7 FLORAL AND FRUITING MORPHOLOGY

7.1 Introduction

Flower characters are valuable in demarcating southern African genera in the Hypoxidaceae (see Chapter 2, Table 2.4). *Pauridia*, a genus endemic to the Western Cape differs in having three fertile stamens while all other genera have six stamens or rarely four. In *Pauridia*, *Rhodohypoxis* and *Saniella*, tepals are fused at the base into a tube and this helps to separate them from *Empodium*, *Hypoxis* and *Spiloxene* that have free tepals. In classifying the genera, Nel (1914) emphasised the taxonomic value of stamens, particularly the way the anthers are attached to the filaments. Hilliard & Burtt (1978) found this character useful to classify the genera of Hypoxidaceae into two groups and they offer an illustrated discussion on the types of anther attachment (discussed under stamens further on).

In *Hypoxis*, the inflorescence is subtended by a leafless scape and bears two (rarely one) to many flowers. The flowers are epigynous, actinomorphic with six (rarely four) petaline tepals in two whorls. Each flower has six (rarely four associated with four tepals) stamens with anthers latrorse, and the pollen grains are single (monads) and monosulcate. The gynoecium is tricarpellate, with a single style, and the stigma is pyramidal or spherical. Placentation is axile and the ovules anatropous. The fruit is a capsule that splits along the circumference and the upper part formed by the persistent tepals drops off as a lid to expose the seeds. Seeds in *Hypoxis* have a black phytomelan crust which is either smooth or papillate and they have a non starchy endosperm. Flowers open for part of the day, each flower once for a single day and are bee-pollinated. Although basic flower morphology in *Hypoxis* is fairly uniform among species, diversity in the genus is reflected by other flowering and fruiting structures including the scapes, flower-bearing axis (rachis), pedicels, capsules and seeds. This Chapter describes the floral and fruiting characters of taxonomic significance in *Hypoxis* and discusses their variation amongst and within taxa.Variation in morphology of these structures, though subtle in some species, is useful in demarcating taxa, especially when used in combination with vegetative characters (discussed in Chapter 5).

7.2 Taxonomic significance of inflorescence and floral characters

7.2.1 Scape

All species of *Hypoxis* produce one or more scapes (leafless peduncles) that arise in the axils of leaves. Generally, scapes are shorter, or about the same length as the leaves except in *H. kraussiana*, *H. parvifolia* and *H. parvula*, where they may be longer than the leaves. Scapes on a plant reach about the same height in most species except in a few robust ones, namely *H. colchicifolia*, *H. galpinii* and *H. rigidula* where their lengths vary. Baker (1898) applied scape length to distinguish among Tropical African species of *Hypoxis*

The scape is generally ancipitous (two-edged) just below the flower-bearing part with sides rounded or flattened (elliptic in cross section). Scapes with rounded sides are found in *H. acuminata*, *H. kraussiana*, *H. longifolia*, *H. rigidula*, *H. stellipilis*, *H. sobolifera* and *H. villosa* while flattened scapes are present in *H. costata*, *H. hemerocallidea*, *H. interjecta*, *H. multiceps* and *H. obtusa*. *Hypoxis filiformis*, *H. longifolia* and *H. tetramera* are distinct in having scapes that are terete and grooved, appearing crescent shaped in cross section. Scapes in the genus are stiff and the upper portion is covered in hairs, in most species more densely so than on the leaves. Indumentum density and colour are diagnostic in few species and add confirmatory value to the identification of a species. For example, in *H. multiceps*, hairs on the scapes are scabrous and yellow, rarely white and this helps to identify the species. Scapes of *H. stellipilis* have a tomentose white indumentum that is distinguishes it from the remaining species with corymbose inflorescences (explained under 7.2.2). The scape is otherwise of little value in classification.

7.2.2 Flower-bearing axis (“Inflorescence”)

The scape in *Hypoxis* terminates in few to many flowers borne in a racemose or corymbose arrangement, rarely is there a solitary flower. In inflorescences with more than four flowers, flowers may be arranged in pairs, alternate or opposite to each other or they may have two basal flowers opposite each other and above these, consecutive tiers of two or three flowers.

Baker (1878b) described the scape in *Hypoxis* as bearing a single flower or few flowers in a corymb, or bearing numerous flowers in an acropetal raceme. In his treatment in Flora Capensis, Baker (1896) recognised two main types of inflorescences in *Hypoxis*, racemose and corymbose. Later, in his key to species in Tropical Africa, Baker (1898) used flowers solitary, corymbose or racemose as a significant character for separating species. Nel (1914) provided a full description of the inflorescence in *Hypoxis* where he adopted the states recognised by Baker but used the term 'false umbel' instead of corymbose. He considered species with racemes to bear 8–18 flowers and have pedicels that vary in length; the lowermost flowers being held on longer pedicels than the flowers above. He noted that in some species, pedicels are reduced and the flowers are almost sessile. Nel (1914) described the corymb (false umbel) as bearing 3–7 flowers with the lowermost flowers having significantly longer pedicels than the flowers above. In addition, Nel noted that the varying lengths of pedicels in this type of inflorescence caused all the flowers to be held at almost the same height and therefore his use of the term false umbel. He recorded the presence of a 'false umbel' in four species, namely *H. angustifolia*, *H. stellipilis*, *H. sobolifera* and *H. villosa*. Nel further related Sections *Angustifoliae*, *Argenteae* and *Villosae*, which he considered to have cleft anther tips, with false umbels where the flowers are held at almost same height. He considered that in general the species with entire anther tips may also have false umbels but with flowers not at the same height. Nel described the variations in the false umbel inflorescences in *Hypoxis* based on number of flowers and bracts, and surmised that the variations may be due to reduction or involution of the raceme. He further considered the inflorescence of *H. rooperi* (= *H. hemerocallidea*) to represent the transition from racemose to corymbose. Heideman (1987) adopted the descriptions provided by Nel and illustrated the variation seen in inflorescences in species of the Witwatersrand. Wiland-Szymańska and Nordal (2006) applied inflorescence type as a differentiating character in their key to species in the Flora of Tropical East Africa region.

As recognised by Baker (1878b) and Nel (1914), inflorescence type is a good character for distinguishing groups of species in *Hypoxis*. In the present study, two inflorescence types are recognised in *Hypoxis*, namely a raceme (Figure 7.1) and a corymb (Figure 7.2). In general, racemes consist of (4-)5–17 flowers and corymbs have 4–5(-10) flowers, but in both types reduction in the number of flowers to less than four is noted. The main difference between the raceme and corymb is in the level at which flowers are held along the axes. In the raceme, flowers are borne on short pedicels (usually up to 15 mm) at varied levels on the axes while in the corymb, the lower flowers are elevated on long pedicels (20 mm or more) to lie at the same level as the terminal flowers. Among species with racemose inflorescences, the reduction in pedicel length of all flowers, except the two lowermost ones gives rise to a spike-like raceme and this is found in *H. colchicifolia*, *H. galpinii* and *H. rigidula*, species with a robust habit.

The racemose state is evident when there are more than four flowers on an inflorescence. However, in a few species like *H. hemerocallidea*, *H. obtusa*, *H. longifolia* and *H. ludwigii*, when there are four or less flowers and these arise from a common point and have pedicels of almost

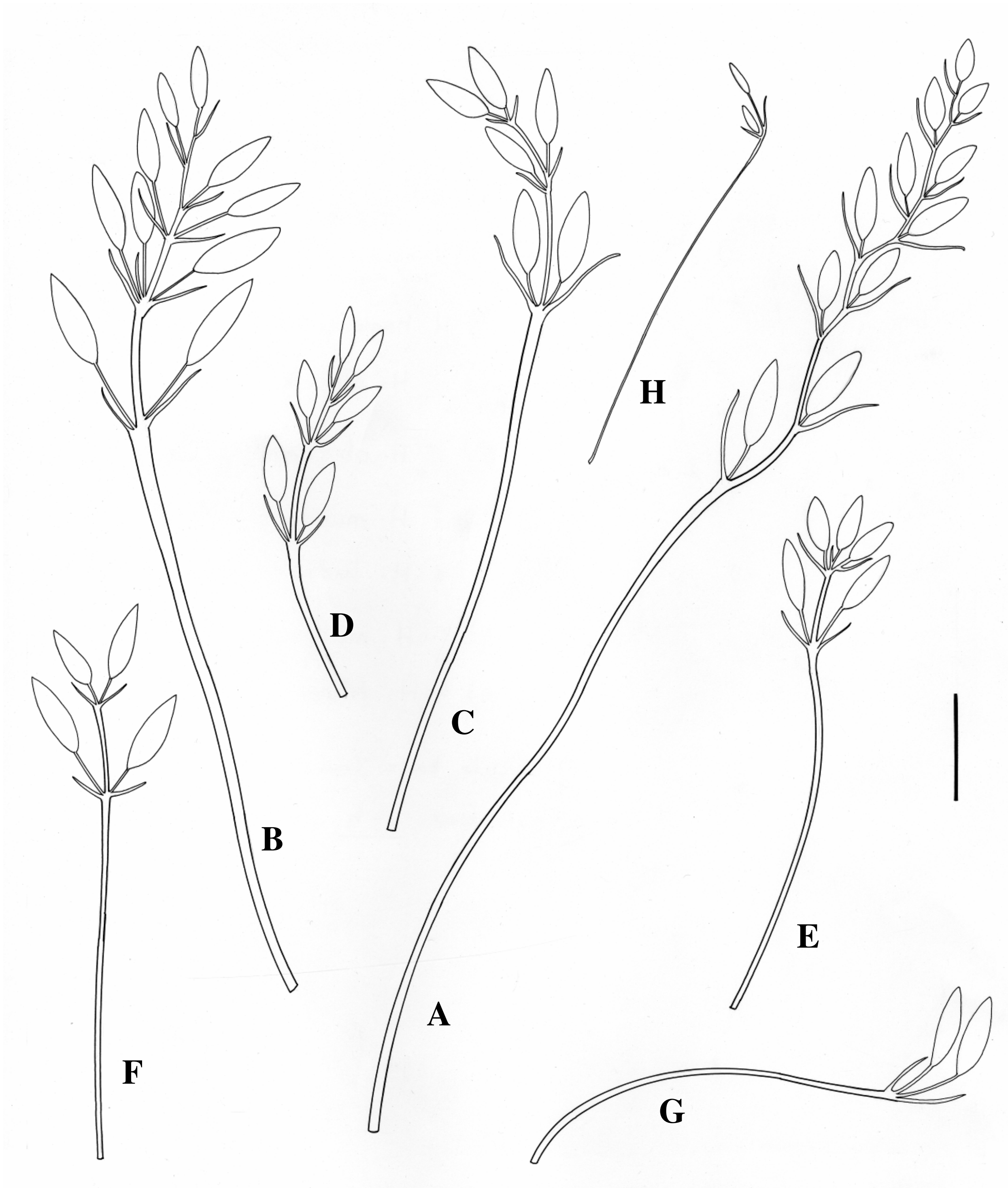

Figure 7.1.—Raceme. A, more than six flowers, *H. rigidula* var. *rigidula*, *Singh 317* (NH); B, more than six flowers, *H. hemerocallidea Singh 321* (NH); C, six flowers, *H, obtusa*, *Singh 583* (NH); D, six flowers, *H. obliqua*, *Cloete 512* (NH); E, five flowers, *H. multiceps*, *Singh 322* (NH); F, four flowers, *H. ludwigii*, *Greene 727* (NH); G, two flowers, *H. multiceps*, *Singh 642* (NH); H, two flowers, *H. filiformis*, *Singh 823* (NH). Scale bar: A–H, 30 mm. Artist: A.J. Beaumont.

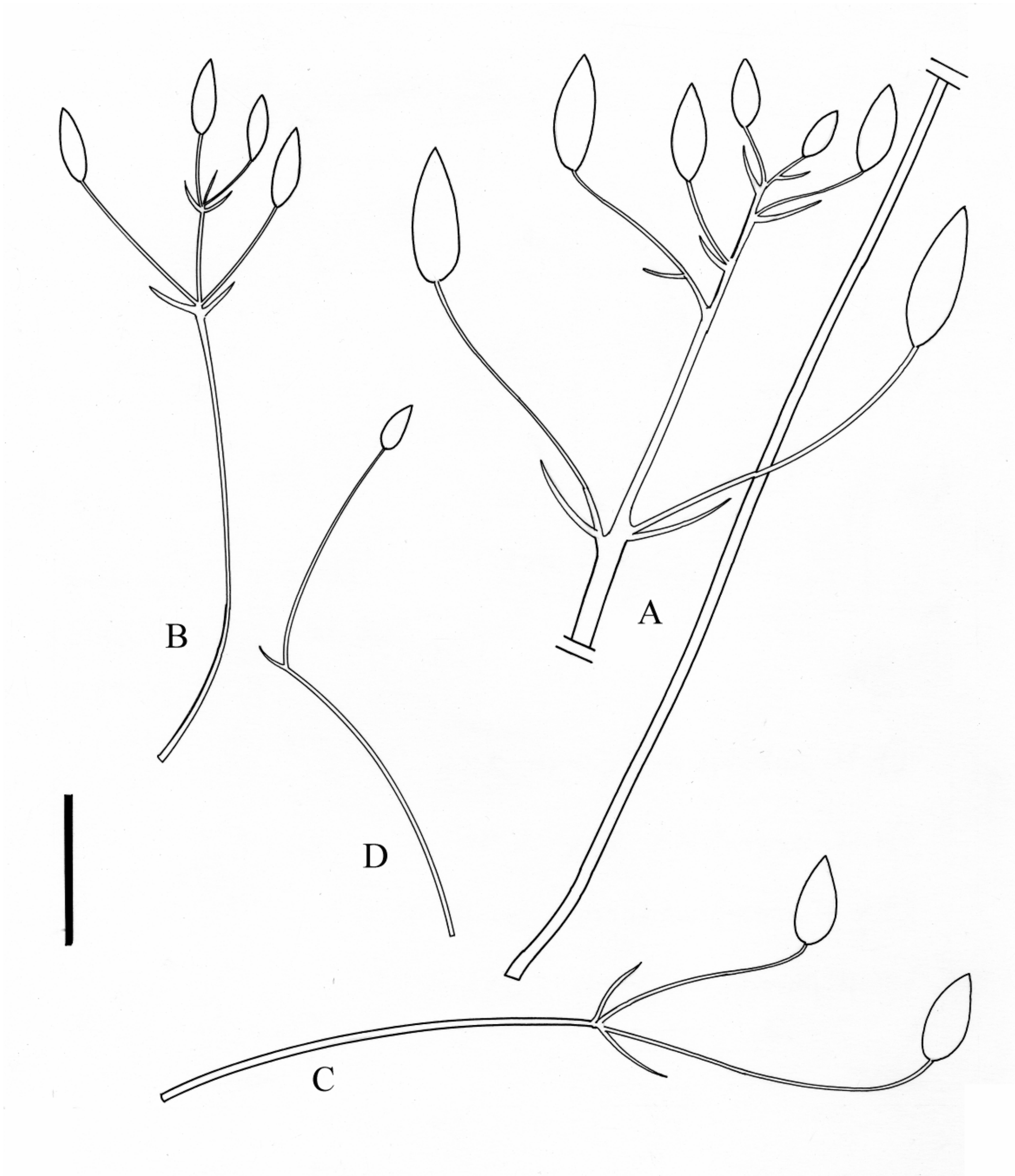

Figure 7.2.—Corymbs. A, seven to eight flowers, *H. sobolifera* var. *sobolifera Singh 233*; B, four flowers, *H. argentea* var. *sericea*, *Singh 498* (NH); C, two flowers *H. membranacea*, *Singh 826* (NH); D, one flower, *H. parvula* var. *parvula*, *Singh 308* (NH). Scale bars: A, B, D, 30 mm; K, 10 mm. Artist: A.J. Beaumont.

equal length, the inflorescence resembles a corymb. In these species, corymb-like inflorescences are occasional and they often occur together with racemes on the same plant. Number of flowers, length of pedicels of the two lowermost flowers and flexibility of pedicels are useful for classifying types of inflorescences in *Hypoxis*. Based on these characters, species can be categorised into groups (Table 7.1). About equal number of species have racemes or corymbs.

Table 7.1.—Distribution of inflorescence types and number of flowers among species

Raceme		**Corymb**	
Pedicels firm and erect, lowermost usually 5–30 mm long Flowers held at varying heights along axis		Pedicels soft and flexible, lowermost usually 10–50 mm long All flowers come to lie almost at the same height	
Flowers 5–17	Flowers 1–5 (rarely 6)	Flowers mostly 4–5(-10)	Flowers 1–2
H. colchicifolia	*H. acuminata*	*H. angustifolia*	*H. flanaganii*
H. galpinii	*H. costata*	*H. argentea*	*H. floccosa*
H. hemerocallidea	*H. filiformis*	*H. gerrardii*	*H. membranacea*
H. longifolia	*H. interjecta*	*H. nivea*	*H. parvula*
H. ludwigii	*H. kraussiana*	*H. stellipilis*	
H. obtusa	*H. multiceps*	*H. sobolifera*	
H. rigidula	*H. obliqua*	*H. villosa*	
	H. parvifolia	*H. zeyheri*	
	H. tetramera		

Inflorescences are produced at the beginning of the growing season, around September and in a few taxa (*H. angustifolia* var. *buchananii*, *H. hemerocallidea* and *H. obtusa*) they are produced continuously throughout the growing season until March. In most species, flowering peaks in October–November after the September rains and/or winter and spring burns. From December onwards, plants reach the fruiting stage and the formation of new inflorescences stops or is reduced.

7.2.3 Flower

In *Hypoxis*, the tepals are free, exposing stamens and style (Figures 7.3 & 7.4). *Hypoxis* flowers are fairly uniform in structure except for slight differences in colour, size and texture of the tepals. In creating sections in *Hypoxis*, Nel (1914) applied two reproductive characters, namely anther apex entire or split, and differences in the relative lengths of style and stigma. These characters were used in combination with the leaf width and number of veins on blades. In her treatment of *Hypoxis* in Central Africa, Wiland-Szymańska (2001) indicated that the gynoecium characters selected by Nel (1914) were not stable for polymorphic species and she cited *H. angustifolia* and *H. hockii* De Wild. as examples. In the following year, Wiland-Szymańska & Adamski (2002) discussed the variation in anther features, and style and stigma ratios in *H. angustifolia*. Comments on these

7.3.—Tepal arrangement. A, *H. hemerocallidea*; B, *H. flanaganii*

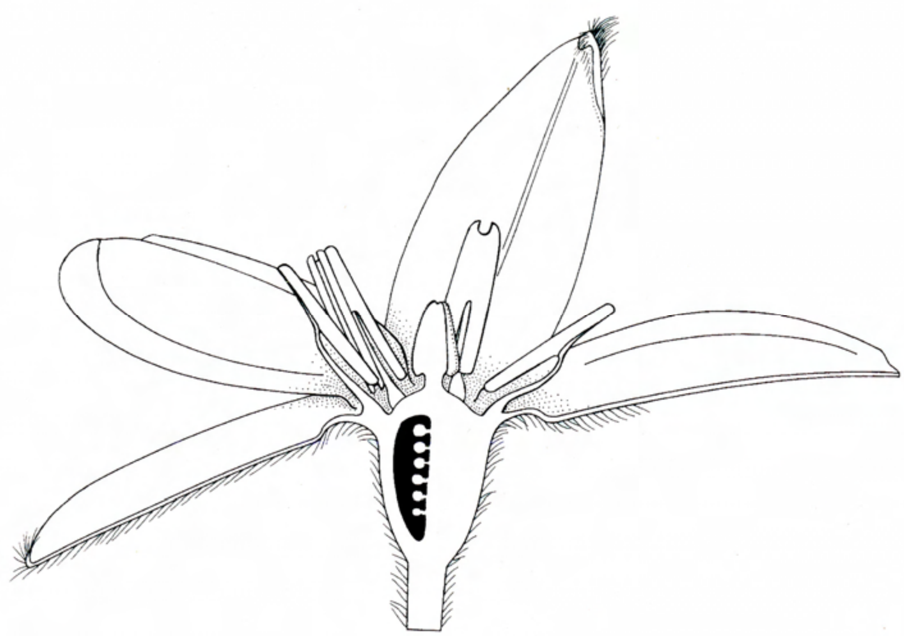

Figure 7.4.—Half flower drawing showing position of stamens relative to tepals in *Hypoxis*. Adapted from Singh (2000).

structures follow under the relevant sections below.

7.2.3.1 Bracts

Each flower in *Hypoxis* is supported by a single bract. In species with single flowers, one or two bracts are present. The presence of the second bract indicates an evolutionary reduction in the number of flowers. The bracts are linear to subulate, acute, keeled and with membranous margins, hairy on the lower surface and range from 4–35 mm in length. In the racemose inflorescences, the bracts are half as long, equal to or longer than the length of the pedicels while in corymbose inflorescences, the bracts are about one third to half as long as the pedicels. The range of the longer bracts in racemes overlaps with the length of bracts in the corymbs, making it difficult to apply the character in sparating species or groups of species. Herndon (1992) found that in the Florida members of *Hypoxis,* the relative lengths of bract and pedicel are useful in demarcating species, but he also cautioned that the character is not very reliable when used on its own. Bracts have not been used on their own or in combination with pedicel lengths in any recent study on the African members of *Hypoxis*.

7.2.3.2 Pedicels

Pedicels in *Hypoxis* are slender and range in length from 10 to 40 mm, being longer in corymbose inflorescences and shorter in racemes. Length of the pedicels has been used by Nel (1914) as a character to separate species. It has also been used in keys by contemporary botanists working on tropical African species of *Hypoxis*. Nordal & Zimudzi (2001), for example, combined length of lowermost pedicels with scape features to distinguish among species in the Flora Zambesiaca region. Wiland-Szymańska and Nordal (2006) also used pedicel length in combination with characters of leaf, scape and inflorescence for species identification. The latter study included five taxa that also occur in southern Africa. Heideman (1987) provided a practical identification key to species of *Hypoxis* on the Witwatersrand. She used pedicel length in combination with leaf, indumentum and flower number to separate *H. filiformis* from *H. argentea*. Further, she described the pedicels of each pair of flowers in *H. filiformis* to be unequal and those of *H. argentea* to be equal. During field work in the Durban area, *H. filiformis* was observed growing with *H. angustifolia* and it was confirmed that the two species can also be separated on the lengths of pedicels, being unequal in *H. filiformis*. Essentially, length of pedicels is an important character for distinguishing between species with racemose and corymbose inflorescences (Table 7.1, Figures 7.1 & 7.2). Pedicels are green in most species but populations of *H. angustifolia* var. *angustifolia*, *H. argentea*, *H. flanaganii* and *H. sobolifera* were found to have red or pink pedicels.

7.2.3.3 Tepals

Flowers in *Hypoxis* have six free tepals arranged in two whorls, the three outer ones alternating with the inner ones in a regular star-shape pattern (Figure 7.3). The tepals are elliptic or ovate-elliptic, with the outer ones slightly narrower with acute tips and the inner tepals with slightly more round tips. In some species, the wider, round tips of the inner tepals gives them an ovate shape. In some plants of *H. filiformis* and *H. tetramera*, tepals may be reduced to four and this was seen mostly in populations of *H. filiformis* growing in bogs. Baker (1878b) recorded the tetramerous state once in an Australian species. Nel (1914) mentioned that he had only seen less than six tepals in *H. saggitata* Nel. Hepper (1968) noted that *H. urceolata* Nel usually has six tepals but four segments do also occur in the species. In *H. angustifolia* and *H. hemerocallidea*, an aberration of eight tepals was recorded during the present study in plants kept in cultivation, but this is extremely rare and clearly an aberration. The stamen number in tetramerous and octamerous plants corresponds to the number of tepals.

Flower colour in *Hypoxis* is yellow except in *H. membranacea* (Figure 5.19B), *H. nivea* (Figure 5.19D) and *H. parvula* var. *albiflora* which have white flowers. All tepals are smooth and bright yellow (seldom white) on the inner (adaxial) surface. The outer (adaxial) surface of outer tepals is green and hairy whereas that of the inner tepals is yellow (with a narrow green band along the midrib) and slightly hairy. Sometimes, the outer surface of tepals in yellow-flowered species is red-keeled and corresponds with red pedicels. This occurs in *H. angustifolia* var *angustifolia*, *H. argentea*, *H. flanaganii* and *H. sobolifera*. In a few specimens of the white-flowered *H. nivea*, the pink colouration is diffused throughout the tepals and flowers are noted as being pink tinged [*Jordaan 952, 1118* (NH)].

In the present study, an association between size and texture of tepals and that of inflorescence types was found. Large (12–20 mm long), thick-textured tepals are found in racemose species while small (4–10 mm long), thin-textured tepals are present in corymbose taxa as well as in taxa with one or two flowers. Nel (1914) also noted that flowers of the corymbose (false umbel) inflorescences are smaller than those in racemes, but did not quantify the differences in flower size. The present study supports Nel's observation on flower size. Wiland-Szymańska (2001) found tepal size to be a diagnostic character and used it on its own to separate species in Central Africa. Nordal & Zimudzi (2001) used flower size in combination with pedicel length to differentiate two closely related taxa with grass-like leaves with width less than 12 mm. In the present, the diameter of open flowers was found to be useful to group species (Singh 2004). In general, *Hypoxis* in southern Africa can be sorted into two groups based on whether the flowers are less than or more than 15 mm in diameter. Flowers less than 15 mm in diameter are associated with corymbose inflorescences while flowers more than 15 mm are found in racemes. However, a few species namely *H. sobolifera*, *H. stellipilis* and *H. villosa* that forms Group 5 (Singh 2004) have corymbose inflorescences but the open flowers are 15–25 mm in diameter, thus overlapping with the size range of flowers from racemose inflorescences. But, in these species, the leaves are flaccid and can be easily distinguished from the stiff leaves of taxa with racemes. In summary, the texture of tepals is difficult to describe for use in a key, but the diameter of open flowers and the length of the tepals are of taxonomic importance in separating species. Flower size, however, cannot be used on its own but only in combination with vegetative and other inflorescence characters.

7.2.3.4 Stamens

Flowers of *Hypoxis* have six stamens, each attached centrally at the base of a tepal (Figures 7.3 & 7.4). The stamens are arranged in two series, the inner three being slightly shorter than the outer three. The two series is not always noticeable in all species, and is less obvious in species with minute flowers like *H. nivea*, *H. flanaganii* and *H. floccosa*. Filaments in *Hypoxis* are subulate except in the *H. filiformis*, *H. membranacea*, *H. nivea* and *H. parvula* in which they are filform. Anthers in *Hypoxis* are linear or lanceolate, sagittate, basifixed or dorsifixed and open by lateral slits (latrorse). Nel (1914) recognised two states for anthers–one with tips entire (Figure 7.5A) and the other with tips split (Figure 7.5B). He used the type of anther tip as a diagnostic character in a key to sections. 'Entire' refers to the thecae being fused at the apex and 'split' means the thecae are free. According to Hepper (1968), Nel was in error in ascribing split anther tips in *H. ledermanii*. Although anther tips in *H. angustifolia* are split, variation is seen in the degree of split and this is illustrated in Wiland-Syzmańska & Adamski (2002). Nel (1914) claimed that the feature of entire or split anther tips can be seen with the naked eye and that it was more noticeable in some sections e.g. *Angustifoliae* than in others e.g. *Nyassicae*. In the present study, it was found that it is difficult to assess the anther tips especially in species with minute flowers, and that it was not a very useful character for separation of species since taxa with similar vegetative morphology have the same anther attributes. Entire anther tips were found to be associated with species with rigid leaves while split anther tips occur in species with flaccid leaves. However, Nel's observations on the state of the anther tips are accurate for southern African species except for *H. hemerocallidea*, where the anther tip is either entire or split. Both anther types occur in *H. hemerocallidea*, Nel (1914) placed *H. hemerocallidea* and *H. rooperi* (considered a synonym of *H. hemerocallidea* in the present study) in different sections.

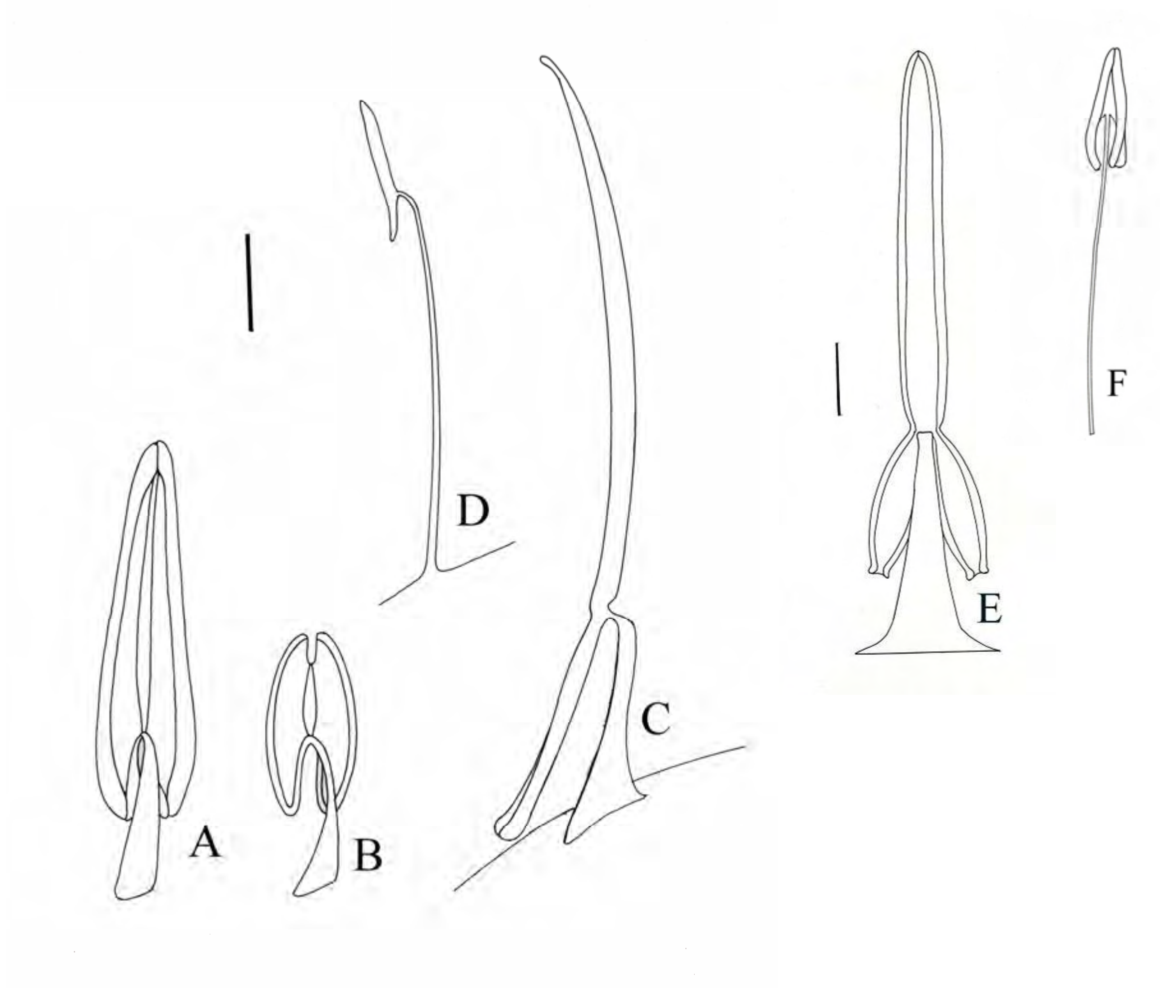

Figure 7.5.—Stamen in *Hypoxis*. A, anther tip entire, *H. hemerocallidea*, *Aubrey s.n.* (NU); B, anther tip spilt, *H. sobolifera* var. *sobolifera*, *Singh & Baijnath 233* (NH); C, stamen showing subulate filament and firm anther attachment, *H. galpinii*, *Singh 632* (NH); D, stamen showing filiform filaments and loose anther attachment, *H. membranacea*, *Singh 366* (NH); E, backview of stamen, *H. galpinii*, *Singh 632* (NH); F, *H. parvula* var. *parvula Singh 366* (NH). Scale bars: A, B, 1 mm; C, D, 2 mm; E, F, 1 mm. Artist: Angela Beaumont.

7.2.3.5 Pollen

Pollen grains in *Hypoxis* are yellow and are quite obvious in the pollen sacs of honeybees (Figure 7.6). Grains in the genus are monosulcate (Figure 7.7A), small, boat-shaped, about twice as long as wide (20–40 x 8–22 µm) and biconvex. The exine is thin and pitted (Figure 7.7B). Pollen grains were found to be similar in all the southern African species of *Hypoxis* and are of no significance for the separation of species.

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Figure 7.6.—Pollen collecting bees. A, honeybee visiting flower of *H. galpinii*, pollen sacs filled with yellow pollen; B, solitary bee in flower of *H. colchicifolia*.

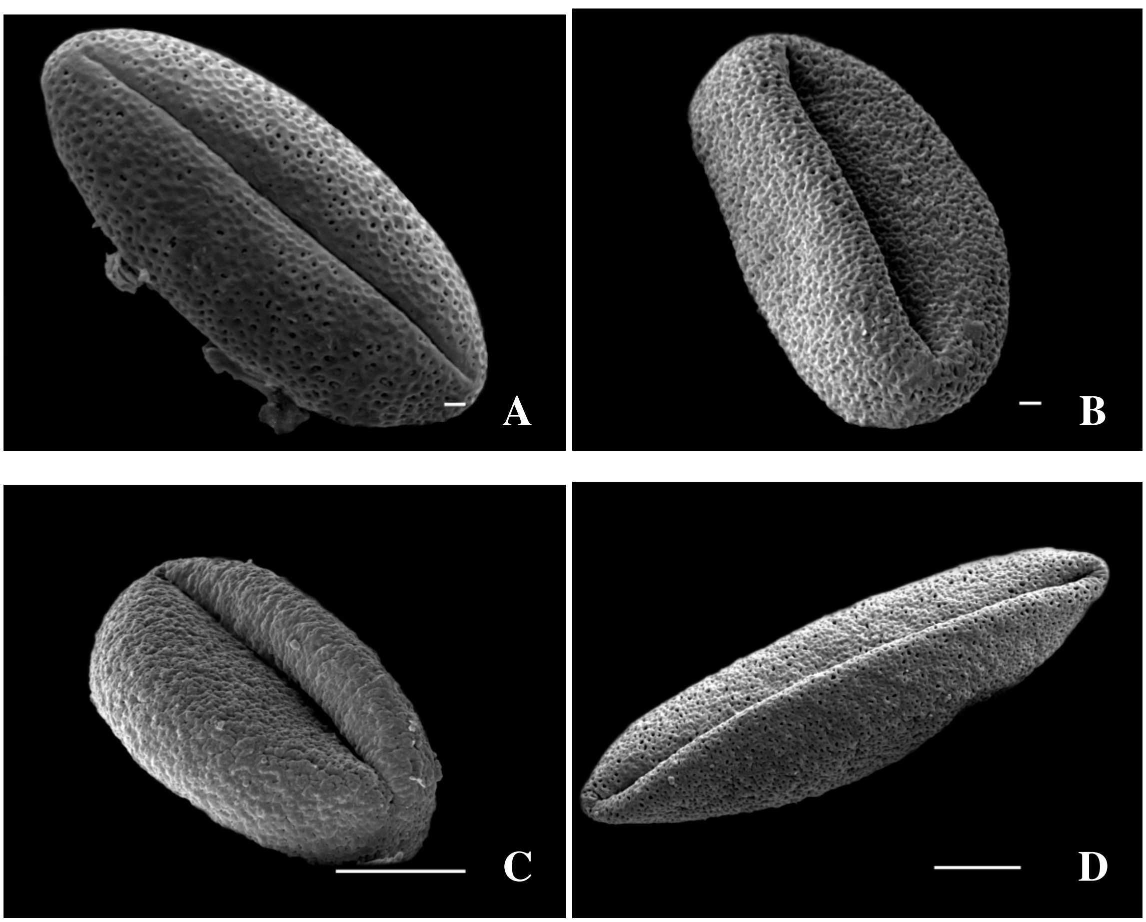

Figure 7.7.—Pollen grains in *Hypoxis* species showing pitted exine, shown in dry state with an infolded furrow. A, *H. galpinii*; B, *H. parvula* var. *parvula*; C, *H. kraussiana*; D. *H. acuminata*. Scale bar: A, B, 1 µm; C, D, 10 µm.

7.2.3.6 Gynoecium

The ovary in *Hypoxis* is inferior, ovate to subglobose 3-locular with axile placentation. Each locule contains 4–16 ovules, biseriately arranged in each locule. The style is well-developed, columnar or filiform; sometimes reduced, then with a broad base and triangular in shape, making the stigma almost sessile. The stigma consists of three concave faces that unite in the shape of a pyramid (Figure 7.8A) and the three free lobes are visible when they become detached from each other, but this is rather uncommon. The stigma in a few species namely *H. membranacea*, *H. nivea* and *H. parvula* and in some specimens of *H. angustifolia* are spherical, but still minutely lobed (Figure 7.8B). The band along the length of the stigma where the lobes unite is papillate (Figures 7.8A & B). Pyramidal stigmas are associated with columnar styles (Figure 7.8A), shorter than or equal to its length, while spherical stigmas are found on filiform styles (Figure 7.8B) that are about 3–5

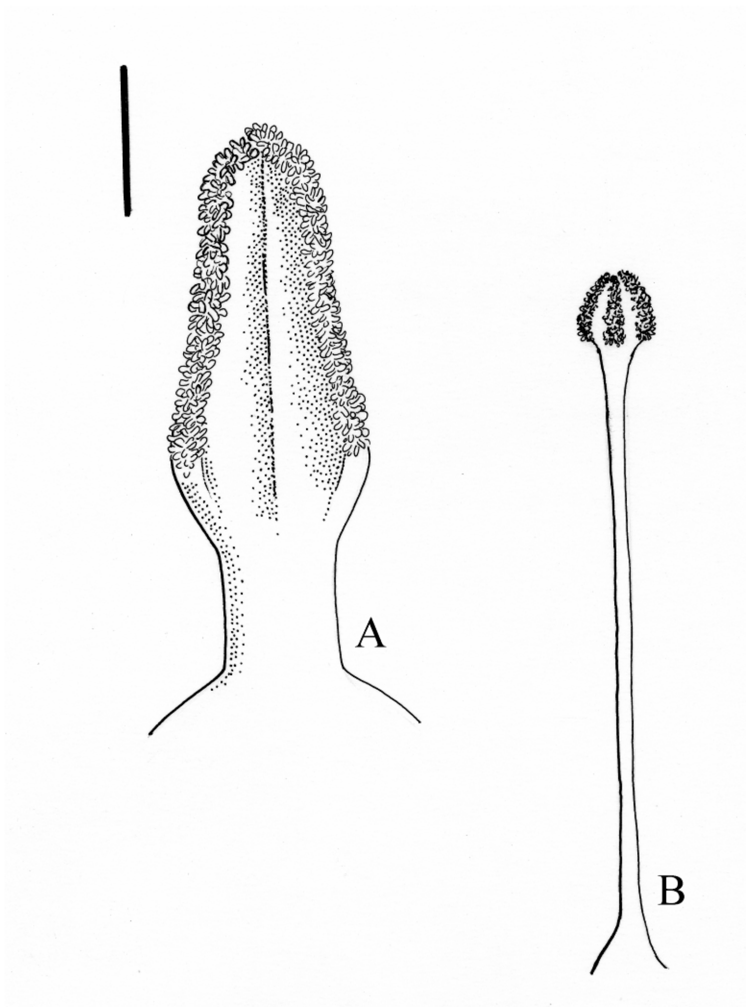

Figure 7.8.—Stigma types in *Hypoxis*. A, pyramidal on columnar style, *H. galpinii*, *Singh 632* (NH); B, speherical on filiform style, *H. parvula* var. *parvula*, *Singh 366* (NH). Scale bar: 1 mm.

times the length of the stigma. Nel (1914) used the spherical stigma on a filiform style to separate *H. membranacea* from the rest of the species. Observations made in the present study confirm that style to stigma ratio is an important character for separating species with filiform styles and minute, spherical stigmas (*H. membrancaea*, *H. parvula*) from those species that have distinct columnar styles and pyramidal stigmas.

7.4 Fruit

The fruit in Hypoxidaceae is either a thin-walled capsule or is succulent to membraneous walled, the latter state referred to as baccate (Nordal 1998). Two types of dehiscence are noted in the thin-walled capsules: (1) circumscissile, where the persistent tepals split open across the carpels and drop off like a lid (pyxis) to expose the seeds and (2) loculicidal, the capsule splits longitudinally (along the carpel walls) into three parts. The 'baccate' fruits are indehiscent, eventually breaking up by disintergration.

Hypoxis fruits are thin-walled capsules (Figure 7.9B) with circumscissile dehiscence (7.9C). In a few of the delicate species namely *H. argentea*, *H. angustifolia*, *H. filiformis* and *H. parvula*, circumscissile dehiscence is followed by longitudinal splitting of the lower part of the capsule (Figure 7.9D). A variation in these types of dehiscence in *Hypoxis* was noted by Hilliard & Burtt (1978) who explained that species growing in damp habitats may lose free dispersal of the seeds and show rather irregular dehiscence. According to them, in these plants, the scape tends to bend downwards after flowering and the fruit being thin-walled is moulded to the shape of the seeds within (Figure 7.10). In the present study, this phenomenon has been observed in plants of *H. angustifolia* and *H. filiformis* growing in the damp habitats. However, not all populations growing in damp conditions show this pattern, for example, capsules of *H. parvula* which grow in moist cliff faces, undergoes circumscissile dehiscence (Figure 7.11).

Capsules in *Hypoxis* are straw-coloured, ovate to round and like the flowers, fruit size varies between the robust and delicate species. In the robust species, capsules are about 7–12 mm x 5–8 mm and in delicate species, they are 3–4 mm x 2–4 mm. Size of capsule can be used in combination with leaf texture and inflorescence type to confirm the identity of a species. Fruit characters are not normally used to define species or groups of species in the genus, probably because they may be lacking on herbarium specimens.

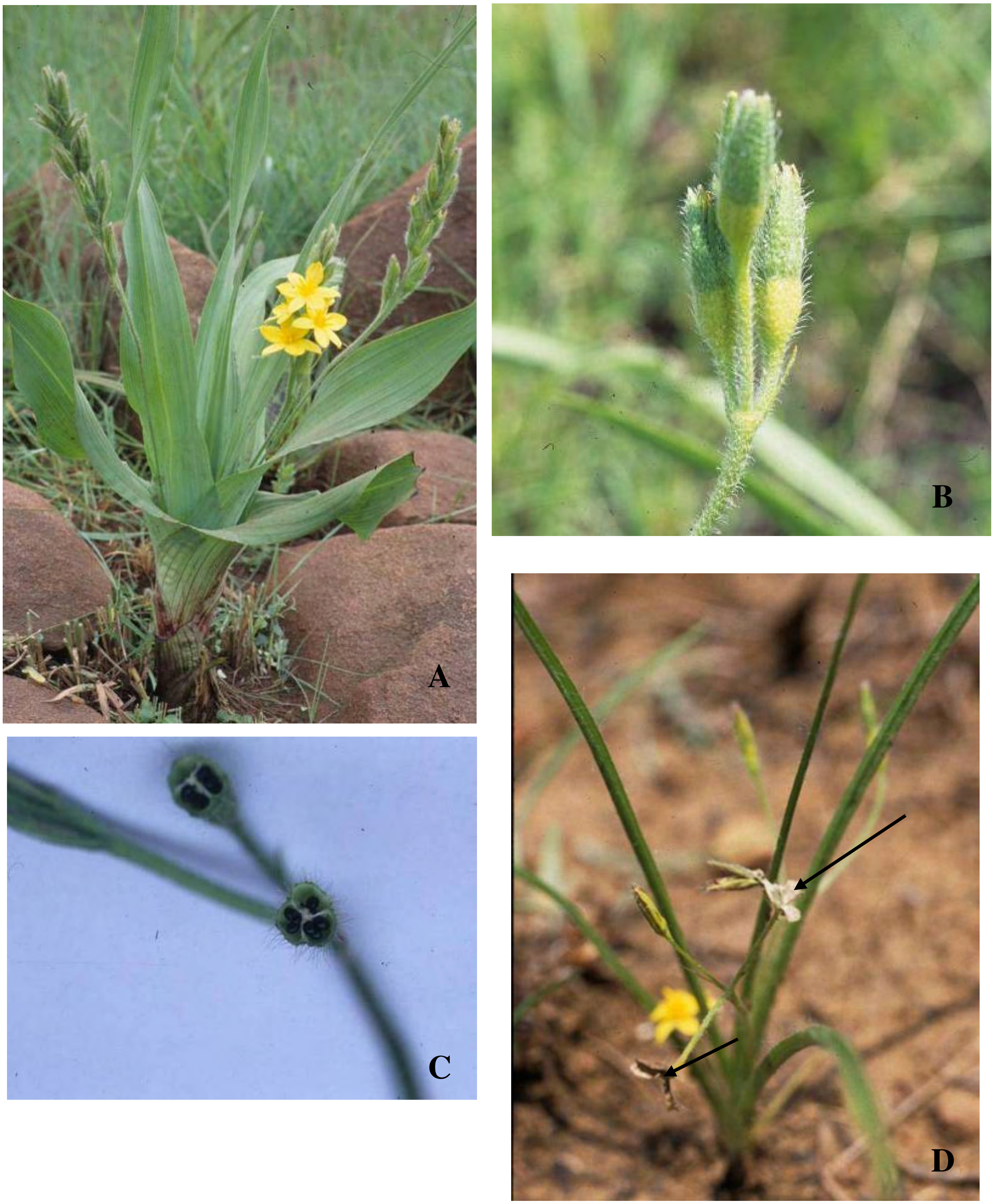

Figure 7.9.—Capsule and dehiscence in *Hypoxis*. A, whole capsules on raceme of *H. colchicifolia*; B, close-up of capsules in *H. longifolia*; C, capsule showing circumscissile dehiscence in *H. angustifolia* var. *buchananii*; D, capsule showing longitudinal dehiscence following circumscissile dehiscence in *H. argentea* var. *sericea* (arrows)

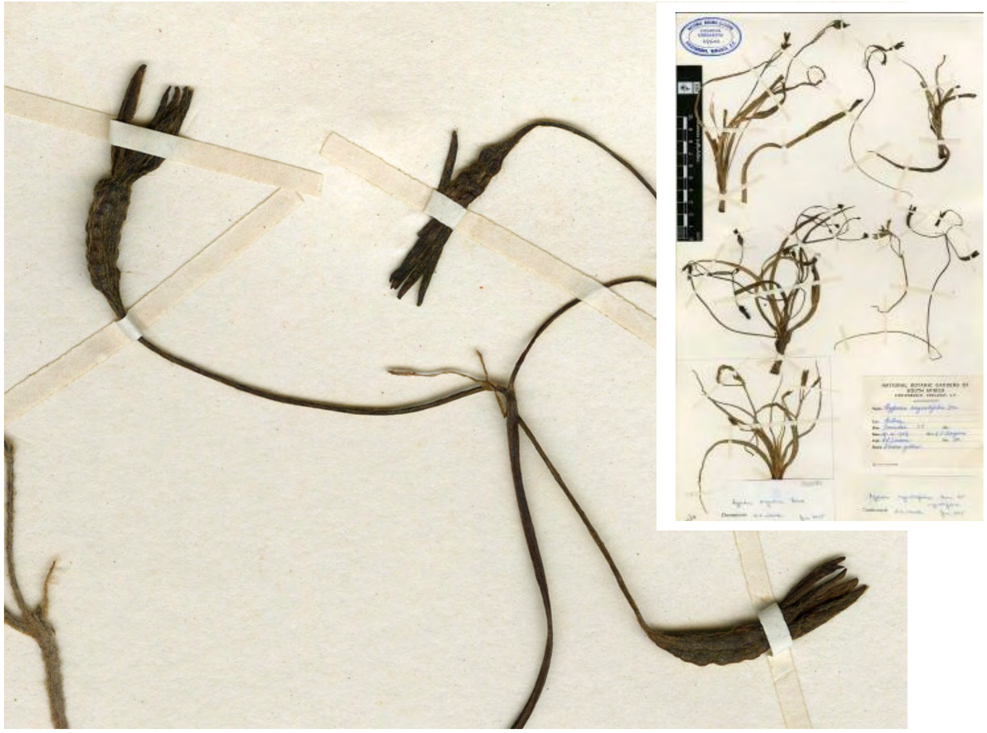

Figure 7.10.—Capsule moulded to shape of seeds in *H. angustifolia* var. *angustifolia* in *Lussem 50* (NBG).

Figure 7.11.—Circumscissile dehiscence in the soft-texture *H. parvula* var. *parvula* (arrows).

7.5 Seed

The Hypoxidaceae is characterised generally by a black (seldom brown), brittle, smooth or papillate phytomelan encrusted seed coat. Phytomelan is one of the prominent characters that differentiate the Hypoxidaceae from the closely related Orchidaceae within the Asparagales (Dahlgren & Clifford 1982). Seed surface characters were found to provide diagnostic characters for species separation in *Hypoxis* in southern Africa. Given the relevance of seed characters to understanding species relationships in the genus, the data on seeds are presented as a separate manuscript (see Appendix 1.5). Much of the data on the seed surface in this study were derived from Scanning Electron Microscopy and although they provide taxonomic evidence for uniqueness or commonality among species, it is not practical to use the character for routine identification in the field or herbarium. Species with unique seed characters like *H. stellipilis* can also be easily separated on vegetative characters. Seed surface characters are useful in confirming relationships among species that were inferred from observations on vegetative morphology and inflorescence and flower characters.

7.6 Conclusions

In this chapter, floral and fruiting features are described, comments on their use by earlier authors are provided and the taxonomic value of characters concluded. Taxonomically, the most informative characters include inflorescence type, filament and style thickness, stigma type and seed surface patterns. In the Discussion presented in Chapter 12, taxonomically significant characters from reproductive morphology are combined with those from the observations on vegetative morphology (Chapter 5) to infer groupings of related species.