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**Autor:** Boulos, Loutfy  
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# A contribution to the flora of South Yemen (PDRY)

LOUTFY BOULOS

## RÉSUMÉ

BOULOS, L. (1988). Contribution à la flore du Sud Yémen (PDRY). *Candollea* 43: 549-585. En anglais, résumés français et anglais.

Bref rappel de la géographie, de la topographie et du climat du Yémen du Sud (PDRY). Révision des principaux travaux sur la flore. Présentation des récoltes faites dans cinq gouvernorats en juin 1987 qui comprennent 629 numéros, dont 628 plantes à fleurs et une fougère, soit 375 espèces et 3 variétés dans 60 familles. Cinq espèces sont nouvelles pour la science, 4 nouvelles pour l'Arabie et 15 nouvelles pour la flore du Yémen du Sud. Une liste annotée des espèces arrangées alphabétiquement et par famille est fournie.

## ABSTRACT

BOULOS, L. (1988). A contribution to the flora of South Yemen (PDRY). *Candollea* 43: 549-585. In English, French and English abstracts.

A brief account on the geography, topography and climate of PDRY (South Yemen) is given. The main works on the flora are reviewed. The present work comprises collections from five Governorates made in June 1987 and amounting to 629 numbers, including 628 flowering plants and one fern. These comprise 375 species and 3 varieties, related to 60 families. Five species are new to science, of which two are described, 4 new to Arabia and 15 new to the flora of South Yemen. An annotated list of the species, alphabetically arranged by family is given.

## Geography and topography

The People's Democratic Republic of Yemen (PDRY), or South Yemen, is situated in the south-western part of the Arabian peninsula. It comprises an area of 287.684 km<sup>2</sup> of which 95% is arid or hyperarid and 5% is semiarid.. The country is characterized by a long coastal belt of about 1200 km along the Gulf of Aden and inland highlands mainly formed of igneous rocks, limestone and sandstone. A low maritime mountain range (300-600 m high) lies between the coastal plains and the inland highlands. These highlands form a plateau which is divided by Wadi Mayfa'ah into western and eastern parts. Some summits reach 2513 m (Jebel Thamer), 2507 m (Jebel Adaran), 2160 m (Jebel Al-Mishyaf) in the western part; 2185 m (Buraika), 2150 m (Kaur) and 1830 m (Jebel Al-Hassu) in the eastern part. In the north the plateau gradually goes down into Ramlet as Sab'atayn close to the desert of the Empty Quarter (Rub Al-Khali), where the main wadis are Wadi Bayhan and Wadi Markha. The plateau drains southwards to the sea by several wadis of which the main ones from west to east are Wadi Tibban (near Aden), Wadi Bana, Wadi Ahwar and Wadi Mayfa'ah. The main wadis east of Wadi Mayfa'ah are Wadi Hajr, Wadi Masilah and Wadi Jiz. An important landmark in the centre of the country is a deep valley or canyon: Wadi Hadaramout which runs east-west with northern and southern tributaries. Wadi Hadramout turns southwards towards the sea where it is called Wadi Masilah.

North and northeast of Wadi Hadramout, several wadis drain to the adjacent desert of the Empty Quarter, of which the most important from west to east are: Wadi Khurdah, Wadi Qinab, Wadi Armah, Wadi Mitran and Wadi Shihan.

Several islands belong to PDRY: in the Gulf of Aden, off the Horn of Africa, an archipelago comprises the Island of Socotra, which is the largest (area about 3100 km<sup>2</sup>), and four other islands: Abd Al-Kuri, Samhah, Darzah and Kal Farun. At Bab Al-Mandab, the southernmost end of the Red Sea lies Perim Island.

### Climate

The entire country is situated in a tropical region. Summers are hot and humid, especially in coastal areas, but winters are mild. The inland highlands are cooler in summer and cold in winter, with occasional snow and frost. The mean air temperature in July is 36.4°C in Aden, 33.4°C in Mukalla and 37.4°C in Beihan. In January, the mean air temperature is 22.2°C in Aden, 19.6°C in Mukalla and 8.3°C in Beihan (altitude 1097 m). In winter the prevailing winds are northeast which bring rain to the coastal area, but dry on inland regions. In summer hot winds blow and cause dust storms on the western coastal region. The mean annual rainfall is low on the coastal regions, e.g. 38 mm in Aden and 60 mm in Mukalla. Rain is mainly in summer on the highlands; the average is about 300 mm on the western highlands and 200 mm on the eastern plateau. Dews and mists are generally useful for the vegetation on the highlands especially in dry seasons.

### Our present knowledge of the flora

The flora of South Yemen is probably the least known among other countries of the Arabian peninsula. Our basic knowledge about the country is mainly attributed to early botanical explorations which date back to the eighteenth century and up to the thirties of this century. Very few collections have been made since. MILLER, HEDGE & KING (1981) compiled an up-to-date botanical bibliography of the Arabian peninsula. The most important works which contributed to our present knowledge on the flora of South Yemen (mainland excluding Socotra) are BLATTER's two classic works: "Flora of Aden", (1914-1916) and "Flora Arabica", (1919-1936), as well as "Flora des tropischen Arabien" of SCHWARTZ (1939) which deals with southern tropical Arabia, in which mainland South Yemen is covered.

In the recent series entitled "Studies in the Flora of Arabia", which was started by MILLER, HEDGE & KING (1981), checklists and keys of some families were studied for Arabia: Cruciferae (HEDGE & KING, 1983), Caryophyllaceae (KING & KAY, 1984) and Gramineae (COPE, 1985).

### The present work

Through the cooperation between the Universities of Kuwait and Aden, the present author together with several colleagues from the University of Aden were able to make a field trip in the People's Democratic Republic of Yemen, where we visited five Governorates from 6 to 16 June 1987 in order to collect plant specimens. The localities from which the collections were made are listed below, with the corresponding dates, numbers of collected specimens and names of collectors.

- 16466-16480 Aden: Labour Island Chalet Complex Hotel, weeds and cultivated ornamentals, sea level, 6.6.1987. Collector: *L. Boulos*.
- 16481-16499 Aden: College of Education, Khor Maksar, weeds and cultivated ornamentals, alt. 10-20 m, 6.6.1987. Collectors: *L. Boulos & A. N. Gifri*.
- 16500-16525 Aden: Wadi Goldmohur, igneous rocks, lava and large boulders in the wadi bed, alt. 20-60 m, 6.6.1987. Collectors: *L. Boulos, A. N. Gifri & W. A. Saeed*.
- 16526-16565 Aden. Jabel Shamsan: Tower of Silence and vicinity, alt. 150 m, 7.6.1987. Collectors: *L. Boulos, A. N. Gifri, M. A. Hussein & G. Awad*.
- 16566-16576 Aden: Littoral sand and salt marshes along the sea to Little Aden from Caltex, alt. 0-20 m, 7.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri & M. A. Hussein*.

- 16577-16610 Aden: Bir Ahmed, upstream of Wadi Tuban, sandy soil, alt. 20 m, 8.6.1987. Collectors: *L. Boulos, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16611-16638 Lahij Governorate: 40-48 km north of Lahij town, along the road to Dhala, north of Jebel Marif, alluvial soil, alt. 650 m, 9.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16639-16685 Lahij Governorate: Wadi Hardaba downstream, 65 km N Lahij town along the road to Dhala, alluvial soil, alt. 800 m, 9.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16686-16705 Lahij Governorate: Wadi Hardaba upstream, 20 km SE Dhala town, alt. 1000 m, 9.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16706-16748 Lahij Governorate. Dhala town: fields and roadsides, alt. 1450 m, 10.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16749-16775 Lahij Governorate: Naqil ('Aqabat) Al-Dhala, rocky slopes, 10-16 km S Dhala town, alt. 1300-1350 m, 10.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16776-16793 Lahij Governorate: Dhala, outside the town, along the road to Lahij, alt. 1450 m, 10.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16794-16795 Lahij Governorate: outside Habilein town, 40 km south of Dhala, rocky open ground, *Euphorbia cactus* dominant, 10.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16796-16822 Abiyan Governorate: 15 km N Shuqra, along the road to Lawdar, volcanic soil, alt. 540 m, 12.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16823-16861 Abiyan Governorate: 32 km N Shuqra, along the road to Lawdar, fields and alluvial soil, alt. 920 m, 12.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16862-16893 Abiyan Governorate: Wadi Dheiqa, 24 km W Al-Mahfid, granite slopes, alt. 520 m, 12.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16894-16917 Shabwa Governorate: 5 km S Habban, along Lawdar-Al-Mukalla road, wadi with calcareous boulders, alt. 1050 m, 12.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16918-16931 Hadramout: 18 km SW Shihr, along the road to Al-Mukalla, sandy soil, alt. 50 m, 14.6.1987. Collectors: *L. Boulos, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16932-16939 Hadramout: 12 km SW Shihr, wadi off the road to Al-Mukalla, near the sea, sandy soil, alt. 50 m, 14.6.1987. Collectors: *L. Boulos, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16940-16941 Hadramout: Shihr, outside the town, maritime sand, 1 km from the sea shore, alt. 50 m, 14.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 16942-16982 Hadramout: Wadi 'Aidid, 5 km NW Hami, near Maqad village, calcareous rocks, alt. 120 m, 14.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*

- 16983-17017 Hadramout: 50 km NW the coastal road, along the road to Sayun, shortly after 'Aqabat Abdullah Gharib, calcareous slopes, alt. 930 m, 15.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 17018-17051 Hadramout: Sayun, outside the town, weeds in fields and road-sides, alluvial soil, alt. 630 m, 16.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 17052-17070 Hadramout: Central plateau, 190 km S Sayun, along the road to Al-Mukalla, calcareous mosaic, alt. 1570 m, 16.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 17071-17085 Hadramout: Central plateau, 215 km S Sayun, along the road to Al-Mukalla, calcareous slopes, alt. 1480 m, 16.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*
- 17086-17094 Hadramout: Central plateau, 225 km S Sayun, along the road to Al-Mukalla, calcareous slopes, alt. 1300 m, 16.6.1987. Collectors: *L. Boulos, A. K. Rowaished, A. N. Gifri, W. A. Saeed & M. A. Hussein.*

From the above localities, 629 numbers of phanerogams (628 flowering plants and one fern) were collected. Two full sets of specimens are deposited in Kuwait University Herbarium (KTUH) and in the newly established Herbarium in Aden University. Duplicates were mainly distributed to BM, E & K. The specimens were identified during summer 1987 mainly in the Herbarium, Royal Botanic Gardens, Kew and Botany Department, British Museum (Natural History), London. A few specimens were identified in the Royal Botanic Garden, Edinburgh.

The 629 collected numbers comprise 375 species (of which 15 are cultivated) and 3 varieties, related to 60 families (59 families of flowering plants and one fern family). Among these, five species are new to science of which two *Euphorbia* species are described by Mrs. Susan Carter, Royal Botanic Gardens, Kew, and published here under her authorship, four are new to Arabia and 15 are new to South Yemen.

The largest families are: Gramineae (50 species), Leguminosae (36), Compositae (29), Euphorbiaceae (23), Asclepiadaceae (17), Zygophyllaceae (16), Acanthaceae (15), Boraginaceae (14), Malvaceae (11), Solanaceae (11) and Chenopodiaceae (10).

The largest genera are: *Euphorbia* (15 species), *Heliotropium* (11 species + 1 var.), *Pulicaria* (9), *Acacia* (7 + 1 var.), *Caralluma* (7), *Fagonia* (6), *Solanum* (6), *Ficus* (5), *Launaea* (5) and *Tephrosia* (5).

The following is an annotated list of species, alphabetically arranged by family.

#### ACANTHACEAE

det. K. Vollesen & L. Boulos, Kew 1987

**Anisotes trisulcus** (Forsskål) Nees — 16687, 16902.

Shrub, 1-1.5 m, flowers orange-red, anthers yellow-green.

**Barleria acanthoides** Vahl — 16678.

Low shrub, flowers white.

**Barleria proxima** Lindau — 16696, 16699.

Low spiny shrub, flowers orange-red.

**Barleria trispinosa** (Forsskål) Vahl — 16759.

Undershrub, 50-90 cm high, flowers orange-yellow.

**Barleria** sp. — 16633.

**Blepharis ciliaris** (L.) B. L. Burtt — 16503, 16628, 16712.

Low procumbent spiny perennial, flowers blue.

**Ecbolium viride** (Forsskål) Alston — 16677, 16698.

Perennial, woody at base, to 1.2 m high, flowers bluish-green.

**Justicia flava** (Vahl) Vahl — 16764, 16786.

Perennial, woody at base, to 60 cm high, flowers yellow.

**Justicia odora** (Forsskål) Vahl — 16710.

Perennial, old branches woody, leaves fragrant, flowers yellow.

**Megalochlamys linifolia** (Lindau) Lindau — New to Arabia. 16910.

Low shrub, leaves glabrous. Previously known from Somalia and Ethiopia, first record to the Arabian Peninsula.

**Peristrophe paniculata** (Forsskål) Brummitt — 16672.

Annual, to 80 cm high, flowers purple.

**Pseuderanthemum atropurpureum** (Benth.) Radlk. — 16494.

Cultivated ornamental shrub, to 2 m high, flowers white with purple spots.

**Ruellia discifolia** Oliv. — 16916, 16999.

Undershrub, 25 cm high.

**Ruellia grandiflora** (Forsskål) Blatter — 16769.

Undershrub, to 50 cm high, flowers yellowish-green.

**Ruellia patula** Jacq. — 16662.

Annual or short-lived perennial, flowers blue.

#### AGAVACEAE

det. J. Cowley, Kew 1987

**Dracaena serrulata** Baker — 17082.

Tree, to 2.5 m high; leaves narrow, sword-like, up to 1 m long.

**Sansevieria ehrenbergii** Schweinf. — 16701.

Perennial, to 1.2 m high including the inflorescence, leaves basal.

#### AIZOACEAE

det. L. Boulos, Kew 1987

**Corbichonia decumbens** (Forsskål) Exell — 16957.

Perennial procumbent herb; leaves fleshy, rounded, glabrous, glaucous; flowers pinkish.

**Gisekia pharnaceoides** L. — 16852.

Annual procumbent herb, stems reddish, flowers white.

**Glinus lotoides** L. — 16581.

Annual prostrate herb, leaves pubescent, flowers greenish-white.

**Mollugo cerviana** (L.) Ser. — 16612.

Delicate annual, flowers pinkish.

**Trianthema crystallina** (Forsskål) Vahl — 16603, 16623, 16803, 16854, 16876.

Annual, prostrate; stems white, brittle; anthers yellow, petals absent.

**Trianthema portulacastrum** L. — 16473.

Annual, prostrate, flowers pink.

**Trianthema triquetra** Roth & Willd. — 16671.

Annual, prostrate, leaves succulent.

**Zaleya pentandra** (L.) C. Jeffrey — 16657, 17029.

Perennial prostrate herb, flowers pinkish.

#### AMARANTHACEAE

det. C. C. Townsend & L. Boulos, Kew 1987

**Achyranthes aspera** L. — 16466, 16717.

Perennial herb, to 1.5 m high; flowers mauve, in spinescent long spikes.

**Aerva javanica** (Burm. f.) Juss. ex J. A. Schultes — 16532, 16582, 16815, 16932, 16986.

Perennial, woody at base, to 1 m high, flowers in white woolly spikes.

**Aerva lanata** (L.) Juss. ex J. A. Schultes — 16755.

Perennial, woody at base, to 60 cm high, leaves almost orbicular, flowers in woolly short spikes.

**Alternanthera pungens** Kunth — 16719.

Annual procumbent herb, rooting at nodes, flowers in axillary spiny clusters, weed.

**Amaranthus graecizans** L. — 16602, 16666, 16835, 17038.

= *A. angustifolius* Lam.

Annual herb; stems much branched, leafy; flowers pinkish-green, weed.

**Amaranthus sparganiocephalus** Thell. — 16735, 16889.

Annual, much branched, fruits in star-shaped axillary clusters, weed.

**Digera muricata** (L.) Mart. — 16661, 16832, 17047.

Annual, leaves much variable in size; flowers reddish, in axillary long spikes.

**Pupalia lappacea** (L.) A. Juss. — 16704.

Perennial, woody at base; flowers greenish, in spherical spiny heads.

**Saltia papposa** (Forsskål) Moq. — 16548, 16685.

Shrub to 3 m high, flowers in terminal branched spikes, fruit hairy.

#### APOCYNACEAE

det. L. Boulos, Kew 1987

**Adenium obesum** (Forsskål) Roem. & Schult. — 16686.

Tree with swollen trunk, to 3 m high; flowers pink, in conspicuous terminal clusters.

**Rhazya stricta** Decne. — 16946.

Perennial, woody at base, to 80 cm high, flowers white.

**Thevetia peruviana** (Pers.) Merr. — 16472.

Cultivated ornamental shrub or small tree; flowers yellow, fragrant.

*ARISTOLOCHIACEAE*

det. L. Boulos, Kew 1987

**Aristolochia rigida** Duch. — 16936.

Perennial; branches prostrate, several metres long; leaves with pleasant smell; flowers large, deep violet.

*ASCLEPIADACEAE*

det. D. V. Field, S. Collette & L. Boulos, Kew 1987

**Blyttia spiralis** (Forsskål) D. V. Field & J. R. I. Wood — 16636.

Shrub, 80 cm high, stem white, leaves rather succulent, flowers yellow.

**Calotropis procera** (Aiton) Aiton f. — 16483.

Shrub to 3 m, flowers purple and white, leaves succulent; latex white, abundant; fruits large, spongy.

**Caralluma awdeliana** (Defl.) Berger — 16901.

Perennial, succulent, leafless herb.

**Caralluma deflersiana** Lavranos — 16724.

Perennial, succulent, leafless herb, flowers deep brown.

**Caralluma flava** N. E. Br. — 17080.

Perennial, succulent, leafless herb, flowers greenish or bright yellow.

**Caralluma lavrani** Rauh & Westel. — 16915.

Perennial, succulent, leafless herb, flowers dull yellow.

**Caralluma penicillata** (Defl.) N. E. Br. — 16859.

Perennial, succulent, leafless herb, to 1.2 m high, flowers greenish with tufts of purple hairs.

**Caralluma shadhbana** Lavranos — 17092.

Perennial, succulent, leafless herb; flowers purplish-red, with tufts of blackish hairs.

**Caralluma subulata** (Forsskål) Decne. — 16729.

Perennial, succulent, leafless herb; flowers deep violet, with tufts of black hairs.

**Ceropegia variegata** Decne. — 16708.

Perennial, succulent, leafless herb, stems long, to 1.5 m, twining; flowers white on upper surface, with brownish spot on lower surface. Stems eaten as a laxative.

**Curroria spec. nov. ined.** nearest to **C. decidua** Planch. ex Benth. subsp. **volubilis** (Balf. f.) Bullock — 16899.

Shrub, to 1.5 m high, branches intricate.

**Glossonema varians** (Stocks) Benth. ex Hook. f. — 16529, 16918.

= *G. edule* N. E. Br.

Perennial herb; flowers yellowish, in small axillary cymes; fruits furnished with soft spines. Unripe fruits edible.

**Leptadenia arborea** (Forsskål) Schweinf. — 16571, 16688.

Richly branched vine, climbing on *Prosopis juliflora* and other trees and shrubs in the littoral region of Aden area, also known from Dhala (alt. 1000 m) in Lahij Governorate. Flowers creamy, fruit 5-8 cm long.

**Pentatropis nivalis** (G. F. Gmel.) D. V. Field & J. R. I. Wood — 16956.

Slender vine, leaves fleshy, flowers greenish-yellow, fruit 3-4 cm long.

**Pergularia daemia** (Forsskål) Chiov. — 16741.

Much branched, tangled vine, leaves cordate, flowers greenish-yellow in axillary and terminal cymes.

**Pergularia tomentosa** L. — 16733, 16783, 16894, 16985.

Perennial, woody at base; leaves cordate, fleshy; flowers in lateral cymes; fruits 4-7 cm long, unarmed; probably a distinct new variety, as usually fruits are armed.

**Sarcostemma viminalis** (L.) R. Br., agg. — 16700, 17070.

Shrub, stems leafless, much branched, tangled; flowers creamy, in axillary cymes; fruit 4-6 cm long, smooth, stiff at maturity.

*BALANITACEAE*

det. M. J. S. Sands, Kew 1987

**Balanites aegyptiaca** (L.) Del. — 17062.

Medium-sized tree, to 4 m high. The trees are not attaining their normal height which is usually 8-10 m high, probably due to the high altitude which is 1570 m in this locality.

*BORAGINACEAE*

det. B. Verdcourt & L. Boulos, Kew 1987

**Heliotropium azzanum** O. Schwartz — 16538, 16664.

Low shrub, young branches herbaceous, flowers white.

**Heliotropium bottae** Defl. — 16726, 16792, 17006, 17084.

Low shrub, young branches herbaceous; leaves undulate, finely white-pubescent; flowers white.

**Heliotropium lasiocarpum** Fisch. & Mey. — 16599, 17022.

Annual, richly branched; leaves large, broadly ovate; flowers white.

**Heliotropium longiflorum** (Hochst. & Steud. ex A. Rich.) Jaub. & Sp. var. **longiflorum** — 16824.

Perennial, woody at base, richly branched, leaves lanceolate; flowers white, in long terminal lax racemes.

**Heliotropium longiflorum** var. **stenophyllum** Schwartz — 16713b

Perennial, woody at base, leaves much narrower than in the typical variety; flowers white in short terminal racemes.

**Heliotropium ovalifolium** Forsskål — 16757.

Perennial, woody at base; leaves greyish-green, ovoid to broadly elliptic; young branches and leaves covered with adpressed white hairs, flowers white.

**Heliotropium pterocarpum** (DC. & A. DC.) Hochst. & Steud. ex Bunge — 16586, 16790, 16796, 16841.

Annual or perennial with woody base, much branched, prostrate, leaves undulate, flowers white.

**Heliotropium rariflorum** Stocks — 16713a, 16801.

Low shrub, stems brittle; leaves short, narrow-lanceolate; flowers white, few, in lax short spikes.

**Heliotropium strigosum** Willd. var. **brevifolium** (Wall.) Clarke — 16905.

Perennial small herb, woody at base, branches prostrate, flowers white.

**Heliotropium zeylanicum** (Burm. f.) Lam. — 16781.

Perennial, woody at base, leaves narrow, flowers white in long terminal spikes.

**Heliotropium** sp. — 16808, 16890, 17004.

Perennial, old branches woody, flowers white.

?**Heliotropium** sp. — 16924.

Perennial, woody at base, flowers yellow.

**Echiochilon strigosum** (Defl.) Johnston — 16991, 17077.

Perennial, woody at base; leaves small, narrow, hispid; flowers pale blue.

**Nogalia drepanophylla** (Bak.) Verdc. — 16954.

= *Heliotropium drepanophylla* Bak.

Perennial, woody at base; branches densely leafy, brittle; leaves fleshy; flowers white with a yellow throat.

**Trichodesma africanum** (L.) R. Br. var. **africanum** — 16820.

Perennial, woody at base, stems and leaves hispid, flowers pale lilac.

#### BURSERACEAE

det. J. B. Gillett, Kew 1987.

**Commiphora gileodensis** (L.) C. Christ. — 17011a.

Shrub or small tree, 2-3 m high, branches not spiny; leaves 3-5-foliolate; fruit 4-valved, with a conspicuous line where it splits.

**Commiphora habessinica** (O. Berg) Engl. — 16907a.

Shrub, 1.5-2.5 m high; leaves simple, sessile, 1-1.5 cm long.

**Commiphora kua** (J. F. Royle) Vollesen — 16907b, 17011b.

Shrub, 1.5-2 m high, branches spinescent; leaves simple, sessile, 5-8 mm long.

#### CAPPARACEAE

det. L. Boulos, Kew 1987

**Cadaba farinosa** Forsskål — 16860.

Shrub, 1-2 m high; leaves small, oval, shortly petiolate.

**Cadaba glandulosa** Forsskål — 16502.

Shrub or small tree, to 3 m high, richly branched; leaves long-petiolate, rounded, glandular.

**Cadaba longifolia** (Forsskål) A. Rich. — 16523, 16546, 16715.

Shrub, to 1.5 m high; leaves variable, but generally much longer than broad; flowers greenish-yellow, ripe fruits bright red inside.

**Cadaba rotundifolia** Forsskål — 16695.

Shrub or small tree to 2.5 m high; leaves orbicular, large, glabrous.

**Capparis cartilaginea** Decne. — 16501, 16560, 16705.

= *C. galeata* Fresen.

Low thorny shrub, often covering a large area on slopes or rocky ground, leaves succulent; flowers large, petals greenish outside, whitish inside, stamens conspicuous; fruits ripen red, of the size of a small pear, edible.

**Capparis spinosa** L. — 16598, 17032.

Thorny shrub, branches spreading; flowers large, white, stamens conspicuous; fruits ripen green, with pink flesh; flower buds and fruits edible.

**Dipterygium glaucum** Decne. — 16600, 16799, 16925, 16931.

Annual herb or perennial with woody base, branches richly branched, leaves variable in shape and size, flowers yellow, fruits winged.

#### CARYOPHYLLACEAE

det. R. A. King & L. Boulos, 1987

**Cometes abyssinica** R. Br. — 16514, 17071.

Perennial, woody at base; leaves linear to lanceolate; flowers white, small; fruit furnished with conspicuous yellowish, finely branched bracts.

**Gypsophila montana** Balfour f. — 16972.

Low perennial herb, flowers mauve.

**Xerotia arabica** Oliver — 16975 (det. R. A. King, Edinburgh 1987).

Perennial with woody base, stems erect; leaves oblong, fleshy, 0.3-1.5 cm long. According to KING & KAY (1984), the genus *Xerotia* Oliver, which is endemic to southern Arabia, was only known from the type gathering from Hadramout, PDRY, until a recent collection was made by M. D. Gallagher from Central Oman.

#### CELASTRACEAE

det. L. Boulos, 1987

**Catha edulis** Forsskål. Local name: Khat — 16658.

Cultivated shrub, young shoots and leaves chewed.

**Maytenus senegalensis** (Lam.) Exell — 17060.

Thorny shrub, to 1.8 m high.

#### CHENOPODIACEAE

det. L. Boulos, 1987

**Chenopodium schraderanum** Schult. — 16785.

Annual herb, strongly aromatic, to 80 cm high, stems simple or branched near the base, flowers in terminal and axillary cymes.

**Cornulaca amblyacantha** Bunge — 16897, 16940.

Low shrub, leaves spiny.

**Halopeplis perfoliata** (Forsskål) Bunge — 16575.

Low shrub, young stems covered with succulent clasping leaves, dominant over large areas in the coastal salt marshes of the Aden region.

**Halothamnus bottae** Jaub. & Sp. — 16601.

= *Salsola bottae* (Jaub. & Sp.) Boiss.

Low shrub, stems much branched, leaves small, flowers yellow, fruits winged.

**Salsola baryosma** (Roem. & Schult.) Dandy — 16935, 17028.

Low shrub, smelling of rotten fish, stems much branched, leaves succulent, fruit winged.

**Salsola rubescens** Franch. — 16912.

Low shrub; leaves greyish-green, finely pubescent, 3-8 mm long, densely grouped in conspicuous distichous groups on young shoots.

**Salsola spinescens** Moq. — 16682, 16858, 16917.

= *S. forskalii* Schweinf.

Low shrub, branches spinescent; leaves about 1 mm long, in spaced branchlets.

**Suaeda aegyptiaca** (Hasselq.) Zohary — 16651, 16812, 17020.

Annual herb, to 50 cm high, richly branched, densely leafy; leaves succulent, linear-cylindrical; flowers in leafy spikes.

**Suaeda monoica** Forsskål — 16568.

Shrub, to 4 m high, much branched; leaves fleshy, linear; flowers green, unisexual.

**Suaeda vermiculata** Forsskål — 16573.

Low shrub, to 50 cm high, much branched; leaves succulent, glaucous, drying black, varying in shape and size from almost spherical to cylindrical.

*CLEOMACEAE*

det. L. Boulos & J. Lamond, 1987

**Cleome brachycarpa** (Forsskål) Vahl ex DC. — 16504, 16557, 16625, 16800, 16923, 16958.

Shrublet, to 20 cm high, leaves aromatic; flowers yellow, 1 cm across; fruit about 1 cm long.

**Cleome macradenia** Schweinf. — 16939, 16979 (det. J. Lamond, Edinburgh 1987).

Shrub, bad-smelling, growing in circular cushion-like hummocks to 1 m across; leaves covered with conspicuous glandular hairs; flowers yellow, fruit 1.5 cm long.

**Cleome paradoxa** R. Br. — 16518, 16542.

Perennial herb to 80 cm high, stems glandular, stiff; leaves long-petioled, compound-digitate; flowers yellow, 3 cm across, in showy long racemes; fruit to 10 cm long.

**Cleome scaposa** DC. — 16508, 16615.

Perennial, woody at base; stems slender, much branched; leaves rounded to cordate, scabrous; flowers yellow, 3 mm across; fruit about 2 cm long.

*COMBRETACEAE*

det. J. B. Gillett &amp; L. Boulos, Kew 1987

**Conocarpus lancifolius** Engler — 16491.

Cultivated tree, to 10 m high.

*COMMELINACEAE*

det. J. Cowley, Kew 1987

**Commelina albescens** Hassk. — 16693.

Perennial herb, leaves narrowly linear, flowers blue.

**Cyanotis nyctitropa** Defl. — 16789.

Perennial herb, leaves hairy.

*COMPOSITAE*

det. C. Jeffrey, P. Halliday &amp; L. Boulos, Kew 1987

**Atractylis kentrophyloides** (Bak.) F. G. Davies. New to South Yemen — 17083.

Perennial, leaves with white-cottony tomentum, heads about 2 cm long and 2 cm across.

**Bidens biternata** (Lour.) Merr. & Sherff. — 16763.

Annual, to 60 cm high, flowers yellow, fruit with few apical spines; waste and cultivated ground.

**Echinops spinosissimus** Turra — 16784.

Perennial spiny herb, to 80 cm high, heads spherical.

**Flaveria trinervia** (Sprengel) Mohr. — 16650, 16736, 17018.

Annual, much branched; leaves simple, 3-nerved; flowers yellow; edge of cultivated and waste ground.

**Helichrysum pumilum** (Klatt) Moeser — 17058, 17074.

Shrublet; leaves minute, silver-white-tomentose; heads small, grouped in terminal clusters.

**Iphiaea anthemidifolia** (Bak.) A. Anderb. — 17001.

Perennial, slightly glandular-hairy, base woody, leaves pinatisect, flowers yellow, heads 1.5 cm across.

**Iphiaea scabra** DC. — 16821, 16881, 16947.

Low shrub, densely glandular-hairy; leaves narrowly-linear, spiny-tipped; heads yellow.

**Iphiaea senecionoides** (Bak.) A. Anderb. — 16952.

Low shrub; leaves succulent, pinnatisect; flowers yellow.

**Kleinia odora** (Forsskål) DC. — 16720, 16691.

Perennial to 80 cm high; stems succulent, branched; leaves soon deciduous, heads in clusters, flowers yellow, achenes with conspicuous pappus.

**Launaea angustifolia** (Desf.) O. Kuntze. New to South Yemen — 17079.

Perennial, woody at base, leaves succulent, flowers yellow.

**Launaea capitata** (Sprengel) Dandy — 17021.

Perennial prostrate herb, leaves in rosette, heads in lateral and terminal clusters, flowers yellow.

**Launaea crassifolia** (Balf. f.) C. Jeffrey — 17008, 17087.

Small perennial; leaves fleshy, coarsely dentate; heads narrow, to 1 cm long, flowers yellow.

**Launaea massauensis** (Fresen.) Sch. Bip. ex O. Kuntze — 16775.

Delicate erect annual; leaves in rosette, lyrate; heads in terminal leafless cymes, very narrow, 8 mm long, flowers yellow.

**Launaea procumbens** (Roxb.) Ramayya & Rajagopal — 16467, 16647, 17023.

Perennial erect annual, branched at base; leaves in rosette, dissected; heads in lax leafless cymes, flowers yellow.

**Pegolettia senegalensis** Cass. — 16742, 16780.

Annual erect herb; leaves glandular-hairy, entire to coarsely dentate; waste ground.

**Pluchea dioscoridis** (L.) DC. var. **arabica** Defl. — 16865.

Shrub or small tree to 2.5 m high, richly branched; leaves entire, broadly lanceolate; flowers lilac.

**Pulicaria argyrophylla** Franchet — 16941, 17059.

Shrublet, stems much branched, leaves silver-white tomentose, flowers yellow; sea level to 1570 m; plants on high altitudes with smaller leaves, less tomentose.

**Pulicaria cylindrica** (Bak.) O. Schwartz — 16933, 16982, 17053.

Low shrub; leaves 1-2.5 cm long, 1 mm broad, terete; flowers yellow; endemic to South Yemen.

**Pulicaria inuloides** (Poir.) DC. — 16778, 16978.

Fragrant perennial, woody at base; flowers yellow, large.

**Pulicaria jaubertii** Gamal-Eldin. Local name: Mashmoum — 16654, 16787, 16831.

Aromatic perennial herb, flowers yellow, sold in local markets as a perfume for ladies' hair.

**Pulicaria petiolaris** Jaub. & Sp. New to South Yemen — 16752.

Aromatic perennial, leaves glandular-hairy, flowers yellow. According to GAMAL-ELDIN (1981) this species was not previously recorded from South Yemen.

**Pulicaria rauhii** Gamal-Eldin — 16995.

Perennial; leaves small serrate, flowers yellow.

**Pulicaria undulata** (L.) C. A. Meyer — 16782, 16849, 17041.

= *P. crispa* (Forsskål) Oliv.

Low aromatic shrub, woody at base, stems much branched, leaves much variable in size, flowers yellow.

**Pulicaria** sp. — 16998.

Perennial, woody at base; leaves narrowly lanceolate, entire, greyish-green with white adpressed hairs.

**Pulicaria spec. nov. ined.** — 17076.

Perennial, woody at base; leaves narrowly spatulate, serrate towards the apex.

**Sonchus oleraceus** L. — 17019.

Annual herb, leaves lyrate, flowers yellow.

**Tagetes minuta** L. — 16738.

Annual aromatic herb, stems much branched; heads narrowly cylindrical, flowers yellow.

**Vernonia arabica** F. G. Davies — 16990.

Perennial, woody at base; leaves grey, deltoid to broadly ovate, shortly petioled, margins dentate; flowers purple.

**Vernonia spathulata** (Forsskål) Sch. Bip. — 16725, 16911.

Low shrub, stems much branched, leaves grey, broadly linear; flowers purple.

*CONVOLVULACEAE*  
det. L. Boulos, Kew 1987

**Convolvulus glomeratus** Choisy — 16506, 16536, 16676.

Perennial twining or prostrate herb, stems long, flowers white.

**Cressa cretica** L. — 16476, 16498, 17033.

Perennial herb; stems much branched, densely leafy, flowers white, small; in salty soils.

**Seddera arabica** (Forsskål) Choisy — 16748, 17063.

Undershrub; leaves small, sessile; flowers cream; heavily grazed.

**Seddera latifolia** Hochst. & Steud. — 16707, 16836, 16888.

Perennial, woody at base, stems much branched; leaves silvery, elliptic; flowers white.

**Seddera virgata** Hochst. & Steud. — 16553, 16680.

Perennial, woody and much branched at base; leaves narrowly linear, grey; flowers white.

*CRUCIFERAE*  
det. L. Boulos, Kew 1987

**Diploaxis harra** (Forsskål) Boiss. — 17072.

Perennial herb, stems branched at base, leaves hairy, flowers yellow.

**Erucastrum arabicum** Fisch. & Mey. — 17040.

Annual, stems much branched, flowers yellow.

**Farsetia linearis** Decne. ex Boiss. — 16877.

Perennial, stems much branched, flowers yellow; fruits narrowly linear, about 1.2 mm broad.

**Farsetia longisiliqua** Decne. — 16620, 16675, 16816, 16883.

Perennial, woody at base, stems much branched, flowers pale lilac; fruit linear, 3-4 mm broad.

**Farsetia stylosa** R. Br. — 16920.

Perennial, woody at base.

*CUCURBITACEAE*  
det. C. Jeffrey, Kew 1987.

**Citrullus colocynthis** (L.) Schrader — 16577.

Perennial, woody at base; stems prostrate, much branched; leaves deeply dissected, flowers yellow; all parts of the plant bitter.

**Coccinea grandis** (L.) Voigt — 16663, 16690, 16740.

Much branched leafy vine, leaves 3-lobed, flowers creamy, ripe fruits with orange-red fleshy pulp.

**Corallocarpus schimperi** (Naud.) Hook. f. — 16537.

Much branched vine, male flowers greenish; mature fruits orange red, in dense groups, ± spherical with a pointed tip.

**Cucumis melo** L. subsp. **agrestis** (Naud.) Grebenc. — 16479, 16584.

Much branched leafy vine, stems coarsely-white-hairy, leaves slightly or not lobed, flowers yellow, fruits smooth.

**Cucumis prophetarum** L. subsp. **prophetarum** (variant) — 16643, 16797, 16968, 17089.

Much branched leafy vine, leaves 3-lobed or rounded, flowers yellow, fruits with conspicuous soft spines.

**Kedrostis gijef** (J. F. Gmel.) C. Jeffrey — 16959.

Much branched vine, stems covered with white bark, leaves deeply dissected, male flowers greenish, female flowers yellowish.

**Zehneria anomala** C. Jeffrey — 16825.

Slender leafy vine; leaves small, fleshy, 3-lobed to almost cordate; flowers greenish; fruits spherical, reddish-orange.

*CYPERACEAE*

det. D. A. Simpson, Kew 1987

**Cyperus conglomeratus** Rottb., s.l. — 16516, 16551, 16927.

Perennial, of much variable aspect; leaves stiff, terete; flower spikes in dense heads.

**Cyperus laevigatus** L. — 16942.

Perennial erect herb, with creeping rootstock, spikes in whitish dense heads.

**Cyperus rotundus** L. — 16499.

Perennial erect herb, with tuberous rootstock, spikelets subtended by leafy bracts.

**Eleocharis geniculata** (L.) Roem. & Schultes — 16944.

Perennial herb, culms growing in dense clusters, inflorescence of a solitary terminal spikelet.

*EUPHORBIACEAE*

det. S. Carter, Kew 1987

**Acalypha fruticosa** Forsskål var. **fruticosa** — 16742, 16756, 16779.

Shrub, leaves ovate with dentate margins, flowers in yellow catkins.

**Acalypha indica** L. — 16649.

Annual erect herb; leaves dark green on upper surface, pale green on lower surface.

**Chrozophora oblongifolia** (Del.) A. Juss. ex Sprengel — 16580, 16669.

Annual or perennial herb; leaves greyish-green; flowers yellow, small; fruit 3-segmented warty capsule.

**Euphorbia arabica** (Hochst. & Steud.) Boiss. — 16513, 16530.

Delicate erect annual, stems much branched, leaves linear.

**Euphorbia balsamifera** Aiton subsp. **adnensis** (Defl.) Bally — 17088.

Shrub, branches much branched, spreading horizontally, cyathea yellow; capsule reddish-brown, hairy.

**Euphorbia cactus** Ehrenb. — 16795.

Shrub to 1.5 m high; stems succulent, 3-5-angled, spirally twisted with long stiff thorns; fruit reddish, with 3 sharply-angled segments.

**Euphorbia cuneata** Vahl — 16794, 16809.

Shrub or small tree, to 2.5 m high; twigs spinescent, with greyish bark; flowers yellow, capsule white-hairy.

**Euphorbia granulata** Forsskål — 16590, 16595, 16607, 16653, 16807, 16817, 16863, 17034.

Annual prostrate herb, much variable, glabrous or pubescent, leaves assymetric, stems much branched, cyathia solitary, capsule 1.5 mm diameter. RADCLIFFE-SMITH (1980) writes "This is a very variable plant as regards indumentum, leaf-shape and size... var. *glabrata* of *E. granulata* is merely a link in the continuous variation series of the indumentum character". Therefore, var. *glabrata* Boiss. is considered here as a synonym of this species.

**Euphorbia hirta** L. — 16758.

Annual, prostrate-ascending, hispid herb, cyathia in dense axillary clusters, capsules adpressed-hairy; in cultivated and waste ground.

**Euphorbia inarticulata** Schweinf. — 16697, 16731, 16861.

Shrub, to 2 m high; stems succulent, spiny, much branched, 3-4-angled; flowers yellow, fruit dark purplish.

**Euphorbia indica** Lam. — 16470.

Annual prostrate herb, leaves hairy, cyathia in axillary clusters.

**Euphorbia noxia** Pax — 17086.

Tree to 3 m; leaves narrow-lanceolate to broadly linear, apex acuminate; cyathia in lax terminal clusters, capsule 1 cm across.

**Euphorbia prostrata** Aiton — 16760.

Delicate prostrate annual; leaves serrulate, slightly assymmetric; capsule hairy only along the keels.

**Euphorbia quaitensis** S. Carter **spec. nov.** affinis **E. pirottae** Terrac. sed habitu fruticoso perenni, radicibus crassis carnis, ramis brevibus carnis numerosis persistentibus, ramulis annuis paginis inferioribus foliorum cyathiis et capsulis pilosis vel hispidus pilis brevibus crispis distinguitur.

**Typus:** South Yemen, *Boulos & al.* 17090 (holotypus K; isotypi KTUH, Aden University).

Perennial herb with a thick fleshy root ca. 2 cm thick, giving rise at ground-level to numerous persistent fleshy branching stems 1-2 cm long, 5-10 mm thick; stems crowned by slender eventually deciduous flowering branches 5-10 cm high, branching dichotomously and sparsely pilose to hispid with short crisped hairs. Leaves sub-fleshy, obovate to lanceolate, to 25 × 8 mm, apex rounded, base tapering into a petiole to 5 mm long, upper surface glabrous, lower surface sparsely pilose; stipules modified as apparently subulate filaments to 2.5 mm long, quickly deciduous. Cymes 2-4-forked; bracts leaf-like. Cyathia solitary, terminal and pseudoaxillary, ca. 1.5 × 2 mm with cup-shaped involucre, shortly pilose above; glands 4(-5), transversely oblong, ca. 0.5 × 1.2 mm, quite separate; lobes 5, rounded, 0.5 mm diam., pilose. Male flowers: bracteoles fan-shaped, 1.5 mm long, plumose; pedicels 2 mm long; filaments 0.5 mm long. Female flower: ovary densely pilose, exerted on a recurved pedicel 3 mm long; styles 1.5 mm long, joined for 0.5 mm, with spreading deeply bifid apices. Capsules and seeds not seen.

*Habitat and flowering times:* calcareous slopes of central plateau, 1300 m; flowering in June.

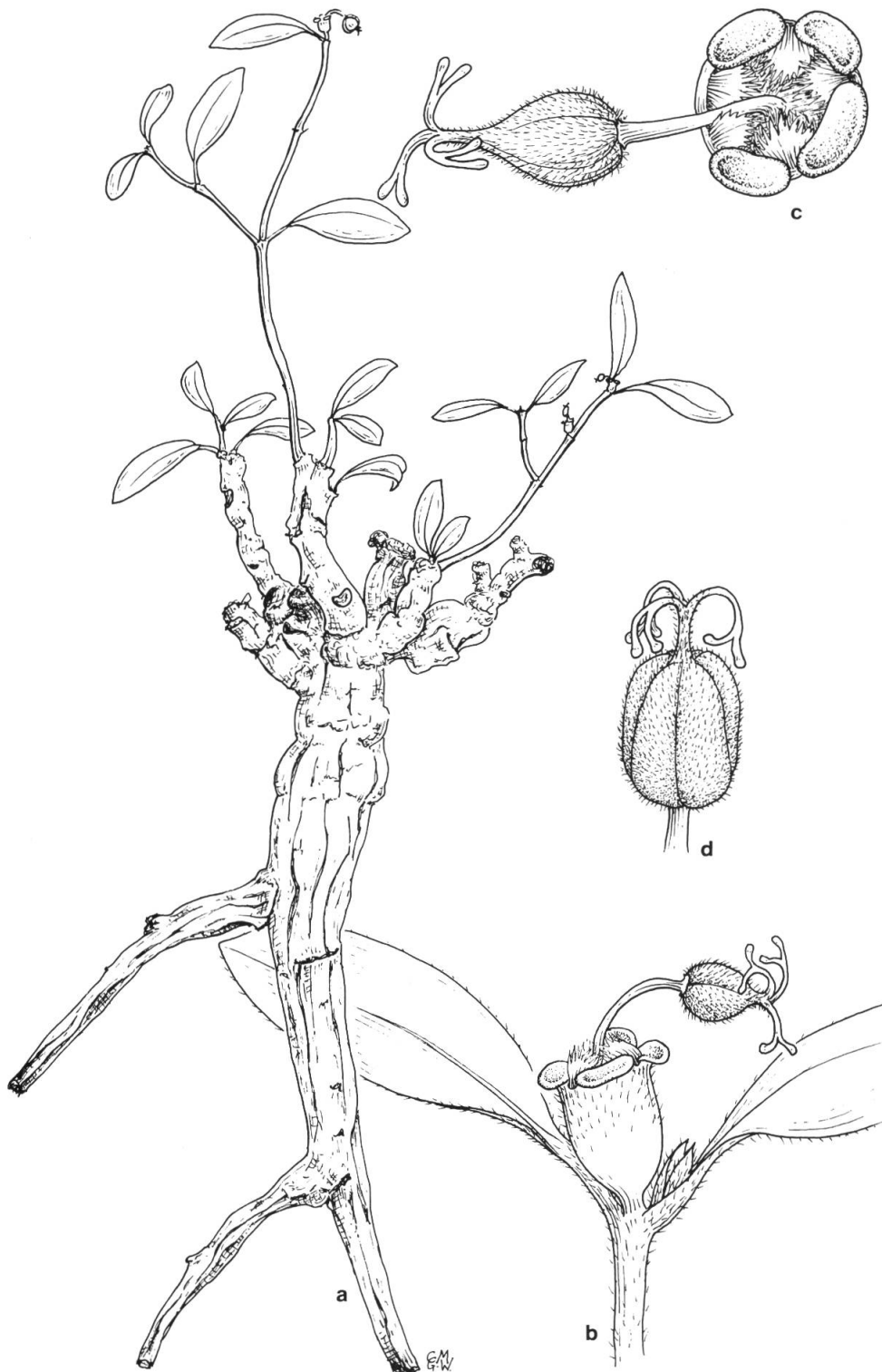


Fig. 1. — *Euphorbia quitensis* S. Carter  
 a, habit of branching  $\times 0.6$  (from *Boulos 17090*); b, flowering branch  $\times 7.5$  (from *Boulos 17090*); c, cyathium from above  
 $\times 11$  (from *Boulos 17090*); d, immature capsule  $\times 11$  (from *Boulos 17090*). Drawn by Christine Grey-Wilson.

**South Yemen (PDRY):** 225 km S of Sayun along road to Al-Mukalla, 16.6.1987, *Boulos, Rowaished, Gifri, Saeed & Hussein 17090* (holotype K; isotype KTUH, Aden University).

The distribution of *Euphorbia pirottae* (syn.: *E. gorinii* Choiv.), a little-known species to which *E. quaitensis* is closely related, is widespread, extending through the drier regions of northeast Tanzania, Kenya, Ethiopia, Somalia and into the Arabian Peninsula. It is an annual or short-lived perennial, with a slightly thickened stem and occasionally a somewhat woody root. The markedly different character of both these features in the plant from Hadramout serve to separate it as a distinct species. Neither the root nor the stem of *E. pirottae* reach the proportions of *E. quaitensis*, which has a much larger fleshy root producing short thickened fleshy persistent stems and branches forming a dwarf knobby shrublet.

Unless the one collection of this new species is of abnormal growth, the inflorescences are shorter than those of *E. pirottae* and the leaves are smaller. Cyathial measurements appear to be very similar, but the hairs on the inflorescences and lower leaf-surfaces are more crisped.

The specific epithet is derived from the local name for the area in which it was discovered, appropriately enough by Professor Boulos and his students from Kuwait University.

***Euphorbia rubriseminalis*** S. Carter **spec. nov. affinis *E. laricae*** Boiss. sed habitu brevissimo, glandulis stipularibus prominentibus, cyathiis ovariis et capsulis pilosis minoribus, seminibus rugosis rubiginosis distinguitur.

**Typus:** South Yemen, *Boulos & al. 17054* (holotypus K: isotypi BM, E, KTUH, Aden University).

Glabrous densely branched succulent shrublet to 30 cm high; branches fleshy, cylindrical, 3-8 mm thick, pale green, leafless on the specimens seen but with numerous prominent spirally-arranged leaf-scars. Leaves not seen; stipules modified as persistent blackish knob-like glands on either side of the leaf-scar. Cymes not seen complete, probably in 3-branched pseudumbels, forking 1-several times; bracts obovate, 2.5 × 1.5 mm, margin ciliolate. Cyathia 2.5 × 3.5 mm with cup-shaped involucre; glands 5, transversely elliptic, ca. 0.8 × 1.5 mm, separate, reddening with maturity; lobes 5, transversely oblong, ca. 0.5 × 1 mm, pubescent. Male flowers: bracteoles ligulate, deeply divided, pubescent; pedicels 2.5 mm long; filaments 0.8 mm long. Female flower: ovary pubescent; styles 1.5 mm long, joined to halfway with deeply bifid spreading thickened and flattened apices. Capsule on a pedicel ca. 1 mm long, very obtusely 3-lobed, 5 × 6.5 mm, buff-coloured (?), pubescent with very short adpressed hairs. Seeds conical with truncate base, very obscurely 4-angled, 3.5 × 2.8 mm, apex flattened ventrally, surface rugose, brownish red.

*Habitat and flowering times:* stony sandy gravel of calcareous mosaic, 180-1570 m; flowering and fruiting apparently most of the year, probably most prolifically at times of good rain.

**South Yemen (PDRY):** 190 km S of Sayun along road to Al-Mukalla, 16.6.1987, *Boulos, Rowaished, Gifri, Saeed & Hussein 17054* (holotype K; isotypes BM, E, KTUH, Aden University); 215 km S of Sayun along road to Al-Mukalla, *Boulos & al. 17075*; between Ghafit and Sibeh, *Lunt 84*; northern Jol near Zamuk, *Popov, Tillin & Gilliland 4217*; 12 km from Ataq towards Nuqba, *Sanadiki 83*.

This new species appears to be confined in distribution to the Hadramout region of South Yemen. *E. larica*, its closest relative, is a much larger shrub, usually ca. 1 m high, occurring in Iran, and the southeast corner of the Arabian Peninsula from the United Arab Emirates and Oman east of the Dhofar Mountains.

Apart from the dwarf size of the new species and its correspondingly smaller cyathial measurements, there are several features in which it differs considerably. Its knob-like glandular stipules are much more conspicuous than those of *E. larica*, which, in contrast, are scarcely noticeable. Most obviously, its smaller capsules are pubescent instead of glabrous; and its seeds are brick-red with a rugose surface instead of black with a smooth surface.

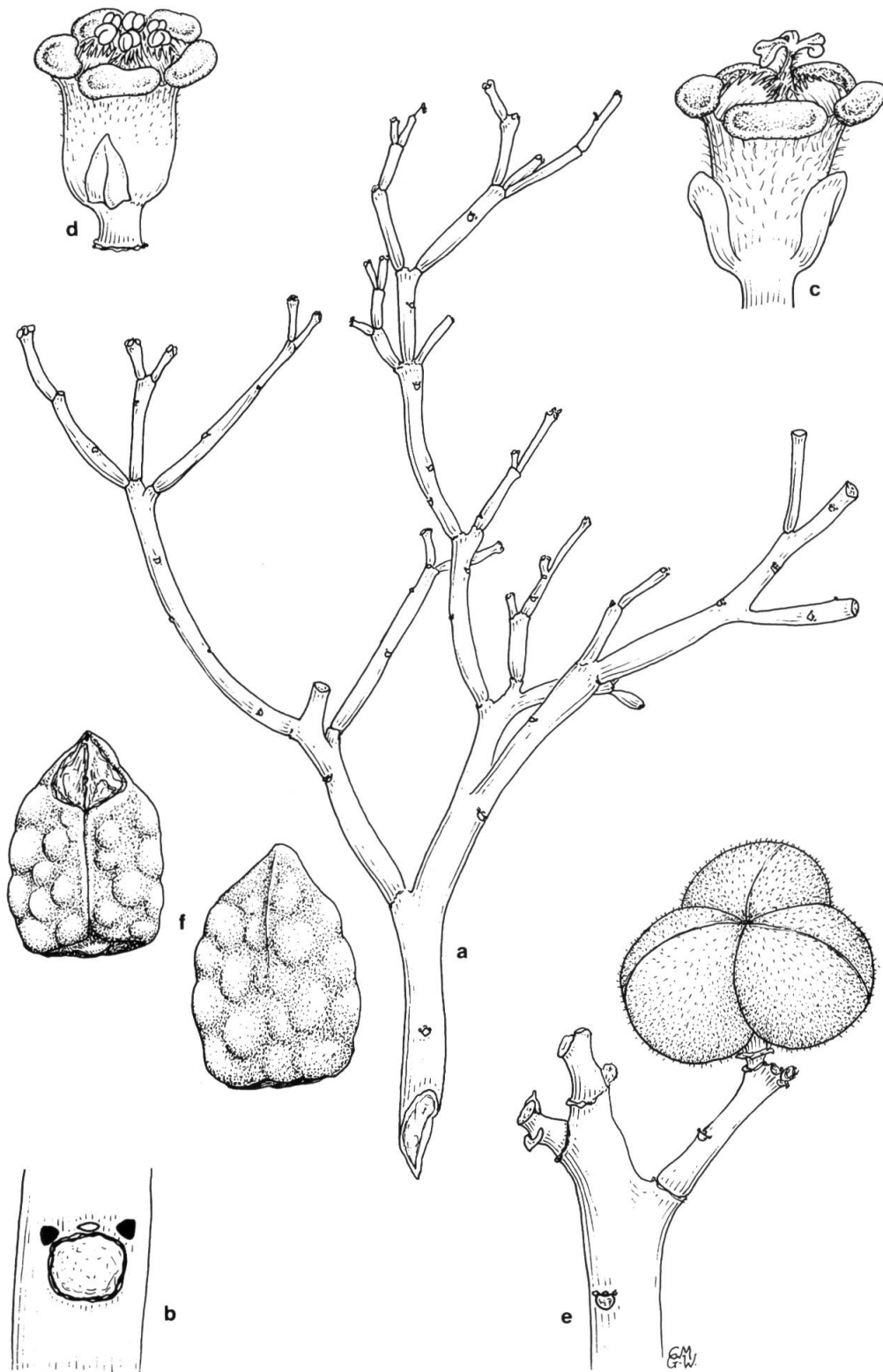


Fig. 2. — *Euphorbia rubriseimalis* S. Carter  
**a**, habit  $\times 0.6$  (from *Lunt 84*); **b**, leaf-scar with glandular stipules  $\times 7.5$  (from *Popov 4217*); **c**, cyathium with developing capsule  $\times 7.5$  (from *Popov 4217*); **d**, cyathium with exserted stamens  $\times 7.5$  (from *Boulos 17054*); **e**, capsule  $\times 3.5$  (from *Boulos 17054*); **f**, seeds  $\times 7.5$  (from *Popov 4217*). Drawn by Christine Grey-Wilson.

**Euphorbia seclusa** N. E. Br. New to Arabia — 16943.

Perennial, woody at base; stems slender, yellowish, much branched from base; leaves 0.5-1.2 cm, narrowly-lanceolate to linear; cyathia in small axillary clusters.

**Euphorbia serpens** Kunth — 16855.

Annual prostrate or ascending, much branched at base, cyathia in small axillary clusters.

**Euphorbia stylosa** Edgew. — 16510, 16544.

Annual erect herb, to 60 cm high, stems much branched, cyathia in terminal lax clusters, capsule 5 mm across.

**Jatropha pelargonifolia** Courb. — 16632, 16640, 16844, 16929.

Shrub, to 80 cm high; stems much branched, with dark sticky patches; leaves palmate, pubescent; flowers greenish-yellow; capsule 1 cm long, 8 mm across.

**Jatropha spinosa** (Forsskål) Vahl — 16679, 16709, 16895, 16993.

Shrub, to 1 m high; stems spiny, much branched; leaves palmate; flowers greenish-red, in terminal clusters; capsule 8 mm long.

**Phyllanthus fraternus** Webster — 16652.

Erect, delicate annual, leaves broadly elliptic, flowers in leafy branches, capsule 2 mm across.

**Phyllanthus maderaspatensis** L. — 16526, 16974.

Annual or perennial with woody base, leaves glaucous, capsule 3.5 mm across.

## GRAMINEAE

det. T. A. Cope & L. Boulos, Kew 1987

**Aeluropus lagopoides** (L.) Trin. ex Thwaites — 16567, 16934, 16948.

Perennial, culms often rooting at nodes, inflorescence of globose heads with dense spikelets; salt marshes and littoral sand.

**Aristida abnormis** Chiov. — 16893.

Annual or short-lived perennial, to 60 cm high, lateral awns absent or reduced.

**Aristida adscensionis** L. — 16609, 16819, 16868.

Annual or short-lived perennial, to 50 cm high; culms in tufts, often branching at base; lateral awns well-developed.

**Aristida mutabilis** Trin. & Rupr. — 16634, 16674.

Annual, culms in basal tufts; panicle open, pale whitish-green.

**Aristida triticoides** Henrard — 16872, 16882.

Perennial, to 1 m high, culms in dense tufts, panicle spike-like, awns unequal.

**Brachiaria deflexa** (Schum) C. E. Hubbard ex F. Robyns — 16750.

Annual tufted grass, spikelets small, in green panicles; waste ground and edges of fields.

**Brachiaria leersioides** (Hochst.) Stapf — 16683, 16770, 16833, 16848.

Annual to 30 cm high, spikelets in open panicles, glumes separated by a distinct internode, edges of cultivated ground.

**Brachiaria ovalis** Stapf — 16565.

Annual to 60 cm high; culms in tufts, branched at base; spikelets to 4.5 mm long.

**Cenchrus ciliaris** L. — 16587, 16668.

Perennial multiform tufted grass, to 1.2 m high, woody at base, erect or ascending, inflorescence spike-like, inner bristles of the involucre united at the base to form a shallow disc about 1 mm diameter.

**Cenchrus pennisetiformis** Hochst. & Steudel — 16545, 16810, 16838, 16970, 16989.

Perennial tufted grass, woody at base, similar to *C. ciliaris* but inner bristles of the involucre united for up to 2.5 mm above the rim of the basal disc.

**Cenchrus setigerus** Vahl — 16843.

Annual or perennial tufted grass, inner bristles rigid, connate to about half their length to form a cup.

**Chloris barbata** Sw. — 16639.

Perennial tufted grass, to 1 m high; cultivated ground.

**Chrysopogon plumulosus** Hochst. — 17010.

Perennial tufted grass, to 60 cm high, awns plumose.

**Cymbopogon schoenanthus** (L.) Sprengel — 16903.

Perennial, densely tufted, slightly aromatic, to 1.2 m high, leaves scabrid, panicle lax.

**Cynodon dactylon** (L.) Pers. — 16469, 16845.

Rhizomatous perennial, inflorescence digitate, racemes 3-7; cultivated ground.

**Dactyloctenium aegyptium** (L.) Willd. — 16474, 17051.

Annual tufted grass, often stoloniferous and rooting at nodes; racemes open, to 6 cm long, ending with an acuminate tip; cultivated ground.

**Dactyloctenium aristatum** Link (first record since SCHWARTZ, 1939) — 16543.

Annual tufted grass; racemes compact, 1-1.8 cm long; stony moist ground.

**Dactyloctenium scindicum** Boiss. — 16613, 16802, 16828, 16866.

Perennial, tufted, stoloniferous grass, rooting at nodes, racemes hardly 1 cm long.

**Danthoniopsis barbata** (Nees) C. E. Hubbard. New to South Yemen — 16870.

Perennial densely tufted grass, culms branched at base, leaves with conspicuous white thick margins, spikelets usually in groups of three.

**Desmostachya bipinnata** (L.) Stapf — 16468.

Perennial rhizomatous tufted grass, to 1.5 m high, inflorescence long panicle of short racemes; waste ground, edges of cultivations.

**Dichanthium foveolatum** (Del.) Roberty — 16517, 16564, 16818, 16971.

Perennial tufted grass, racemes solitary; glume of sessile spikelet pitted.

**Digitaria ciliaris** (Retz.) Koeler — 17046.

Annual tufted grass, racemes digitate, spikelets about 3 mm long; cultivated and waste ground.

**Digitaria velutina** (Forsskål) P. Beauv. New to South Yemen — 16772.

Annual tufted grass, racemes delicate, diverging from a central axis, spikelets to 2 mm long; damp rocky slopes.

**Echinochloa colona** (L.) Link — 16646, 16739a, 17025.

Annual tufted grass, racemes 4-rowed, appressed to the axis of the panicle; moist and cultivated ground.

**Eragrostis barrelieri** Daveau — 16648, 16840.

Annual glaucous grass, panicles mainly terminal, reduced axillary panicles arise from lower nodes; weed of cultivated ground.

**Eragrostis mahrana** Schweinf. — 16930.

Perennial tough grass, culms much branching; leaves short, stiff.

**Eragrostis minor** Host — 16864.

Annual tufted grass, leaves with crateriform glands along the margin.

**Eragrostis papposa** (Roem. & Schult.) Steudel — 16774.

Short-lived perennial, easily mistaken for an annual, panicle lax; spikelets purplish, 1 mm across; rocky ground.

**Eriochloa fatmensis** (Hochst. & Steudel) W. D. Clayton — 16737, 17048.

Annual, culms procumbent, spikelets with a bead-like swelling at the base; weed of cultivated ground.

**Halopyrum mucronatum** (L.) Stapf — 16572.

Perennial tough grass, growing in dense tussocks to 1.5 m high, littoral sand dunes.

**Hyparrhenia hirta** (L.) Stapf — 16762.

Perennial tufted rhizomatous grass, to 80 cm high, rocky ground.

**Leptotherium senegalense** (Kunth) W. D. Clayton — 16880, 16906.

Annual or short-lived perennial, to 40 cm high, glumes tuberculate-spinulose, the lower elongated and recurved.

**Ochthochloa compressa** (Forsskål) Hilu — 16611.

= *Eleusine compressa* (Forsskål) Aschers. & Schweinf.

Stoloniferous perennial, inflorescence of 2-4 digitate racemes.

**Odyssea mucronata** (Forsskål) Stapf — 16574, 16605.

Spiny perennial, growing in dense tufts to 2 m high, culms stiff, leaves pungent; littoral sand, excellent soil binder.

**Panicum antidotale** Retz. — 16475.

Perennial, to 1.5 m high, culms much branched from a woody rootstock, spikelets 2.5 mm long; cultivated ground.

**Panicum turgidum** Forsskål — 16593, 16656, 16814, 16922.

Perennial, culms richly branched, spikelets 4-4.5 mm long; coastal and inland sandy dry soils, excellent fodder.

**Paspalidium desertorum** (A. Rich.) Stapf — 16477, 16497.

Stoloniferous perennial, raceme-rachis 3-angled, spikelets 2 mm long; cultivated ground.

**Pennisetum divisum** (J. Gmelin) Henrard — 16610.

Much branches perennial, culms stiff, leaves inrolled; coastal and inland sandy soils.

**Pennisetum orientale** Rich. (first record since SCHWARTZ, 1939) — 16751.

Perennial to 1.5 m high, leaves to 60 cm long and 1.5 cm broad, loosely inrolled, panicles elongated and narrow (20 × 1.5 cm); rocky slopes.

**Setaria verticillata** (L.) P. Beauv. — 17044.

Annual tufted grass, panicle spike-like, spikelets surrounded by retrorsely barbed bristles, adhering to clothes; cultivated ground.

**Sorghum** × **drummondii** (Nees ex Steudel) Millsp. & Chase. New to South Yemen — 16793.

Cultivated for fodder.

**Sporobolus consimilis** Fresen. — 16569.

Perennial, in dense tussocks, to 2 m high; culms robust, stiff, from short rhizomes; dominant in littoral sandy soils.

**Sporobolus spicatus** (Vahl) Kunth — 16496, 16965.

Perennial, culms procumbent, or stoloniferous, mat-forming; panicle narrowly cylindrical, smooth; coastal and inland sandy soil, salt tolerant.

**Stipagrostis paradisea** (Edgew.) de Winter — 16509, 16540.

Densely tufted perennial, central awn plumose throughout, glumes 1-3-nerved; rocky ground.

**Stipagrostis uniplumis** (Lichtenst.) de Winter — 16868a.

Short-lived perennial; central awn plumose in its upper  $\frac{2}{3}$ , glabrous below.

**Tetrapogon tenellus** (Konig ex Roxb.) Chiov. — 16665.

Annual or short-lived perennial, spikelets with 2-5 fertile florets, lowest lemma short-ciliate or almost glabrous; alluvial cultivated soil.

**Tetrapogon villosus** Desf. — 16562, 16887.

Densely tufted perennial, lowest lemma long-ciliate; stony ground.

**Tragus berteronianus** Schultes — 16823.

Tufted annual, to 20 cm high; raceme narrowly cylindrical, very dense; spikelets in pairs, upper glumes 3-5-nerved.

**Tragus racemosus** (L.) All. — 17049

Tufted annual, to 30 cm high, raceme spike-like, spikelets in clusters of 3-6 florets (of which 1-2 are sterile), upper glume 7-nerved.

**Urochloa panicoides** P. Beauv. — 16739.

Tufted annual, often creeping, panicles with few spreading racemes; spikelets flattened, elliptic; cultivated moist ground.

#### LABIATAE

det. R. M. Harley & L. Boulos, Kew 1987

**Becium filamentosum** (Forsskål) Chiov. New to South Yemen — 16747, 16771.

Low shrub, leaves serrate, flowers pale lilac with long exserting stamens.

**Endostemon tenuiflorus** (Benth.) Ashby — 16718.

Dwarf perennial, leaves narrowly elliptic with undulate margins, flowers white. In Kew only one specimen from South Yemen, collected by Botta in 1853.

**Lavandula subnuda** Benth. — 16994.

Shrub, stems much branched, almost leafless, flowers blue in terminal long spikes. Usually plants have either foliage or flowers, rarely with both at the same time; it is recommended therefore to collect sterile specimens with leaves only.

**Leucas glabrata** (Vahl) R. Br. New to South Yemen — 16744.

Perennial herb, to 60 cm high, stems much branched, leaves serrate, flowers white in short axillary clusters.

**Leucas inflata** Benth. — 16673.

Low shrub, stems much branched, leaves dentate towards the apex, flowers white in dense axillary clusters.

**Ocimum forskolei** Benth. — 16645, 16871.

Aromatic shrub, stems much branched; leaves ovate to broadly elliptic, almost entire; flowers pale lilac to white.

**Ocimum spec. nov. ined.** — 16988.

Dwarf perennial, woody and much branched at base, leaves long-petiolate serrate, flowers white.

**Otostegia fruticosa** (Forsskål) Schweinf. ex Penzig subsp. **schimperii** (Benth.) Sebald — 17017.

Shrub, to 1 m high, stems much branched, flowers white.

**Teucrium rhodocalyx** Schwartz — 16996, 17066.

Dwarf perennial, much branched and woody at base, leaves greyish-white-hairy, flowers mauve.

**LEGUMINOSAE**

det. L. Boulos, Kew 1987

**Acacia etbaica** Schweinf. — 16728.

Flat-topped tree, to 6 m high, bark brown, rough; flowers cream, in spherical heads; fruit 4-10 cm long, 6-8 mm broad.

**Acacia hamulosa** Benth. — 16519, 16635, 16908.

Shrub or small tree to 3.5 m high; flowers white, in cylindrical spikes; fruits straw-yellow, to 12 cm long and 3.5 cm broad.

**Acacia hunteri** Oliv. — 16631.

Shrub or small tree, to 4 m high, flowers cream, in cylindrical spikes, fruits papery, 3-6 cm long, 1-1.5 cm broad.

**Acacia mellifera** (Vahl) Benth. — 16550, 16839.

Tree to 4 m high, leaves with few large leaflets, flowers whitish-pink, fruits 4-6 cm long, to 1.8 cm broad, conspicuously constricted between the seeds.

**Acacia nilotica** (L.) Del. subsp. **indica** (Benth.) Brenan — 16484.

Cultivated tree to 15 m high, flowers bright yellow in spherical heads, fruit whitish-tomentose lomentum to 15 cm long.

**Acacia oerfota** (Forsskål) Schweinf. — 16554.

= *A. nubica* Benth.

Shrub, to 2 m high, flowers white, in spherical heads, fruit narrowly to broadly linear, to 14 cm long, and 1.2 cm broad.

**Acacia tortilis** (Forsskål) Hayne — 16606, 16626, 16980.

Tree or large shrub, to 5 m high, flowers white, in spherical heads; fruit twisted, constricted between the seeds.

**Acacia tortilis** (Forsskål) Hayne subsp. **spirocarpa** (Hochst. ex A. Rich.) Brenan var. **crinata** Chiov. — 16896.

Tree to 4 m high, fruits twisted, densely white-villous.

**Alhagi graecorum** Boiss. — 17045.

Shrub, stems spiny, leaves simple, soon deciduous, flowers purple, fruit to 3 cm long, 4 mm broad, constricted between seeds; waste ground.

**Argyrolobium roseum** (Camb.) Jaub. & Sp. — 16512.

Annual, leaves trifoliate, fruit narrowly linear, to 2 cm long, 2.5 mm broad.

**Cadia purpurea** (Picc.) Aiton — 17068.

Shrub, to 2 m high, flowers whitish to pink; fruit linear, flat, to 10 cm long, 1 cm broad.

**Caesalpinia eriantha** Choiv. var. **pubescens** Brenan — 17000.

Low shrub, branching horizontally close to soil surface; fruit blotched with purple, linear, to 6 cm long, 1.2 cm broad.

**Caesalpinia pulcherrima** (L.) Swartz — 16482.

Ornamental shrub, inflorescence long raceme, flowers red; fruit linear to 10 cm long, 1.5 cm broad.

**Cassia adenensis** Benth. — 16552, 16878.

Shrub, to 2 m high, stems much branched, flowers bright yellow in long racemes, petals with dark brown veins; fruit flattened, to 3.5 cm long, 1.5 cm broad.

**Cassia auriculata** L. — 16493.

Ornamental shrub or small tree to 3 m high; fruit to 8 cm long, 1.5 cm broad.

**Cassia holosericea** Fresen. — 16604, 16822, 16963.

Perennial herb; fruit pubescent, flattened, lunar to broadly elliptic, to 3 cm long, 1.5 cm broad.

**Cassia italica** (Miller) Lam. ex F. W. Andrews — 16597, 17050.

Low shrub, leaflets large; flowers yellow, large, in long racemes; fruit flattened, curved, to 1.5 cm broad.

**Indigofera articulata** Gouan — 16962.

Low shrub, leaves greyish-glaucous, flowers scarlet-red; fruit about 1 cm long, constricted between the few seeds.

**Indigofera oblongifolia** Forsskål — 16827, 16857.

Low shrub, leaflets linear, flowers scarlet-red in short axillary spikes; fruit narrowly linear, to 3 cm long.

**Indigofera semitrijuga** Forsskål — 16811, 16926.

Procumbent white-tomentose annual, stems much branched, flowers violet-red; fruit short, 2-seeded.

**Indigofera spinosa** Forsskål — 16630, 16723.

Spiny low shrub, flowers scarlet-red; fruit long-stalked, cylindrical, to 1.5 cm long.

**Medicago sativa** L. — 17031.

Cultivated for fodder.

**Prosopis cinerea** (L.) Druce — 16488.

Cultivated tree, to 8 m high, flowers cream in long spikes; fruit to 20 cm long, narrow, irregularly constricted between the seeds.

**Prosopis farcta** (Banks & Sol.) Macbride — 17037.

Shrub, stems much branched with sharp spines; flowers cream in lax, narrow spikes; fruit brownish-purple, variable in shape and size, to 4 cm long and 2 cm broad.

**Prosopis juliflora** (Sw.) DC. — 16570.

Tree, to 6 m high, flowers yellowish-cream in long spikes; fruit to 22 cm long, 1 cm broad, constricted between the seeds. The tree is completely naturalized and dominant in the coastal region of Aden and other regions.

**Rhynchosia memnonia** (Del.) DC. — 16539, 16826.

Twining perennial herb, leaves 3-foliolate, flowers yellow, fruit to 1.5 cm long, constricted between the few seeds.

**Sesbania grandiflora** (L.) Poir. — 16492.

Cultivated tree, to 5 m high; fruit to 40 cm long, 8 mm broad, straight, inconspicuously constricted between the seeds.

**Sesbania sesban** (L.) Merrill — 16486.

Cultivated shrub, to 3 m high, flowers yellow, in lax racemes; fruit to 15 cm long, narrow, constricted between the seeds.

**Taverniera aegyptiaca** Boiss. — 16950.

Shrub to 50 cm high; leaves simple, small; flowers flesh-coloured; fruit short, with hooked bristles.

**Taverniera glauca** Edgw. — 16563.

Shrub, to 60 cm high; leaves simple, long petioled, blade almost orbicular, to 2 cm diameter.

**Tephrosia nubica** (Boiss.) Baker — 16507, 16547, 16874.

Perennial, woody at the base, to 60 cm high, stems much branched, leaves greyish-green, flowers pinkish; fruit to 2 cm long, densely white-villous.

**Tephrosia purpurea** (L.) Pers. — 16589, 16961.

Perennial to 60 cm high, stems much branched, flowers purple; fruit to 4 cm long, 3 mm broad.

**Tephrosia schweinfurthii** Defl. — 16904.

Perennial, growing amongst other bushes; leaves simple, narrowly lanceolate; flowers scarlet-red.

**Tephrosia subtriflora** Hochst. ex Baker. New to South Yemen — 16900.

Perennial, stems decumbent, branched at the base, flowers white; fruit to 2.5 cm long, 3 mm broad.

**Tephrosia uniflora** Pers. — 16555, 16578.

Perennial, woody at base, stems much branched, flowers axillary, solitary or in twos; fruit to 4 cm long, 5 mm broad.

*LILIACEAE*

det. J. Cowley, Kew 1987

**Aloe doei** Lavranos — 16714, 17085.

Perennial, leaves succulent; flowers orange (lower 2/3), yellow and green (upper 1/3).

**Aloe fleurentinorum** Lavranos & Newton — 17067.

Perennial, leaves succulent, flowers pinkish.

**Asphodelus tenuifolius** Cav. — 17043.

Annual to 30 cm high, flowers white.

**Urginea** sp. aff. **indica** (Roxb.) Kunth — 16617.

Bulbous perennial, leaves narrow, flowers in long lax racemes; fruit 1 cm across, long-pedicelled.

*LOASACEAE*

det. B. Verdcourt &amp; L. Boulos, Kew 1987

**Kissenia arabica** R. Br. ex Chiov. — 16525.= *K. spathulata* R. Br.Annual to 50 cm high, leaves sticky, flowers white, calyx much elongated in fruit. One of two representatives of the family *Loasaceae* in the Old World; the second is *K. capensis* Endl. in SW Africa and the Cape Province.*LORANTHACEAE*

det. R. M. Polhill, Kew 1987

**Phragmanthera regularis** (Steudel ex A. Rich.) Gilbert. New to South Yemen — 16768.Woody parasite on *Ficus salicifolia* Vahl, leaves broadly elliptic.*LYTHRACEAE*

det. L. Boulos, Kew 1987

**Lawsonia inermis** L. — 16480.= *L. alba* Lam.

Ornamental shrub to 2 m high, flowers creamy, fragrant.

*MALVACEAE*

det. L. Boulos, Kew 1987

**Abutilon fruticosum** Guill. & Perr. — 16566, 16642, 16983, 17094.

Shrub to 80 cm high, leaves cordate, much variable in size; flowers yellow, long-pedicelled.

**Abutilon pannosum** (Forst. f.) Schlecht. Local name: 'Afar — 16471, 16495, 16850, 16977, 17024.

Perennial, woody at base, stems much branched; leaves ovate-cordate, velvety-canescens; flowers yellow, axillary.

**Cienfuegosia welshii** (T. Anders.) Garcke — 16558, 17014.

Shrub to 60 cm high, flowers yellow with crimson centre, fruits with characteristic brownish spots.

**Gossypium areysianum** Defl. — 16805.

Shrub, to 1 m high, leaves 3-lobed. Previously known from 3 collections from the coastal plains of South Yemen (VOLLESEN, 1987).

**Hibiscus deflersii** Schweinf. — 16692, 16788.

Shrub, to 80 cm high, flowers scarlet-red, conspicuous.

**Hibiscus micranthus** L. f. — 16549.

Shrub, stems much branched at base, flowers whitish to pale mauve; fruit globular, 8 mm across.

**Pavonia subaphylla** O. Schwartz. New to South Yemen — 17002.

Small perennial, woody and much branched at base; leaves small, 3-5 lobed.

**Pavonia triloba** Hochst. — 16834.

Perennial, to 40 cm high; leaves deeply 3-lobed, central lobe largest; flowers pinkish.

**Senra incana** Cav. — 16596, 16655, 16953.

Perennial, to 1 m high; leaves palmate, variable, usually slightly 3-5-lobed; flowers deep purple, conspicuous, in small lateral clusters

**Sida alba** L. — 16851.

= *S. spinosa* L.

Perennial, woody at base; leaves narrowly ovate, dentate; flowers whitish-yellow.

**Thespesia populnea** (L.) Solander ex Correa. Local names: Lakid, Teffah Adan — 16490.

Popular ornamental tree, to 6 m high; flowers yellow, conspicuous; fruit globular to 4 cm across.

*MELIACEAE*

det. B. Verdcourt & L. Boulos, Kew 1987

**Azadirachta indica** (L.) A. Juss. — 16485.

Ornamental tree, to 10 m high, leaves to 30 cm long, with characteristic asymmetric large leaflets; flowers in large open panicles.

**Turraea parviflora** Defl. New to South Yemen — 16913, 17065.

Shrub, to 2 m high, flowers white.

*MENISPERMACEAE*

det. L. Boulos, 1987

**Cocculus pendulus** (J. R. & G. Forst.) Diels — 16627.

Liane, stems much branched, flowers greenish, fruits deep red when ripe.

*MORACEAE*

det. L. Boulos, Kew 1987

**Ficus carica** L. — 16754.

Tree to 5 m high, leaves to 15 cm long and 10 cm wide, 3-lobed or entire; fruits small, to 2 cm long, edible, a variety locally known as "Palace".

**Ficus populifolia** Vahl — 16761.

Tree to 6 m high; leaves cordate, often 3-lobed; fruits red when ripe.

**Ficus salicifolia** Vahl — 16767.

Tree to 8 m high, stems much branched, leaves lanceolate to narrowly elliptic, fruit 8 mm diameter.

**Ficus sycomorus** L. Local name: Gimmeiz — 16749.

Tree to 12 m high, trunk often very thick; leaves broadly ovate, not lobed; fruits large, edible, in short clusters on woody branches.

**Ficus vasta** Forsskål — 16765.

Tree to 6 m high; leaves cordate, very large, to 15 cm, almost as long as broad; fruits in clusters on the tips of branches.

*MORINGACEAE*  
det. L. Boulos, Kew 1987

**Moringa oleifera** Lam. — 16487.

Cultivated tree to 4 m high, flowers white; fruit cylindrical, to 25 cm long, 1 cm broad, longitudinally grooved.

*NYCTAGINACEAE*  
det. R. D. Meikle, Kew 1987

**Boerhavia coccinea** Mill. — 16621.

Perennial prostrate herb; stems glandular, sticky; leaves broadly ovate; flowers pink.

**Boerhavia diffusa** L. — 16515, 16561.

Perennial, to 80 cm high, woody at base, stems much branched; flowers pink, long-pedicelled, in leafless lax terminal cymes.

**Boerhavia elegans** Choisy — 16618, 16886.

Perennial, to 60 cm high, woody and leafy at base, stems delicate; flowers pink, minute, in naked lax cymes.

**Boerhavia repens** L. 16641.

Perennial prostrate herb, leaves broadly ovate with undulate margins, flowers pink in axillary clusters.

**Commicarpus coccinea** Mill. — 16644.

Perennial erect herb, woody at base, branches much branched; leaves broadly ovate, fleshy; flowers pink in terminal and axillary cymes.

**Commicarpus helenae** (J. A. Schultes) Meikle — 16616, 16667, 16856, 16867.

Perennial erect herb, woody at base; leaves fleshy, variable in shape and size, to 5 cm, usually as long as broad; flowers mauve, in terminal and axillary cymes.

**Commicarpus squarrosus** (Heimerl) Standl. New to South Yemen — 17003, 17057.

Perennial, base and lower branches woody; leaves fleshy, thick; flowers magenta, conspicuous, in short terminal cymes. According to MEIKLE (1978), this species is known in Arabia only from Oman.

**Commicarpus stenocarpus** (Chiov.) Cuf. New to South Yemen — 16973.

Perennial, base and old branches woody; leaves fleshy, hardly exceeding 1 cm, about as long as broad; flowers pinkish in terminal lax short spikes. According to MEIKLE (1978), this species is known in Arabia only from Oman.

*PALMAE*

det. L. Boulos, 1987

**Hyphaene thebaica** (L.) Mart. — 16576.

Tree, to 12 m high, trunk branched. A wine called "tari" is produced from the tops (apical buds) of the trees, which is later transferred into a vinegar. The tree forms pure stands of dense vegetation on vast areas in the coastal region of Aden.

*PAPAVERACEAE*

det. L. Boulos, 1987

**Argemone mexicana** L. — 16777.

Annual prickly herb, flowers yellow conspicuous, fruit to 3.5 cm long; naturalized.

*PLUMBAGINACEAE*

det. B. Verdcourt & L. Boulos, Kew 1987

**Limonium cylindrifolium** (Forsskål) Verdcourt ex Cuf. — 17073.

Perennial with woody base; leaves narrowly cylindrical, to 8 cm long, 2 mm broad; flowers pink.

*POLYGALACEAE*

det. L. Boulos, Kew 1987

**Polygala abyssinica** R. Br. ex Fresen. — 17016.

Perennial, woody at base; stems erect, much branched; leaves linear, soon deciduous; flowers pale yellow.

**Polygala erioptera** DC. — 16521, 16638.

Annual or short-lived perennial, stems much branched; leaves narrowly elliptic, sessile; petals green with broad white margins.

**Polygala irregularis** Boiss. — 16879.

Annual herb, stems branched from the base; leaves very narrowly linear, to 5 cm long, 1 mm broad; flowers pink and white with green veins.

**Polygala senensis** Klotzsch — 16706, 16909.

Shrub to 60 cm high, stems much branched; leaves shortly petiolate, to 1 cm long; flowers magenta and yellow with green veins.

*PORTULACACEAE*

det. L. Boulos, Kew 1987

**Portulaca oleracea** L. — 16591, 16885.

Annual succulent herb, stems prostrate, flowers yellow; cultivated ground.

**Portulaca quadrifida** L. — 16478.

Annual, delicate, prostrate herb; nodes with characteristic tufted white hairs, leaves succulent, small, flowers yellow; cultivated ground.

*PRIMULACEAE*  
det. L. Boulos, 1987

**Anagallis arvensis** L. — 17027.

Annual herb, stems densely leafy, flowers orange-red; cultivated ground.

*RESEDACEAE*  
det. L. Boulos, Kew 1987

**Ochradenus arabicus** Chaudhary, Hillcoat & Miller — 17056.

Shrub to 60 cm high; stems much branched, spinescent; flowers yellow in terminal spikes.

**Ochradenus baccatus** Del. — 16732.

Shrub, to 80 cm high, stems much branched; leaves very-narrowly linear, to 5 cm long; flowers yellow, in terminal panicles.

**Reseda sphenocleoides** Defl. — 16534, 16766, 16914, 16949, 16987.

Perennial erect herb, to 60 cm high, stems woody at base; leaves succulent elliptic to spatulate, entire; flowers yellow in dense terminal spikes.

*RHAMNACEAE*  
det. D. Hillcoat & L. Boulos, B. M. 1987

**Ziziphus leucodermis** (Bak.) Schwartz — 16960, 16981.  
= *Rhamnus leucodermis* Bak.

Thorny shrub to 80 cm high; stems much branched; leaves almost sessile, elliptic, to 1 cm long and 4 mm broad; fruit globular, about 6 mm across.

**Ziziphus spina-christi** (L.) Willd. — 16489, 16559.

Thorny tree or shrub, leaves much variable, fruit to 1.5 cm across.

*RUBIACEAE*  
det. D. Bridson & L. Boulos, Kew 1987

**Jaubertia aucheri** Guill. — 17015.

Shrub to 60 cm high, of a characteristic bad smell, stems much branched; leaves succulent, very narrowly lanceolate, to 6 mm long.

**Kohautia caespitosa** Schinzl. — 16873, 16955.

Perennial, to 60 cm high, woody at base; stems erect, leafy mainly at base; leaves narrowly elliptic to linear; flowers creamy, in lax, terminal, leafless cymes.

**Kohautia retrorsa** (Boiss.) Bremek. — 16921.

Perennial, branched at base; flowers to 1 cm long, in lax terminal cymes.

*SALVADORACEAE*

det. L. Boulos, 1987

**Salvadora persica** L. Local name: Swak — 16500, 16535, 16964.

Shrub, stems much branched; leaves succulent, much variable in shape and size; flowers creamy, in open panicles; fruit reddish when ripe. The woody branches yield the well-known tooth brush "Meswak or Swak".

*SAPINDACEAE*

det. L. Boulos, 1987

**Dodonaea viscosa** (L.) Jacq. — 17052.

Dioecious shrub, to 80 cm high, stems much branched; leaves spatulate, glandular, sticky, shiny; female flowers greenish, fruit red winged.

*SCROPHULARIACEAE*

det. B. Verdcourt, S. Collette &amp; L. Boulos, Kew 1987

**Anticharis arabica** Endl. — 16608, 16614a, 16660, 16862.

Annual glandular herb, to 15 cm high, stems few-branched, leaves narrowly elliptic to spatulate; flowers pale blue, 5-6 mm long, axillary.

**Anticharis glandulosa** Aschers. — 16511, 16541, 16614b, 16806.

Annual glandular herb, to 35 cm high, stems much branched, densely-leafy; leaves densely glandular, broadly elliptic; flowers deep blue, 1 cm long, axillary.

**Campylanthus pungens** O. Schwartz — 16997.

Shrub, to 50 cm high, stems much branched, leafless, flowers mauve.

**Kickxia pseudoscoparia** D. Sutton — 16892.

Perennial, to 60 cm high, stems much branched, leafless or with few filiform small leaves, flowers yellow.

**Lindenbergia sinaica** Benth. — 16875, 16951.

Perennial, to 40 cm high, stems much branched, leaves conspicuously dentate, flowers deep violet with orange-yellow throat.

**Schweinfurthia latifolia** Baker — 16967.

Perennial to 1 m high, stems erect or decumbent; leaves broadly ovate, to 5 cm, almost as long as broad; flowers to 2 cm long, yellow, with violet mouth; fruit to 1 cm across. Endemic to Hadramout.

**Schweinfurthia pedicellata** (T. Anders.) Benth. & Hook. f. — 16522, 16528, 16804.

Annual herb, to 40 cm high, stems mainly branched at base, leaves narrowly linear; flowers white, long-pedicelled; fruit globular, 5 mm across.

**Schweinfurthia pterosperma** A. Braun — 16579.

Annual, to 25 cm high, stems branched; leaves spatulate, to 5 cm long, 1.2 cm broad; flowers white, with yellow mouth; fruit globular, to 5 mm across.

*SOLANACEAE*  
det. L. Boulos, 1987

**Datura innoxia** Mill. — 17039.

Annual to 50 cm high, stems much branched; leaves large, conspicuously asymmetric; flowers white, axillary, solitary; flowers densely prickly; cultivated and neglected ground.

**Lycium shawii** Roem. & Schult. — 16637, 16684, 16853.

Spiny shrub, to 1.2 m high, branches spinescent, flowers pale blue; fruit globular, to 6 mm diameter, red when ripe.

**Solanum albicaule** Kotschy ex Dunal — 16689.

Prickly shrub, young stems whitish, flowers pale blue with conspicuous yellow stamens; fruit globular, to 8 mm across, red when ripe.

**Solanum glabratum** Dunal var. **sepicula** (Dunal) J. R. I. Wood — 16830.

Prickly shrub, to 60 cm high, leaves spiny along the mid-rib on lower surface, flowers blue-violet, fruit red.

**Solanum incanum** L. — 16727.

Thorny shrub, to 1 m high, stems and leaves densely pubescent, flowers violet; fruit yellow, globular, to 3 cm across.

**Solanum nigrum** L. — 17035.

Annual herb, leaves variable, flowers white, fruit not seen.

**Solanum palmetorum** Dunal — 16711, 16730.

Prickly shrub, to 60 cm high, stems much branched, leaves variable, flowers orange-red with conspicuous yellow anthers; fruit orange-red when ripe, globular, to 6 mm across.

**Solanum pubescens** Willd. — 16992, 17069.

Unarmed shrub, to 60 cm high, stems densely leafy; leaves pubescent, broadly ovate; flowers pale blue; fruit globular, to 1 cm across.

**Withania ribeckii** Schweinf. ex Balf. f. — 17091.

= *W. adunensis* Vierh.

Perennial, to 60 cm high, stems much branched; leaves greyish-green, broadly ovate, pubescent; fruits axillary, solitary or in axillary clusters of 2-3.

**Withania somnifera** (L.) Dunal — 16716, 16773, 16837, 17036.

Perennial, to 80 cm high, stems much branched, leaves variable, flowers green; fruits orange-red, in dense axillary clusters.

**Withania sphaerocarpa** Hepper & Boulos var. **sphaerocarpa**. New to Arabia — 17012.

Shrub, to 1.2 m high, stems much branched, leaves ovate to elliptic; flowers greenish-yellow, axillary with short calyx teeth; fruit spherical.

*STERCULIACEAE*  
det. L. Boulos, B. M. 1987

**Melhania muricata** Balf. f. — 17007.

Low shrub, to 15 cm high; leaves small, narrowly elliptic, greyish-green, inconspicuously serrate; flowers greenish, fruit enclosed in reddish green epicalyx lobes.

**Melhania phillipsiae** Bak. f. — 16869.

Shrub to 80 cm high, stems much branched; leaves to 10 cm long, 3.5 cm broad, densely pubescent; flowers yellow, fruit enclosed in large epicalyx lobes.

**Melhania stipulosa** J. R. I. Wood — 16746.

Small perennial, 5 cm high; leaves to 2.5 cm long, narrowly elliptic, irregularly serrate; stipulate, stipules filiform; flowers orange-yellow; fruit enclosed in epicalyx lobes, 8 mm broad.

*TAMARICACEAE*

det. L. Boulos, Kew 1987

**Tamarix aphylla** (L.) Karst. — 16694.

Tree to 8 m high; stems leafless, articulate.

**Tamarix arabica** Bunge — 16481, 16566.

Shrub to 2 m high, leaves minute, flowers mauve in dense terminal panicles.

*THYMELAEACEAE*

det. B. Verdcourt & L. Boulos, Kew 1987

**Gnidia somalensis** (Franch.) Gilg. — 16984, 17061.

Shrub, to 40 cm high, stems much branched; leaves narrowly lanceolate, to 3 cm long; flowers yellow, in terminal heads, subtended by conspicuous green bracts.

*TILIACEAE*

det. L. Boulos, 1987

**Corchorus depressus** (L.) Stocks — 16520, 16592, 16624.

Perennial procumbent, stems much branched; leaves small, broadly ovate, long-petioled; flowers yellow; fruit cylindrical, stiff, to 1.4 cm long, 2 mm broad.

**Corchorus trilocularis** L. — 16846, 17026.

Annual erect herb, stems much branched; leaves broadly ovate to elliptic to 5 cm long, dentate; flowers yellow; fruit cylindrical, to 5 cm long, 2 mm broad.

**Grewia erythraea** Schweinf. — 17013, 17064, 17081.

Shrub, stems stiff, much branched, leaves cuneate, flowers white; fruit orange, in clusters of 3-4.

**Grewia tenax** (Forsskål) Fiori — 16681, 16702, 16722.

Shrub or small tree to 3 m high; leaves orbicular, long-petioled; sepals reddish-brown, petals white, fruit greenish-yellow.

*TYPHACEAE*

det. L. Boulos, 1987

**Typha domingensis** Pers. — 16891.

Monoecious, perennial, marsh plant, to 2 m high; leaves to 1 m long, narrowly linear; male flowers overtopping female flowers on a long brownish dense spike.

*UMBELLIFERAE*

det. C. C. Townsend &amp; L. Boulos, Kew 1987

***Pimpinella etbaica*** Schweinf. — 16527.

Delicate annual, flowers white.

*URTICACEAE*

det. L. Boulos, Kew 1987

***Forsskaolea tenacissima*** L. — 16776, 16813.

Perennial erect herb, stems much branched; leaves sticky, whitish on lower surface; flowers in small axillary clusters.

***Forsskaolea viridis*** Ehrenb. New to South Yemen — 16533.

Annual erect herb, stems much branched, leaves green; flowers small, in axillary clusters.

*VERBENACEAE*

det. B. Verdcourt &amp; Sebsebe Demissew, Kew 1987

***Lantana viburnoides*** (Forsskål) Vahl — 16721, 16791.

Shrub, stems much branched; leaves ovate to elliptic, serrate; flowers white.

*VITIDACEAE*

det. L. Boulos, Kew 1987

***Cissus quadrangularis*** L. — 16629.

Vine, stems quadrangular, leaves fleshy, flowers creamy.

***Cissus rotundifolia*** (Forsskål) Vahl — 16670, 16847.

Vine; leaves orbicular, to 8 cm diameter, fleshy; flowers greenish, in lax panicles; fruit to 8 mm long, 6 mm broad.

***Cyphostemma ternatum*** (Forsskål) Descouings — 16937.

Vine; leaves dentate, undulate, fleshy; flowers in open panicles; fruit to 6 mm long.

*ZYGOPHYLLACEAE*

det. M. N. El-Hadidi, Kew 1987

***Fagonia hararensis*** Hadidi. New to Arabia — 16919.

Perennial; leaves unifoliolate, to 6 mm long, 4 mm broad, glandular hairy, sticky; flowers mauve. According to EL-HADIDI (1978) this species is only known from the type locality in Harar, Ethiopia.

***Fagonia isotricha*** Murb. var. *isotricha* — 16928, 16945, 17009.

Perennial; leaves succulent, 3-foliolate; flowers mauve.

***Fagonia ovalifolia*** Hadidi — 16588.

Annual; leaves unifoliolate, narrowly-elliptic; flowers mauve.

***Fagonia paulayana*** Wagner & Vierh. — 16524, 16619.

Annual; leaves unifoliolate narrowly-linear; flowers long-pedicelled, mauve.

**Fagonia schweinfurthii** Hadidi — 16594, 16884.

Annual; leaves 1-foliolate and broadly elliptic at lower branches, 3-foliolate and narrowly linear on upper branches, central leaflet longest; flowers mauve.

**Fagonia socotrana** (Balf. f.) Schweinf. var. **socotrana** — 17078.

Shrub; leaves succulent, unifoliolate, almost orbicular, to 1 cm; flowers mauve.

**Kelleronia gillettiae** Baker f. var. **gillettiae** — 16969.

Shrub to 1.2 m high, leaves to 8-foliolate; flowers yellow, conspicuous.

**Tribulus omanense** H. Hosni var. **nova** ined. — 16585.

Perennial procumbent herb, stems much branched; leaves greyish green, densely white hairy, flowers yellow; fruit conspicuously winged.

**Tribulus parvispinus** Presl — 16703, 16745.

Annual procumbent herb, stems much branched from base, leaves greyish-green, flowers yellow, fruit with small spines.

**Tribulus pentandrus** Forsskål var. **pentandrus** — 16789.

Annual procumbent herb; leaves greyish green, white-hairy; flowers yellow small, fruit with crested spines.

**Tribulus terrestris** L., s.l. — 16829.

Annual procumbent herb, stems much branched, flowers yellow, fruit armed with long spines.

**Zygophyllum decumbens** Del. var. **decumbens** — 17055, 17093.

Shrub, stems much branched, leaves glaucous, leaflets flattened.

**Zygophyllum decumbens** Del. var. **megacarpum** H. Hosny — 17005.

Shrub, leaves broader and fruit larger than in the above variety.

**Zygophyllum hamiense** Schweinf. — 16966, 17042.

Shrub, young branches and leaves whitish-green, leaflets cylindrical, fruit to 1.2 cm long.

**Zygophyllum simplex** L. — 16531, 16583, 16622, 17030.

Annual or biennial procumbent herb; leaves simple, green, cylindrical; flowers yellow, fruit small.

**Zygophyllum** sp. — 16898.

Perennial, stems much branched, purplish-green, leaves whitish-green, leaflets 1-2, cylindrical; fruit almost cylindrical, to 8 mm long, 4 mm across.

**FILICALES (ACTINIOPTERIDACEAE)**

det. L. Boulos, 1987

**Actiniopteris radiata** (Swartz) Link — 16753.

Tufted fern; fronds fan-shaped, whitish-green.

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