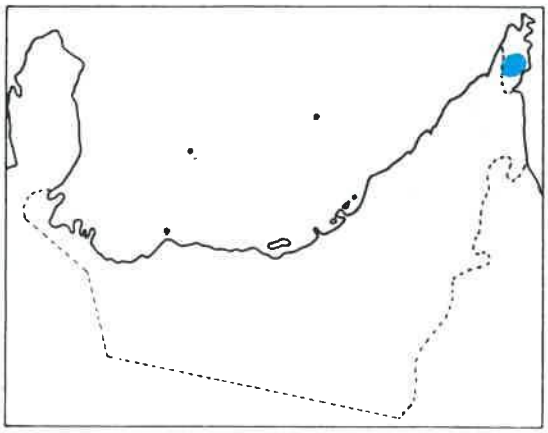
Single sp. Herbaceous plant growing from rhizome. Leaves lanceolate, pointed, sheathing stem base. Flowers large with petals fused into basal tube, with 3 stamens. Fruit a small capsule.

1. Iris sisyrinchium L.

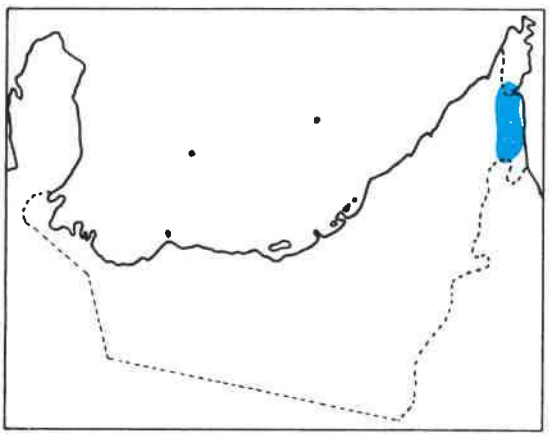
Perennial to 40 cm, dying back to rhizome each year. Stem slender, slightly curved, usually with 2 narrow bright green leaves rising from base and exceeding inflorescence. Flowers 1-4, terminal and lateral in axils of swollen, leaf-like scales; petals to 4 cm, outer ones spreading and bright blue spotted with yellow near base, inner ones thinner, more erect. Seeds orange or red, rounded.

To date recorded only in fields and fringing terrain of summit hamlet of Agebat in Ruus al Jibal (Northern Oman). Possibly introduced accidentally, but very common elsewhere in Arabia.

Iris sisyrinchium *in terraced field at Agebat, Ruus al Jibal, 1800 m.*



Juncus socotranus *in wadi near Siji, 300 m.*



Juncaceae — **rush** family

Herbaceous sedge-like plants growing from creeping rhizomes, with unbranched stems. Leaves usually cylindrical, sometimes grass-like. Flowers very small, but inflorescence often prominent because of large cymes and 3 or 6 coloured stamens. Flowers wind-pollinated.

1. Juncus socotranus (Buch.)

Tall perennial marsh plant to 2 m with erect, very smooth stems. Leaves without nodes, sheathing stem at base and tapering to very sharp points, some exceeding heads. Flowers clustered towards tip of stem like large red and yellow knots; stem extends beyond head like an open leaf; flowers exceeded by reddish stamens, Mar.-Jun. Fruit a capsule with many seeds.

A mountain rush found in flowing or still water, occasionally forming large clumps.

Gramineae — **grass** family

A very large family of annuals and perennials, mostly with hollow (sometimes pithy) jointed stems and solid nodes. Leaf blades narrow, linear, sheathed at base. Inflorescence consists of small florets clustered on leafless spikelets, on stalk in panicle, or stalkless on spike. Fruit a grain.

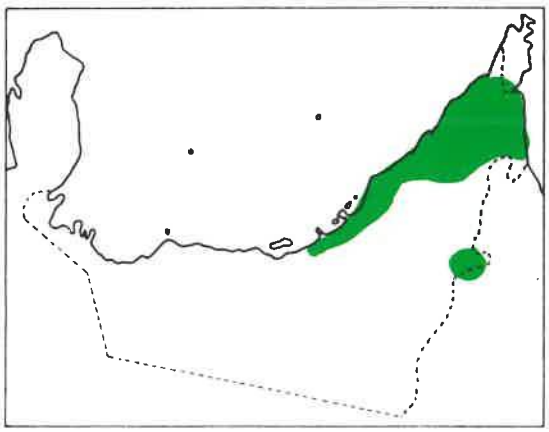
The following descriptions cover only the more common grasses of the U.A.E. A full list of spp. recorded follows in the Appendix.

1. Aeluropus lagopoides (L.) Trin. ex Thwaites

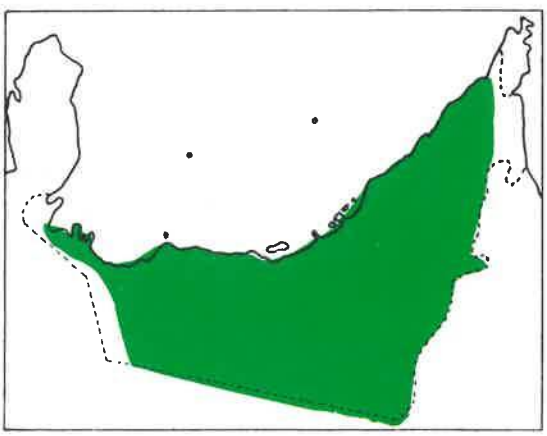
Perennial, grey or blue-green, of various aspect but usually forming dense, spreading mats, occasionally in larger clumps with smooth, slender, erect stems. Stolons can extend to several m, sending up a shoot at each of up to 30 nodes; often tufted with yellowish stems and many short, lanceolate leaves in opposite rows; thin flaps around lowest nodes sometimes white like tatty wood shavings. Head a thick, blunt, greyish spike, 1-2 cm; usually a short curved leaf just below spike, rising beside it; flowering variable.

Very common grass in compressed saline soils over a high water table; along both coastlines, in towns and beside mountain steams. Rapidly colonises land reclaimed by coastal dredging.

Aeluropus lagopoides near Eastern Lagoon, Abu Dhabi Island, 1 m.



Astenatherum forskalii in gravel desert near Habshan, Western Region, 100 m.



2. Astenatherum forskalii (Vahl) Nevski

Perennial desert grass to 30 cm with short, sand-encrusted tuber-like roots, much-branched from thick base into several to many ascending flowering stems and numerous shorter leaves. Stems and leaves smooth, pale green or buff; leaf-sheaths often yellowish and infiltrated with blown sand. Spike to 12 cm rising from upper leaf sheath. Spikelets thin, pointed and very dense, to 1 cm, yellowish or purple-tipped, Mar.-Jul. After flowering, spikes tend to open out and become loosely plume-like.

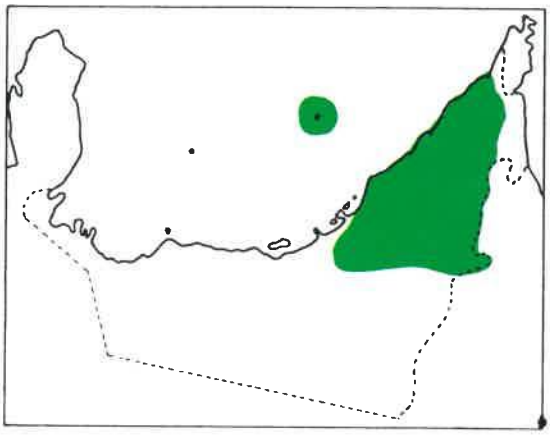
Common in all open desert areas, including deep sand of western dunes and around Al Ain and Shwayb. A very pliable grass that bends with the wind.

3. Cenchrus ciliaris L.

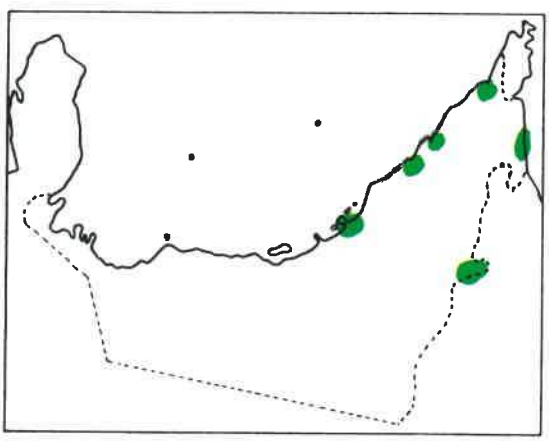
Perennial, tufted, much-branched with stems to 90 cm or higher, usually straw-coloured, of dry aspect. Stems erect, stiffly angled at each node. Leaf blades narrowly pointed, usually long and smooth. Head a dense spike 6-10 cm long and 1-2 cm thick, roughly cylindrical, silky white but maturing yellowish-ragged. Spikelets clustered, surrounded by purple-tinged bristles, Feb.-May or beyond.

Common along Arabian Gulf coast, offshore islands and in lower rocky habitats fringing sand deserts. Abundant inland from Abu Dhabi to Ras al Khaimah. May be confused with **Pennisetum divisum,** which is generally taller with thicker nodes and more rounded stems.

Cenchrus ciliaris *just inland of Jebel Ali, 50 m.*



Chloris virgata *in Abu Dhabi town, 10 m.*



4. Chloris virgata Swartz

Semi-prostrate annual to 50 cm, occasionally to 1 m in protected surroundings with smooth green stems and reddish nodes. Leaves to 20 cm, flat and pointed, sometimes bent back below flower head. Flowers in 4-12 equal spikes, separate but ascending from one central point; spikes brown or purple to 6 cm with 2 tiers of dense spikelets, each with terminal hair tuft which gives a soft, silky aspect, Feb.-Jun. or later.

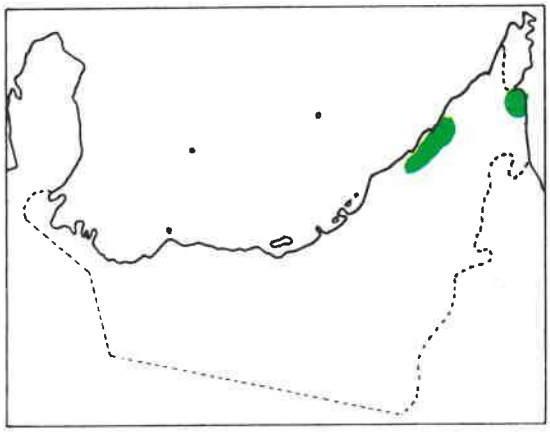
Very common weed in disturbed habitats, including gardens, farms, plantations and waste land in cities, especially in damp soils.

5. Cutandia memphitica (Spreng.) Benth.

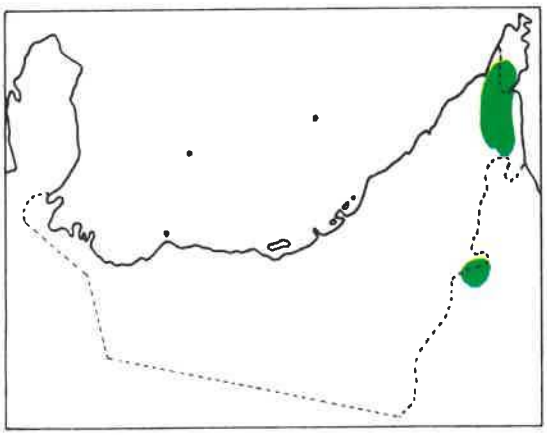
A small, erect annual, much-branched, 20-25 cm, with lower stem often prostrate to first node; stems reddish below. Leaf blades green, broadest at sheath, tapering to level with flower heads. Panicles with short branches, dividing into short spikelet plus a branchlet, continuing to zigzag in this manner 2-3 times; each spikelet to 1 cm, tapering at both ends, Jan.-Apr.

A distinctive grass, locally common along the Ajman — Ras al Khaimah littoral in an area of fossil dunes, often in association with **Rumex pictus** and **Aizoon canariense.** Also occasional at Dibba.

Cutandia memphitica *at Tell Abrak, Umm al Qawain, 20 m.*



Cymbopogon parkeri *at west base of Jebel Hafit, 350 m.*



6. Cymbopogon parkeri Stapf [syn. **C. commutatus** (Steud.) Stapf]

Very tufted, strongly-rooted perennial of grey aspect when not in flower, 20-60 cm. Base thickened with grey old and green new growth. Stems many, erect. Leaves coarse and narrow, curving and curling up and outwards. Flower spikes to 20 cm with pairs of spikelets at irregular angles along upper third of stem; these disparate angles help in field identification. Flowering Feb.-May. Plant has a faint citrus aroma, especially if rubbed.

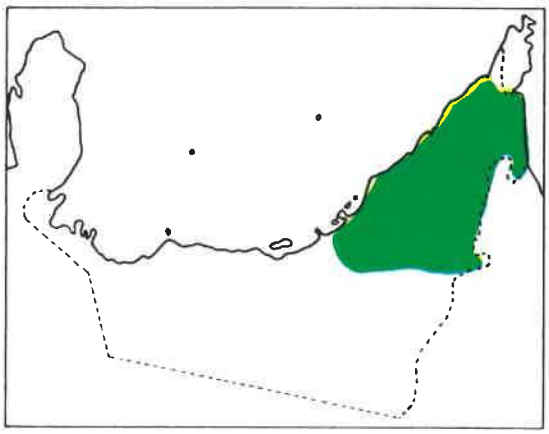
Very common in mountains up to 3000 ft. Occasionally browsed. Sometimes forms dense stands where wadis widen out at base of mountains.

7. Cynodon dactylon (L.) Pers.

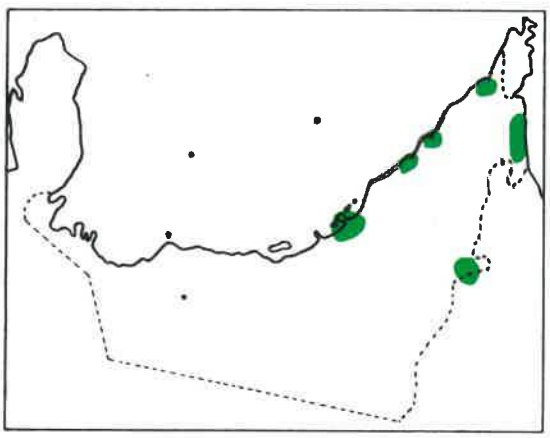
Perennial, creeping grass with long stolons and rooting at nodes, to 50 cm and often forming extensive mats. Leaf blades short and tapering, crowded at base. Flowering stems very erect and thin, terminating in digitate cluster of 4-7 narrow, equal spikes, each to 5 cm, green to purplish; spikes regular with tiny equal spikelets; heads identical, flowering variable. If water available, new foliage but not necessarily flowering stems produced at any time.

Widespread weed of cultivated and disturbed, moist habitats. Not in deep sand nor higher mountains. Tenacious and difficult to eradicate.

Cynodon dactylon *in Abu Dhabi town. 10 m.*



Dactyloctenium aegyptium *in Bateen, just above shore line, Abu Dhabi town, 2 m.*



8. Dactyloctenium aegyptium (L.) P. Beauv.

Annual with smooth, erect stems to 35 cm, occasionally with semi-prostrate stems rooting at nodes. Much-branched from base with many broad, flat ascending leaves. Flowering stems terminate in (usually) 4 spikes arranged in a cross, semi-erect or bent downwards; each spike thick and bristly with a thin row of spikelets either side of a noticeable green or white line; spikes darker above, green or reddish-brown. Flowering variable but especially Feb.-May.

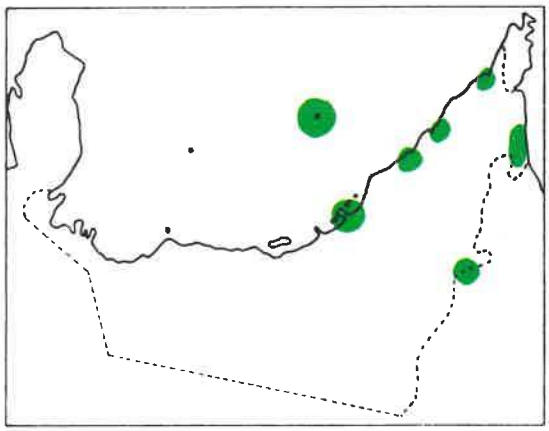
Common in damp habitats in towns and fringing oases and plantations, often in thick, spreading clumps.

9. Echinochloa colona (L.) Link.

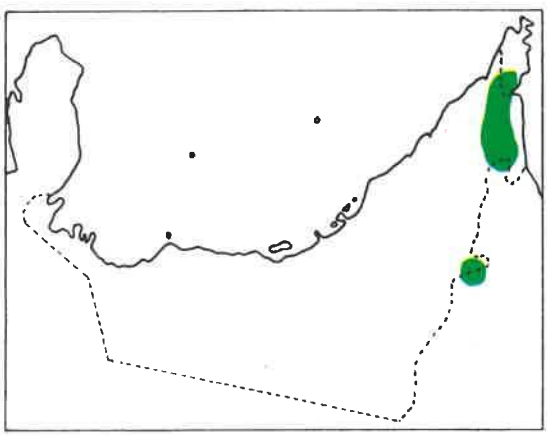
Annual or perennial to 45 cm with several ascending stems, though frequently spreading as much as erect. Base dense; occasionally rooting at lower nodes. Flowering stems triangular in cross-section. Main leaves extend to heads, with a shorter leaf just below panicle; blades flat, to 1 cm broad, dark green or brownish. Panicle comprises several oblong spikes to 1-5 cm with close-packed spikelets; spikes like thin ears of wheat, Jan.-May.

Common weed of towns, plantations and fields in disturbed and damp soils, often under shade of other vegetation. Not found in open desert.

Echinochloa colona *in Abu Dhabi town, 10 m.*



Eleusine compressa *in typical boulder habitat at base of Jebel Hafit, 400 m.*



10. Eleusine compressa (Forssk.) Asch. & Schweinf.

Perennial to 50 cm with 2-9 stiff wiry stems, growing from creeping rhizome and rooting at nodes. Base area densely leafy; leaves narrowly-pointed to 12 cm, slightly hairy along margins, overall pale green; 2-3 leaflets present about halfway up naked stems. Flowers on 3-4 spikes radiating horizontally from stem tops, 2-4 cm; spikelets very compressed, Mar.-May.

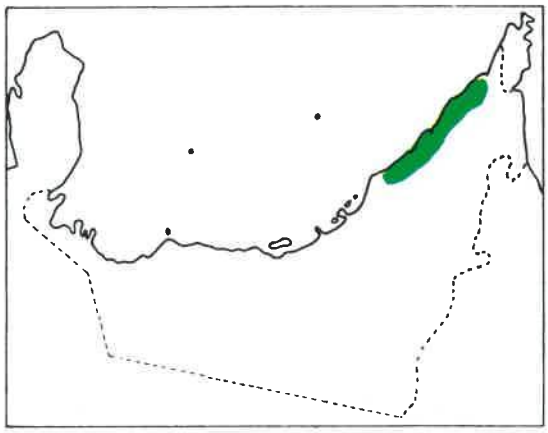
Found mostly in lower mountain habitats, especially in accumulated sand and silt in lower wadis. Small clumps fairly common.

11. Halopyrum mucronatum (L.) Stapf

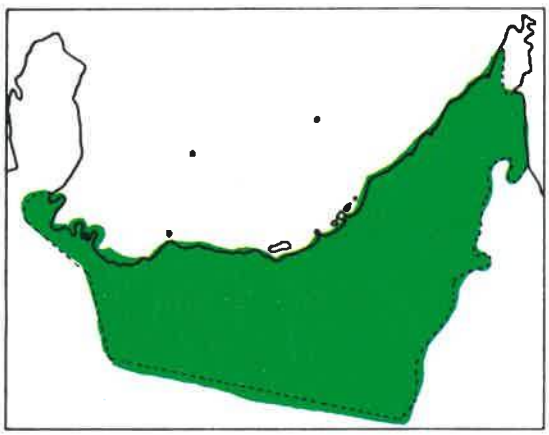
Perennial to 1.5 m in extensive clumps. Stolons several m long, helping to stabilise dune areas by rooting at nodes. Lower stems thick, gradually tapering and nodding over above, golden when mature. Leaves narrow with distinct inner ribs, tapering to point. Panicles bent over just above highest leaves; each panicle of 3-6 side branches, each bearing 4-6 stiff spikes 3-6 cm long, pale green maturing yellow, Sep.-Nov.

Large belts occur on coastline south of Jebel Ali and on inshore islands, e.g. Gharab, Futaisi and Sadiyat; also on relict dunes along Umm al Qawain littoral. A feature of west tip of Abu Dhabi Island, near present day Hilton Hotel, until early 1980s.

***Halopyrum mucronatum** at Jebel Ali on coast, 10 m.*



***Panicum turgidum** in desert foreland E of Abu Dhabi new airport, 50 m.*



12. Panicum turgidum Forssk.

Much-branched perennial to 1.25 m, usually in bushy clumps. Base woody and thickened with many dead lower stems and sheaths. Roots thick, sand-encrusted. Nodes conspicuous, dark brown, lower ones enclosed by old sheaths. Leaf blades narrow and pointed; one leaf sheathed around stem below panicle, which comprises a few short branchlets each bearing 3-10 spikelets, yellowish in flower, Nov.-Apr. but variable. Grains reddish or orange, conspicuous in small groups of 2-4 on hair-like stalks.

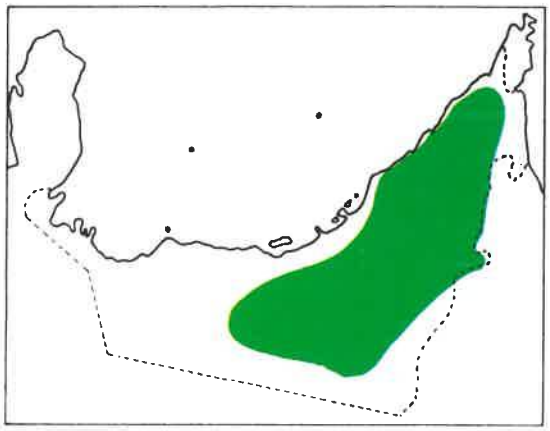
Characteristic desert grass especially in deep sand throughout U.A.E.; less common in far west. Always heavily grazed and stunted.

13. Pennisetum divisum (Gmel.) Henr.

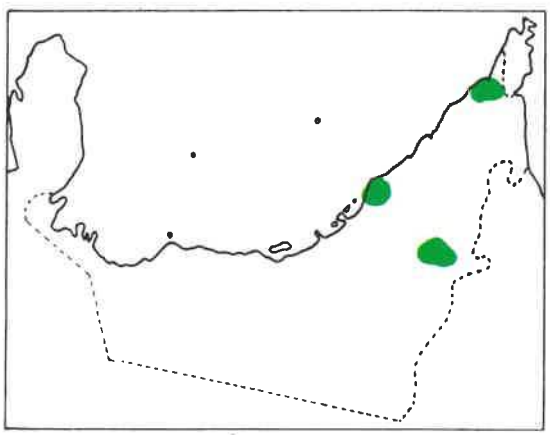
Perennial tufted grass to 80 cm in thick tussocks with individual stems sometimes higher. Base and lower stems woody; stems bent at swollen brown nodes and often appear dry and dead. Leaf blades rigid, pointed, rising to half way up stems, higher if protected from grazing camels. Flowers on roughly cylindrical white spikes, 5-8 cm by 1 cm wide; spike soft and woolly in flower but later ragged and bristly, darkening. Flowering variable, mostly Dec.-May.

Very common in central desert towards north. Prefers stable sandy areas; usually in association with **Panicum turgidum** and **Cenchrus ciliaris.**

***Pennisetum divisum** in sand desert near Al Samha, Abu Dhabi–Dubai road 50 m.*



***Phragmites australis,** part of huge clump at Rams, Ras al Khaimah, 2 m.*



14. Phragmites australis (Cav.) Trin.ex Steud.

Reed-like perennial to 3.5 m in dense thickets. Stems erect, hollow, to 2 cm thick at base. Leaves flat, 2-3 cm broad below, tapering 1 m to thread-like point. Panicle a plume, like pampas grass, 15-35 cm by 15 cm wide, much-branched, at first purple, later silky yellow and finally silvery-white; dense initially, later ragged. Spikelets very open, to 2 cm, Feb.-May.

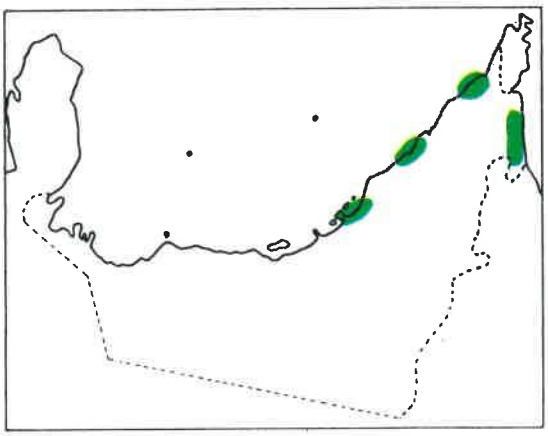
Very conspicuous in huge beds but few habitats; along coast north of Rams; occasionally fringing pools between Abu Dhabi and Al Ain; large colony survives at Muqta Bridge in Abu Dhabi. Occasionally cultivated in gardens and against walls.

15. Polypogon monspeliensis (L.) Desf.

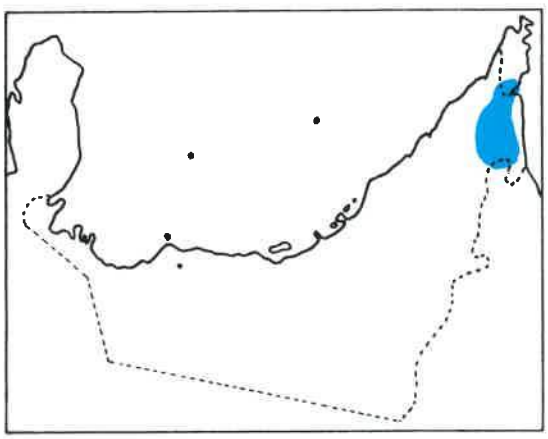
Annual to 50 cm with tufted solitary or several stems, sheathed at base. Stems smooth, straw-coloured, with nodes mostly concealed by sheaths. Leaves flat and dark green, to 20 cm, tapering. Dense cylindrical panicle conspicuous, to 12 x 4 cm with soft bristles like an artist's brush, often quite silvery. Spike somewhat resembles erect tail of rabbit, Feb.-May.

Common weed of damp habitats in towns and villages but not found in open, dry desert areas; thrives in marshy conditions and appreciates some shade.

Polypogon monspeliensis *in marshy area, E of Abu Dhabi Island, 1 m.*



Setaria verticellata *in marshy area, Ras al Khaimah creek, 2 m.*



16. Setaria verticellata (L.) P.Beauv.

Tufted annual to 75 cm, often shorter, overall dark green and very leafy. Numerous stems smooth and bent at brown nodes. Leaf blades rough, to 15 cm broad in middle with parallel veins. Spike dark green, dense, cylindrical, rough, 5-8 cm. As plant matures, spike curves and turns yellow or brownish with numerous downward-facing barbed bristles that feel sticky, Jan.-Jun. Spikes easily caught up in hair and clothes.

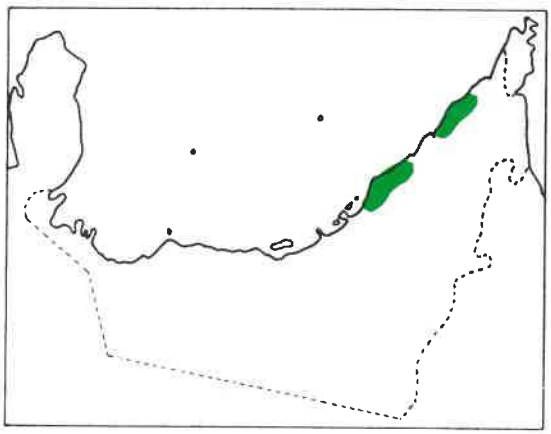
Not widespread, but locally in disturbed, damp habitats especially in urban areas and plantations. Rare in mountains.

17. Sporobolus arabicus Boiss.

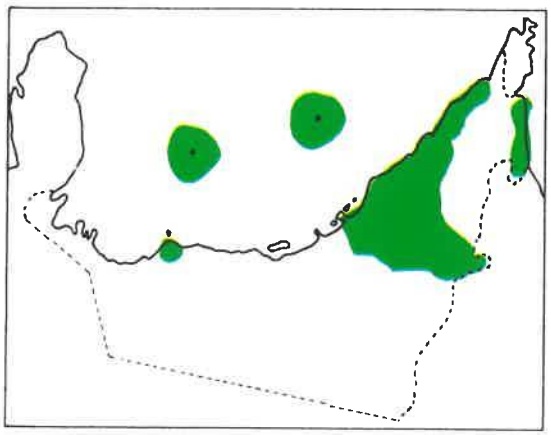
Perennial with long stolons and several slender erect stems to 1 m. Base woody and branches and leaves buff; a few branches taper to acute point. Leaves rolled, narrow, finely-pointed to 25 cm, upper ones shorter and standing out at stiff angle. Flowering stems thin, rising well above rest of plant. Panicle very open in a loose spike, often difficult to distinguish against background vegetation, with profile of a lacy triangle to 15 cm long with 2-4 cm spikelets on thread-like stalks, Mar.-Aug.

Common on inshore inlands, e.g. Futaisi and Gharab, where it is the locally dominant grass; also along coast between Abu Dhabi and Dubai, in association with **Limonium axillare** and **Zygophyllum hamiense;** small pockets further north along coast.

Sporobolus arabicus *on Gharab Island, Abu Dhabi, 5 m.*



Sporobolus spicatus *at Abu Dhabi old sewage farm, 1 m.*



18. Sporobolus spicatus (Vahl) Kunth

Perennial to 40 cm with creeping stolons, often forming extensive mat-like clumps, variable in appearance. Much-branched from base and rooting nodes; base often white and rest of foliage blue-green. Leaves narrow, rough on upper suface, younger ones flat, older ones rolled and narrowly-pointed. Flowering stems very thin, erect, with 4-6 narrowly-cylindrical equal spikes to 6 cm, pointed and very pale, often powdery. Spikelets minute but densely clustered, throughout year but noticeably Nov.-May. New growth produced in damp conditions but not necessarily any flowering spikes.

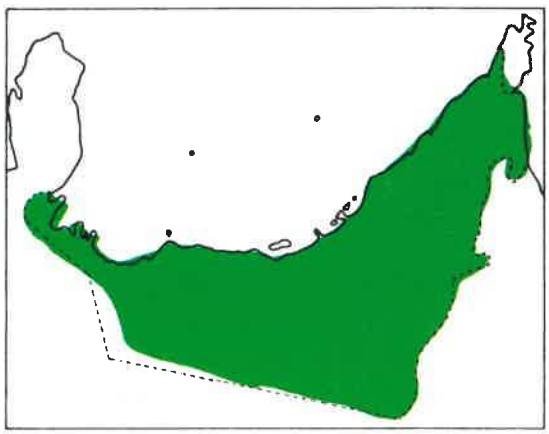
Perhaps commonest weed of towns, plantations and lowland farms; can tolerate high salinity. In dry months not rooting at nodes, and stolon growth minimal.

19. Stipagrostis plumosa (L.) Munro ex T. Anders.

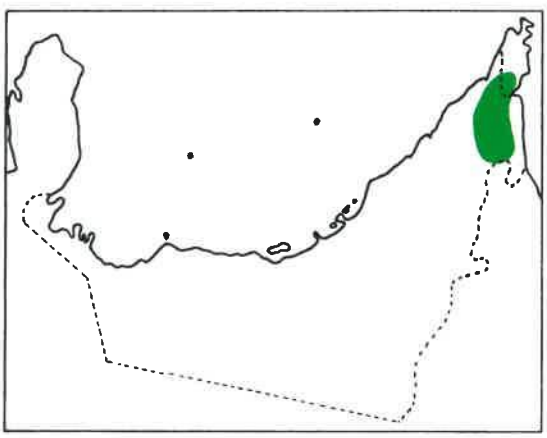
Tufted perennial to 35 cm with small but conspicuous plumelike heads. Base dense with many dead stems and old sheaths, whitish. Stems thin, bent at lowest nodes but erect above. Leaf blades short and narrow, tapering thread-like, often quite curved, grey-green. Head to 15 cm in a plume of loose feathery branchlets; spikelets with fine silky white hairs to 5 cm, Feb.-Jul.

Very common in variety of habitats, in large colonies on gravel and compact sand in central desert; around foothills of Al Ain and north from Hatta to Dhaid plain. After extensive seasonal rains may temporarily dominate normally arid and poor desert areas, e.g. Sueyhan and parts of western dunes.

***Stipagrostis plumosa** on Jebel Hafit, 400 m.*



***Tetrapogon villosus** in Wadi Jeema, Hatta, 700 m.*



20. Tetrapogon villosus Desf.

Perennial grass to 40 cm, tufted at base and with slender erect stems. Leaves narrowly-pointed, blue-green, to 15 cm, sprouting from base and sometimes laterally from upper stems; usually a thin furled leaf reaching halfway up the mature head. Spike waxy white to 8 cm, dense in centre and covered with erect silky hairs which exceed spikelets by 1 cm, Feb.-Jun. Heads distinctive in clumps against rocky background.

Fairly common throughout mountains at lower elevations among boulder debris, especially in accumulated silts.

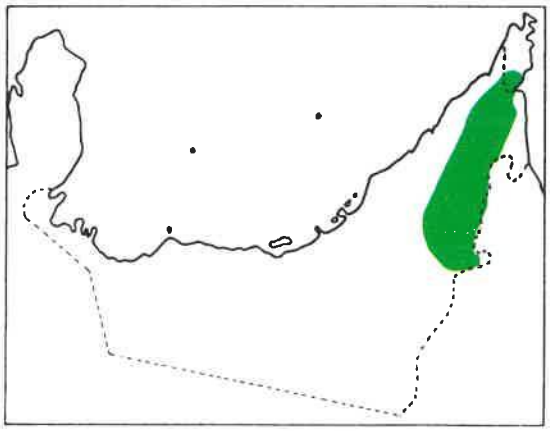
21. Tragus racemosus (L.) All.

Small annual, usually in a semi-prostrate, flattened whorl some 15-20 cm in diameter and a few cm high, though more erect in sheltered spots. Flowering stems of equal length, to 9 cm, parts below spikes enclosed in leaf sheaths; stems bent near base. Leaves stiff and flat, pointed, with tips often bent back sharply. Spikes 4-6 cm, dark green maturing rusty brown with dense cover of spikelets, Feb.-May.

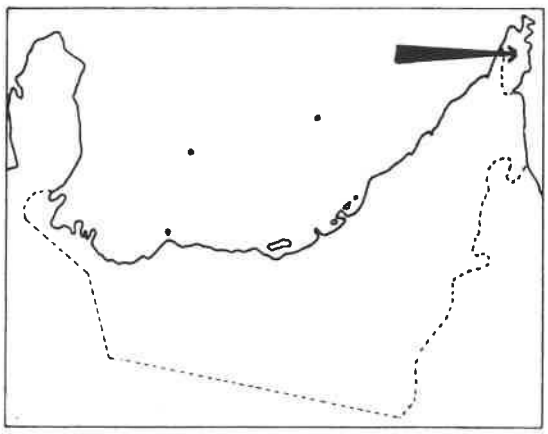
Fairly common in both compact sandy and gravelly habitats on alluvial plains, parts of central desert and in lower foothills.

Tragus berteronianus Schultes is similar but more erect, to 15 cm, and with denser and narrower spikes. Less common, especially under **Acacia** scrub between Al Ain and Hatta. Recorded in flower Apr.-May.

Tragus racemosus *in rough gravel desert near Madam, 250 m.*



A velvety thin layer of annual grasses in a terraced field in the Ruus al Jibal at approx. 5000 ft. These fields are dusty and bare for most of the year but put on a temporary green mantle after winter rains. Note the longer grasses and weeds in the small enclosure around the palm tree. These grasses are cut as fodder for goats.



Palmae — **palm** family

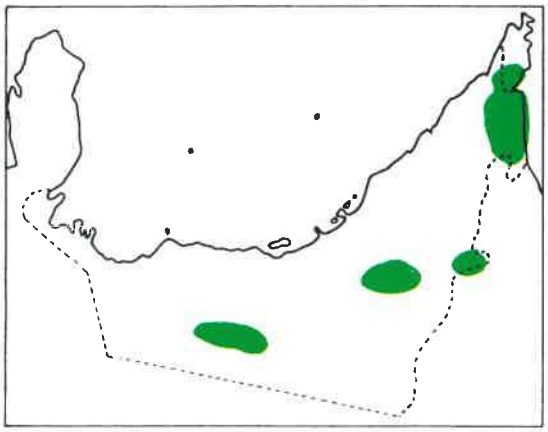
Shrubs and trees with extremely large, pinnate leaves, very long and sharply pointed; lower leaflets modified into sharp spines. Flowers short-lived, small, with sexes on different trees; there are 3 sepals, 3 petals and 2 whorls each of 3 stamens. Fruit a 1-seeded fleshy berry. Extensively cultivated for dates and landscaping purposes.

1. Phoenix dactylifera L.

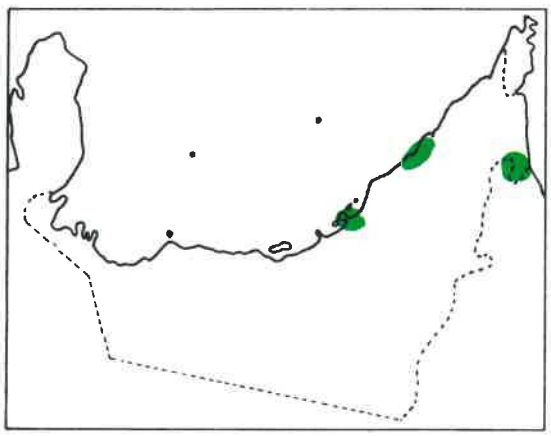
This name covers numerous subspp. but essentially it is a shrub or tree with cylindrical stem, often with basal suckers, to 15 m. Leaflets each to 1.25 m, often folded upwards. Flowers waxy white on thickened stalk, Feb.-Apr. Fruit a date of various colours, smooth and firm initially, turning soft and wrinkled in maturity. In natural state date palm is a spreading bush but if lower leaves continually cut back it forms a sizeable trunk and grows upwards so that leaves eventually form drooping crown.

Cultivated throughout country at all elevations; tolerant of some salinity. Spontaneous growth not common except in neglected or abandoned groves and occasionally near pools in central desert. Common amenity tree of towns and parks.

Phoenix dactylifera, *showing fruit, Al Ain oasis, 350 m.*



Typha domingensis *in small wadi area 20 km SW of Hatta, 500 m.*



Typhaceae — **reedmace** family

1 sp. in U.A.E. Tall marsh plant growing from thick, submerged rhizome. Leaves sheathed from base, ascending narrowly. Flowers in cylindrical spikes near top of stem. Fruit a hairy nutlet, dispersed by wind.

1. Typha domingensis Pers.

Tall perennial to 3 m. Stem reed-like, very erect, to 3 cm thick at base. Leaves yellowy-green, almost as tall as flowering stems, leathery, to 2.5 cm wide, tapering. Head like bullrush, comprising 2 dense spikes 2-6 cm apart, upper one dark brown, lower one green maturing light brown; upper spike longer and stem tapers to point just above. Flowering Mar.-May. Plant dies right back to near ground level in late summer.

Mostly in wadi systems around Hatta; occasionally around town sewage outlets. Grazed by camels.

Cyperaceae — sedge family

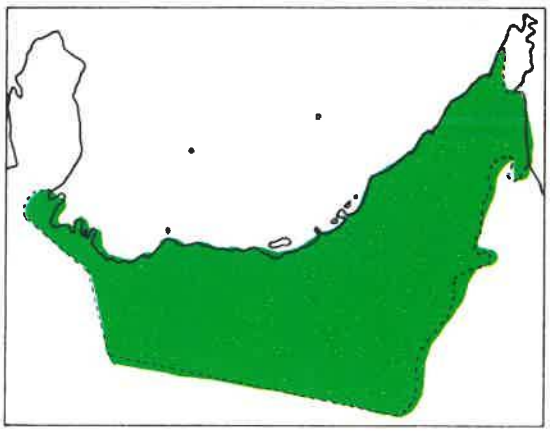
Perennial sedges growing from rhizomes, with solid triangular stems. Leaves long, narrow and pointed, lower parts sheathed. Flowers inconspicuous in open spiky panicles, with 3 stamens. Fruit a tiny nut. Widespread.

1. Cyperus conglomeratus Rottb.

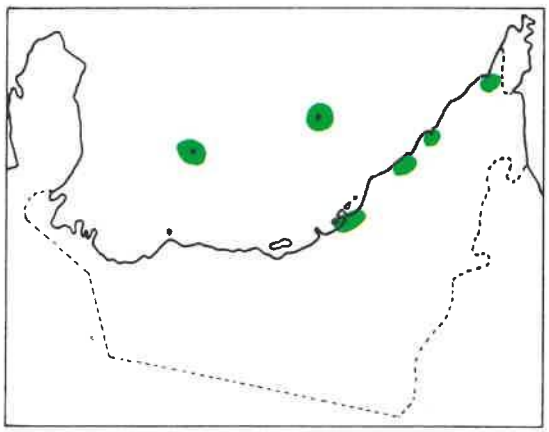
Very variable aspect from dwarf form with single stem a few cm high to bushy plants with several stems to 60 cm. Root fibres woolly and base usually surrounded by old brown leaf sheaths. Young growth pale green but for much of year plant is dull brown or straw-coloured. Leaves cylindrical, tapering to thread-like point, often curving over to ground. Heads very variable on erect stems; dwarf form with knot of spikelets, but larger form with 3-6 radiating spikes up to 4 cm on short stalks; stamens pale yellow, drooping, Dec.-Jun.

Ubiquitous throughout all desert areas and lower hills; dwarf form mostly on or near coastline.

Cyperus conglomeratus *in desert just N of Abu Dhabi new airport, 50 m.* (dwarf)



Cyperus rotundus *at Abu Dhabi old sewage farm, 1 m.*



2. Cyperus rotundus L.

Slender sedge, usually with single flowering stem to 20 cm from rooting stolon nodes that form small, black rhizomes. Leaves 3-6 from base, some longer than stems and spreading outwards, bright green, often brown-tipped. Stem tapers leaf-like to point about 5-10 cm above head; a short leaf extends outwards from base of head. Flowers in several rays of 4-8 spikelets on short stalks, each separate from its neighbour; spikelets thin, reddish-brown, rarely beyond 2 cm long, Dec.-May.

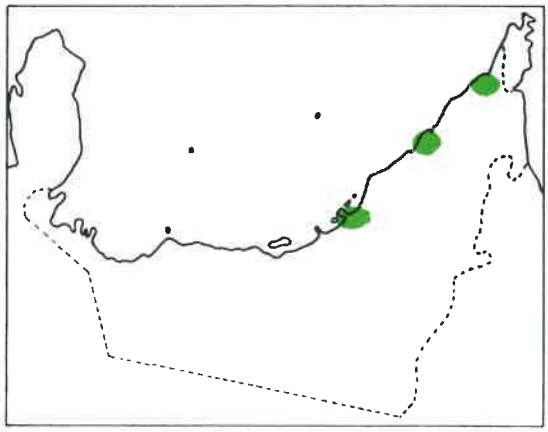
Fairly common weed of ditches, damp plantations and gardens.

3. Scirpus maritimus L.

To 50 cm with thin bulbous rhizome and short rootlets; sending up single stem or a clump if rhizome splits. Stem base surrounded by light glossy green, later light brown, sheaths. Leaves shiny green, stiffly erect, the tallest clasping and rising above flower heads. Head comprises 4-6 cylindrical, blunt-tipped spikes, 1-3 cm on short stalks; spikes yellowish brown, Dec.-May.

In marshy areas especially near towns. Its height and densely-clumped aspect distinguishes it from **Cyperus** spp.

Scirpus maritimus *in tidal water at Abu Dhabi old sewage farm.*



APPENDIX

Checklist of Plant Species Collected and/or recorded in the United Arab Emirates

Families generally in line with D. J. Mabberley, 1987, **The Plant Book,** Cambridge University Press.

Numbers refer to specimen records in the Herbarium of the Royal Botanic Garden, Edinburgh, Scotland, United Kingdom.

Key to Localities:

A – Ajman
AD – Abu Dhabi
D – Dubai
F – Fujeirah
RAK – Ras al Khaimah
S – Sharjah
UAQ – Umm al Qawain
O/B – Oman border around Buraimi
O/M – Oman Musandam, Ruus al Jibal

Note: O/B and O/M indicate species recorded from Oman only, and not yet recorded by the author in the UAE proper. Conversely, very many of the species in this list are also found in neighbouring parts of Oman. Parts of O/M are up to 2,000 feet higher than adjacent parts of the UAE. The list of cultivated plants and exotics is incomplete.

Key to Collectors:

unmarked – the author
B – L. Boulos
E – J. Edmondson
MH – K. Müller-Hohenstein
SK – C.J. Skene

Key to Literature Records:

C – T. Cope 1985
G – A. El-Ghonemy 1985
H & K – I. Hedge & R. King 1983
J – M. Jongbloed 1987
K & E – T. Kwei & T. Esmonde 1983

ACANTHACEAE			
Blepharis ciliaris (L.) B.L. Burtt	– locally common		
ADIANTACEAE			
Adiantum capillus-veneris L.	– locally common	F	213
Ceterach officinarum DC.	– rare	O/M	850
Cheilanthes pteridioides (Reich.) C. Chr.	– rare	O/M	1120a
C. vellae (Ait.) F. Muell.	– rare	O/M	1120b
Onychium divaricatum (Poir.) Austin	– uncommon	F	743
AIZOACEAE			
Aizoon canariense L.	– locally common		E 30902
Gisekia pharnaceioides L.	– common	AD, A, UAQ	162
Mesembryanthemum nodiflorum L.	– offshore islands		224
Zaleya pentandra (L.) Jeffrey	– locally common		552
AMARANTHACEAE			
Aerva javanica (Burm. f.) Juss.	– locally common		MH 86168
Amaranthus graecizans L.	– locally common		1092
A. hybridus L.	– locally common		287
A. viridis L.	– locally common		288
Pupalia lappacea (L.) Juss.	– uncommon	O/M	1016

APOCYNACEAE

Carissa macrocarpa (Echl.) A. DC.	– town ornamental		1093
Catharanthus roseus (L.) G. Don	– town ornamental	K & E	
Nerium oleander L.	– fairly common	F, RAK	177
Plumeria rubra L.	– town ornamental	K & E	
Rhazya stricta Decne.	– locally common		217

ARISTOLOCHIACEAE

Aristolochia bracteata Retz.	– rare	F	882

ASCLEPIADACEAE

Calotropis procera (Ait.) Ait. f.	– locally common		665
Caralluma cf. arabica N.E. Brown	– uncommon	F, RAK	1122
Glossonema varians (Stocks) Benth.	– uncommon	AD, D, RAK	588
Leptadenia pyrotechnica (Forssk.) Decne.	– common	AD, RAK	321
Pentatropis spiralis (Forssk.) Decne.	– locally common	F, RAK	667
Pergularia tomentosa L.	– locally common		308
Periploca aphylla Decne.	– locally common		725

BIGNONIACEAE

Jacaranda mimosifolia D. Don	– town ornamental	K & E	
Tecoma stans (L.) Willd.	– town ornamental	K & E	
Tecomella undulata (Roxb.) Seem.	– uncommon	A, D	619

BORAGINACEAE

Arnebia hispidissima (Lehm.) DC.	– very common some years		335
Cordia myxa L.	– oasis cult.	F, RAK	675
Echiochilon kotschyi (Boiss. & Hohen.) I.M. Johnston	– rare	AD, D	640
E. persicum (Burm. f.) I. M. Johnston	– rare	D	493
Gastroctyle hispida (Forssk.) Bge.	– rare	UAQ	780
Heliotropium cf. bacciferum Forssk.	– rare	AD	028
H. calcareum Stocks	– common		202
H. digynum (Forssk.) Aschers. ex C. Christ.	– locally common	AD	262
H. europaeum L.			B 15776
H. kotschyi (Bge.) Gürke	– very common		348
H. lasiocarpum Fisch. & C.A. Meyer	– rare	AD	653
H. ramosissimum (Lehm.) DC.	– rare	AD	010
Moltkiopsis ciliata (Forssk.) I.M. Johnston	– common		044
Trichodesma africana (L.) R. Br.	– uncommon	F, RAK	1127

CAPPARACEAE

Capparis cartilaginea Decne.	– locally common	AD, F	680
C. spinosa L.	– less common, also offshore		267
Cleome amblyocarpa Barr. & Murb.	– locally common		219
C. brachycarpa Vahl ex DC.	– locally common	AD coast	338
C. dolichostyla Jafri	– locally common	D, F	270
C. aff. droserifolia Del.			E 3149
C. aff. quinquinervia DC.	– locally common	S	1079
C. rupicola Vicary	– common	F	704
Dipterygium glaucum Decne.	– very common		027
Maerua crassifolia Forssk.	– rare	O/B	

CARYOPHYLLACEAE

Cometes surattensis L.	– locally common	AD, F, RAK	105
Dianthus cf. crinitus Sm.	– rare	F, RAK	178
Dianthus cyri Fisch. & C.A. Meyer	– uncommon	AD (Al Ain), F	881
Gymnocarpos decandrum Forssk.		AD, F, RAK	562
Gypsophila bellidifolia Boiss.	– locally common	F, RAK	059
Herniaria hemistemon J. Gay	– uncommon	AD, F	494
H. hirsuta L.	– rare	F	1145
Paronychia arabica (L.) DC.	– locally common	F, UAQ	785
Polycarpaea repens (Forssk.) Aschers. & Schweinf.	– uncommon	F	MH 86259
P. spicata Wight & Arn.	– uncommon	AD, F	584
Sclerocephalus arabicus Boiss.	– locally common	AD	108
Silene apetala Willd.	– rare	F	1149

S. linearis Decne.	– locally common	F, RAK	540
S. villosa Forssk.	– very common some years		450
Spergula fallax (Lowe) Krause	– locally common	F, RAK	824
Spergularia bocconii (Scheele) Asch. & Graebn.	– rare	(KEW BW 07/15)	
S. diandra (Guss.) Heldr. & Sart.	– uncommon		E 3118a
S. marina (L.) Griseb.	– uncommon	AD coast	026
Sphaerocoma aucheri Boiss.	– locally common	AD, D, F	506

CASUARINACEAE

Casuarina cristata Miq.	– cult.	G	
C. equistetifolia J.R. & G. Forst.	– cult. ornamental	K & E	
C. glauca Sieb. ex Spreng.	– cult.	G	
C. lehmanniana Miq.	– cult.	G	

CHENOPODIACEAE

Agriophyllum minus Fisch. & C.A. Meyer	– rare	AD (Sueyhan)	273
Anabasis setifera Moq.	– locally common		365
Arthrocnemum macrostachyum (Moric.) Moris & Delponte	– common		894
Atriplex leucoclada Boiss.	– locally common		283
Bassia muricata (L.) Aschers.	– uncommon	AD	428
Beta vulgaris L.s.l.	– escape	RAK	826
Bienertia cycloptera Bge.	– uncommon	AD, D	356
Chenopodium album L.	– very common		
C. murale L.	– very common		721
Cornulaca aucheri Moq. (det. uncertain)		AD coast	138
C. monacantha Del.	– ubiquitous		026
Halocnemum strobilaceum (Pall.) M. Bieb.	– locally common		294
Halopeplis perfoliata (Forssk.) Bge.	– locally common	Gulf coast	368
Haloxylon persicum Bge.	– locally common	AD desert	652
Hammada elegans (Bge.) Botsch.	– common		347
Salsola baryosma (Roem. & Schult.) Dandy	– locally common		358
S. rubescens Franch.	– uncommon		437
S. schweinfurthii Solms.–Laub.	– uncommon	AD coast	398
S. tetrandra Forssk.	– uncommon	AD coast	350
Seidlitzia rosmarinus (Ehrenb.) Bge.	– rare	AD coast	604
Suaeda aegyptiaca (Hassel). Zoh.	– uncommon	Gulf coast	226
S. vermiculata Forssk. ex Gmel.	– more common		404

CISTACEAE

Helianthemum kahiricum Del.	– uncommon, mostly mts.		564
H. lippii (L.) Dum.-Cours.	– common	A, D, UAQ	036
H. salicifolium (L.) Miller	– uncommon	O/M	1116

COMBRETACEAE

Terminalia catappa L.	– town ornamental	K&E	

COMPOSITAE

Amberboa sp.	– uncommon	D (Hatta), RAK	534
Anthemis odontostephana Boiss.	– uncommon	O/M	1105
Artemisia (poss. herba-alba Asso)	– uncommon	RAK	645
Asteriscus hierochunticus (Michon) Wiklund	– uncommon	O/M	1048
Atractylis cancellata L.	– uncommon	F	1054
Blumea bovei (DC.) Vatke	– rare	RAK	893
Calendula arvensis L.	– locally common	O/M	1109
Carthamus oxycantha M. Bieb.	– uncommon	AD	654
C. tinctorius L.	– local escape	AD (Al Ain)	1009
Centaurea pseudosinaica Czerep.	– uncommon	AD, RAK	013
Cichorium intybus L.	– rare	RAK	515
Crepis sp.	– locally common	O/M	740
Echinops sp.	– common	F, RAK	1060
Eclipta prostrata L.	– uncommon	F	384
Flaveria trinervia (Spreng.) Mohr	– locally common		222
Filago desertorum Pomel	– locally common	AD, F, RAK	573
Helichrysum glumaceum DC.	– uncommon	O/M	749
H. makranicum (Rech. f. & Esfand.) Rech. f.	– uncommon	AD, RAK	571
Hochstetteria schimperi DC.	– uncommon	D (Hatta)	634
Ifloga spicata (Forssk.) Sch.–Bip.	– locally common		243

Iphiona scabra Decne.			MH 86131
Launaea capitata (Spreng.) Dandy	– locally common		794
L. massauensis (Fres.) Chiov.	– locally common	F, RAK	707
L. aff. mucronata (Forssk.) Muschler	– locally common	AD, D, S	625
L. nudicaulis (L.) Hook. f.	– locally common	AD, D	810
L. procumbens (Roxb.) Ramayya & Rajagopal	– common	D (Hatta)	635
L. spinosa (Forssk.) Sch.-Bip.	– locally common	F, RAK	569
Pentanema divaricatum Cass.	– common	F, RAK	507
Pluchea dioscoridis DC.	– locally common	AD	144
P.cf. ovalis (Pers.) DC.	– uncommon	D (Hatta)	898
Pulicaria edmondsonii Gamal-Eldin	– uncommon	AD, S	664
P. glutinosa Jaub. & Spach	– common	F, RAK	113
P. undulata (L.) C.A. Meyer	– fairly common	RAK	508
Reichardia tingitana (L.) Roth	– fairly common	F, RAK	1053
Rhanterium epapposum Oliv.			
Senecio abyssinicus A. Rich.	– uncommon	AD, RAK	1153
S. glaucus L. subsp. coronopifolius (Maire) C. Alexander	– common	RAK, UAQ	451
Sonchus oleraceus L.	– widespread		145
Urospermum picroides (L.) F.W. Schmidt	– locally common	F, RAK	1139
Vernonia arabica F.G. Davies	– common	AD, RAK	210
V. cinerea (L.) Less.	– uncommon	F	649
Wedelia paludosa DC.	– ornamental		1094
Zoegea purpurea Fresen.	– uncommon	F (Masafi)	1158
CONVOLVULACEAE			
Convolvulus acanthocladus Boiss.	– common	O/M	1068
C.arvensis L.	– locally common		127
C. austro-aegypticus Abdallah & Sa'ad	–		E 3061
C. cephalopodus Boiss.	– fairly common, coast		401
C. cephalopodus Boiss. subsp. cephalopodus	–	AD	421
C. pilosellifolius Desr.	– rare	AD	551
C. prostratus Forssk.	– common		324
C. virgatus Boiss.	– common	F, RAK	075
Cressa cretica L.	– uncommon	AD	125
Cuscuta planiflora Ten.	– locally common	F, RAK	1103
Ipomoea batatas (L.) Lam.	– cult.	F, RAK	720
Ipomoea pes-caprae (L.) R. Br.	– ornamental		B 15840
CRASSULACEAE			
Crassula aff. schimperi Fisch. & C.A. Meyer	–	F	E 3118
Umbilicus sp.	– rare	O/M	1121
CRUCIFERAE			
Anastatica hierochuntica L.	– locally common	AD, F, RAK	247
Brassica tournefortii Gouan	– locally common	F, RAK	470
Capsella bursa-pastoris (L.) Medik.	– uncommon		
Diplotaxis harra (Forssk.) Boiss.	– common	RAK	620
Eremobium aegyptiacum (Spreng.) Boiss.	– common		221
Eruca sativa Miller	– H & K		
Erucaria crassifolia (Forssk.) Del.	– H & K		
E. hispanica (L.) Druce	– locally common	F, RAK	487
Erucastrum arabicum Fisch. & C. A. Meyer	– locally common		784
Farsetia aegyptia Turra	– uncommon		435
F. heliophila Bge. ex Cosson	– rare	AD, RAK	352
F. linearis Decne.	– locally common	(Rams)	747
F. stylosa R. Br.	– common	O/M	245
Malcolmia africana (L.) R. Br.	– uncommon	F, RAK	1112
Morettia parviflora Boiss.	– locally common	O/M	116
Notoceras bicorne (Ait.) Caruel	– rare		1142
Physorrhynchus chamaerapistrum (Boiss.) Boiss.	– common	RAK (Masafi)	226
Raphanus sativus L.	– cult.	F, RAK	719
Savigyna parviflora (Del.) Webb	– common	F	039
Schimpera arabica Hochst. & Steud.	– fairly common		786
Sinapsis arvensis L.	– common	RAK, UAQ	793
Sisymbrium erysimoides Desf.	– locally common	F, RAK, UAQ	486
S. irio L.	– H & K	F, RAK	
S. officinale L.	– H & K		
Zilla spinosa (L.) Prantl	– locally common	AD, F, RAK	008

CUCURBITACEAE

Citrullus colocynthis (L.) Schrad.	– common		E 3054
Corallocarpus schimperi (Naud.) Hook. f.	– rare	F	1074
Cucumis prophetarum L.	– uncommon	D, F	

CYNOMORIACEAE

Cynomorium coccineum L.	– locally common		

CYPERACEAE

Cyperus conglomeratus Rottb.	– ubiquitous		295
C. laevigatus L.	– uncommon		143
C. rotundus L.	– common		123
Fimbristylis cymosa R.Br.	– uncommon	RAK	193
Scirpus maritimus (L.) Pall.	– common		314

DIPSACACEAE

Pterocephalus brevis Coult.	– uncommon	O/M	1058

EPHEDRACEAE

Ephedra foliata Boiss. ex C.A. Meyer	– common	F, RAK, UAQ	181
E. intermedia Schrenk & C.A. Meyer	– common	O/M	

EUPHORBIACEAE

Andrachne aspera Spreng.	– uncommon	F	1102
A. telephioides L.	– uncommon	F, RAK	325
Chrozophora oblongifolia (Del.) Juss. ex Spreng.	– common		E 3139
C. plicata (Vahl) Juss. ex Spreng.	– J		
C. sabulosa Kar. & Kir.	– less common		158
C. tinctoria (L.) Raf.	–		MH 86109
Euphorbia arabica Hochst. & Steud. ex Boiss.	– uncommon	F, RAK	706
E. granulata Forssk.	– uncommon	O/M	1043
E. hirta L.	– rare		223
E. indica Lam.	– uncommon	F	873
E. larica Boiss.	– common	F, RAK	114
E. serpens Kunth	– very common		424
E. tirucalli L.	– hedging ornamental	K & E	
Phyllanthus maderaspatensis Willd.	– rare	D (Hatta)	268
Ricinus communis L.	– common	J, K & E	

FRANKENIACEAE

Frankenia pulverulenta L.	– common	AD, F, RAK	140

GENTIANACEAE

Centaurium sp.	– rare	D (Hatta)	211
C. sp.	– uncommon	O/B (Rimthah)	657
C. pulchellum (Sw.) Druce	– rare	O/M	1002

GERANIACEAE

Erodium glaucophyllum (L.) Ait.	– J		
E. laciniatum (Cav.) Willd.	– J		
E. malacoides (L.) L'Hérit.	– rare	AD	032
E. mascatense Boiss.	– common	O/M	736
E. neuradifolium Del. ex Godr.	– common	F, RAK	280
Geranium trilophum Boiss.	– rare	F	582
Monsonia nivea (Decne.) Webb	– very common		037
Oxalis corniculata L.	– uncommon	F	659

GRAMINEAE

Aeluropus lagopoides (L.) Trin.	– very common		146
Aristida abnormis Chiov.	– uncommon	D (Hatta)	543b
A. adscensionis L.	– fairly common		152
A. funiculata Trin. ex Rupr.	– C		
Arundo donax L.	– C		

Astenatherum forskalii (Vahl) Nevski	– common		237
A. fragilis (Guinet & Sauvage) Concert	– G		
Avena fatua L.	– C		
A. sativa L.	– G		
A. sterilis L. subsp. ludoviciana (Durieu) Gill & Magne	– C		
Brachiaria eruciformis (Smith) Griseb.	– C		
B. ramosa (L.) Stapf	– G		
B. reptans (L.) C. Gardner & C.E. Hubb.	– uncommon	O/M	672
Brachypodium distachyon (L.) P. Beauv.	– rare	RAK	489
Bromus madritensis L.	– uncommon	AD	094
B. pectinatus Thunb.	– C		
Cenchrus ciliaris L.	– common		419
C. pennisetiformis Hochst. & Steud.	– fairly common		578
C. setigerus Vahl	– C		
Centropodia fragilis (Guinet & Sauvage) Cope	– C		
Chloris barbata Sw.	–		B 15743
C. virgata Swartz	– fairly common		089
Coelachyrum brevifolium (Hochst.) Nees	– uncommon	AD	153
C. piercii (Benth.) Bor	– rare	AD (Shwayb)	156
Cutandia memphitica (Spreng.) Boiss.	– uncommon	A, UAQ	457
Cymbopogon commutatus (Steud.) Stapf	– common		051
C. schoenanthus (L.) Spreng. subsp. schoenanthus	– C		
Cynodon dactylon (L.) Pers.	– very common		086
Dactyloctenium aegyptium (L.) P. Beauv.	– common		079
D. scindicum Boiss.	– uncommon	AD	139
Desmostachya bipinnata (L.) Stapf	– rare	S (Kalba)	723
Dichanthium foveolatum (Del.) Roberty	– rare	AD	E 3034
Digitaria sanguinalis (L.) Scop.	– common		080
Echinochloa colona (L.) Link	– common		397
Eleusine coracana (L.) Gaertner	– C		
Enneapogon desvauxii P. Beauv.	– C		
E. schimperianus (Hochst. & A. Rich.) Renvoize	– C		
Eragrostis barrelieri Daveau	– common	AD	152
E. cilianensis (All.) Vign.	– common		192
E. ciliaris (L.) R. Br.	– fairly common	RAK	196
E. japonica (Thunb.) Trin.	– C		
E. papposa R. & J. Steud.	– uncommon	AD	081
E. pilosa (L.) P. Beauv.	– uncommon	AD	033
E. poaeoides P. Beauv.	– G		
E. tenella (L.) P. Beauv.	– C		
Halopyrum mucronatum (L.) Stapf	– common, coastal		310
Hyparrhenia hirta (L.) Stapf	– rare, AD (Khazna)		557
Lasiurus scindicus Henrard	– C		
Leptochloa fusca (L.) Kunth	– C		
Leptothrium senegalense (Kunth) W.D. Clayton	– G		
Lolium rigidum Gaudin	– G		
L. temulentum Forssk.	– G		
Ochtochloa compressa (Forssk.) Hilu	– uncommon	AD	242
Panicum antidotale Retz.	– uncommon	AD	600
P. turgidum Forssk.	– common		595
Pennisetum divisum (J. Gmelin) Henrard	– common		594
Phalaris canariensis L.	– G		
P. minor Retz.	– rare	AD town	090
P. paradoxa L.	– G		
Phragmites australis (Cav.) Trin. ex Steud.	– locally common		322
Poa annua L.	– uncommon	islands	417
Polypogon maritimus Willd.	– G		
P. monspeliensis (L.) Desf.	– locally common		147
Rostraria cristata (L.) Tzvelev	– uncommon	AD, UAQ	458
R. pumila (L.) P. Beauv.	–		B 15736
Saccharum griffithii Munro ex Benth.	– uncommon	AD	794
S. ravennae (L.) Murr.	– locally common	AD	312
Schismus arabicus Nees	– C		
S. barbatus (L.) Thell.	–		B 15386
Setaria verticillata (L.) P. Beauv.	– locally common		151
S. viridis (L.) P. Beauv.	–		B 15795
Sorghum bicolor (L.) Moench	– cult. C		
S. halepense (L.) Pers.	– C		
Sphenopus divaricatus (Gouan) Reichb.	– C		
Sporobolus arabicus Boiss.	– Gulf coast		316

S. spicatus (Vahl) Kunth	– very common		085
Stipa capensis Thunb.	– offshore		418
Stipagrostis acutiflora (Trin. & Rupr.) de Winter	– C		
S. ciliata (Desf.) de Winter	– uncommon	F	382
S. foexiana (Maire & Wilczek) de Winter	– C		
S. hirtigluma (Steud. ex Trin. & Rupr.) de Winter	– C		
S. lanata (Forssk.) de Winter	– C		
S. obtusa (Del.) Nees			MH 86226
S. paradisea (Edgew.) de Winter	– G		
S. plumosa (L.) Munro ex T. Anders.	– common		157
S. sokotrana (Vierh.) de Winter	– rare	AD, D	593
Tetrapogon villosus Desf.	– fairly common		576
Tragus berteronianus Schultes	– rare	AD (Shwayb)	154
T. racemosus (L.) All.	–rare	AD (Al Ain)	238
Tricholeana teneriffae (L.f.) Link	–		E 3148
Triraphis pumilio R. Br.	– C		
IRIDACEAE			
Iris sisyrinchium L.	– uncommon	O/M	751
JUNCACEAE			
Juncus rigidus Desf.	– fairly common	F	484
J. socotranus (Buch.)–	– uncommon	RAK	198
LABIATAE			
Lavandula subnuda Benth.	– common	F, RAK	203
Leucas inflata Benth.	– common	F, RAK	566
Ocimum forskolei Benth.	– uncommon	O/B	674
Salvia aegyptiaca L.	– common	O/M	744
S. macilenta Boiss.	– common	F, RAK	380
S. macrosiphon Boiss.	– rare	F	1005
Teucrium stocksianum Boiss. subsp. stocksianum	– common	F, RAK	705
LEGUMINOSAE			
Acacia arabica Willd.	– cult.		
A. nilotica (L.) Willd. subsp. nilotica	–	AD	683
A. tortilis (Forssk.) Hayne	– very common		
Albizia chinensis (Lour.) Rehder	– ornamental	G	
Albizia lebbeck (L.) Benth.	– ornamental	K&E	
Alhagi maurorum Medik.	– common		313
Argyrolobium roseum (Camb.) Jaub. & Spach	– common		227
Astragalus annularis Forssk.	– uncommon	RAK	469
A. eremophilus Boiss.	– rare	D (Hatta)	303
A. fasciculifolius Boiss.	– locally common	F	E 3087
A. hauarensis Boiss.	– common	AD, D	337
A. schimperi Boiss.	– uncommon	UAQ	454
A. squarrosus Bge.	– uncommon	A, UAQ	463
A. vogelii (Webb) Bornm.	– rare	AD (Shwayb)	1007
Caesalpinia bonduc (L.) Roxb.	– ornamental	F	880
Cassia italica (Mill.) F. W. Andr.	– common		444
Clitoria ternata L.	– rare	D (Hatta)	690
Crotalaria aegyptiaca Benth.	– common		526
C. persica (Burm. f.) Merrill	– uncommon	D (coast)	
Hippocrepis bicontorta Loisel.	– common	AD,RAK,UAQ	462
H. constricta Kunze	– common	F, RAK	529
Indigofera arabica Jaub. & Spach	– common		438
I. argentea L.	– common		261
I. articulata Gouan	– common	AD	795
I. caerulea Roxb.	– rare	F	607
I. intricata Boiss.	– uncommon	AD, D	805
I. oblongifolia Forssk.	– common	F	650
Lotononis platycarpa Boiss. & Spr.	– uncommon	D (Hatta)	713
Lotus garcinii DC.	– common		282
L. glinoides Del.	– uncommon	AD (islands), F	410
L. halophilus Boiss. & Spr.	– uncommon	AD, RAK	432b
Medicago laciniata (L.) Mill.	– common		1162
M. polymorpha L. (var. brevispina (Benth. emend. Heyn) Heyn)	–	D (Hatta)	548
M. sativa L.	– uncommon	D (Hatta)	

Melilotus indicus (L.) All.			445
Ononis serrata Forssk.	– uncommon	A, UAQ	
Parkinsonia aculeata L.	– town ornamental	K & E	
Prosopis cinerea (L.) Druce	– common		678
P. farcta (Banks & Sol) MacBride	– uncommon	AD	699
P. juliflora (Sw.) DC.	– ornamental, common		614
Pseudolotus makranicus (Rech. f. & Esfand.) Rech. f.	– uncommon	F	
Rhynchosia schimperi Hochst. ex Boiss.			134
Scorpiurus muricatus L.	– uncommon		
Sesbania aegyptiaca Pers.	– town ornamental	K & E	632
Taverniera cuneifolia (Roth) Arn.	– uncommon	D (Hatta)	638
T. spartea (Burm. f.) DC.	– locally common	F, RAK	201
Tephrosia apollinea (Del.) DC.	– very common	AD,F,RAK	770
T. nubica (Boiss.) Baker	– rare	RAK (Manama)	480
T. persica Boiss.	– uncommon	F, RAK	718
Trifolium alexandrinum L.	– rare	S (Kalba)	547
T. resupinatum L.	– rare	AD	549
Trigonella hamosa L.	– fairly commom		276
Vicia monantha Retz.	– rare	AD	753
V. sativa L.	– rare	O/M	

LILIACEAE

Aloe aff. vera L.	– uncommon	F, RAK	687
Asparagus stipularis Forssk.	–		MH 86040
Asphodelus tenuifolius Cav.	– common		732
Dipcadi erythraeum Webb & Berth.	– locally common	AD	1085

LYTHRACEAE

Lawsonia inermis L.	– cult., plantations		872

MALVACEAE

Abutilon pannosum (Forst.) Schlect.	– fairly commom	F, RAK	386
Hibiscus sp. (micranthus L.?)	– uncommon	F	375
H. rosa-sinensis L.	– town ornamental	K & E	
Malva parviflora L.	– common, also islands		777
Sida urens L.	– rare	F	311

MELIACEAE

Melia azederach L.	– ornamental	G, K & E	

MENISPERMACEAE

Cocculus pendulus (Forssk.) Diels	– common	F, RAK	579

MOLLUGINACEAE

Limeum arabicum Friedr.	– locally common		263

MORACEAE

Ficus bengalensis L.	– ornamental	K & E	
F. carica L.	– fairly commom	F, RAK	271
F. salicifolia Vahl	– locally common		MH 86184

MORINGACEAE

Moringa peregrina (Forssk.) Fiori	– uncommon	AD (Hafit), F	730

MYRTACEAE

Eucalyptus camaldulensis Dehnh.	– cult. G		
E. pimpiniana Maiden	– cult. G		

NYCTAGINACEAE

Boerhavia diffusa L.	– common	F, RAK	183
B. elegans Choisy	– common	F, RAK	115
Bougainvillea spectabilis Willd.	– town ornamental	K & E	
Commicarpus helenae (J.A. Schultes) Meikle	– uncommon	F, RAK	512
C. stenocarpus (Chiov.) Cufod.	–	F (Masafi) Sk	

OLEACEAE

Jasminum sambac (L.) Ait.	– rare, cult.	O/B	670

ORCHIDACEAE

Epipactis veratrifolia Boiss.	– rare, streams	O/B	673

OROBANCHACEAE

Cistanche tubulosa (Schenk) Wight	– common		885
Orobanche cernua Loefl.	– in tomato fields	AD	817

PALMAE

Phoenis dactylifera L.	– common, mostly cult.		722

PLANTAGINACEAE

Plantago afra L.	– uncommon	D, F	544
P. amplexicaulis Cav.	– uncommon	F	887
P. boissieri Hausskn. & Bornm.	– locally common	RAK, UAQ	447
P. ciliata Desf.	– locally common		910
P. notata Lag.	– uncommon	O/M	1106
P. ovata Forssk.	– locally common	F, RAK	768

PLUMBAGINACEAE

Dyerophytum indicum (Gibs. ex Wight) O. Kuntze	– common	F, RAK	729
Limonium axillare (Forssk.) O. Kuntze	– common		724
L. carnosum (Boiss.) O. Kuntze	– rare	RAK (Rams)	482

POLYGALACEAE

Polygala erioptera DC.	– locally common	S, UAQ	182
P. aff. irregularis Boiss.	– uncommon	RAK, UAQ coasts	502

POLYGONACEAE

Calligonum comosum L'Hérit.	– common		504
Emex spinosus (L.) Campd.	– fairly common		286
Polygonum argyrocoleum Steud. ex Kuntze	– uncommon	AD	129
Pteropyrum scoparium Jaub. & Spach	– common	F, RAK	062
Rumex dentatus L.	– rare	AD coast	289
R. pictus Forssk.	– uncommon	A, UAQ	449
R. vesicarius L.	– common	AD,F, RAK, UAQ	067

PORTULACACEAE

Portulaca oleracea L. subsp. oleracea	– common		13

PRIMULACEAE

Anagallis arvensis L.	– common	AD, F, RAK	733

RESEDACEAE

Ochradenus arabicus Chaudhary, Hillcoat & Miller	– common		002
O. aucheri Boiss. subsp. aucheri	– common		186
Reseda aucheri Boiss.	– common	AD, (Hafit), F, RAK	056

RHAMNACEAE

Zizyphus jujuba Mill.	– town ornamental	K & E	
Z. nummularia (Burm. f.) Wight & Walk.– Arn.	–		MH 86033
Z. spina-christi (L.) Willd.	– common		379

ROSACEAE

Amygdalus arabicus Oliv.	– over 1500 m.	O/M	623
Neurada procumbens L.	– common		767

RUBIACEAE

Callipeltis cucullaria (L.) Rothmn.	–	F (Masafi)	1146
Gaillonia aucheri (Guill.) Aschers. & Schweinf.	– common	F, RAK	541
Galium ceratopodum Boiss.	– uncommon	O/M	1135
G. setaceum Lam.	– uncommon	F, RAK	580
Kohautia retrorsa (Boiss.) Brem.	– rare	D (Hatta)	391
Pseudogaillonia hymenostephana (Jaub.& Spach) Lincz.	–	F, RAK	1019
Pterogaillonia calycoptera (Decne.) Lincz.	– uncommon	O/M	1037

RUTACEAE

Haplophyllum tuberculatum (Forssk.) A. Juss.	– locally common		065

SALVADORACEAE

Salvadora persica L.	– locally common	AD, D, RAK	663

SAPINDACEAE

Dodonaea angustifolia L.f.		AD (Hafit), F	MH 86121

SCROPHULARIACEAE

Anticharis arabica Endl.	– uncommon	AD (Hafit), D, RAK	172
Bacopa monnieri (L.) Pennell	– uncommon	F, RAK	176
Kickxia ramosissima (Wall.) Janchen	– uncommon	F, RAK	513
Linaria simplex (Willd.) DC.	– rare	F (Masafi)	1151
Lindenbergia arabica (Moore) Hartl	–		Sk 33
L. aff. fruticosa Benth.	– uncommon		627
Misopates orontium (L.) Rafin.	– uncommon	F (Masafi)	1167
Schweinfurthia papilionacea (Burm.f.) Boiss.	– common	F	1096
Scrophularia arguta Soland. ex Ait.	– locally common	O/M	843
S. deserti Del.	– uncommon	AD, D, F	1024
Verbascum omanense Huber-Morath	– uncommon	D (Hatta)	905

SOLANACEAE

Hyosycamus insanus Stocks	– uncommon	AD, F	618
H. muticus L.	–		
Lycium shawii Roem. & Schult.	– common		443
Physalis minima L.	– rare	D (Hatta)	684
Solanum nigrum L.s.l.	– locally common		597
S. incanum L.	– locally common	F, RAK	871
S. villosum Miller	– uncommon	RAK	197
Withania somnifera (L.) Dun.	– uncommon	S (Kalba)	388

TAMARICACEAE

Tamarix aphylla (L.) Karst.	–		MH 86145
T. arabica Bge.	– locally common		284
T. aucherana (Decne.) Baum	– locally common		367
T. passerinoides Del. ex Desv.	– G		

TILIACEAE

Corchorus depressus (L.) Stocks	– locally common	F, RAK	326
C. trilocularis L.	– local	F plantations	272
Grewia erythraea Schweinf.	– locally common	D, F, RAK	612
G. tenax (Forssk.) Fiori	–		MH 86196

TYPHACEAE

Typha domingensis Pers.	– uncommon	AD, D, RAK	

UMBELLIFERAE

Ammi majus L.	– locally common	AD, F, RAK	509
Anethum graveolens L.	– cult.	RAK	827
Daucus durieua Lange	– rare	F (Masafi)	1144
Ducrosia anethifolia (DC.) Boiss.	– uncommon	AD	585
Pimpinella eriocarpa Banks & Sol.	– uncommon	O/M	1030
P. aff. puberula (DC.) Boiss.	– uncommon	RAK	187

Pycnocycla caespitosa Boiss. & Hausskn.	– rare	D (Hatta)	209
Scandix pecten-veneris L.	– rare	O/M	1118
URTICACEAE			
Forsskaolea tenacissima L.	– common	F, RAK	206
Parietaria alsinifolia Del.	– rare	F (Masafi)	1160
VERBENACEAE			
Avicennia marina (Forssk.) Vierh.	– locally common		MH 86037
Clerodendrum inerme (L.) Gaertn.	– town ornamental	K & E	
Lantana camara L.	– town ornamental	K & E	
Lippia (Phyla) nodiflora (L.) Greene	– uncommon	AD	142
VIOLACEAE			
Viola cinerea Boiss.	– locally common	AD, F, RAK	1039
ZYGOPHYLLACEAE			
Fagonia bruguieri DC.	– common		190
F. indica Burm.f.	– common	F, RAK	218
F. ovalifolia Hadidi	– common	AD, D	165
Seetzenia lanata (Willd.) Bullock	– locally common	AD, F	236
Tribulus arabicus Hosni	–	AD (Liwa)	MH 86275
T. omanense Hosni	– widespread		689
T. parvispinus Presl	– rare	Sk (Khor Kalba)	394
T. terrestris L.	– common		783
Zygophyllum hamiense Schweinf.	– very common		104
Z. qatarense Hadidi	– rare	F	E 3002
Z. simplex L.	– very common		292

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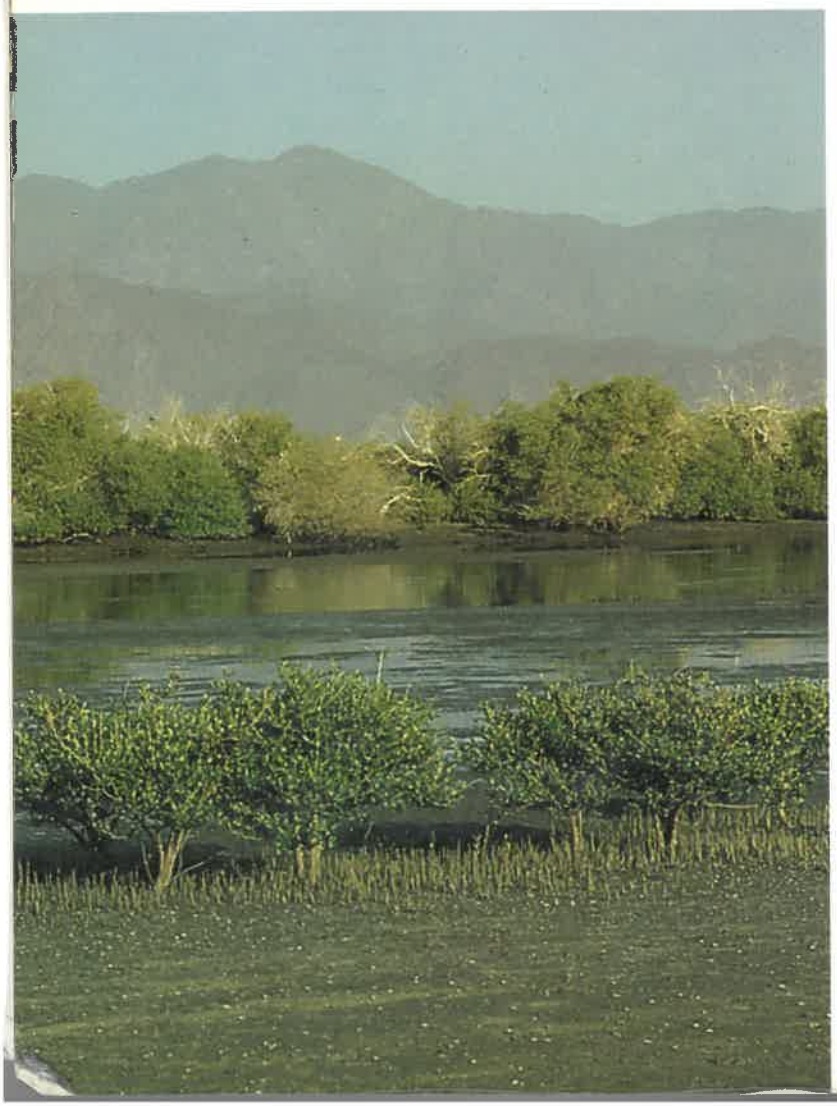
PLANT NAMES IN DESCRIPTIONS

THE AUTHOR

Rob Western has worked in Abu Dhabi as a language instructor since 1978. His interest in the plants of desert areas goes back to the late 1960s when he was teaching in Sudan, followed by several years in northern Libya. The distinction between the Mediterranean flora of the Libyan coastline and the desert tolerant species of the Sahara plateau served to increase his fascination for the vegetation of arid areas. On arrival in Abu Dhabi he became the Plant Recorder for the recently-established Emirates Natural History Group (E.N.H.G.) and set about surveying the UAE comprehensively. There were no local plant guides so between 1980 and 1989 plants were photographed and representative samples collected for identification purposes. All determinations have been carried out by staff at the Herbarium of Edinburgh Royal Botanic Garden and the Royal Botanical Garden at Kew. Rob Western has also set up a modest herbarium in Abu Dhabi for the E.N.H.G. At present he is working on Das Island in the Arabian Gulf, but still makes regular recording trips into the interior of the UAE.



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