The native species of *Gossypium* (*Malvaceae*) in Africa, Arabia and Pakistan

K. Vollesen

Summary. 12 species of *Gossypium* are recognised as being native in the area. Of these *G. trifurcatum* Vollesen is described as new and the following new combinations are made: *G. bricchettii* (Ulbrich) Vollesen, *G. anomalum* Wawra & Peyr. subsp. *senarense* (Wawra & Peyr.) Vollesen, *G. herbaceum* L. subsp. *africanum* (Watt) Vollesen.

Because of their immense importance to man, the cultivated species of *Gossypium* have been extensively studied over the years and divided into a multitude of varieties, forms and races. It is not my intention to deal with the cultivated part of the genus although four species – *G. arboreum* L., *G. barbadense* L., *G. herbaceum* L. and *G. hirsutum* L. – are – or have been – widely cultivated in Africa. For a comprehensive list of newer literature to the cultivated species, see Fryxell (1980).

Much less attention has been given to the wild species and in particular the native African species have been largely ignored since the revision of Hutchinson (1947). Hutchinson had very limited material at his disposal, and the much richer material now available necessitates some corrections to his work. It can now be seen that his species-concept in some cases (especially in the *G. somalense*-complex) was too wide.

Fryxell (1980) in his extremely comprehensive treatment of *Gossypium* gives a key to all the species in the genus. This key depicts the phylogenetic relations between the species, but – for the practical purpose of naming specimens from a given area – it can be a bit difficult to use.

With these points in mind it was decided to attempt a review of the native African and Asian species, and at the same time provide a key which might prove more easily applicable, and which includes new species or species not accepted by Fryxell (1980).

The cited collections are all kept at Kew (K) except where otherwise indicated.

Key to the species of Gossypium native in Africa, Arabia and Pakistan

1. Leaves digitately 3-foliolate; corolla pink with wine-red centre, fading to bluish . . . . . **1. G. triphyllum**
   Leaves unlobed or ± deeply lobed but never digitately divided; corolla yellow with or without dark centre (reported pink in some specimens of *G. anomalum*). 2
2. Leaves ± deeply 3–7-lobed with at least middle lobe ± contracted at base; calyx with distinct triangular teeth 3
   Leaves unlobed or very shallowly 3-lobed, lobes triangular, never narrowed at base 5

Accepted for publication June 1986.

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions

3. Epicalyx-bracts linear to lanceolate, entire or 1–3-toothed or -fid apically . . . . . **2. G. anomalum**
Epicalyx-bracts broadly ovate to cordiform, with grossly dentate to laciniate margin (5 or more teeth per side) 4
4. Calyx-teeth longer than wide; capsule 10–13 mm long, with conspicuous black glands; seeds without white cottony lint, with brownish fuzz . . . . . **4. G. stocksii**
Calyx-teeth wider than long; capsule 15–20(–25) mm long, without black glands; seeds with white cottony lint . . . . **5. G. herbaceum**
5. Epicalyx-bracts linear to lanceolate, entire or deeply 3-fid; calyx with distinct triangular teeth. 6
Epicalyx-bracts broadly ovate to cordiform, entire to laciniate with at least 5 teeth per side 7
6. Main leaf-veins anastomosing, not reaching the entire margin; epicalyx-bracts lanceolate, narrowed at base, entire or with undulate margin . . . . . **6. G. areysianum**
Main leaf-veins running straight into the dentate margin; epicalyx-bracts linear, deeply 3-fid . . . . . **3. G. trifurcatum**
7. Leaves unlobed; epicalyx-bracts acuminate with entire margin; calyx-lobes longer than tube; corolla without dark centre **7. G. longicalyx**
Leaves shallowly 3-lobed; epicalyx-bracts dentate to laciniate or entire and rounded; calyx-lobes shorter than tube or ± obsolete; corolla with dark centre 8
8. Capsule 3–4-valved, glabrous to sparsely strigose, acute or apiculate; calyx and epicalyx gland-dotted; major epicalyx-veins all running straight into the margin 9
Capsule 5-valved, densely strigose, cuspidate; calyx and epicalyx not gland-dotted; all or at least lower epicalyx veins anastomosing; calyx with wavy margin 11
9. Capsule 13–15 mm long with 2-seeded locules; calyx with an irregular number of triangular teeth . . . . . **9. G. sp. A.**
Capsule up to 11 mm long with 1-seeded locules 10
10. Calyx with distinct triangular teeth; corolla gland-dotted . . . . . **8. G. incanum**
Calyx with wavy margin or broad rounded lobes; corolla not gland-dotted . . . . . **10. G. somalense**
11. Epicalyx-bracts laciniate towards apex with apical veins running into the teeth . . . . . **11. G. bricchettii**
Epicalyx-bracts entire or subentire with all the veins anastomosing . . . . . **12. G. benadirense**

Enumeration of the species

1. Gossypium triphyllum (*Harv.*) *Hochr.* in Bull. Herb. Boiss., 2: 1004 (1902). Type: Namibia, Damaraland, *Miss Elliott* s.n. (holotype TCD). Fig. 1A, Map 3.

Fugosia triphylla Harv. in Harv. & Sond., Fl. Cap. 2: 588 (1862).
Cienfugosia triphylla (Harv.) K. Schum. in Bot. Jahrb. Syst. 10: 47 (1888).
Gossypium anomalum Wawra & Peyr. subsp. *triphyllum* (Harv.) Roberty in Candollea 13: 26 (1950).

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions

ANGOLA. *Exell & Mendonça* 2771 (BM), *de Menezes & Henriques* 36.
BOTSWANA. *Wild & Drummond* 6952.
NAMIBIA. *Borle* 3289, *Brown* 8700 (C, K), *Dinter* 14 (BM, K), *Een* s.n. (BM), *Engler* 6220, *Hardy* 2011, *Rautanen* 56, *Story* 6289 (BM), *Walter* 1/43 (BM), *Wanntorp* 118, *de Winter* 2675, 2947, *de Winter & Leistner* 5145 (BM, K).

Among the African species, *Gossypium triphyllum* is closest to *G. anomalum*, (see Fig. 1, A & B) and artificial hybrids show a certain degree of fertility (Saunders 1961). But where the two coexist (the border area between Angola and Namibia), natural hybrids have never been recorded. Fryxell (1980), on the other hand, considers them to belong to two different subgenera.

2. Gossypium anomalum *Wawra ex Wawra & Peyr.* in Sitzber. Math.-Nat. Akad. Wiss. Wien Cl. 38: 561 (1860). Types: Angola, *Wawra* 262 & 285 (syntypes W). Fig. 1, B. Map 1.

subsp. **anomalum**

Hibiscus anomalus (Wawra & Peyr.) O. Ktze., Rev. Gen. Pl. 1: 68 (1891).
Cienfugosia anomala (Wawra & Peyr.) Gürke in Bot. Jahrb. Syst. 19, Beibl. 48: 2 (1894).
Cienfugosia pentaphylla K. Schum. in Bot. Jahrb. Syst. 10: 48 (1888). Type: Namibia, *Marloth* 1321 (holotype B destroyed, fragment K!).
Gossypium microcarpum Welw. ex Gürke in Bot. Jahrb. Syst. 19, Beibl. 48: 2 (1894), nom. nud.

ANGOLA. *Barbosa* 9787; *Carisso & Mendonça* 632 (BM, FT), *Carisso & Sousa* 297 (BM), 340 (BM); *Exell & Mendonça* 2271 (BM), 2369 (BM), 2697 (BM); *Gossweiler* 267, 4936 (BM, K), 10875 (BM, K), 12086 (BM), 12119 (BM), s.n., Cabinda; *Henriques & Brites* 1117 (BM), *Henriques & Moreno* 55 (BM); *Humbert* 16089 (BM); *de Menezes* 285; *Santos* 1039 (BM, K); *Teixeira* 346 (BM); *Welwitsch* 5220 (BM), 5221 (BM, C, K).
NAMIBIA. *Fleck* 471, *Giess* 3023, *Hardy* 2071, *Ihlenfeldt et al.* 3098, *Leippert* 4778 (BM), *Lindney* s.n., *Macdonald* 579 (BM), *Oliver et al.* 6561, *Pearson* 9129, 9175, *Tölken & Hardy* 834, *van Vuuren* 1183, *de Winter* 3154, *de Winter & Leistner* 5342, 5845.

subsp. **senarense** (*Wawra & Peyr.*) *Vollesen* comb. nov. Map 1.

Gossypium senarense Fenzl ex Wawra & Peyr. in Sitzber. Math.-Nat. Akad. Wiss. Wien Cl. 38: 561 (1860). Type: Sudan, *Kotschy* 90 (holotype W; isotype K!).
Gossypium capitis-viridis Mauer in Trudy Sredne Aziatsk. Gosud. Univ. Lenina, n.s. 18: 19 (1950). Type: Cap Verde Islands, *Stewart* 5020 (holotype LE).
Gossypium barbosanum Phillips & Clement in Bot. Mus. Leafl. 20: 214 (1963). Type: Cultivated, seeds from Cap Verde Islands, *Phillips & Clement* 891 (holotype US (Econ. Herb. Oakes Ames)).
Gossypium herbaceum L. (1753) var. *steudneri* Schweinf. ex Gürke in Bot. Jahrb. Syst. 19, Beibl. 48: 2 (1894), nom. nud.
Gossypium anomalum Wawra & Peyr. (1860) var. *steudneri* Roberty in Candollea 13: 27 (1950), non Schweinf. ex Gürke (1894), nom. illegit.

NIGER. *Newby* 112, *Popov* 60/24 (BM), *Vaillant* 791.
CHAD. *Chevalier* 11063, 11066, *Gaston* 1237, *J. B. Hutchinson* 113 (BM).
SUDAN. *Aglen* 56, *Hanza* 62, *MacMichael* 1536.

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions

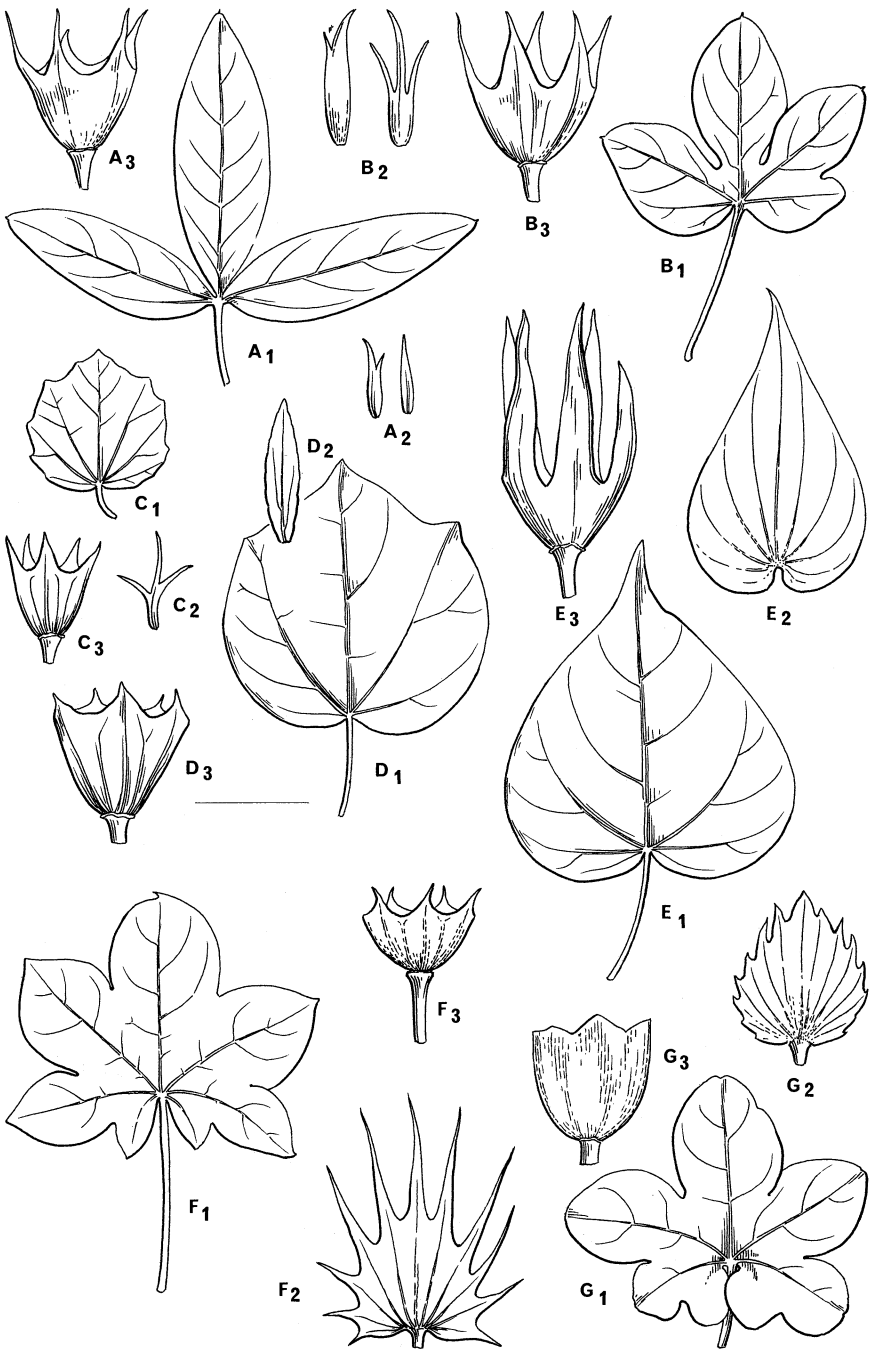


FIG. 1. *Gossypium* spp. **A** *G. triphyllum*; **B** *G. anomalum*; **C** *G. trifurcatum*; **D** *G. areysianum*; **E** *G. longicalyx*; **F** *G stocksii*; **G** *G. herbaceum* spp. *africanum*. Leaf (**1**) × ⅔; epicalyx-bract (**2**) × 1; calyx (**3**) × 2. **A 1** from *Wanntorp* 118, **2–3** from *de Winter* 5145. **B 1–3** from *Aglen* 56. **C 1–3** from *Hemming* 1822. **D 1–3** from *Anthony* 92. **E 1** from *Greenway & Kanuri* 14193, **2–3** from *Greenway & Kanuri* 14206. **F 1** from *Radcliffe-Smith* 5344, **2–3** from *Glover & Gilliland* 895. **G 1** from *Ngoni* 511, **2–3** from *Lugard* 198. Drawn by Eleanor Catherine.

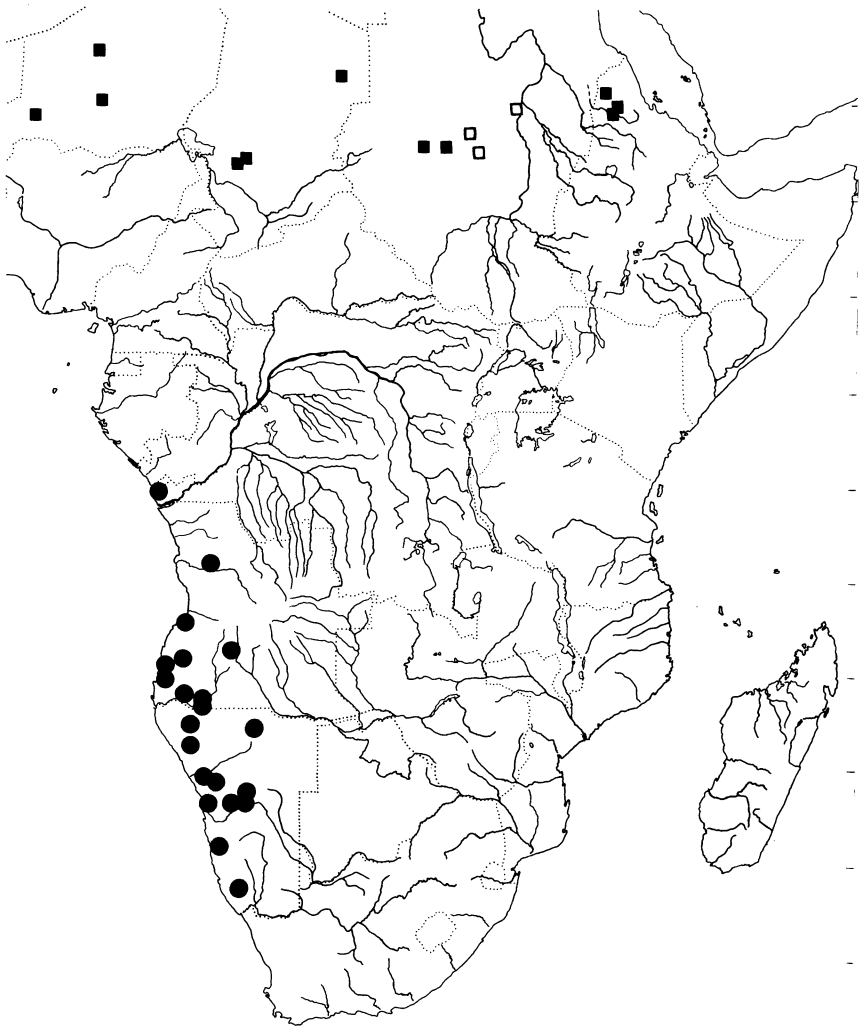
This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions

ETHIOPIA. *Baldrati* D.88 (FT), *Bartolommei-Gioli* 18 (FT), *O. Beccari* 215 (FT), *Pappi* 6065 (FT), 7734 (FT), *Steudner* 1134.

Saunders (1959) studied the variation within *G. anomalum* and concluded that there was no basis for dividing the species into infraspecific taxa. However, the material now available of wild plants has convinced me that the species can be safely divided.

The material from Northern Africa can be consistently separated from that from Southern Africa by the presence of long spreading simple hairs on the young branches and petioles. This, coupled with the large disjunction (see Map 1), seems sufficient to keep them as two separate subspecies.

Some collections from southern Africa do have long spreading hairs, but



MAP 1. Distribution of *Gossypium anomalum* subsp. *anomalum* (●) and subsp. *senarense* (■). Open squares are records from *Knight* (1949).

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions

these on close examination always prove to be stellate hairs with long branches.

There is nothing in the descriptions to suggest that *G. capitis-viridis* and *G. barbosanum* are anything but straightforward synonyms of *G. anomalum* subsp. *senarense*. Fryxell (1980) has already reduced *G. barbosanum* to a synonym of *G. capitis-viridis*, and the differences are really much less clear-cut than his key suggests. The 5–7-lobed leaves on the type of *G. barbosanum* can easily be explained by it being a vigorous cultivated specimen. Some vigorous specimens of subsp. *anomalum* from Namibia (e.g. *Hardy* 2071) have 7-lobed stem-leaves with a weak tendency to lobing of the central lobe. *G. anomalum* often has 3- or 4-loculed capsules and deeply 3-fid epicalyx-bracts.

Knight (1949) was the first to comment on the relict-like distribution of *G. anomalum* in N Africa. See also distribution of *G. somalense* in the same area.

3. Gossypium trifurcatum *Vollesen* sp. nov. ab omnibus ceteris speciebus *Gossypii* foliis non lobatis grossedentatis et bracteis epicalycis linearibus profunde trifurcatis differt. Typus: Somalia, *Hemming* 1822 (holotypus K; isotypus EA). Fig. 1, C. Map 4.

Shrub to 1 m; all parts stellate tomentellous, stems gradually becoming glabrous, older branches greyish. Leaves not gland-dotted; petiole 2–4 mm long; stipules 2–4 mm long, subulate to linear, lamina up to 3·5 × 4 cm, cordiform to broadly so, unlobed (or some very shallowly 3-lobed), grossly dentate, 5–7-veined from base with main veins running straight into the margin and terminating in the larger teeth, apex acute to rounded, base subcordate to shallowly cordate. Flowers in 1-flowered axillary cymes (often 1–2 extra buds present but these aborting at an early stage); pedicels 1–3 mm long, subtended by leafy bracts. Epicalyx-bracts 3, linear, deeply divided into 3 linear lobes (the two lateral sometimes with two small additional teeth near base), middle lobe 6–12 mm long, side-lobes 2–6 mm long, with black glands under indumentum. Calyx 5–7 mm long, with black glands, with 5 triangular acuminate teeth c. 2 mm long each with a strong central rib-like vein and two weaker commissural veins. Corolla pale yellow (turning reddish with age) with dark maroon centre, exposed parts in bud pink, funnel-shaped; petals 1·5–2 cm long, obovate with irregularly crenulate upper margin; column c. 7 mm long, densely covered with subsessile stamens except at base; style protruding c. 1 cm from column, with dark glands; stigmas coherent. Capsule c. 8 mm long, glabrous, with black glandular pustules, retuse at apex, locules 1-seeded; seed with brownish "fuzz".

Somalia *Gillett et al.* 23071.

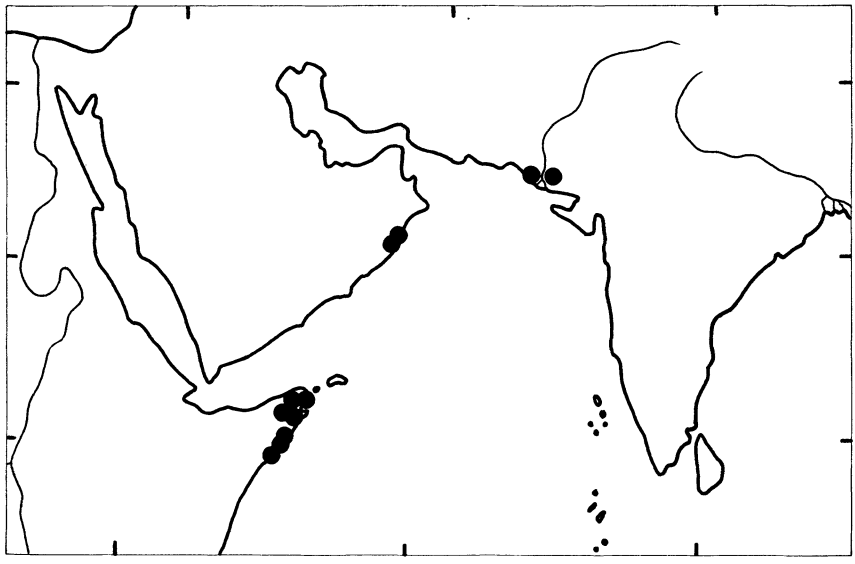
G. trifurcatum seems – on account of its epicalyx-bracts – closest to *G. anomalum*. It is the only species of *Gossypium* with dentate leaves. All other species have either unlobed entire leaves or lobed leaves with entire lobes.

4. Gossypium stocksii *Mast.* in Hooker, Fl. Brit. Ind. 1: 346 (1874). Types: India, *Dalzell* 4 (lectotype K!, selected here), *Stocks* 469 (syntype K!). Fig. 1F, Map 2.

Somalia. *Beckett* 693, *Collenette* 122 (FT, K), *Gillett et al.* 22961, 23100, 23427B, *Glover & Gilliland* 895, *Hemming* 1678, *Merla et al.* s.n. (FT), *Puccioni & Stefanini* 688 (FT), 805 (FT), 833 (FT), 1015 (FT).

Oman. *Bent* 173, *Maconochie* 2984, *Miller* 2303, *Radcliffe-Smith* 5344, *Vesey-*

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions



MAP 2. Distribution of *Gossypium stocksii*.

Fitzgerald 12756/2 (BM), 12810/5 (BM).

PAKISTAN. *Cooke* s.n., Sind (BM, K), *Stearn* 8, *Watt* s.n.

Despite its large distribution-area this species shows surprisingly little variation, and there is certainly no basis for recognising infraspecific taxa. Superficially it may look somewhat like the cultivated *G. herbaceum*, but it is immediately recognised by the absence of cottony lint on the seeds and the well-developed calyx-lobes. Artificial hybrids between the two are sterile (Saunders 1961). Sterile artificial hybrids with *G. somalense* have also been produced, but the distributions of the two species are mutually exclusive (Maps 2 & 3), and natural hybridisation is therefore not likely.

5. Gossypium herbaceum *L.*, Sp. Pl. 2: 693 (1753). Type: Cultivated specimen, probably from Asia Minor.

subsp. **herbaceum**

For references and synonomy to this widely cultivated taxon, see Fryxell (1980).

subsp. **africanum** *(Watt) Vollesen*, comb. nov. Fig. 1G, Map 4.

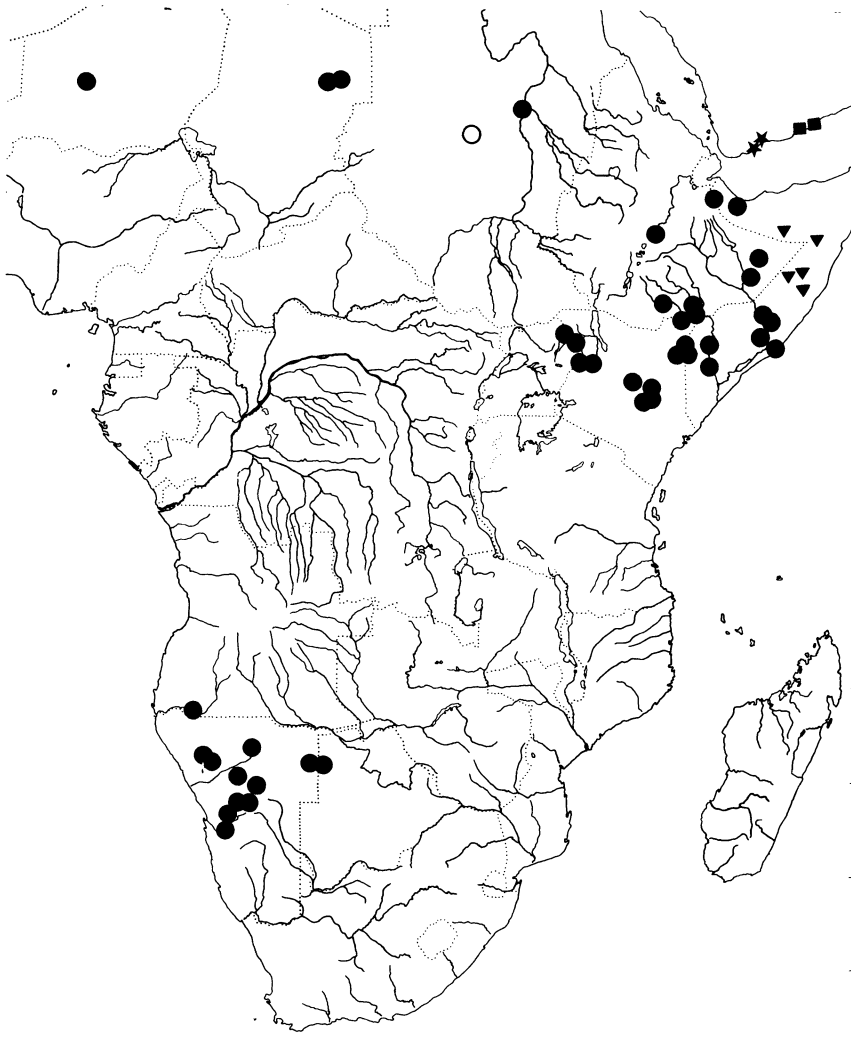
Gossypium obtusifolium Roxb. ex G. Don, Gen. Hist. 1: 487 (1831) var. *africanum* Watt, Wild and Cult. Cotton Pl.: 153, t. 23 (1907). Type: Botswana, *Lugard* 198 (holotype K!).

Gossypium africanum (Watt) Watt in Bull. Misc. Inf. 1926: 205 (1926).

Gossypium transvaalense Watt in Bull. Misc. Inf. 1926: 207 (1926). Type: Transvaal *Burtt Davy* 369 (holotype K!).

Gossypium africanum (Watt) Watt var. *bracteatum* Watt in Bull Misc. Inf. 1926: 206 (1926). Type: Moçambique, *W. Johnson* 76a (holotype K!).

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions



MAP 3. Distribution of *Gossypium triphyllum* (●, southern Africa), *G. somalense* (●, northern Africa), *G. bricchettii* (▼), *G. areysianum* (★) and *G. incanum* (■). Open circle is record from *Knight* (1949).

Gossypium herbaceum L. var. *africanum* (Watt) Hutch. & Ghose in Ind. Journ. Agric. Sci. 7: 250 (1937).

MOZAMBIQUE. *Bolus* 7680, *de Carvalho* s.n., *Gomes & Sousa* 532, 3470, *Hornby* 732, *Jansen et al.* 7561, *Pedro* 44, s.n., *Pedro & Pedrogao* 643, 908, 1192, 1270, 1400, 1410, 1959, 2002, 2032, *Pedrogao* 242, 283, 316, 344, 362, *Rogers* 21351, *Smuts* 321.

ZIMBABWE. *Eyles* 1195, *Goodier* 655, *Müller* 663, *Plowes* 3423.

BOTSWANA. *Drummond & Seagrief* 5159, *Ngoni* 511, *Pole Evans* 3311, *Pope et al* 823, *Powell* 904, *P. A. Smith* 100, 150, 3121 (C), *Story* 4699.

ANGOLA. *de Silva* 2996, *Simpson* 1.

NAMIBIA. *Louw* s.n., *Rautanen* 59, *Rodin* 8966, *de Winter* 3642.

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions

SWAZILAND. *Prior* 138, *Rodin* 4214.

TRANSVAAL. *Codd* 4833, 5219, *Galpin* 742, *Gerber* 17, *Gouveia & Pedro* 1595, *J. Hutchinson* 22, *J. Hutchinson & Pole Evans* 2654, 2684, *van Jaarsveld* 1207, *Leemann* 120, *Pole Evans* 838, 1448, 1466, 1924, *Rehmann* 5227, *Rogers* 107, 2647, 6997, 20870, *Schlieben* 7443, *Story* 4842, *Strey* 3470, *Strey & Schlieben* 8634, *Thorncroft* 74.

NATAL. *Repton* 6006, *Strey* 6596, *Stephen & Craan* 985, 1336, 1364, *Ward* 1470, *Wells* 2214.

Hutchinson (1954) discusses the origin of cultivated cotton and argues convincingly for the idea that the cultivated forms of *G. herbaceum* are directly descended from this taxon, which is the only wild taxon in the genus with lint. It has been argued that the wild form in southern Africa is merely plants originally escaped from cultivation but this is contradicted by several facts. One of the more compelling arguments (Hutchinson 1954) is that it has its own moth, the larvae of which live only on the wild form and not on the cultivated forms. Its restricted distribution (Map 4) also contradicts the escapee-theory. If it were an escaped plant it would be expected to be widespread in the rest of the distribution-area of *G. herbaceum*.

Hutchinson (1954), Saunders (1961) and Fryxell (1980) still consider this taxon to be only a variety, but examination of the large amount of recent material from southern Africa has convinced me that it is better considered as a subspecies and a very distinct one at that. It seems that the extensive breeding of subsp. *herbaceum* has brought the two taxa to the verge of genetic incompatibility. Where subsp. *herbaceum* has been grown within the area of subsp. *africanum* (e.g. southern Malawi) no intermediates seem to occur. However, a few intermediate collections have been seen from the Sudan (e.g. *Pfund* 474) and Pakistan (e.g. *Jafri* 2444) which seem to make it more reasonable to treat them as two subspecies. Whether these indicate a former much wider distribution of the same type as *G. anomalum* and *G. stocksii* or are just to be considered occasional throwbacks to the more original type can hardly be decided on the basis of this meagre material.

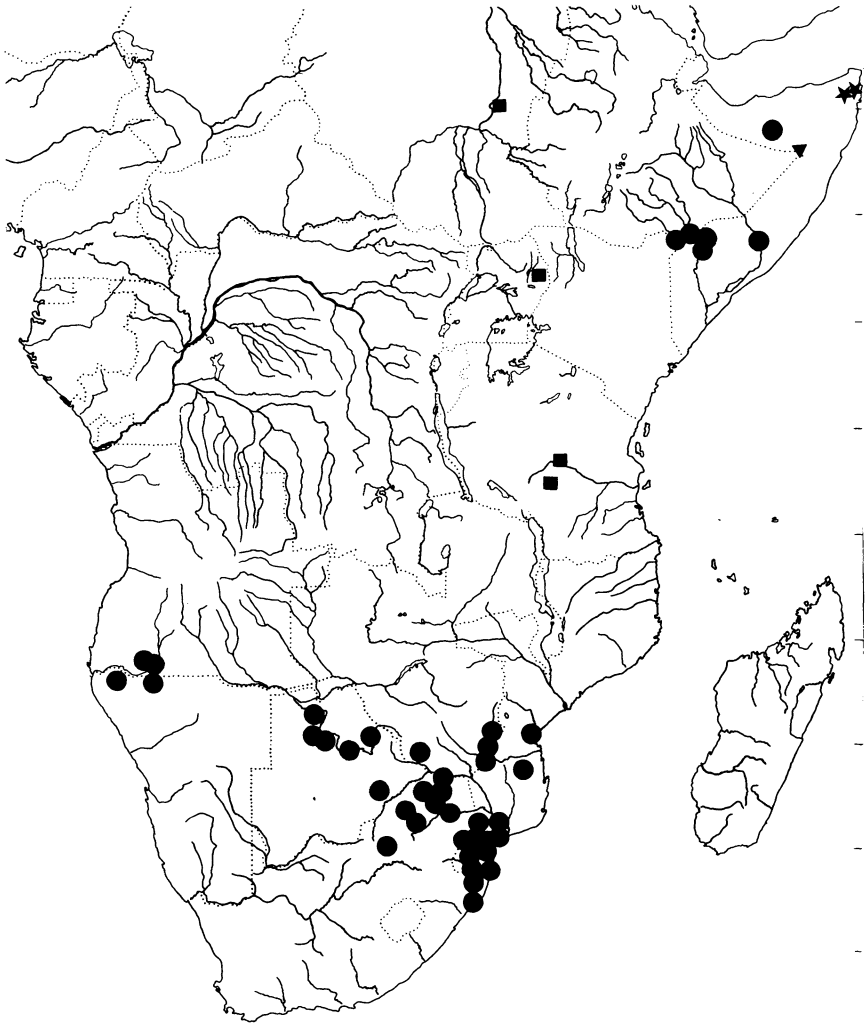
The only character which invariably separates subsp. *herbaceum* is the absence of long simple hairs on stems and petioles. As is the case in *G. anomalum* (see p. 341), some collections of subsp. *africanum* may have quite long spreading hairs, but these will on closer examination prove to be stellate hairs with long branches.

A number of further characters ± completely separate the two taxa: the stipules are shorter (3–8(–9) mm in subsp. *africanum* and (6–)9–15 mm in subsp. *herbaceum*). The calyx is usually ciliate, which is only rarely the case in ssp. *herbaceum*. The capsule is shorter (1·5–2(–2·5) cm in subsp. *africanum* and 2–3·2 cm in subsp. *herbaceum*) and opens up much more widely when mature. The capsule characters are no doubt a direct response to selection for larger fruits in cultivated subsp. *herbaceum*, but it is difficult to see why the other characters should have developed like this as a response to breeding.

6. Gossypium areysianum *Defl.*, Esq. de Geogr. Bot.: 49 (1894). Type: South Yemen, *Deflers* 1058 (holotype P!). Fig. 1D, Map 3.

Fugosia areysiana (Defl.) Defl. in Bull. Soc. Bot. France 42: 299 (1895).
Gossypium anomalum Wawra & Peyr. (1860) subsp. *areysianum* (Defl.) Roberty in Candollea 13: 27 (1950).

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions



MAP 4. Distribution of *Gossypium herbaceum* subsp. *africanum* (●, southern Africa), *G. benadirense* (●, northern Africa), *G. longicalyx* (■), *G. trifurcatum* (★) and *G. sp. A.* (▼).

S. YEMEN: *Anthony* 92 (BM, K), *Hearn* 1 (BM).

This species is only known from three collections from the coastal plains of the People's Democratic Republic of Yemen (South Yemen). It is very easily recognized by its lanceolate to narrowly elliptic epicalyx-bracts spreading widely from the calyx and its well-developed inflorescences with up to five flowers.

According to Saunders (1961), *G. areysianum* is closely related to *G. incanum, somalense* and *stocksii* and artificial hybrids are quite easily produced in cultivation although they are invariably sterile. In nature, however, these species all occur in different areas (see maps) and natural hybridization is therefore extremely unlikely to occur. No natural hybrids have ever been recorded.

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions

7. Gossypium longicalyx *J. B. Hutchinson & Lee* in Kew Bull. 13: 221 (1958). Type: Tanzania, *Disney* 33 (holotype EA, photo K!). Fig. 1E, Map 4.

SUDAN. *Broun* 43 (BM).

UGANDA. *J. B. Hutchinson & Lee* 1 (K) & 2 (BM), both grown from seeds from type-locality in Tanzania. *Wilson* 390 (a loose label at Kew, no specimen found, orig. at EA).

TANZANIA. *Greenway & Kanuri* 14193, 14206.

Gossypium longicalyx is morphologically very isolated in Africa. Unlobed leaves, entire cordiform cuspidate epicalyx-bracts and a large deeply lobed calyx are unique among the African species. As pointed out by Saunders (1961), it is in some respects (e.g. entire leaves) more reminiscent of the native American species.

This is another species with a very extraordinary relict-like distribution. It is the only one whose distribution to a certain extent bridges the gap between the northern and southern centres of distribution. Compare maps 1–3.

8. Gossypium incanum (*Schwartz*) *Hillcoat* in Empire Cotton Growing Rev. 36: 165 (1959). Type: South Yemen, Hadramaut, Ras Fartali, *Paulay* s.n. (holotype W). Fig. 2D, Map 3.

Cienfugosia incana Schwartz in Mitt. Inst. Allg. Bot. Hamburg 10: 165 (1939).

S. YEMEN. *Guichard* 139 (BM), *Maxwell Darling & Proctor* 95 (BM, K), *Proctor* 3 (BM).

Like *G. areysianum*, a species with a very restricted distribution along the coast of the People's Democratic Republic of Yemen. It is clearly related to *G. somalense* and the species around it, but differs in having a calyx with well-developed triangular lobes. Saunders (1961) reports that it produces sterile hybrids with *G. somalense* in cultivation.

9. Gossypium sp. A. Fig. 2E, Map 4.

SOMALIA. *Hemming & Watson* 3156.

This species superficially resembles *G. incanum* from Yemen but has a much larger hairy capsule with 2-seeded locules. It also produces 2–4-flowered inflorescences whereas the flowers are always in 1-flowered cymes in *G. incanum*. Of the 5 calyx teeth, 1–2 are triangular acute teeth distinctly longer than wide, while the other three are broader than wide and approach the broadly rounded or almost obsolete teeth of the following species (see Fig. 2C). More material is needed of this plant before it can be confidently described as a new species.

10. Gossypium somalense (*Gürke*) *J. B. Hutchinson,* Evol. Gossyp.: 31 (1947). Type: Somalia, *Ellenbeck* 220 (holotype B†). Fig. 2C, Map 3.

Cienfugosia somalensis Gürke in Bot. Jahrb. Syst. 33: 380 (1903).

Cienfugosia ellenbeckii Gürke in Bot. Jahrb. Syst. 33: 381 (1903). Types: Ethiopia, *Ellenbeck* 2069 & 2082 (syntypes B†).

Gossypium ellenbeckii (Gürke) Mauer in Trudy Sredne-Aziatsk. Gosud. Univ. Lenina, n.s. 18: 19 (1950).

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions

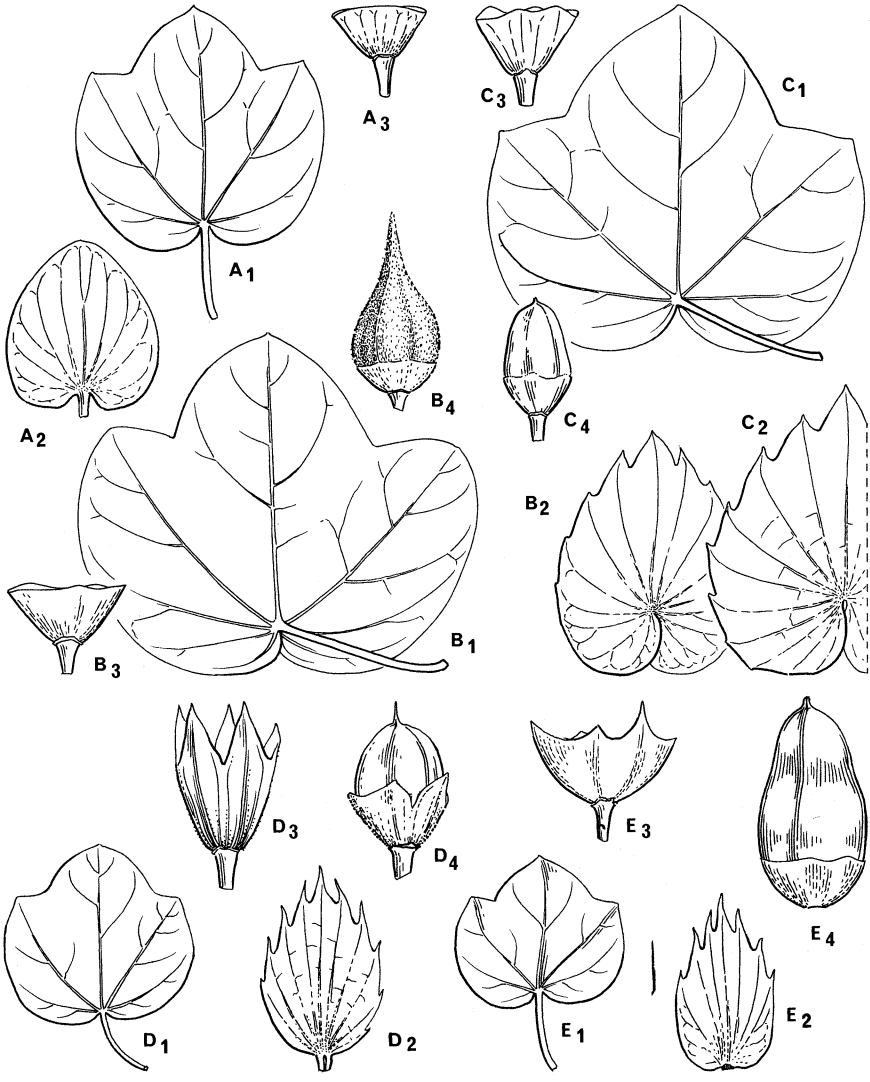


FIG. 2. *Gossypium* spp. **A** *G. benadirense*; **B** *G. bricchettii*; **C** *G. somalense*; **D** *G. incanum*; **E** *G. sp. A*. Leaf **(1)** × ⅔; epicalyx-bract **(2)** × 1; calyx **(3)** × 2; capsule **(4)** × 1½. **A 1 & 3** from *Gillett* 13286, **2** from *Gilbert et al.* 7597. **B 1** from *Gillett* 23139, **2–4** from *Bally* 9592. **C 1** from *Bally* 14934, **2–4** from *Gilbert et al.* 7414. **D 1–4** from *Maxwell Darling* 95. **E 1–4** from *Hemming & Watson* 3156. Drawn by Eleanor Catherine.

Gossypium paolii Mattei in Boll. Stud. Inform. R. Giord. Palermo 2 (4): 223 (1916). Type: Somalia, *Paoli* 543 (holotype FT!).

NIGER. *Popov* 86 (BM).

CHAD. *J. B. Hutchinson* 86 (BM), *Vinchon* s.n. (BM, K).

SUDAN. Unknown collector, Omdurman (BM, K).

ETHIOPIA. *Barnes* s.n. (FT), *Friis et al.* 2840, *Gilbert* 3460, *Gilbert et al.* 7414, 7648, *James & Thrupp* s.n.

SOMALIA. *Gillett* 4507 (FT, K), *Gillett et al.* 23209, 24769, *Kevan* s.n. (BM, K),

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions

Pignatti s.n. (FT), *Puccioni & Stefanini* 114 (FT), 160 (FT).
UGANDA. *Wilson* 862, 1267.
KENYA. *Adamson* EAH 13542 (FT, K), *Bally* 5041, 12821, *Bally & Radcliffe-Smith* 14549, 14934, 14971, *Gilbert & Thulin* 1223, *Gillett* 13331 (FT, K), 21101, *Kirrika* 99, *Mathew* 6816 (FT, K), *Powys* 275, *Sampson* 35 (BM, K).

From the Sudan westwards *G. somalense* has a very relict-like distribution (Map 3). It is quite likely that further collecting in coastal Ethiopia will show the distribution to be more continuous. Compare distribution of *G. anomalum* subsp. *senarense* (Map 1).

11. Gossypium bricchettii (*Ulbrich*) *Vollesen* comb. nov. Fig. 2B, Map 3.

Cienfugosia bricchettii Ulbrich in Bot. Jahrb. Syst. 48: 378 (1912). Type: Somalia, *Robecchi-Bricchettii* 338 (holotype FT!).

SOMALIA. *Bally* 9592, *Beckett* 1402, *Gillett et al.* 21941, 23139.

12. Gossypium benadirense *Mattei* in Boll. Stud. Inform. R. Giord. Colon. Palermo 2 (4): 223 (1916). Type: Somalia, *Paoli* 995 (holotype FT!). Fig. 2A, Map 4.

ETHIOPIA. *Gilbert et al.* 7597.
SOMALIA. *Gillett et al.* 24284, *Hemming* 2080 (FT, K), *Kuchar* 15609.
KENYA. *Gillett* 13286 (FT, K).

These last two species are both closely related to *G. somalense*, and both were included in it by Hutchinson (1947). This point of view was accepted by Saunders (1961) and Fryxell (1980). Since Hutchinson's revision much new material from Ethiopia, Kenya and Somalia has become available, and it now seems impossible to accept all the material in one species. I consider that there are three distinct species in this group. The most important distinguishing characters are found in the fruit where there is a division between *G. somalense* with 3–4-valved and *G. benadirense-bricchettii* with 5-valved capsules.

REFERENCES

Fryxell, P. A. (1980). The natural history of the cotton tribe. 245 pp. Texas A & M University Press.
Hutchinson, J. B. (1954). New evidence on the origin of the Old World cottons. Heredity 8: 225–241.
——, Silow, R. A., & Stephens, S. G. (1947). The evolution of *Gossypium* and the differentiation of the cultivated cottons. 160 pp. Oxford University Press, London.
Knight, L. (1949). The distribution of wild species of *Gossypium* in the Sudan. Empire Cotton Growing Review 26: 278–286.
Saunders, J. H. (1959). Studies in the wild species of cotton. I. Variation within *Gossypium anomalum*. Heredity 13: 249–260.
—— (1961). The wild species of *Gossypium* and their evolutionary history. 62 pp. Oxford University Press, London.

This content downloaded from 170.140.26.180 on Sun, 21 Feb 2016 00:33:14 UTC
All use subject to JSTOR Terms and Conditions