

## *Euphorbia gummifera*, *E. gregaria* and a new species from Damaraland

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### ABSTRACT

The identity of *Euphorbia gummifera* Boiss. and *E. gregaria* Marl. is discussed and a new species, *E. damarana* Leach, is described. A key to the species including *E. carunculifera* Leach from southern Angola and a map showing their distribution are provided. The possible significance of these species in the phylogeny of the genus is also discussed.

Some morphological deviations from the norm for the genus might, at first, seem to justify the exclusion of *Euphorbia gummifera* Boiss. *E. gregaria* Marl. and *E. damarana* Leach (described on p. 000) from *Euphorbia*. The most important deviations are found in the relatively large, 3-6-merous, fleshy fruits with delayed modes of dehiscence and, in *E. damarana*, a relatively thick, hard, woody septate endocarp; this species also lacks the usual partial partitions at the base of the inside wall of the involucre.

However, some at least of these deviations are to be found in other quite different and apparently scarcely related species which are, and it seems correctly, universally accepted in *Euphorbia*, for example, the large, 3-6-locular, fleshy fruits of *E. virosa* Willd. and delayed patterns of dehiscence in such widely divergent species as *E. monteiri* Hook. f., *E. lathyris* L. and an as yet undescribed geophyte from Zambia. In view of this and the apparently close affinities existing between the three species under discussion and such species as *E. hamata* Sweet, *E. garipeina* Boiss. and *E. tirucalli* L., I have little or no hesitation in accepting them as belonging in *Euphorbia* as presently constituted.

Of some historical interest in this connection are a letter signed by Radlkofer and a note by Pax which are attached to a specimen of *E. damarana* (Rautanen 208) in the herbarium of Zürich University. In the former, Radlkofer (replying, it seems probable, to Pax) makes the point that the 5-locular fruit does not necessarily exclude Rautanen's plant from Euphorbiaceae, but he nevertheless refrains from offering any suggestion regarding its correct generic placing. According to Pax's note the material is excluded from *Euphorbia* by its anastomosing laticiferous ducts. However, Boodle & Fritsch (Solereider's Systematic Anatomy of the Dicotyledons, 1908) question the accuracy of Pax's concept of the laticifers, and their doubts seem to receive justification in subsequent literature, from which it appears that no anastomoses are known in the non-articulated laticiferous cells which occur in *Euphorbia*.

These three species, together with *E. carunculifera* Leach from southern Angola, appear to form a closely related group which may be of considerable importance in relation to the phylogeny of the genus. The dioecious habit and multi-locular fruits ("multi-" in the context of *Euphorbia*) of these species are among characters usually considered to be primitive and it may be significant that these and similar

assumedly primitive traits are by no means uncommon in the same general geographical area (the Namib and its environs).

One is prompted to ask whether these characters have in fact survived because of suitable environmental conditions or have developed in response to these factors, as have geophytes and other life forms; certainly it seems probable that delayed dehiscence (not considered to be primitive) may be an adaptation to prolonged drought periods and appears to be directly comparable to the arrested development of the follicles in Stapelieae. It may also be noteworthy in this connection that several taxa possessing assumedly primitive characters (e.g. *E. virosa*, *E. damarana* and *E. carunculifera*) are often closely associated with *Welwitschia*.

Although apparently forming a distinct evolutionary group, no attempt is made at this stage to fit these species into the formal nomenclature of the subgeneric hierarchy, as it is considered that this should be left in abeyance until a much larger proportion of the species, their distribution, variation, synonymy etc. are known in greater detail than at present. Many species are still to be described, while others are so incompletely known that they are little more than names, of which even the identity is, in some instances, still subject to considerable doubt; whole areas, particularly in Africa, are virtually unknown euphorbia-wise and many important aspects (e.g. palynology), especially in relation to the succulent species, remain almost entirely unstudied. It is felt that any formal classificatory decisions reached on such inadequate information add nothing to our knowledge and lead almost inevitably to unnecessary nomenclatural complication and instability.

In large areas of their respective distributions, which extend from just south of the Orange River to north of Benguela in Angola, these gregarious plants form large colonies in which they are not only the dominant but often almost the only perennial species. The colonies sometimes extend for many kilometres and often determine the character of the vegetation over vast areas.

Vegetatively the four species are very similar in appearance and from a distance are scarcely to be distinguished from one another. However, in fruiting characteristics they are very distinctive and their distributions are sufficiently disjunct for identifications made from minor characters usually to be reliably confirmed by the locality when only sterile material is available.

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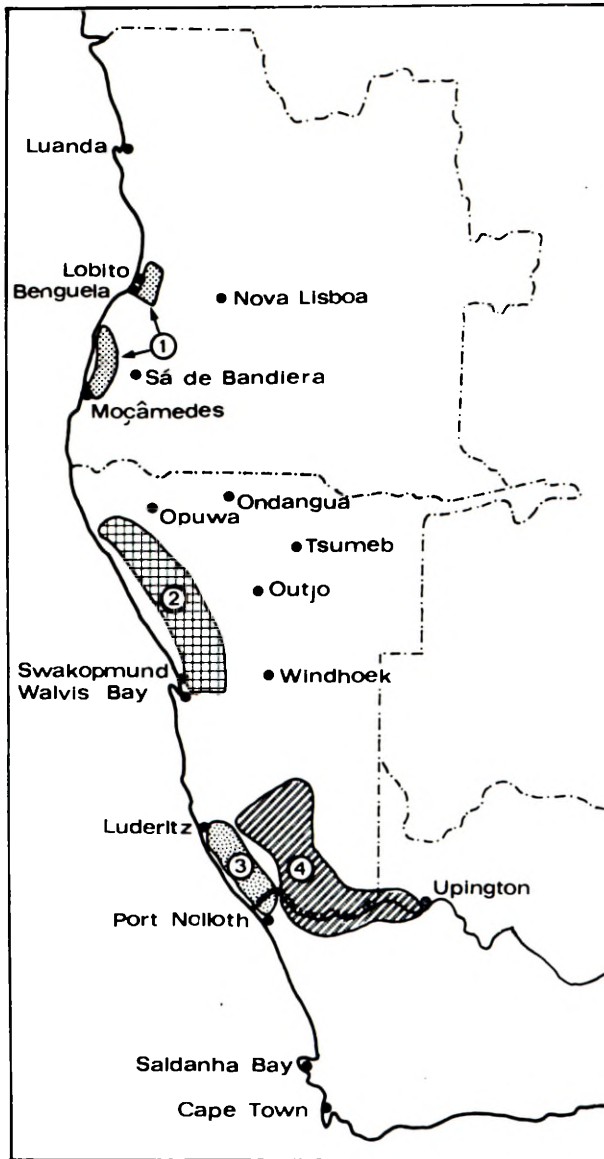


FIG. 1.—Approximate areas of distribution of *Euphorbia carunculifera*, (1), *E. damarana* (2), *E. gummifera* (3) and *E. gregaria* (4).

A key to the species, based (1) on fruiting characters and (2) on vegetative characters follows:

Gregarious, dioecious, unarmed shrubs, 1–3 m high with distinctly ribbed or terete, rod-like branches and branchlets.

(1) Key to species based on fruiting characters

Capsules very shortly exserted from the involucre:

Capsules obtusely 3–4-lobed, truncate at the base, 10–12 mm diam. Seed ecarunculate,  $\pm 5,5$  mm long and broad,  $\pm$  flat on the ventral side. . . . . *E. gummifera*

Capsules subglobose, 4–6-locular,  $\pm 20$  mm diam. Seeds ecarunculate,  $\pm 8$  mm long  $\times$  6 mm broad somewhat angular on the ventral side from being compressed on each side of the suture. . . *E. damarana*

Capsules far exserted from the involucre:

Capsules subglobose 3–5-locular,  $\pm 20$  mm diam.; pedicel  $\pm 15$  mm long abruptly decurved. Seeds ecarunculate,  $\pm 6,5$  mm long  $\times$  3,5 mm broad, usually somewhat angular on the ventral side. . . *E. gregaria*

Capsules ellipsoid or ovoid, obtusely 3–4-lobed  $\pm 10$  mm long  $\times$  8 mm diam.; pedicel 7–9 mm long, erect and straight. Seeds carunculate, obtusely 4-angled,  $\pm 4$  mm long  $\times$  3 mm diam. . . . . *E. carunculifera*

(2) Key to species based on vegetative characters

Branches relatively freely rebranched, hard and woody, usually somewhat curved, decurrently 3-ribbed from the slightly prominent but insignificant leaf scar; leaves minute, ovate, recurved, tomentulose. Shrubs averaging 1 m high; winter rainfall areas of the southern Namib, usually less than 80 km from the coast. . . . . *E. gummifera*

Branches rather sparingly rebranched above, terete (not ribbed), tough and fibrous rather than woody:

Leaf scar and inflorescence bracts provided with a pair of dark glands at their base; leaves narrowly elliptic, erect (neither recurved nor channelled), almost glabrous. Shrubs averaging 2,25 m high; Namib and adjacent areas of the southern Kaokoveld. . . . . *E. damarana*

Leaf scar and inflorescence bracts without dark glands:

Branchlets alternately or randomly produced; leaves narrowly obovate, strongly recurved, channelled, densely tomentulose. Shrubs averaging 1,5 m high; Namaqualand mainly along the Orange and Fish rivers, usually more than 100 km from the coast. . . . . *E. gregaria*

Branchlets and branches often dichotomously forked on each side of an old terminal inflorescence. Shrubs averaging 1,75 m high; southern Angola, semi-desert between Moçâmedes and Lucira. . . . . *E. carunculifera*

Difficulty may sometimes be experienced in the identification of leafless sterile specimens when branches become shrivelled in the course of drying, as a pattern of decurrent wrinkles, somewhat similar to that of the ribs in *E. gummifera*, sometimes appears, especially in specimens of *E. gregaria*. It has, unfortunately, not been possible to find a "key" character to cover such instances.

*Euphorbia gummifera* Boiss., Cent. Euphorb.: 26 (1860); in DC. Prodr. 15, 2: 97 (1862); Marloth in Trans. Roy. Soc. S. Afr. 1: 316 (1910); N.E. Br. in Thistleton-Dyer, Flora Cap. 5, 2: 295 (1915); Dinter in Feddes Repert. 17: 264 (1920–21); Range in Feddes Repert. 36: 254 (1934); White, Dyer & Sloane, Succ. Euphorb. 1: 130 (1941); Jacobsen, Handb. Succ. Pl. 1: 437 (1960); P. G. Meyer in Merxm. Prodr. Fl. S.W. Afr. 67: 26 (1967), p.p. excl. specim. *De Winter & Leistner 5709 et Merxmüller & Giess 1465*; Jacobsen, Sukk. Lexikon: 191 (1970); Giess in Dinteria 4: 60 (1971). Type: S. Africa, N. Cape. *Drège 2944 (P! S!)*.

*Euphorbia sessiliflora* E.Mey., *Drège Zwei Pfl. Docum.*—184 (1843) nom. nud., non Roxb. (1814).

Type: as above

Plant an unarmed, probably unisexual shrub, up to  $\pm 1,5$  (1,8) m high  $\times 2$  m diam., freely branched from the base, relatively freely alternately branched and rebranched above. Branches and branchlets hard and woody with a succulent grey-green bark, usually shortly decurrent at their junctions with the main branches but seldom articulated, characteristically decurrently 3-ribbed from the slightly prominent but minute leaf-scar, ultimate branchlets  $\pm 7$ –10 mm diam. Leaves minute, ovate, subacute, recurved, minutely tomentulose. Inflorescence sessile, terminal or lateral from near the apex of the branchlets, cyathia clustered; bracts scale-like red-brown, ovate, acute,  $\pm 1,5$  cm long  $\times 1$  mm wide. Involucre red, minutely whitish tomentose,  $\pm 2,5$ –3 mm long  $\times 4$ –5 mm diam. including the glands, more or less obconic, truncate at the base; glands 5–6, dark red, convex, transversely broadly elliptic or very broadly obovate, spreading or strongly deflexed, 1,0–1,5 mm wide  $\times 0,75$ –1,0 mm long; lobes 5–6, erect, broadly obovate or subquadrate, entire or dentate, densely woolly tomentose outside, woolly ciliate, glabrous within; bracteoles filamentose, finely divided and woolly at the dark reddish apex, 2,5 mm long;  $\sigma$  pedicels 2,0–2,5 mm long  $\pm 0,35$  mm diam.; filaments noticeably thicker than the pedicels,  $\pm 0,45$  mm diam., 2 mm long; anther cells and pollen bright yellow. Capsule more or less broadly ovoid, obtusely 3–4-lobed, truncate at the base, broadly subacute at the apex, 10–12 mm diam., 7–10 mm high, sparingly, minutely white puberulous; barely exerted from the involucre on a pubescent pedicel 1,5–2,0 mm long; perianth distinct but rudimentary (not merging with the capsule base). Seed more or less broadly ovoid, slightly concave at the truncate base, broadly subacute at the apex, dorsi-ventrally slightly compressed or somewhat 3-angular in section from being slightly compressed on each side of the suture, 5,5–6,0 mm long, 5–6 mm broad, 4–5 mm thick, smooth, pale creamy brown with patches of darker colour and a brown suture. (Description based partly on *Giess, Volk & Bleissner 5371* and partly on *Leach & Cannell 15072*).

SOUTH WEST AFRICA.—2615 (Luderitz): Rots Koppie (–CB), *Range 72 (SAM)*; Haalenberg (–CB), st. 28.i.1929, *Dinter 6697 (BOL; K; Z)*; *ibid.* cult. Kirstenbosch, st. July 1930, *NBG 1781/27 (BOL)*; *ibid.* fr. 2.viii.1973, *Leach & Cannell 15072 (K; LISC; M; MO; PRE; SRGH; WIND)*; *ibid.* st. Sept. 1927, *Pillans 5934 (BOL)*; *ibid.*  $\sigma$  Sept. 1927, *Pillans 5960 (BOL)*;

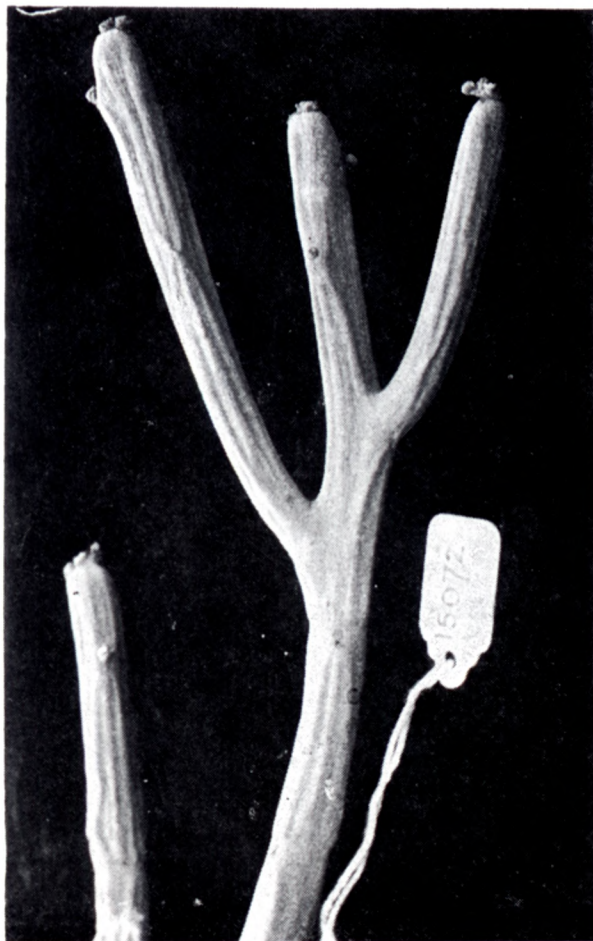


FIG. 2.—*Euphorbia gummifera*. Branch showing characteristic pattern of three ribs decurrent from the leaf scar. *Leach & Cannell 15072*.

st. 27. viii. 1919, *Pole Evans sub PRE No. H19371 (PRE)*; Tschaukaib,  $\sigma$  fl., Nov. 1908, *Marloth 4636 (PRE)*; Namib, st. 16.ix.1913 *Range 1868 (SAM)*. 2616 (Aus): Garub(Garup) (–CA), fr. 8.i.1910, *Dinter 1046 (SAM)*; 21.ii.1909, *Pearson 41743, 41752 (K)*. 2715 (Bogenfels): Pomona (–A), fr. May, 1928, *Kolle s.n. (PRE)*; fr. Jan., 1926, *Wagner sub Marloth 6804 (PRE)*; Namib near Pomona, fl. Nov., 1908, *Marloth 4636 (PRE)*. 2716 (Witpütz): Namuskluft (–DD), fr. 21.ii.1963, *Giess, Volk & Bleissner 5371 (M; WIND)*.

CAPE.—2816 (Oranjemund): between Groot Derm & Arris Drift (–B), fr. Oct., 1926, *Pillans 5234 (BOL; K)*; "Zwischen Verleptpraam und der Mündung des Gariap, unter 1000'" *Drège 2944 (P; S)*. 2817 (Violsdrif):  $\pm 27$  km from Violsdrif towards Stinkfontein (–CD), lvs. 11.v.1969, *Werger 392 (PRE; SRGH)*.

*E. gummifera* is the least widely distributed of the trio, being restricted to the winter rainfall areas of the Namib from Luderitz Bay to just south of the Orange River, usually less than 80 km from the coast.

The shrubs are the smallest of the group but are more freely rebranched than those of either of its relatives; from both of these it differs in its smaller cyathia, differently shaped, very much smaller, 3–4-lobed capsules and smaller seeds, while its hard, woody, darker coloured, ribbed branches and branchlets, which are usually decurrent at their junctions, are quite different from the terete, more rod-like branches of *E. gregaria* and *E. damarana*.

Plants appear generally to be unisexual but the remains of an involucre attached to a partially dehisced capsule (*Giess et al 5371*) bears a number of  $\sigma$  pedicels surrounding the  $\sigma$  pedicel; from this it seems that at least some individuals may be bisexual. The capsules appear to separate first between the lobes, while dehiscence appears often to be either



FIG. 3.—*Euphorbia gummifera*.  
Large numbers of plants at  
Haalenberg.



FIG. 4.—*Euphorbia gummifera*.  
Shrub  $\pm 1$  m high, showing  
freely rebranched rather  
twiggy habit. *Leach & Can-*  
*nell* 15072.

very retarded or perhaps sometimes incomplete, judging from the detached (or ready to fall) capsules found at the Haalenberg locality. The nauseous odour mentioned by Marloth was not noticed and it is thought that this may prove to be of a seasonal nature.

A specimen with prominent leaf bases, originally collected at Haalenberg, S.W. Africa, cultivated at Kirstenbosch, NBG 1781/27, "young branches pubescent", shows the relationship with *E. hamata* Sweet and *E. gariiepina* Boiss. in its atypical attenuated twigs, even more clearly than in normal wild specimens.

*Euphorbia gregaria* Marloth in Trans. Roy. Soc. S. Afr. 2: 36, t. 1, fig. 7 (1910); N.E.Br. in Thistleton Dyer, Flora Cap. 5, 2: 295 (1915); in Ann. Bolus Herb. 1: 102 (1915), "*E. gregarica*"; Dinter in Feddes Rept. 17: 264 (1920–21), p.p. excl. specim. *Dinter* 2823; Marloth, Fl. S. Afr. 2 (2): 139 (1925); Range in Feddes Rept. 36: 254 (1934); White, Dyer & Sloane, Succ. Euphorb. 1: 133 (1941);

Jacobsen, Handb. Succ. Pl. 1: 436 (1960), p.p. excl. distrib. "between Jakalswater and Usakos"; P. G. Meyer in Merxm., Prodr. Fl. S.W. Afr. 67: 26 (1967), p.p. excl. distrib. "Swakopmund Distr."; Jacobsen, Sukk. Lexikon: 190 (1970). Type, S.W. Africa, *Marloth* 4683 (B†; PRE!).

"Aggenys *Euphorbia*", Pearson in Ann. S. Afr. Mus. 9: 9(1911).

Plant an unarmed, unisexual, rounded shrub averaging about 1,5 m in height, densely branched from the base and rather less densely, alternately branched above, with the ultimate branches and branchlets 6–12 mm in diam. *Branches* ascending, erect, terete, neither ribbed nor striate in the live state, fibrous and tough, with a succulent, greyish green bark, usually somewhat tawny-tomentose towards the apex, especially on younger parts. *Leaves* caducous, sessile, narrowly obovate, subacute, rather fleshy, densely tomentose, strongly recurved, usually somewhat channelled,  $\pm 7$  mm  $\times$  2,5 mm. *Inflorescence* a densely tawny-tomentose cluster of very shortly pedunculate cymes, terminally or laterally

produced on or towards the apex of the branches and branchlets; *bracts* broadly ovate, rather fleshy; peduncles and cyme branches stout, up to  $\pm 4$  mm long (usually less), all densely tomentose. *Male cyathia* usually crowded, deciduous; involucre glabrous inside, cupshaped,  $\pm 3$  mm deep, 6–6.5 mm diam. including the glands; glands 5, distant, fleshy, spreading, sometimes slightly deflexed, more or less semicircular, lightly rugulose on the glabrous upper surface, 1.5–2.0 mm wide; lobes 5, erect, more or less subquadrate, irregularly truncate or coarsely dentate,  $\pm 1.5$  mm wide. *Male flowers*  $\pm 60$ , arranged in 5 fascicles opposite the lobes and closely grouped around an aborted female flower borne on a short pentagonal pedicel; fascicles each subtended on the inside by a pair of more or less obovate cuneate, relatively fleshy, tomentulose woolly bracts about 4 mm long; bracteoles numerous, mostly filamentose or a few membranous, more or less cuneate,  $\pm 3$  mm long, and rather woolly at the more or less truncate apex; pedicels glabrous  $\pm 3$  mm long; filaments  $\pm 1$  mm long and with the anthers glabrous. *Female involucre* densely tawny-tomentose, narrowly obconic, truncate at the base,  $\pm 6$  mm diam. including the glands,  $\pm 5$  mm long, otherwise more or less as in the male. *Ovary* densely tomentose, more or less ellipsoid or ovoid, very soon exerted from the involucre on a stout pedicel; ovule suspended under

the cross section varying somewhat, dependent on the number of locules,  $\pm 7$  mm long, 6–6.5 mm wide, 5–6 mm thick, brownish cream or creamy brown with darker patches and markings and a dark brown suture. (Description based mainly on *Leach & Cannell* 14049, with seed from *Pearson* 8719).

SOUTH WEST AFRICA.—2517 (Gibeon): Uitkoms Farm (–CD), fr. 26.ii.1963, *Giess, Volk & Bleissner* 5536 (WIND). 2616 (Aus): Kuibis, st. Nov. 1908, *Marloth* 4683 (K; PRE). 2617 (Bethanie): Tschaunaup Mission (–DA), fr. 25.ii.1947, *Gerstner* 6362 (PRE). 2618 (Keetmanshoop):  $\pm 8$  km N of Narubis (–DC), fr. 17.iv.1933, *Lang* sub *Transv. Mus.* 31754 (PRE);  $\pm 3$  km N of Narubis (–DC), fl. & fr. 22.ix.1967, *Leach & Cannell* 14049 (SRGH). 2716 (Witpütz):  $\pm 40$  km S of Aus (–AB), fr. 24.ii.1963, *Giess, Volk & Bleissner* 5460 (M; WIND). 2717 (Chamaites): near Gawachab (–AB), fl. & fr. 8.xi.1970, *Leach & Cannell* 14715 (BOL; LISC; M; PRE; SRGH). Holog (–BD), fr. 19.i.1916, *Pearson* 9719 (BOL); fl.  $\delta$   $\pm$  8.xi.1970, *Leach & Cannell* 14717 (PRE); Fish River Canyon, "bei Logerplatz" (–DA), fr. 1952–53, *Walter* 2328 (M; WIND); 2718 (Grünau): Wasserfall (–BA),  $\delta$  fl. 14.xii.1912, *Pearson* 8084 (BOL; K; SAM); Krai Kluff Ravine, Gt. Karasburg (–BA), 19.i.1913, *Pearson* 8564 (BOL; K; SAM); near Klein Karasburg, fr. Sept. 1909, *Marloth* 4683 (PRE); Klein Karas, fr. 22.iv.1931, *Ortendahl* 147 (S); W slopes of Great Karasberg, 12.xii.1912, *Pearson* 8075 (K). 2817 (Vioolsdrif): "Driekoppen Mtn." SE of AiAis (–AB), st. Sept. 1931, *Pillans* 6567 (BOL);  $\pm 16$  km N of Vioolsdrif (–DA), dry inflo. 5.viii.1973, *Leach & Cannell* 15079 (K; M; PRE; SRGH; WIND). 2819 (Ariamsvlei): near Nakob (–BB),  $\delta$  fl. 10.iv.1956, *Theron* 1949 (PRE); between Nakob & Ariamsvlei (–BB),  $\delta$  fl. 23.ix.1967, *Leach & Cannell* 14051 (BOL; M; S; WIND).

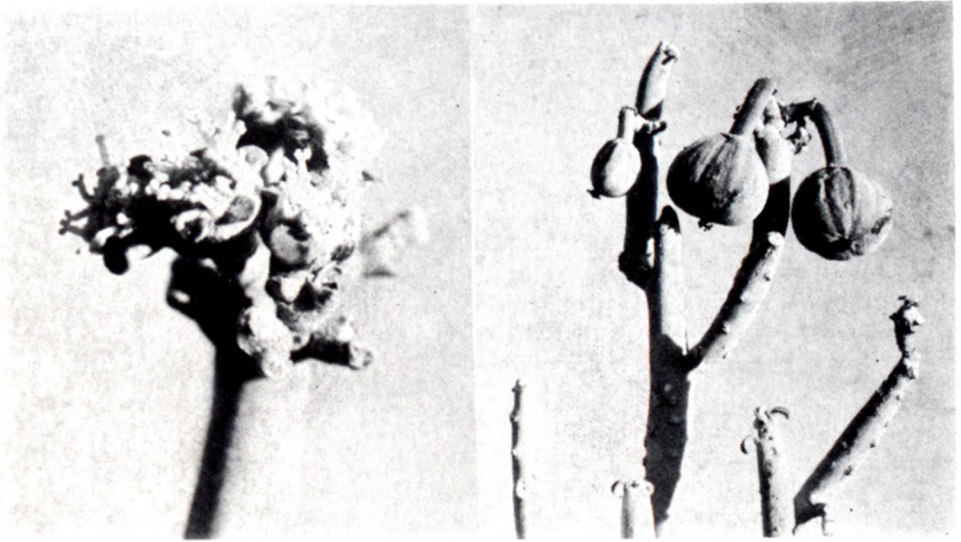


FIG. 5.—*Euphorbia gregaria*. Left: inflorescence of  $\delta$  plant with crowded cyathia. Right:  $\gamma$  plant showing long-pedicelled fruits. *Leach & Cannell* 14049.

a fleshy, pad-like obturator. *Styles* 3–5, fleshy, tomentose on the outside, glabrous on the deeply channelled rugulose inner face,  $\pm 2$  mm long, free nearly to the base, widely spreading, strongly recurved at the much dilated, bifid apices. *Capsule* tawny-tomentose, more or less obovoid, becoming somewhat pointed at the apex when dry, 3–5 locular, slightly obtusely angular,  $\pm 20$  mm diam. and almost as long, very tardily dehiscent, separating first between the locules, far exerted on a sharply decurved, densely tomentose pedicel up to 20 mm long  $\times$  5 mm diam.; perianth more or less circular or obtusely pentagonal,  $\pm 8$  mm diam. *Seed* more or less broadly ovoid, flat or slightly concave at the truncate base, somewhat broadly subacute at the apex with a beak on the dorsal side of a small depression at the end of the suture, more or less obtusely 4-angled from being slightly compressed on each side of the suture with a slight obtuse ridge down the back, often somewhat dorsiventrally compressed, then often almost flat on the ventral side (cf. *E. gummifera*),

CAPE.—2820 (Kakamas): between Nakop & Naroegas (–AA), fl. & fr. 23.ix.1967, *Leach & Cannell* 14053 (SRGH),  $\delta$  fl. 21.ix.1970, *Leach & Cannell* 14491 (SRGH);  $\pm 112$  km W of Upington (–AA), fr. Apr. 1933, *Lang* sub *Transv. Mus.* 31855 (PRE; SRGH);  $\pm 45$  km E of Naroegas (–BC),  $\delta$  fl. 19.v.1955, *De Winter* 3586 (M; PRE; WIND); Aughrabies (–CB), st. *Esterhuysen* 733 (BOL). 2918 (Gamoep): Aggenys (–BB), fl. 7.i.1909, *Pearson* 3338 & 3538 (BOL; K); Wortel (–BB), fl. 10.i.1909, *Pearson* 3339 (BOL; K). 2919 (Pofadder): near Pella (–AA), st. 20.vi.1927, *Hörnemann* sub *Marloth* 13383 (PRE); fr. only, 8.i.1909, *Pearson* 5037 (K).

*E. gregaria* is widely distributed, mainly along the Fish and Orange rivers and usually more than 100 km from the coast. Large numbers are to be seen to the west of Seeheim, often associated with *E. virosa* Willd., and frequently forming large colonies in which it is the dominant species; eastwards its distribution extends as far as Kakamas, plants being common on both sides of the Orange River.

It was feared that the large numbers of plants to be inundated at the site of the Naute Dam to the south-east of Seeheim might so taint the water

(toxicity tests had been made at Onderstepoort) as to render it unsuitable for human or animal consumption. However, further tests carried out by Dr M. Wolf at the Veterinary Diagnostic Centre, Windhoek, disclosed that no such effect was evident, even at 20–25 times the concentration expected. It is thought that the two related species may also be similarly innocuous since no irritating effects on the mucous membranes, such as smarting nostrils, have been noted despite extensive handling of both dry and living specimens.

In habit *E. gregaria* most closely resembles *E. damarana* but is rather more freely rebranched above and of a somewhat smaller stature, while its densely tawny tomentose inflorescence and leaves, which are strongly recurved and lack the characteristic dark glands at their base, are both quite different from those of the Damaraland plants. When in fruit *E. gregaria* is immediately distinguished from either of its congeners by the long deflexed pedicel on which its large rather fig-like fruits are borne. In addition to being far exserted from the involucre these fruits are very much larger and differently shaped from those of *E. gummifera*, from which the inland species is further distinguished by its terete (not ribbed) branches and branchlets. Production of fruits and seeds appears to be very erratic and is thought probably to be dependent on seasonal conditions.

***Euphorbia damarana* Leach, sp. nov.**

*E. gregaria* sensu Dinter in Feddes Repert. 17: 264 (1920–21), p.p. quoad specim. Dinter 2823; sensu White, Dyer & Sloane, Succ. Euphorb. 1: 133 (1941), p.p. quoad fig. 121; sensu Jacobsen, Handb. Succ. Pl. 1: 436 (1960), p.p. quoad distrib. "between Jakalswater and Usakos". *E. gummifera* sensu P. G. Meyer dubitatione in Merxm., Prodr. Fl. S.W. Afr. 67: 26 (1967), p.p. quoad specim. De Winter & Leistner 5709 et Merxmüller & Giess 1465. *E. sp. aff. E. gregaria*, Giess in Dinteria 4: 69 (1971).

*Euphorbiae gregariae* Marl. affinis sed folia anguste elliptica, fere glabra, haud recurva nec canaliculata; glandulis nigris stipulaneis basi foliorum bractearumque instructa; cyathiis masculis usque ad duplo grandioribus et pedicellis bracteolisque tholum prominentem formantibus; glandulis transverse oblongis saepe contiguis; capsula brevissime ex involucre exserta, loculis 4–6 valde distincta. *E. gummiferae* Boiss. etiam affinis sed ab illa (praeter capsulam breviter stipitatum) characteribus simillimis atque aliis statim dignoscenda.

*Frutex* erectus, rotundatus, inermis, apparenter unisexualis, usque ad 3 m altus, saepe 6 m diam. attingens, e basi ramosissimus, superne parce temere ramosus; ramis ramulisque ultimis 6–12 mm diam. *Rami* bacillares, teretes, plus minusve recti, fibrosi et tenaces cortice succulento, nec costati nec striati, pallide flavovirens, scabridiusculi, glabri vel raro ramulis juvenissimis ad apicem flavido-tomentulosi. *Folia* caduca, sessilia, anguste elliptica, subacuta, usque ad 9 mm longa  $\times$  3,5 mm lata, fere glabra vel interdum sparse tomentosa, basi in quoque latere glandula nigra instructa. *Inflorescentia* terminalis in ramis ramulisque disposita; pedunculi et rami cymarum brevi, crassi, glabri vel interdum flavido tomentosi; bracteae parvae, plus minusve late ovatae, c. 1 mm longae, porphyreae, saepissime glandulis nigris basi instructae. *Cyathia mascula* decidua; involucre flavido-tomentosum, infundibuliforme, c. 4 mm longum, 6–9 mm diam. glandulis inclusis; glandulis 5, carnosis, transverse oblongo-ellipticis, c. 3–4 mm  $\times$  2 mm, saepe contiguis plerumque valde deflexis, flavis vel fuscis; margine plerumque leviter crispato; lobis 5 tomentosis, erectis, transverse oblongis, irregulariter truncatis vel grosse dentatis,

c. 2 mm latis; flores masculi numerosi 5-fasciculati et cum bracteolis filiformibus pilosis tholum prominentem formantes; fasciculi bracteolis partim connatis intra subtenti sed involucri septis carentibus; flos femineus vestigialis. *Inflorescentia feminea* similis sed pedunculis paucioribus vel cyathiis interdum sessilibus, raro plus quam 3 capsulis maturescentibus; involucre flavido-tomentosum, plus minusve urceolatum, c. 6 mm longum  $\times$  5,5–6 mm diam. glandulis inclusis; glandulis 5, carnosis, transverse oblongo-ellipticis, 2–2,5 mm latis, c. 1,5 mm longis, patulis vel deflexis, plerumque separatis, fuscis vel forsitan interdum flavis; lobis 5, illis cyathii masculi similibus sed extus intusque densius tomentosis; bracteolis filiformibus vel aliquanto spatulatis brevibus fimbriato-laciniatis, c. 2 mm longis. *Ovarium* ovoideum, flavido-tomentosum, mox ex involucre partim exsertum; stylis crassis, c. 1,5 mm longis, libris fere ad basim, patulo-recurvis, profunde sulcatis, apice dilatatis bifidis rugosis. *Capsula* loculis 4–6, subsphaerica, levissime angulata et apice in sinubus brevissime leviter sulcata, flavo-virens demum flavis, tomentulosa, c. 20 mm diam., 16 mm alta, endocarpio lignoso aliquanto crasso, breviter ex involucre pedicello tomentoso, c. 4 mm longo exserta; perianthio rudimentali vel carenti. *Semen* plus minusve ovoideum, basi truncatum, apice subacutum parum oblique truncatum, in quoque latere suterae compressum, c. 8 mm longum, 6–6,5 mm latum, 5,5 mm crassum, laeve brunneo-cremeum vel pallide brunneum saepe fuligineo-maculatum.

Type: S.W. Africa, Damaraland, *Leach & Cannell* 15064 A ♀ (K; LISC; M; PRE, holo.; SRGH; WIND).

Plant an erect, unarmed, apparently unisexual, rounded shrub up to 3 m high and often as much as 6 m in diam., densely branched from the base, rather sparingly and randomly rebranched above, with the ultimate branches and branchlets 6–12 mm in diam. *Branches* more or less straight and rod-like, terete, neither ribbed nor striate, fibrous, and tough with a succulent bark (occasionally grazed, a short tuft of fibres then being left at the apex), pale yellowish green, often somewhat whitish from the resinous deposit on the surface, very slightly rough to the touch, glabrous or rarely slightly yellowish tomentulose on very young apical new growth. *Leaves* apparently fleeting, sessile, narrowly elliptic, subacute, up to 9 mm long  $\times$  3,5 mm wide (in cult. up to 22 mm  $\times$  8 mm), almost glabrous or sometimes with a sparse tomentum, erect or spreading (when erect with a peculiar incurved set to the base), with a dark gland (presumably stipular in origin) on each side at the base. *Inflorescence* a cluster of very shortly pedunculate cymes, terminal on the branches and branchlets or occasionally on short lateral flowering spurs; bracts scale-like, more or less broadly ovate, about 1 mm long, red-brown, often with a dark gland on each side at their base; peduncles and cyme branches short ( $\pm$  2 mm) and stout, glabrous or sometimes yellowish tomentose. *Male cyathia* deciduous; involucre yellowish tomentose, shallowly funnel-shaped,  $\pm$  4 mm long with the basal portion solid and somewhat stalk-like, 6–9 mm diam., including the glands; glands 5, fleshy, transversely oblong-elliptic, usually slightly crisped on the margins, about 3–4 mm  $\times$  2 mm, contiguous or separate, usually strongly deflexed so that the upper surface is turned outward; lobes 5, tomentose, transversely oblong,  $\pm$  2 mm wide, erect, irregularly truncate or coarsely toothed at the rather woolly apex; male flowers numerous, intermingled with a dense mass of woolly bracteoles, which with the pedicels eventually form a prominent woolly



FIG. 6.—*Euphorbia damarana*. Plants at the type locality,  $\pm 64$  km west of Khorixas (Welwitschia),  $\pm 2$  m high.

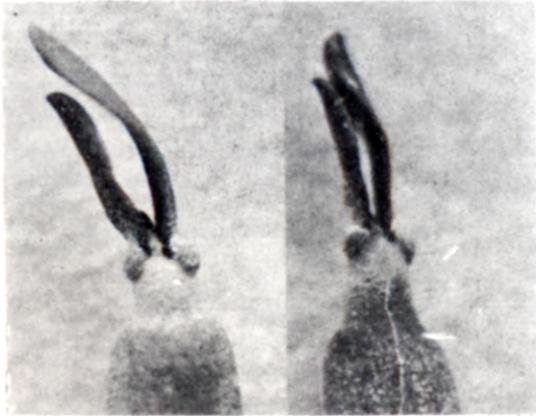


FIG. 7.—*Euphorbia damarana*. Erect, almost glabrous leaves with dark stipular glands.

dome, arranged in 5 fascicles, not separated by partitions or pockets on the inside of the involucre wall but each subtended on the inside by a bract formed from partially united bracteoles; the fascicles are closely grouped around what appear to be the vestiges of an undeveloped female flower. *Female inflorescence* similar to the male but with fewer, more frequently tomentose peduncles and cyme branches; it is seldom that more than one or two capsules reach maturity (4 seen only once); involucre yellowish tomentose, somewhat urceolate,  $\pm 6$  mm long, 6 mm diam. including the glands,  $\pm 3,5$  mm diam. at the base of the 3,5 mm long, solid basal portion (this solid portion, similar to that in the male involucre, is here treated as being part of the involucre in view of the supporting bracts at its base; however, it could perhaps be considered as being integral with the cyme branch as in some instances there are traces of a junction with the base of the involucre cup); glands 5, fleshy, dark coloured or perhaps sometimes yellow, transversely oblong-elliptic, 2–2,5 mm wide,  $\pm 1,5$  mm long, spreading to strongly deflexed, slightly crenulate and crisped on the margins, usually separate; lobes 5, more or less as in the male cyathium but densely tomentose inside and out; bracteoles filiform or somewhat spatulate, densely woolly at the apex,  $\pm 2$  mm long, closely arranged around the ovary. *Ovary* ovoid, yellowish tomentose, very soon

partially exerted from the involucre. Styles, equal in number to the locules of the ovary, very stout,  $\pm 1,5$  mm long, free almost to the base, spreading recurved, deeply grooved down the inner face, much dilated at the divergently bifid, rugose apices. *Capsule* subspherical, slightly angular, yellowish green, tomentulose, more densely so towards the base, averaging 20 mm diam.  $\times 16$  mm high, 4–6-locular, with a relatively thick, hard, woody, 4–6 septate endocarp, very tardily dehiscent, perhaps sometimes incompletely so, opening first between the locules with the styles persistent, very shortly exerted from the involucre on a stout, tomentose pedicel about 4 mm long; perianth rudimentary or lacking. *Seed* more or less oblong-ovoid, with a central depression at the truncate base, slightly obliquely truncate at the broadly subacute apex, somewhat 3-angled in cross-section from being compressed on each side of the suture, up to 8 mm long, 6,5 mm wide  $\times 5,5$  mm thick but varying somewhat depending on the number of seeds in the capsule and the degree of compression to which they were consequently subjected, smooth, brownish cream to pale brown with a dark brown suture and blackish brown blotches on the flattened areas on each side of the suture, around the apex and often at the base, with a whitish area around the hilum.



FIG. 8.—*Euphorbia damarana*. 1, hard woody endocarp with two locules removed; 2, fleshy outer covering of fruit partially removed to show woody interior.



FIG. 9.—*Euphorbia damarana*.  
Plant at the type locality  
showing crowded rod-like  
branches.



FIG. 10.—Fruiting branches of *Euphorbia damarana*.  
*Leach & Cannell 15064*.

SOUTH WEST AFRICA.—1812 (Sanitatas):  $\pm$  56 km W of Otjihu on Orupembe road (–BB), fr. 4.v.1957, *De Winter & Leistner 5709* (M; PRE; WIND); Otjikongo (–BD), fl. 29.i.1958, *Merxmüller & Giess 1465* (M). 2013 (Unjab Mouth):  $\pm$  155 km W of Khorixas (Welwitschia) (–B), fr. 1.iv.1963, *Hardy & De Winter 1471* (PRE). 2014 (Welwitschia):  $\pm$  64 km W of Khorixas (Welwitschia) (–AD), fl. & fr. 27.vii.1973, *Leach & Cannell 15064A*, B $\sigma$  (K; LISC; M; PRE; SRGH; WIND); Sorris Sorris (–DD), st. 11.iv.1955, *De Winter 3148* (PRE; WIND); S of Ugab River, on Uis road (–DD), fl. & fr. 29.vii.1973, *Leach & Cannell 15068* (BOL; K; MO; PRE; Z). 2114 (Uis): S of Ugab River on Sorris Sorris road (–BB), fl. & fr. 29.vii.1973, *Leach & Cannell 15067* (BM; M; NBG; SRGH; WIND); near Brandberg, fr. 7.xii.1947, *Rodin 2752* (BOL; PRE). 2115 (Karibib): Klein Spitzkoppe (–CC),  $\sigma$ fl. 18.iii.1963, *Giess, Volk & Blessner 5811* (M). 2215 (Trekkoopje): Aukas (–AB)  $\sigma$  fl. 20.viii.1919, *Pole Evans* sub *PRE H19308 & H19309*, (PRE); Trekkoopje (–AC), st. Sept. 1920, *Reuning* sub *Marloth*

9920. (PRE); Jakalswater (–CB),  $\sigma$  fl. Apr. 1913, *Dinter 2823* (SAM); Tinkas Flats,  $\sigma$  fl. 8.ii.1970, *Jensen 473* (PRE); along the railway line between Usakos and Swakopmund, fr. 22.vi.1942, *Turvey* sub *PRE 32336* (PRE); between Usab and Ubib, fr. 6.viii.1892, *Rautenen 208* (Z).

This, the tallest of the three closely related species, has a distribution restricted almost entirely to desert areas to the north of the tropic of Capricorn. The southernmost record is from Tinkas Flats in the Namib Desert Park at approximately 22° 50' S; this locality is more than 300 km from the most northerly known for *E. gummifera* and almost as distant from the nearest recorded occurrence of *E. gregaria*.

The main concentration known to me lies on the southern side of the Ugab River, where it constitutes not only the dominant species, but at the time of year when fruiting material was collected virtually the only species to be seen over a vast tract of country extending to the lower slopes of the Brandberg. At the type locality west of Khorixas (Welwitschia), colonies are rather smaller but again the species is dominant where present. Regeneration at both localities appeared to be very poor, but fruits with apparently viable seed were produced in large numbers in July 1973; it would therefore be interesting to learn the seedling and subsequent juvenile position in the following few seasons.

*E. damarana* appears to be most closely related to *E. gregaria* but differs, most significantly, in its shortly pedicelled, often 6–locular fruits with hard woody endocarp and larger seeds. The almost glabrous erect leaves of *E. damarana* are quite different from those of *E. gregaria*, in that species heavily tomentose and strongly recurved, while the dark stipular glands at the base of the leaves and bracts allow most (even sterile) specimens to be distinguished from similarly sterile material from either of its close relatives. The larger male cyathia with bracteoles and pedicels forming a prominent woolly dome, and transversely oblong, often contiguous glands are also characteristic of the new species. A relationship with *E. gummifera* is also evident but here there is much wider divergence in flowering and fruiting characters, while the ribbed, woody branches and branchlets of the smaller, more freely rebranched shrubs of the southerly based species are quite different from those of *E. damarana*. Affinities with *E. carunculifera* and *E. tirucalli*, albeit



less close, are evidenced by the vegetative characters and gregarious colony forming habit of the former and the dark stipular glands and peculiar inflexing of the base of the erect leaves of the latter.

Ripe fruits of *E. damarana*, already dry and beginning to split between the locules when collected, have shown no further signs of dehiscing, their whole character, with fleshy outer covering and hard woody endocarp, being reminiscent of that of the indehiscent fruits of *Elaeophorbia*.

#### ACKNOWLEDGEMENTS

Mr and Mrs Ian Cannell for their companionship and assistance in the course of the expedition to the Kaokoveld and elsewhere in South West Africa.

The Directors of: The Bolus Herbarium, University of Cape Town (BOL); The Royal Botanic Gardens, Kew (K); Botanische Staatssammlung, München (M); The National Botanic Gardens, Kirstenbosch (NBG & SAM); Muséum National d'Histoire

Naturelle, Paris (P); The Botanical Research Institute, Pretoria (PRE); Naturhistoriska Riksmuseum, Stockholm (S); The National Herbarium, Windhoek, S.W.Africa (WIND); the Institut für Systematische Botanik der Universität, Zürich (Z), for the loan of much valuable material.

The Director, Dept. of Nature Conservation and Tourism, Windhoek for the necessary collecting permits.

Mr W. Giess, Curator of the National Herbarium, Windhoek, for the facilities of the herbarium & other personal assistance.

Dr L. Jaklitsch of Salisbury, for translations of the letters and notes attached to the *Rautenen* specimen of *E. damarana*.

Dr B. de Winter, Director, Botanical Research Institute, Pretoria (PRE), for the facilities of the herbarium and library and much appreciated assistance in connection with the Kaokoland expedition.