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A NATURAL HISTORY STUDY OF KURKUR OASIS, LIBYAN DESERT, EGYPT. IV. THE VEGETATION¹

by

LOUTFY BOULOS

NATIONAL RESEARCH CENTRE, DOKKI, CAIRO

In the first paper of this series, Reed (1964, p. 13-18) gave a history of exploration and scientific research at Kurkur Oasis. Reviewing the reports of these studies one finds notes on occasional observations on the plant life of the area, e.g. Willcocks 1899 (p. 6), Ball 1902 (p. 23, 40), Hurst 1910 (p. 268), Cuvillier 1934 (p. 349) and 1935 (p. 138, 139), Shata 1962 (p. 298) and Butzer 1964 (p. 128). The present paper presents an account of the vegetation of this region as well as that of a few of the surrounding areas.

Kurkur is a small uninhabited oasis; it lies at latitude 23° 54' N and longitude 32° 19' E, about 62 km southwest of Aswan and about 55 km west of the Nile at Dabud (fig. 1). The oasis occupies what seems to be the confluence of three wadis joined

¹Previous publications in this series on the natural history of Kurkur Oasis by members of the Yale University Prehistoric Expedition to Nubia are as follows: I. Introduction, by Charles A. Reed; *Postilla*, Yale Peabody Mus., no. 84 (1964):1-20. II. Paleoclimates, by Karl W. Butzer; *Canad. Geog.*, 8 (1964):125-140. III. Landforms, by Karl W. Butzer; *Ann. Assoc. Amer. Geog.*, 55 (1965):578-591.

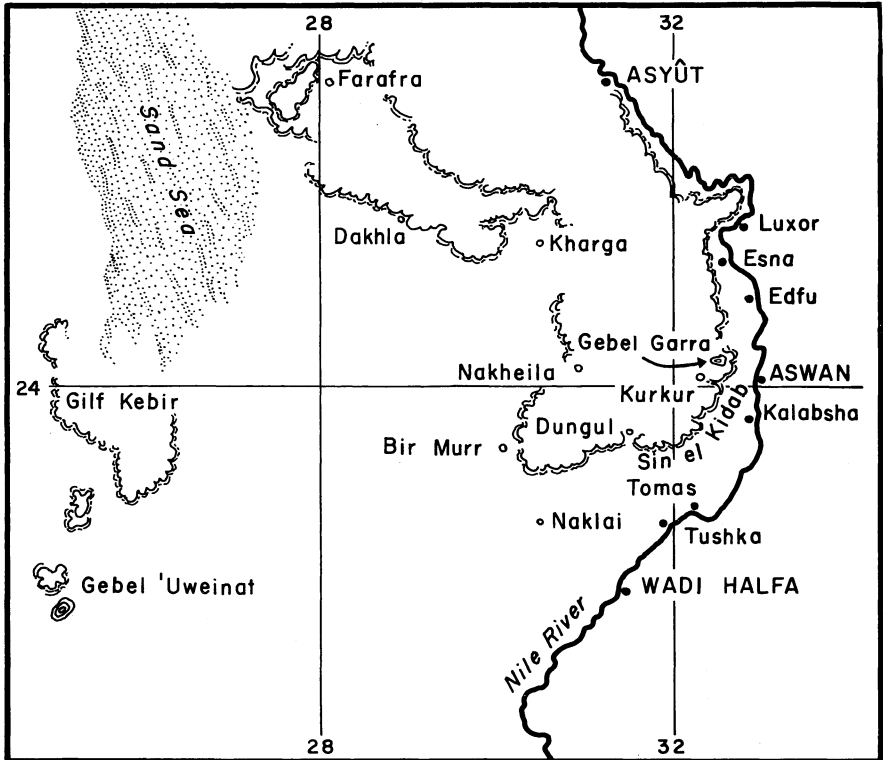


Fig. 1. Map of Nubia and part of upper Egypt, with adjacent areas of the Western (Libyan) Desert. (After Murray, 1939)

in the form of the letter Y (fig. 2). These are the upstream parts of Wadi Kurkur which extends eastward till it meets the Nile River at Dabud.

The area is practically rainless; the mean annual rainfall recorded at the nearest meteorological station of Aswan is 3 mm. This mathematical mean is misleading. The rainfall is not an annually recurring phenomenon but an accident that may happen once every decade. The main source of water for the oasis is seepage along a line that seems to follow the direction of the north-west wadi. The plant growth indicates the line of seepage, the geological basis for which has been described by Butzer (1964). The three wells reported by the various visitors to the Kurkur

9-21 December 1964. Notes were also made on the plant growth of a smaller affluent of Wadi Kurkur (3 km south of the oasis) and on a part of the road between Kurkur and Dungul, 20-40 km south of Kurkur.

Kassas and Imam (1954, p. 424) defined the term wadi as a dried riverbed in a desert area. A wadi may be transformed into a temporary water course after a heavy rain. Each wadi has a main channel and branched affluents. Kassas (1953, p. 256) summarized the features of desert wadi vegetation as follows: "The organization of the plant community is a permanent framework of perennials, the interspaces of which are occupied during the spring by the ephemerals. . . . The vegetation is subject to seasonal changes resulting from differences in growth form of component species, and the seasonal changes of the climate. . . . Another type of vegetational change is the accidental modification due to exceptionally wet or exceptionally dry years."

In Egypt, wadis are much more abundant in the Arabian (Eastern) Desert than in the Libyan (Western) Desert. In the latter, oases are occasionally present but are practically unknown from the Eastern Desert.

It is thus obvious that a typical desert wadi vegetation is dependent upon rain water. According to the above definition, Wadi Kurkur is not a typical desert wadi but rather an oasis since its main vegetation is supported by groundwater and not by rain. However, the upstream parts of the affluents of wadi Kurkur represent typical wadi vegetation, being more dependent on rainfall.

THE OASIS

The oasis proper is a part of the wadi bed covered by dense growth of plants with groves of dom palms and date palms, and patches of reeds around the wells (fig. 3). There are a number of wells, which are mostly silted; two of these "wells" are permanently open; each is actually a small shallow pool surrounded by reeds (fig. 4). Within the area of the oasis the water table is high.

The plant growth around a well is organized into: a ring of reeds (*Typha australis*), (fig. 4) and/or *Phragmites communis*, (fig. 5), followed by a ring zone of rush (*Juncus arabicus*), a further and more extensive zone of halfa grass (*Desmostachya*



Fig. 3. General view of the Oasis of Kurkur showing the dense growth of reeds and the wells (where the man is standing). Note the groves of dom palms and date palms, with camel-thorns and halfa grass on the higher ridges.

bipinnata), and an outer zone of a mosaic of *D. bipinnata* and camel-thorn (*Alhagi maurorum*). In the vicinity of one of the wells there is a patch of *Imperata cylindrica*, a halfa grass similar in appearance to *D. bipinnata*. The growth of *Desmostachya bipinnata* forms a floor carpet of the wadi bed with a cover ranging from complete cover in the central part to lesser cover on the sides. This green carpet is studded by dom palms (*Hyphaene thebaica*) and date palms (*Phoenix dactylifera*); the former are more numerous. In the central part of the oasis there is a single bush of tamarisk (*Tamarix nilotica*) near one of the wells.

What has formerly been a dense mass of dom palms in the center of the oasis (fig. 6) is now a desolate scene of dying trunks (fig. 7), the result, according to our Bedouin guide, of a fire



Fig. 4 Reeds (*Typha australis* and *Phragmites communis*) growing around one of the wells in the oasis.

started in the autumn of 1964, a few months before the visit of the writer. The oasis has no permanent inhabitants, but is occa-



Fig. 5. *Phragmites communis* growing around one of the wells. Associated species are: *Typha australis*, *Juncus arabicus* and *Desmostachya bipinnata*. In the background dom and date palms are seen.

sionally visited by nomads who find in the wadis of the area some *Acacia* wood which they use for charcoal making, halfa grass

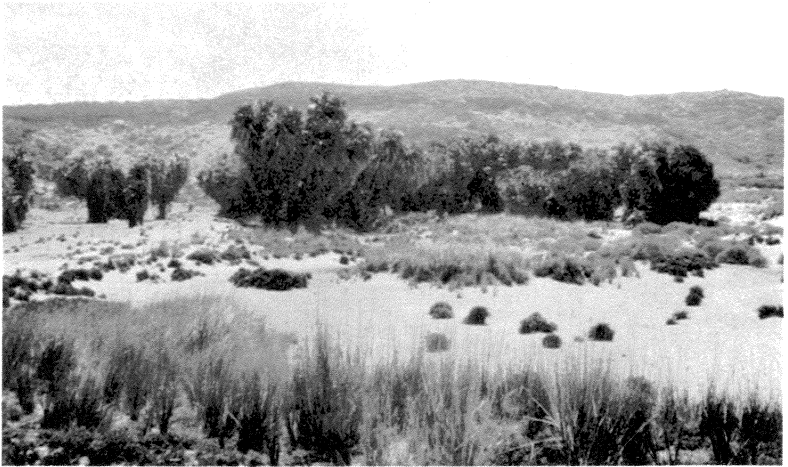


Fig. 6. The central mass of dom palms at Kurkur Oasis, March, 1963, before they were burned.

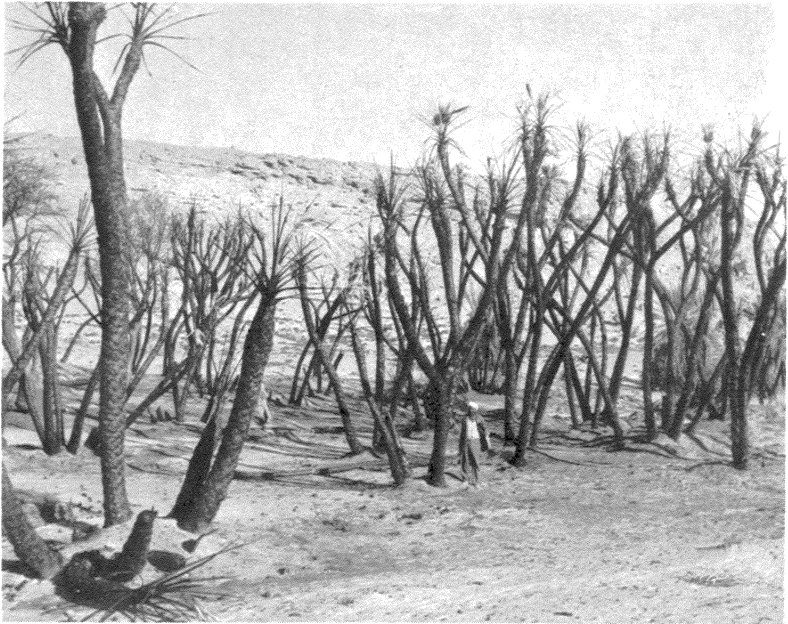


Fig. 7. Clump of burned dom palms in Kurkur Oasis, December, 1964.



Fig. 8. Fresh green pasture of halfa grass (*Desmostachya bipinnata*) appearing in the burned areas. Note also camel-thorns (*Alhagi maurorum*) and scattered fruits of dom palm.

(*Desmostachya bipinnata*) for their animals, and dates and dom-
fruits which they collect and sell in the Aswan market together
with the charcoal. When such visitors come to the oasis they may
set fire to the dried *Desmostachya* growth, a practice which causes
the production of some fresh foliage of this halfa grass and pro-
vides some green pasture for their animals (fig. 8). The fire may
catch the palms by accident.

NORTHWEST WADI

The northwest wadi may ecologically and geomorphologically
be divided into two sections: a downstream section deeply cut
across the limestone plateau with a clearly defined channel bounded
by cliff sides (figs. 9 and 10), and an upstream section with an

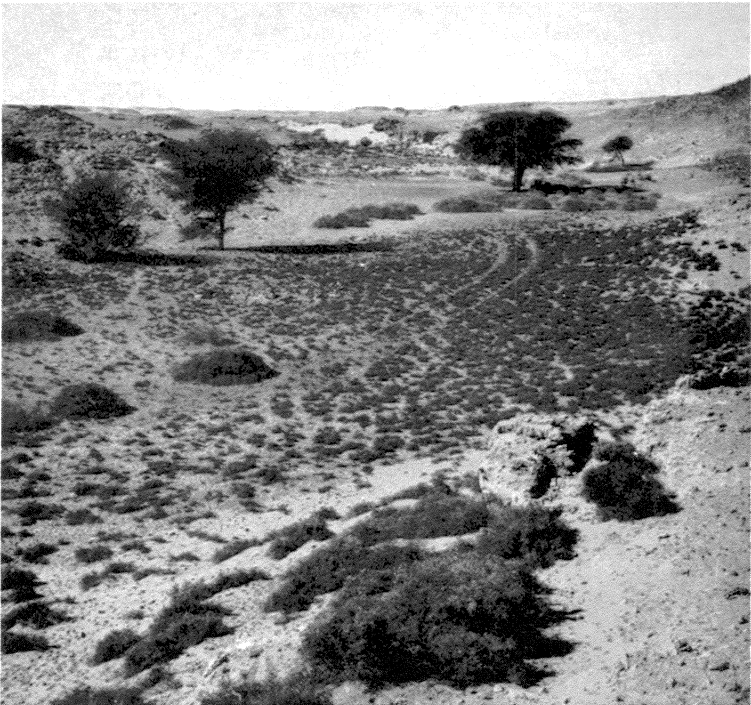


Fig. 9. Rich growth of *Alhagi maurorum* in the entrance of the
northwest wadi. Note the patches of *Zygophyllum coccineum* and scattered
individuals of *Acacia raddiana* (tree) and *A. flava* (bush).

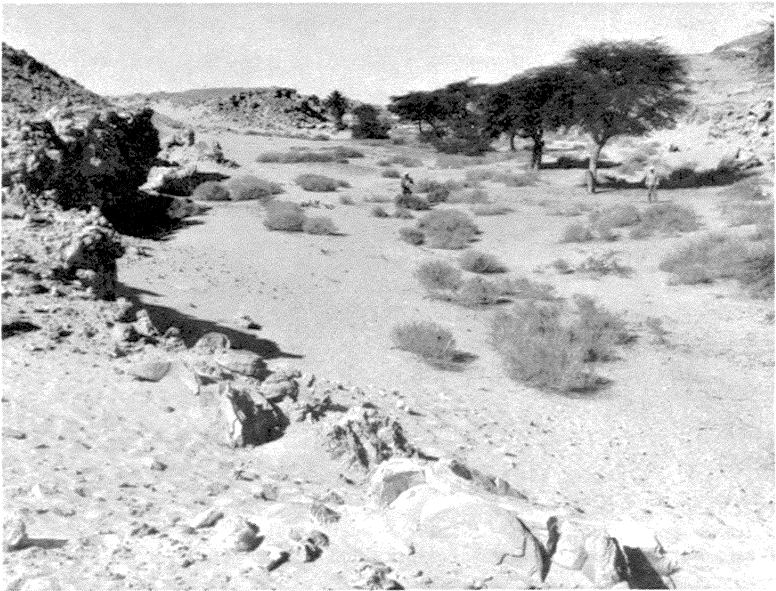


Fig. 10. A general view of a part of the northwest wadi showing the scrub and growth of *Acacia raddiana* (tree), *A. flava* (bush), and the undergrowth of *Zygodium coccineum*. Note the date palm in the distant background.

ill-defined shallow course on the surface of the plateau. In the latter section the course of the wadi is often lost amidst extensive areas of plant growth. The whole wadi runs along what seems to be a seepage line which feeds the plant growth that obviously would not be found otherwise in this rainless country.

The downstream section (near the confluence with the oasis proper) is characterized by a carpet of *Alhagi maurorum* with patches of bean caper (*Zygodium coccineum*) and a distant open scrub of acacia trees (*Acacia raddiana*) and bushes (*A. flava*), (fig. 9). This rich growth of *Alhagi* indicates a copious supply of subsurface water. As one continues up the wadi, the part shown in fig. 9 is followed by a less moist part shown in fig. 10, where the vegetation consists of open *Acacia* scrub with the undergrowth dominated by *Zygodium coccineum*; the other species is prickly clover (*Fagonia parviflora*). This vegetation-type is typical of desert wadis which receive occasional rains or run-



Fig. 11. A hillock formed of sand mixed with dead remains of *Tamarix amplexicaulis*. Note the *Acacia raddiana* tree and, in the foreground, the undergrowth of *Zygophyllum coccineum*. In the distant background dry *Fagonia parviflora* are also to be seen.

off from higher ground, and the situation would seem to indicate a local blockage of the seepage. In the distant background of fig. 10, a few palms may be seen. This part of the wadi seems to indicate a subsurface supply of water deeper than the central part, near the wells, and is also characterized by a number of hillocks formed of sand mixed with dead remains of *Tamarix amplexicaulis* (fig. 11). These are evidently relicts of phytogenetic hillocks built around the growth of *Tamarix*. The presence of *Tamarix amplexicaulis* hillocks in this area as well as in Dungul oasis may be attributed to former more humid climatic conditions which are no longer existing. Similar hillocks of *Tamarix mannifera* and *T. aphylla* were recorded by Girgis (1965) in the deltaic part of Wadi Qena in the Eastern Desert. In the vicinity of the hillocks of *Tamarix amplexicaulis* there is an extensive patch of rosin weed (*Cressa cretica*), indicating saline soil.

The upstream section has an eastern part which may be described as halfa grass country (*Desmostachya bipinnata*) and a western part as a camel-thorn country (*Alhagi maurorum*) with *Acacia* scrub. There is a sterile expanse between these two parts. Fig. 12 shows the grassland growth of *D. bipinnata* on shallow



Fig. 12. A general view of the upstream extension of the northwest wadi on the plateau showing the grassland growth of *Desmostachya bipinnata* on shallow sheets of sand overlying the limestone plateau.



Fig. 13. A sand hill covered and stabilized by the growth of *Desmostachya bipinnata*.



Fig. 14. The plant growth of *Alhagi maurorum* and *Acacia raddiana* on sandy hills. Associated species are *Desmostachya bipinnata* and *Acacia flava*.

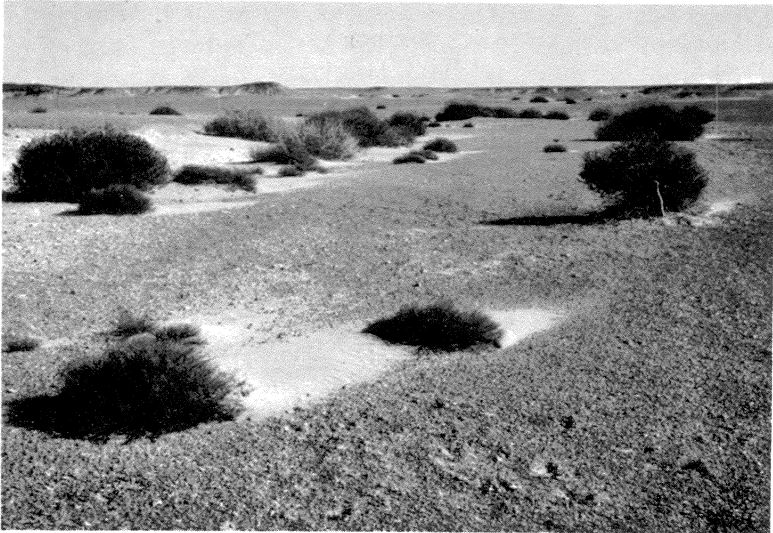


Fig. 15. The thin cover of *Zygophyllum coccineum* in the upstream part of the north wadi.

sheets of sand overlying the surface of the limestone plateau. In this part there are extensive sand hills covered and stabilized by the growth of this halfa grass (fig. 13). Fig. 14 shows the plant growth in the *Alhagi maurorum*-*Acacia raddiana* country. These two types of plant growth indicate a subsurface supply of water, as contrasted with desert plants which might survive on water from rare sporadic rains.

NORTH WADI

The mouth of the wadi is about 600 m to the north of the northern well of the oasis. The vegetation-type of the central part of the oasis expands, though in a thinner form, into this mouth. In this part there is a rather dense scrub of *Acacia raddiana* and *A. flava* with occasional dom palms and a rich undergrowth of *Zygophyllum coccineum*. Throughout the major part of this wadi the vegetation is essentially an open scrub of *Acacia flava*. In the upstream part the vegetation is a thin cover of *Zygophyllum coccineum* (fig. 15).

Apart from the plant growth within its mouth, the vegetation in the rest of the North Wadi is typical of those desert wadis which receive some water occasionally. It is obvious that this wadi is less favored by seepage than is the northwest wadi.

SOUTH WADI

This wadi is the downstream continuation of the oasis valley and is part of the principal channel of the drainage system (Wadi Kurkur) of which the other two wadis are affluents. The channel of this wadi follows a southern direction for a short distance from the wells of the oasis, then turns and cuts its way across the scarp of the Sin-el-Kidab down to the plain, across which it proceeds east till it meets the Nile.

The vegetation in the part of the wadi extending southward from the wells is the continuation of that of the oasis: dom palm, date palm, *Acacia raddiana* and *A. flava*, with an undergrowth of *Desmostachya bipinnata* and *Alhagi maurorum*. On the peripheral parts of the wadi, *Zygophyllum coccineum* may be abundant.

At the eastward bend of its course the plant growth of the wadi bed suddenly changes into a dense growth of *Phragmites*

communis and *Juncus arabicus*, with some bushes of *Tamarix amplexicaulis*. This complex is very similar to the plant growth around the wells of the oasis (though *Typha australis* is absent). Though this locality has no apparent well, it is obvious that the water table is high.

Further eastward there is a part of the wadi where the bed is covered by large rounded boulders mixed with other deposits. In this part there is an area covered by a dense thicket of *Tamarix amplexicaulis* (fig. 16). Associated species include *Juncus arabicus* and *Desmostachya bipinnata*. The peripheral ridges have lines of growth of *Alhagi maurorum* following fissures in the rock. *Zygo-phyllum coccineum* is also present.

The area of *Tamarix amplexicaulis* represents the eastern limit of the influence of ground water. The remainder of the wadi channel eastward is a typical desert habitat with a sparse plant



Fig. 16. A general view of a part of the south wadi showing the thicket of *Tamarix amplexicaulis*. Note *Juncus arabicus* behind the large rounded boulder in the foreground, and date palms and dom palms in the background. On the sides note the growth of *Alhagi maurorum*.



Fig. 17. The open growth of *Zygothymus coccineum* and *Fagonia thebaica* var. *violacea* in the upstream part of an affluent of Wadi Kurkur.

growth of *Zygothymus coccineum* and a few widely spaced bushes of *Tamarix* and stumps of dead date palms. In this part there are relicts of dry *Schouwia thebaica*, a desert annual. These are obviously remains of its growth following a previous rain: a rare incident in this nearly rainless desert (see Reed 1964, for a discussion of rain in the Kurkur area).

As the wadi crosses the scarp of the Sin-el-Kidab it follows a shallow and ill-defined course across the plain (Lower Nuba Plain, Shata 1962) for 50 km throughout which the vegetation is a sparse growth of *Zygothymus coccineum* and *Fagonia parviflora*.

OTHER OBSERVATIONS

The vegetation in a small affluent wadi joining the South Wadi at its eastward bend was also studied. The plant growth consisted of a rich cover of *Alhagi maurorum* in the downstream part (confluence with the South Wadi), and an open growth of *Zygothymus coccineum* and *Fagonia thebaica* var. *violacea* var. nov. (fig. 17)

in the upstream part. It is apparent that the downstream part receives some of the subsurface supply of water whereas the upstream part is typical desert habitat.

The plants were also studied on the limestone plateau on a stretch of the Kurkur-Dungul road, 20-40 km south of Kurkur. The notable feature was the profuse dry remains of the following species: *Farsetia ovalis*, *Farsetia ramosissima*, *Monsonia nivea*, *Fagonia thebaica* var. *violacea*, mignonette (*Reseda pruinos*), *Bassia muricata*, triple-awned grass (*Aristida plumosa*), *Schouwia thebaica* and caltrops (*Tribulus mollis*). These are evidently the remains of a rich ephemeral plant growth which appeared in a rainy year. Living individuals of the following desert perennials were observed: *Acacia flava*, *Fagonia parviflora*, *Cornulaca monacantha* and *Salsola baryosma*, whose growth may be explained by the presence of some underground water.

LIST OF SPECIES COLLECTED, WITH SOME TAXONOMIC REMARKS

CHENOPODIACEAE

Bassia muricata (L.) Murr.

Cornulaca monacantha Del.

Salsola baryosma (R. et Schult.) Dandy

CONVOLVULACEAE

Cressa cretica L.

CRUCIFERAE

Farsetia ovalis Boiss. This species is treated as a variety of *Farsetia aegyptia* Turra in Täckholm et al., 1956.

Farsetia ramosissima Hochst. et Fourn.

Schouwia thebaica Webb

GERANIACEAE

Monsonia nivea (Decne) Decne ex Webb

GRAMINEAE

Aristida plumosa L.

Desmostachya bipinnata (L.) Stapf

Imperata cylindrica (L.) Beauv.

Phragmites communis (L.) Trin. Several varieties are known of this species, classified according to the breadth of leaves, length of panicle, etc., (Täckholm et al. 1956). In our material both narrow and broad-leaved, short, lax and long, dense-panicked plants were observed growing together.

JUNCEAE

Juncus arabicus (Asch. et Buch.) Adams.

LEGUMINOSAE

Acacia flava (Forsk.) Schweinf. This species is occasionally attacked by insects which form characteristic long narrow spine-like conical cocoons on the branches. This attack is specific and is not recorded on any other species of *Acacia*.

Acacia raddiana Savi. Normally this species possesses glabrous branches, leaflets and legumes. Our material is rather hairy; it may represent a hybrid between *Acacia raddiana* and the pubescent *A. tortilis* (Forsk.) Hayne.

Alhagi maurorum Medic.

PALMAE

Hyphaene thebaica (L.) Mart.

Phoenix dactylifera L.

RESEDACEAE

Reseda pruinoso Del.

TAMARICACEAE

Tamarix amplexicaulis Ehrenb. According to Täckholm et al. (1956) this species was thought not to occur in the Libyan

Desert or in the Nile region. However, more recently the writer has recorded it from the Nubian Desert, the Nile Valley in Nubia, (Boulos, in press) and from Dungul Oasis (unpublished work).

Tamarix nilotica (Ehrenb.) Bunge

TYPHACEAE

Typha australis Schum. et Thonn.

ZYGOPHYLLACEAE

Fagonia parviflora Boiss. Täckholm et al. (1956) treat this species as a variety of *Fagonia bruguieri* DC.

Fagonia thebaica Boiss. var. *violacea* var. nov.

Locality: Affluent of Wadi Kurkur, about 3 km south of the oasis, 13.12.1964.

Holotype in the Herbarium of Botany Department, Faculty of Science, Cairo University (CAI). Isotypes in the Herbaria of Desert Institute, Mataria, Cairo (CAIH) and Department of Biology, Yale University, New Haven, Connecticut (YU). It may be described as follows: *affinis Fagonia thebaica differt spinis brevioribus et petalis violaceis.*

Our plant looks to be somewhat between *Fagonia thebaica* Boiss. and *F. arabica* L. It has the large hairy capsules of *F. arabica*, but the spines are shorter and the leaflets narrower and fleshy, approaching those of *F. thebaica*. It differs from both by its intensely violet flowers. It is described here as a variety of *F. thebaica*; however, further research may prove that it deserves a higher taxonomic rank (cf. El-Hadidi, in press).

Tribulus mollis Ehrenb. ex Schweinf. This species was previously known in Egypt only from the district of Gebel Elba, in southeastern Egypt (Täckholm et al., 1956).

Zygophyllum coccineum L.

Three complete collections representing specimens of the plants listed above are deposited in the following herbaria:

1. Herbarium of the Botany Department, Faculty of Science, Cairo University (CAI).
2. Herbarium of the Desert Institute, Mataria, Cairo (CAIH).
3. Herbarium of the Department of Biology, Yale University, New Haven, Connecticut (YU).

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