NOTES ON *EUPHORBIA* SPECIES FROM THE NORTHWESTERN CAPE

Preparation of an account of the Euphorbiaceae for the Cape Department of Nature Conservation project 'Flora of Namaqualand' has highlighted the chaotic taxonomy of the genus *Euphorbia* in southern Africa. The monumental publication of Alain White, R. Allen Dyer & Boyd L. Sloane (1941) provides a wealth of information in the form of illustrations, but it does little to explain the extent of variation that occurs in the field. The keys provided are often unreliable and many of the species are extremely difficult to distinguish from one another.

Over the past 30 years many new species of *Euphorbia* have been described from southern Africa. Far too narrow a species concept seems to have been applied which sometimes bears little relevance to the position in nature.

During recent investigations it was found that several recently described taxa were impossible to separate from earlier, in some cases very little-known ones. Re-collection and cultivation of some of these has allowed a more in-depth comparison with newer taxa and makes some synonymy necessary.

E. celata *R.A. Dyer* in Bothalia 11: 278 (1974). Type: *Hall 4272* (PRE, holo.).

E. miscella Leach: 341 (1984a). Type: *Leach & Williamson 16545* (NBG, holo.!; PRE, iso.!).

H. Hall collected *E. celata* at two widely separated localities: north of Vredendal and along the bank of the Groen River west of Garies, about 120 km further to the north. More recent collecting has proved it to be fairly plentiful, if localized, at both of these localities and has in addition revealed its occurrence along the Swartlintjies River some 80 km further northwards as well as near Komaggas, yet further north near Lekkersing, the type locality of *E. miscella*, and near Alexander Bay at the mouth of the Orange River. The species thus seems to be of scattered occurrence over most of the low-lying parts of Namaqualand.

Both the localities Lekkersing and Alexander Bay were mentioned by White, Dyer & Sloane (1941) and Wilman (1946) for *Euphorbia wilmaniae* Marloth. Leach (1984a) was the first to point out that this material (at least from Lekkersing) represented a quite different species to *E. wilmaniae*. However, in sorting this out, he described the new species *E. miscella*. This was unnecessary in my opinion. Leach compared the new species only to *E. namuskluftensis* Leach and no mention is made of *E. celata*.

Euphorbia celata (Figure 1) is generally an insignificant plant with only short portions of stem protruding above the soil. Plants are mostly found in very exposed places, usually on or near the summit of low hills or on small outcrops in low-lying areas. They grow in crevices in rock outcrops or in flat patches of coarse quartz, granite or shale gravel shallowly overlying bedrock.

In *E. celata* the stems may become densely tufted (as in *E. namuskluftensis*), but this is not usual and they tend rather to form small clusters connected by rhizomes to the central tuber, making subsidiary roots and tubers along the way. Plants with a neat, central, ± turnip-shaped tuber such as in Dyer (1974: fig. 2) have been dug out in several localities, but more usually excavation yields a dense mass of slender, interwoven rhizomes rooting sporadically along their length with several subsidiary tubers and it is difficult to locate the central tuber. This is as recorded by Leach for *E. miscella* (Leach 1984a: fig. 1).

In the southern part of its distribution range (north of Vredendal and along the Groen River) *E. celata* has relatively few tubercles on the stems and they are essentially arranged into three angles. Along the Swartlintjies River,

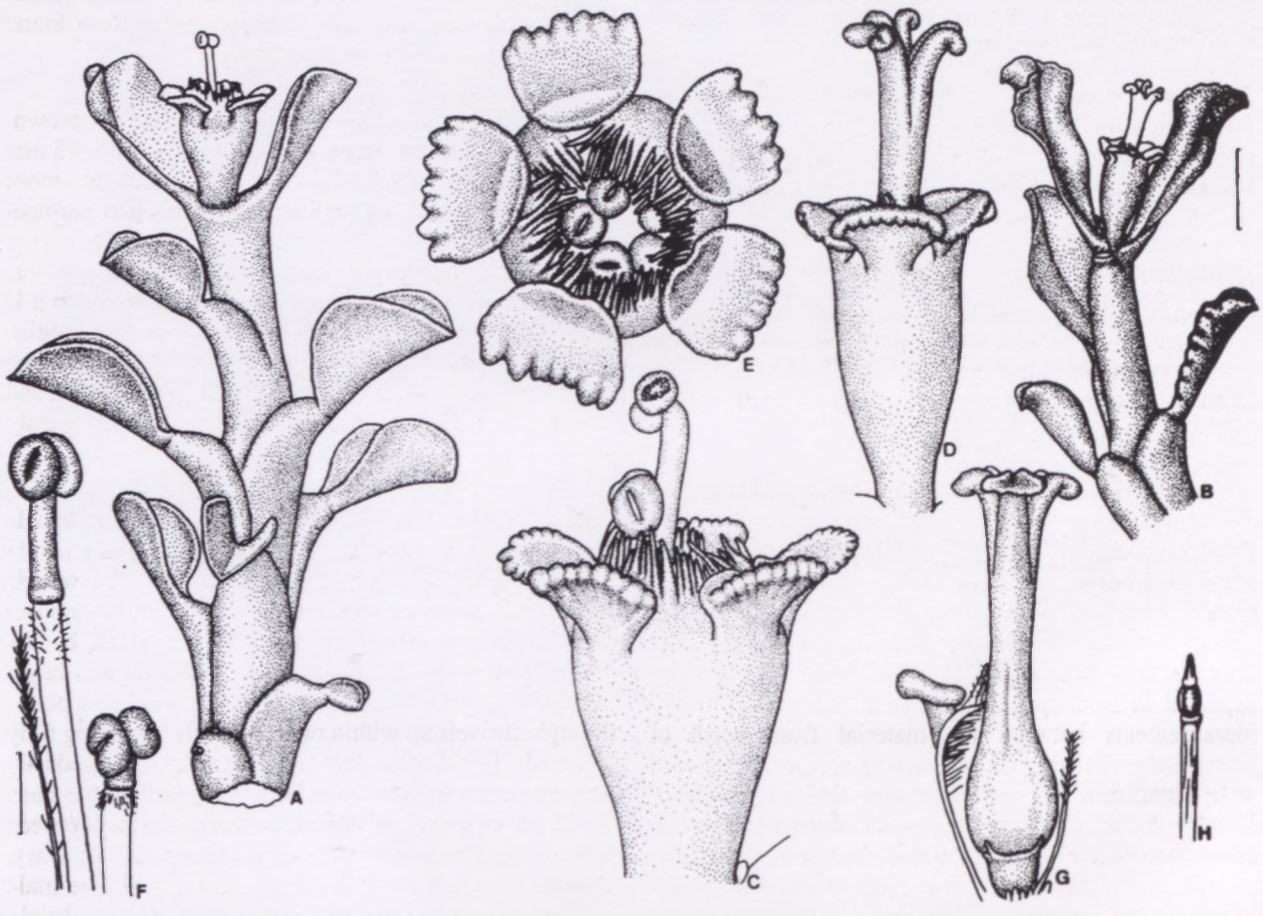


FIGURE 1.—*Euphorbia celata*. A, portion of young stem of male plant; B, portion of young stem of female plant; C, side view of male cyathium; D, side view of female cyathium; E, face view of male cyathium; F, male flowers with bracteole; G, dissection of female cyathium showing involucral gland, part of lobe, female flower, bracteole and bracteole primordia; H, rudimentary female floret in male cyathium. All drawn from *Bruyns 3704*, north of Vredendal. Scale bar: A, B, 3 mm; C–H, 1 mm.

on low hills south of Komaggas and in the numerous populations around Lekkersing, the stems are generally shorter and thicker with more densely arranged, more compressed tubercles. However, in these localities and in the hills just north of Komaggas (where plants were seen relatively sheltered among and inside bushes) any specimens that were even slightly protected showed new growth very similar to that from the southern portion of the distribution range.

North of Vredendal and along the Groen River the leaves of *E. celata* are usually 3–6 mm long. North of this they are often much smaller (as short as 1.5 mm) and their size is dependent on the situation of the plant (in sheltered branches they are still 3–4 mm long). The leaf is about as long as or longer than the tubercle to which it is affixed and in this respect is exactly as in *E. miscella*.

In *E. celata* (as in *E. miscella*) a terminal cyathium is produced, subtended by 2–3 leaf-like bracts in the axils of which further cyathia may develop. This is different to the situation in *E. namuskluftensis* where the cyathia are solitary and are borne near the apex of the branch in the axils of the tubercles. In *E. namuskluftensis* each cyathium is 'borne on a short, glabrous, bracteate peduncle' (Leach 1983: 190). This is lacking in both *E. celata* and *E. miscella*.

For *E. miscella* and *E. celata* the dimensions of the cyathia are summarized below (measurements based on Figure 1 for *E. celata* are given in brackets after Dyer's data; measurements based on *Bruyns 4637* are given in brackets after Leach's data for *E. miscella*.

E. miscella (Leach 1984a)
Male cyathium: up to 4.5 × 3.5 (4.0 × 2.5–3.0 mm), stipe 2–4 mm long (1–2 mm long), pedicels glabrous. Female cyathium: 3.5 × 4.5 (2.0–2.5 × 2.0 mm), style ± 2.5 mm long, capsule 7 mm diam.

E. celata (Dyer 1974)
Male cyathium: 4 × 4 mm (3.5 × 4.5 mm), peduncle 4 mm (1 mm) (pedicels sparsely pubescent towards apex). Female cyathium: 4.0 × 1.5 (3.0 × 2.5 mm), style 2.5 mm long (4 mm long, part protruding from involucre 2.5 mm long), capsule 5.5–6.0 mm diam.

The material on which Figure 1 is based was collected at the type locality of *E. celata* but differs from the flowering material seen by Dyer (1974). *Bruyns 4637* was collected from near the type locality of *E. miscella*. It is highly unlikely that more than one very similar species occurs at these localities and thus one is compelled to accept that variability occurs in *E. celata*, as is to be expected in most species. The small differences in the measurements between the material from north of Vredendal and that from Lekkersing are not considered to be significant and the remarkable similarity between Leach's *E. miscella* and *E. celata* forces one to the conclusion that these two represent the same species.

Specimens examined

CAPE.—2816 (Oranjemund): Kortdoringberg, (–DA), *Van Jaarsveld 5421A* (NBG). 2817 (Vioolsdrift): 10 km N of Lekkersing, (–CC), *Bruyns 4638* (BOL); Lekkersing, (–CC), *Marloth 12441* (STE). 2917 (Springbok): south of Lekkersing, (–AA), 18 July 1970, *Wisura 1622* (NBG); *Williamson 3323* (BOL), *3206* (NBG); *Leach 16545* (NBG); N of Gemsbokvlei, (–AA), *Bruyns 4637* (BOL); hills N of Komaggas, (–CD), *Bruyns 4617* (BOL); S of Komaggas, (–CD), *Bruyns 4595* (BOL). 3017 (Hondeklip Bay): Swartlintjies River, (–AB), *Bruyns 3556* (BOL); Groen River, (–DD), *Hall 4282* (NBG); *Bruyns 1733* (BOL). 3118 (Vanrhynsdorp): north of Hol R. Station, (–AD), *Hall 4722* (PRE); *Bruyns 3704* (BOL).

E. quadrata *Nel* in Jahrbuch der Deutschen Kakteengesellschaft: 42 (1935). Type: *Herre sub SUG 6519* (STE, holo.!; BOL, iso.!).

E. francescae Leach: 563 (1984b). Type: *Williamson 3248* (NBG!).

Euphorbia quadrata has been remarkably rarely collected. Originally discovered by Hans Herre in 1930 in the Stinkfontein Mountains, it was rediscovered by Oliver, Tölken & Venter in 1977 and since then only three collections seem to have been made. This is partly due to the remoteness of the areas in which it occurs and also to the inconspicuousness of the plants. On the summit of the Cornellsberg they grow fully exposed, forming small, densely branched, rounded shrubs with somewhat of an 'alpine shrublet' habit. However, lower down they were found to reach 1 m in height but were easily overlooked due to their nondescript appearance with large numbers of slender, scarcely succulent twigs and few leaves. At another locality further to the west they were common on the sheltered upper southwestern slope of a peak, growing inside other bushes and among rocks and were again inconspicuous despite being up to 0.5 m tall. It appeared that any branches projecting from the sheltering bushes were soon eaten back, and exposed plants were found grazed right back to the main stem.

In *E. quadrata* a complex system of thickened, brown, root tubers develops. The main stem may be up to 25 mm thick and this branches under the soil surface into more slender roots which are swollen at intervals into sausage-like tubers up to 30 mm thick. The aerial stems have a peculiar colouration: the youngest tissue usually to just below the leaves is a striking red-purple after which it is striped lengthwise through the splitting of this reddish bark. The reddish hue disappears after one season and older stems are covered with a uniformly greyish bark and have a somewhat rubbery consistency, not becoming truly woody (Figure 2).

As is usual in bisexual *Euphorbia* cyathia, the female flower appears first and the free parts of the styles are fully divergent after 3–5 days (Figure 2B, G). The female flower in *E. quadrata* remains erect for about 10 days and then bends downwards through the space left by the missing involucral gland just as the male flowers begin to appear (Figure 2C, D). If no pollination takes place, the style shrivels up within two days of its becoming fully recurved. If pollination does take place, the style gradually becomes erect and the ovary begins to swell. It has been found that an interval of several months may occur between pollination and the onset of development of the ovary. Colours observed in the flowers are unusual: the male pedicel is pale translucent green, the filament bright pinkish red and the anther is yellow lined with red along the pore; the female pedicel is greyish green except for red just beneath the ovary (the rudimentary calyx), the ovary is dark green and the styles are pink.

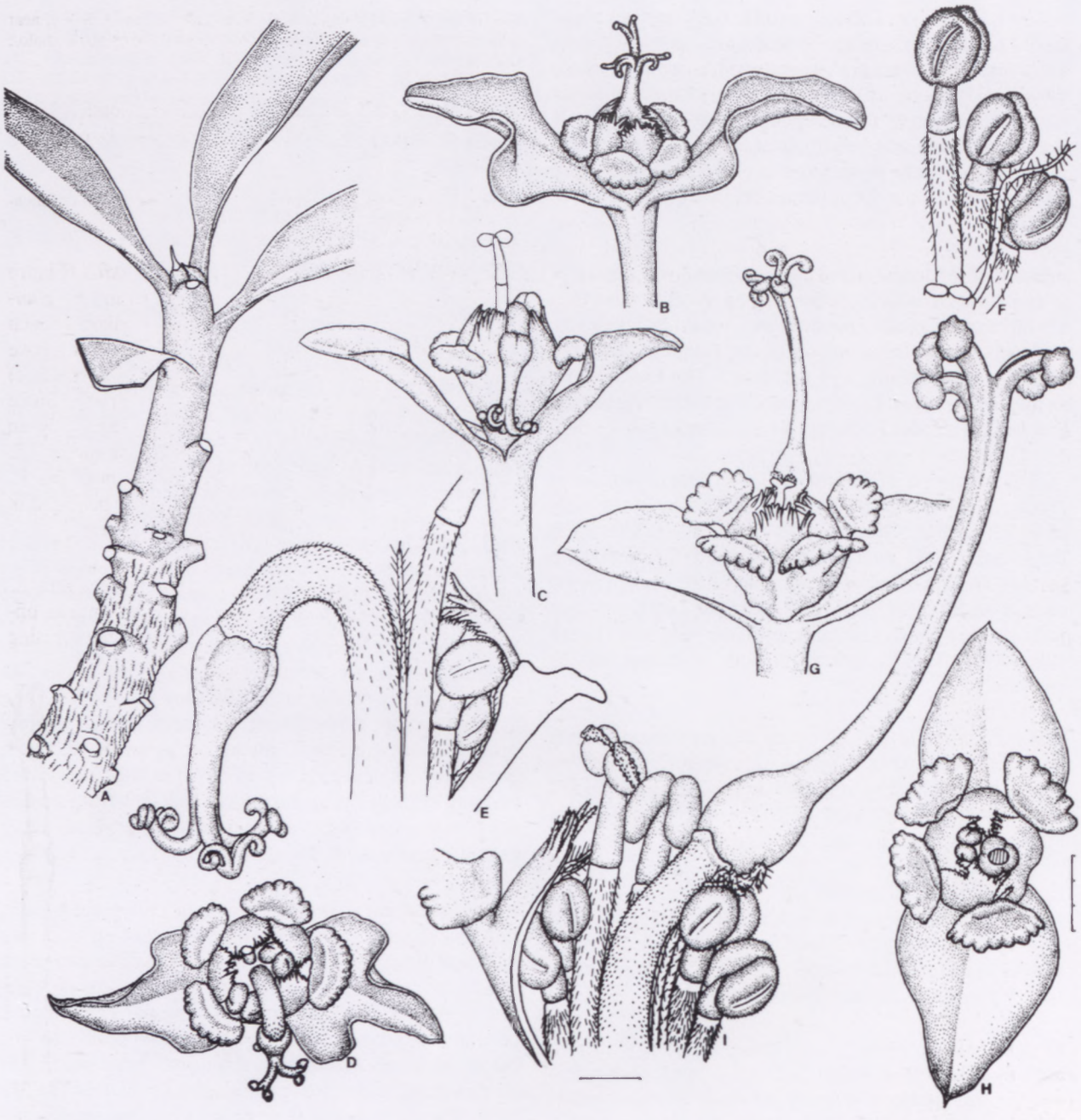


FIGURE 2.—*Euphorbia quadrata*. A, portion of young stem; B, G, side views of young cyathium with female floret still erect; C, side view of cyathium with female flower recurved; D, H, face views of cyathium; E, I, dissection of cyathium showing involucral lobe, male flowers, female flower and some bracteoles; F, cluster of male flowers. B–F drawn from *Bruyns 4044* (Cornellsberg summit); A, G, H, I from *Bruyns 3936* (Vandersterrberg). Scale bar: A–D, G, H, 3 mm; E, F, I, 1 mm.

Euphorbia quadrata and *E. francescae* both come from the summit of the Stinkfontein Mountains. *E. francescae* is given as differing from the former by 1, its much smaller plants with very short, tuberculate branches (± 30 mm long); 2, longer male flowers; 3, subglobose ovary; 4, very much shorter styles which are free almost to the base.

I have visited the summit of the Cornellsberg to investigate *Euphorbia francescae*. Compared to the type specimen, which is a remarkably minute plant, others at the same locality formed shrublets up to 200 mm tall and the same in diameter (as observed also by *Oliver et al.* on their specimen). All specimens seen were much stunted by grazing and by the heavy winds which sweep across this very exposed mountain top and this clearly explains the fact that they were much smaller than either the plants seen further down the mountain or the specimen cultivated at Stellenbosch by Herre (the type of *E. quadrata*). Their branches were therefore unusually short. Nevertheless, the 30 mm given by Leach for the length of the branches was observed to be on the small side and 30–100 mm would be more accurate. Leach considered Nel's species to be without small tubercles on the stems and Nel (1935) does not mention them in his description, but they are clearly present on the isotype specimen at BOL.

Nel does not mention the size of the male flowers. Leach (1984b: 567) gives the filaments in *E. francescae* as ± 1.5 mm long and states that they are longer than in *E. quadrata*. In Figure 2C the protruding male flower has a filament 2 mm long whereas in Figure 2E the filament is slightly less than 1.5 mm long. On the isotype of *E. quadrata* (BOL) the filaments are 2 mm long. Therefore I see no basis for Leach's statement about the relative sizes of the male flowers.

The styles of *E. quadrata* were given by Nel as 9 mm long. Leach gives them for *E. francescae* as '± 1.5 mm long, free almost to the base'. In Leach's illustrations (1984b: fig. 2.2) the styles are a little over 2 mm long with fused and free parts almost exactly equal in length. The somewhat thickened base that he shows (which he obviously did not include when measuring the style) has not been found in other material from the same site and is probably due to the styles already having begun to dry out (as pointed out above, this happens quickly after the female flower becomes recurved, if pollination has not occurred). In my collections the lengths of the styles were 3.5 mm on the Cornellsberg and 8 mm on the Vandersterrberg. These measurements are from very few specimens (one plant in the first case and three in the second) but even from these and including Nel's data, it is clear that *E. quadrata* varies considerably in this character so that this distinction is meaningless.

I conclude that it is not possible to distinguish *E. francescae* from *E. quadrata* with any certainty. The name *E. francescae* is therefore placed into synonymy.

Specimens examined

CAPE.—2816 (Oranjemund): Vandersterrberg, (–BD), *Bruyns 3936* (BOL). 2817 (Vioolsdrif): Cornellsberg, (–CA), *Oliver, Tölken & Venter 697* (PRE); *Williamson 3248* (NBG); *Bruyns 4044* (BOL); near summit of Stinkfontein Mountains, *Herre sub SUG 6519* (STE, holo.; BOL, iso.).

E. exilis *Leach* in Leach & Williamson, South African Journal of Botany 56: (1990). Type: *Leach & Bayer 17129* (NBG!).

E. glandularis Leach & Williamson: 75 (1990). Type: *Leach & Hilton-Taylor 17019* (NBG!).

Leach & Williamson (1990: 77) gave *E. exilis* (Figure 3) as occurring mainly on the Knersvlakte and *E. glandularis* in a small area to the northwest of Steinkopf (Leach & Williamson 1990: 76). More recently similar plants have been collected near Nigramoep (northwest of Springbok) and north of the Groen River (west of Garies). Since the plants are not readily distinguishable, except by an experienced collector, from the much commoner *E. ephedroides* E. Mey. ex Boiss. and members of the *E. decussata* complex, the species will probably be found in much of the intervening territory in due course.

Leach & Williamson distinguished *E. exilis* from *E. glandularis* by the 'smaller stature (300–400 mm as opposed to 0.6–1.0 m), its densely branched, clump-forming

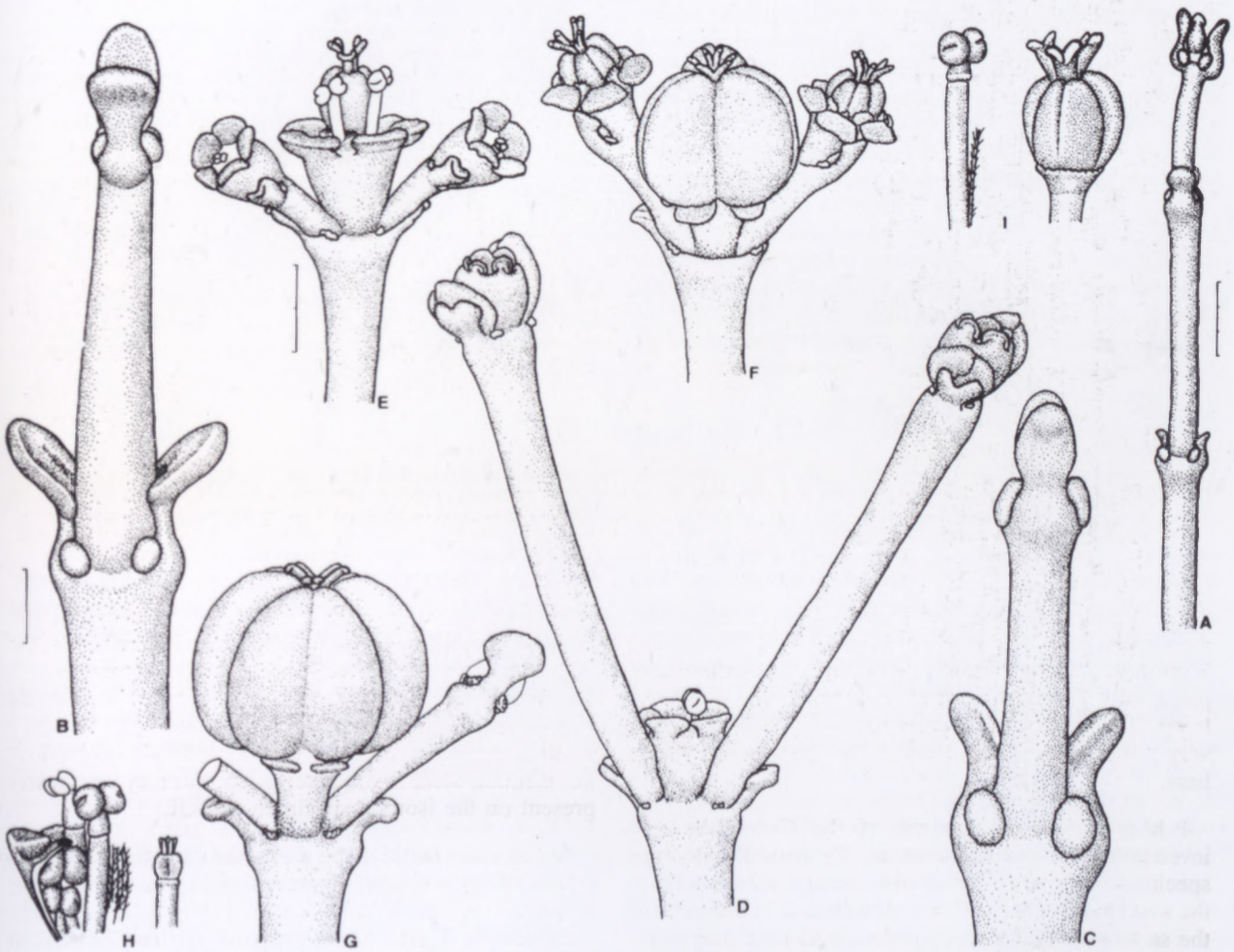


FIGURE 3.—*Euphorbia exilis*. A–C, portion of young stem; D, older male cyathium with two developing males on axillary branches; E, bisexual cyathia; F, female cyathia with one capsule nearing maturity; G, female cyathium with capsule near maturity; H, dissection of male cyathium showing involucral gland, part of lobe, male flowers and rudimentary female flower (separated); I, male and female flowers from separate (unisexual) cyathia. A, C, D, G drawn from *Bruyns 3214* (Nigramoep); B, H, from *Bruyns 3835* (Groen River); E, F, I from *Bruyns 3225* (N of Vredendal). Scale bar: A, 3 mm; B, C, H, I, 1 mm; D–G, 2 mm.

habit with soft, more slender branches, much smaller stipular glands, its frequently pink involucres and maroon bracts, its smaller capsule which is not ribbed in the sinuses and is borne on a longer pedicel, styles which are not appressed to the top of the capsule, and less prominently keeled seeds which are only ± 1.2 mm thick as opposed to 1.6 mm' in *E. glandularis*.

Plants collected near Nigramoep were 300–400 mm tall and thus, although geographically closest to *E. glandularis*, were actually more similar in stature to *E. exilis*. They were also extremely densely branched, as were those along the Groen River, far more so than plants seen at Hol River (Knersvlakte) but very similar to those seen at Quaggaskop on the Knersvlakte. Plants from the Groen River had slightly smaller stipular glands than those from Nigramoep (compare Figure 3B & 3C). Stipular glands of this size are also found on specimens from the Knersvlakte [*Hall 3734* (NBG) and others] and the minute stipular glands shown by Leach & Williamson (1990: fig. 4.9) had perhaps already dried out when drawn and were thus a fraction of their fresh size (Figure 3).

Recent collections suggest that the length of the female pedicel is an unreliable character. In particular, in *E. glandularis* the capsule is shown to squash the involucre on development (Leach & Williamson 1990: fig. 3.10) whereas in *E. exilis* this is not the case. In the material figured here from near Nigramoep (Figure 3G) the pedicel is slightly longer than that of a specimen from the Knersvlakte (Figure 3F). As can be seen in Figure 3E, F & I, the styles vary significantly in length at a single locality (Knersvlakte again), being quite close to the ovary (more like *E. glandularis*) in 3F & I and more erect in 3E (more like *E. exilis*). In the plant from Nigramoep (Figure 3G) they are much closer to the ovary, though not as closely adpressed as shown by Leach & Williamson for *E. glandularis*. The difference in the length of the united part of the styles (± 0.5 mm) and the 0.4 mm difference in thickness of the seeds given by Leach, are considered to be of questionable significance. Thus one of these names is unnecessary and *E. glandularis* is reduced to synonymy.

Specimens examined

CAPE.—2917 (Springbok): Klipfontein, (–BA), *Williamson 3773, 3789; Leach & Hilton-Taylor 17019* (all NBG); NE of Nigramoep, (–BC), *Bruyns 3214* (NBG). 3017 (Hondeklip Bay): 5 km NW Baievlei, (–DB), *Bruyns 4590* (BOL); 2 km towards Soutfontein, (–DB), *Bruyns 4588* (BOL); north of Groen River, (–DB), *Bruyns 3835* (BOL). 3018 (Kamiesberg): Kamagab, (–CD), *Bruyns 4586* (BOL). 3118 (Vanrhynsdorp): north of Vredendal, (–AD), *Hall 3734* (NBG); *Bruyns 3225* (NBG); Quaggaskop, (–BC), *Leach & Hilton-Tayor 16994* (NBG); *Bruyns 4035* (BOL); Hol River, (–CB), *Leach & Hall 14180* (NBG); Aties, (–DA), *Leach & Bayer 17129* (NBG).

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