

Studies in Cyperaceae in southern Africa. 19: The genus *Bolboschoenus*

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The genus *Bolboschoenus* (Ascherson) Palla, a segregate from *Scirpus* L. *sensu lato*, is considered for the geographical area of the Flora of southern Africa. Two species are recognized. *B. maritimus* (L.) Palla is widespread and variable; *B. nobilis* (Ridley) Goetghebeur & D.A. Simpson is restricted to Namibia. Descriptions, known distributional areas and ecological notes are given for both species, as is a key for identification. Electron micrographs of achenes and achene surfaces are provided.

Die genus *Bolboschoenus* (Ascherson) Palla, 'n segregaat van *Scirpus* L. *sensu lato*, word vir die geografiese gebied van suidelike Afrika oorweeg. Twee spesies word erken. *B. maritimus* (L.) Palla is wydverspreid en variërend; *B. nobilis* (Ridley) Goetghebeur & D.A. Simpson is beperk tot Namibië. Beskrywings, bekende verspreidingsareas en ekologiese aantekeninge, asook 'n sleutel vir identifikasie, word voorsien. Elektronmikrogramme van agene en ageenoppervlakke word voorsien.

Keywords: *Bolboschoenus*, taxonomy, southern Africa.

Introduction

The genus *Bolboschoenus* (Ascherson) Palla is a segregate from *Scirpus* L. *sensu lato*. Wilson (1981, p.157) and Goetghebeur and Simpson (1991, pp. 170, 172) have commented on its affinities and on the embryo type characteristic of its species. These authorities support its maintenance as a genus distinct from the closely allied *Schoenoplectus* Palla, another segregate from *Scirpus* s.l. They stress that the species of *Bolboschoenus* [approximately 16, of which *B. maritimus* (L.) Palla has the widest distribution] are in need of revision, preferably on a world-wide basis, as species delimitation is extremely confused.

Goetghebeur and Simpson (1991) re-assessed the African taxon *Scirpus laetiflorens* C.B. Clarke (Clarke 1902), which Clarke (1902) and Podlech (1967) had recorded for South West Africa (Namibia). It was pointed out that this species, synonymous with *Scirpus nobilis* Ridley and sometimes included within *S. maritimus* L. as var. *nobilis* (Ridley) C.B.Cl., has the characteristics of *Bolboschoenus*. The new combination necessary, namely *B. nobilis* (Ridley) Goetghebeur & D.A. Simpson, was made.

This paper surveys *Bolboschoenus* for the geographical area of the Flora of southern Africa in order to reconsider the entities represented, in relation to Goetghebeur and Simpson's recognition of *B. maritimus* and *B. nobilis* as distinct species in Angola and Namibia, and also to record the distribution of the taxa recognized. *B. maritimus*, as presently delimited, is known to exhibit wide variability.

Material and methods

The study is based on examination of specimens in South African herbaria and others kindly loaned from B, BM, M and WIND. Field knowledge has been incorporated where such information was available. Micromorphological detail has been recorded with the aid of scanning electron microscopy. An advantage was the quite extensive representation of *B. maritimus* (*Scirpus maritimus*) available from extra-

territorial localities. This made possible comparison of southern African plants with examples from other continents in both the northern and southern hemispheres.

Results

General

The study supports the findings of Goetghebeur and Simpson (1991) that *B. nobilis* is worthy of distinction from *B. maritimus* at specific level. In the area of the Flora of southern Africa, *B. nobilis*, as its name suggests, is a taller, more robust, coarser, more scabrid plant with far larger, more branching inflorescences of smaller, more obviously bristly spikelets, than *B. maritimus*. What is more, these two species are allopatric, although towards the known southern limits of distribution for *B. nobilis* in Namibia (to which country of the Flora area the species is confined) they approach, being represented in adjacent geographical grid squares (2416, *B. nobilis*; 2417, 2517, *B. maritimus* — Figure 1).

B. nobilis is less known than *B. maritimus*. Population studies in natural habitats are needed for both species, but especially the former.

Distribution and habitat

The study area (Figure 1)

In the area of the Flora of southern Africa, *B. nobilis* is known only from fairly mountainous country, a little inland from the coast, from 17° to 25°S and from 17°50' to 12°50'E in Namibia. Here plants favour the more or less permanent water of the deeper springs that exist along drainage lines among the mountains (J.D. Ward, pers. commun.). *B. maritimus* is not frequent in Namibia, being recorded from more inland localities at Grootfontein (about 19°S, 18°E) and in the Gibeon district (about 25°S, 17°50'E). This species is also confined to water and drainage lines, but is usually rooted in the black clay soils often underlying sand, or in the chemically enriched, dark-coloured sand

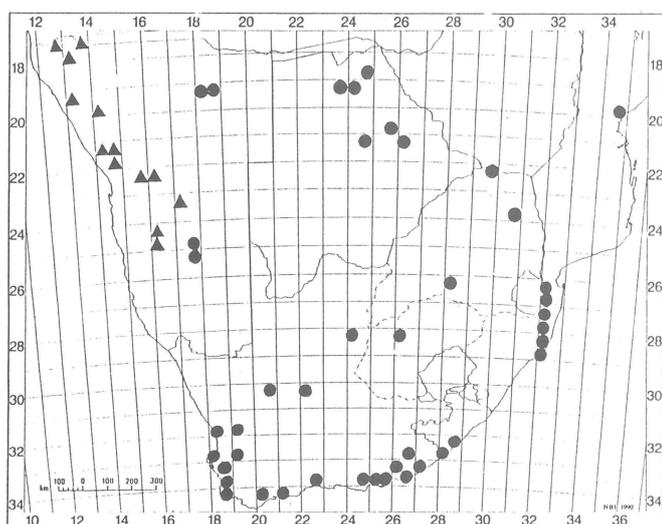


Figure 1 Known distribution of *Bolboschoenus maritimus* (●) and *B. nobilis* (▲) in southern Africa.

itself. It is well represented wherever streamlets exist along the southern African coastline south of approximately 31°50'S; therefore, it is present near both western and eastern shores of the subcontinent. It is well represented in Maputaland, and in the border area of Swaziland/Mozambique. Throughout the more arid interior there are occasional records, except for the most deserts, hottest central zone. The question of whether it is absent here, or whether the lack of records reflects inadequate field investigation, remains unanswered.

Extra-territorial sub-Saharan Africa

Outside the study area, *B. nobilis* has been reported only for Angola. *B. maritimus* is also in Angola, but its distributional relationship with *B. nobilis* is not known. [Goetghebeur and Simpson (1991) do not mention this, and early records of both species are not readily mapped.] It also occurs in Zambia (banks of the Zambesi River), Mozambique, Malawi, Kenya, Tanzania, Somaliland, Senegal and Senegambia. There are early herbarium records for Uganda (PRE) despite Haines and Lye's (1983) statement that the species is not known to occur in that country. Brain (1934) does not mention it for Southern Rhodesia (Zimbabwe) but it is present there (B, SRGH). A thorough distributional survey in Africa seems necessary.

Variability

B. nobilis

There is no account that discusses inter- and intra-population variability within this species. Herbarium specimens indicate reasonable morphological uniformity, but this needs field confirmation. Too little is known of the taxon to attempt other than a general morphological description (refer to Formal Taxonomy).

B. maritimus

Each population shows intra-population variation, mainly evident in the robustness of plants, with concomitant width of culms and leaf blades, and extent of branching of the inflorescences from a rayed anthela (compound or simple),

to a head of sessile spikelets, to a solitary spikelet (appearing terminal). Field study shows that plants growing under optimal conditions (usually in water) are the most robust with tallest, widest culms and branching inflorescences. Plants growing under poorer conditions (fringing the population) are more slender; so, too, are culms produced later in the growing season. In the two latter categories inflorescences are mostly unbranched heads, or, less often, solitary spikelets.

There are also differences in spikelet coloration, shape, size, extent of pubescence of the abaxial glume surface and projection of the excurrent, usually reflexed glume awn. These variations appear to be associated with particular localities, so that an impression is gained on inspection of herbarium sheets, that almost each population has its own distinctive appearance. However, more detailed analysis and measurement show these differences to be mainly spurious, because the generalizations deduced are often modified by exceptions. At the present stage of knowledge, it would be unwise to attempt infraspecific classification.

A few generalizations follow, but these require further confirmation from detailed field study and are given merely as guides:

- Plants from coastal situations ranging from approximately 32°S, 18°E to approximately 32°S, 29°E, are predominantly characterized by dark brown spikelets, 14 – 25 mm long by 5 – 8 mm wide that are ovate in outline. The glumes are closely imbricated, the abaxial pubescence and the excurrent awns being less well marked than in plants from further north and from inland localities. These spikelets, generally 1 – 20 per inflorescence, are most frequently organized into a head with a few short rays, or are rayless. This aspect of *B. maritimus* relates closely to plants from Europe (Britain, France, Germany, Holland).
- Plants from north of 30°S, from both coastal and inland localities, are predominantly characterized by light brown spikelets, (14 –) 20 – 44 mm long by (2 –) 3 – 5 mm wide, that are oblong in outline. The glumes are more widely spaced along the rhachilla, the abaxial pubescence and the excurrent awns giving a bristly appearance. These spikelets are generally organized into rayed anthelas [rays (1 –) 3 – 8 (– 10)]. Occasionally there is reduction to a head, but solitary spikelets are rare or absent. This aspect of *B. maritimus* relates to specimens from tropical Africa and approaches more closely to the facies of *B. nobilis*.

Exceptions are not uncommon, for example *Acocks 17572* (PRE) from Calvinia has oblong spikelets (33 × 4 mm), and *Forbes 739* (J) from Johannesburg has the facies of Cape coastal plants.

Features distinguishing *B. nobilis* and *B. maritimus* in southern Africa

In Table 1 are summarized the differences that Goetghebeur and Simpson (1991) suggested might help to distinguish these taxa in Angola and Namibia.

Of these, we found anther and anther crest lengths to be most reliable. Nowhere in the study area did spikelet numbers per inflorescence within *B. maritimus* approach the 100 – 200 stipulated by Goetghebeur and Simpson (1991) for *B. nobilis*. Paradoxically, however, less robust Namibian

Table 1 Features helping to distinguish between *B. nobilis* and *B. maritimus* (Goetghebeur & D.A. Simpson 1991).

Character	<i>B. nobilis</i>	<i>B. maritimus</i>
Contralaminar portion of sheath apex	Shallowly concave, with a narrow membranous band and dark brownish margin; nerves sharply angled round sheath apex	Deeply cleft, the cleft membranous, red-dotted, margin more or less hyaline, rarely coloured; nerves gently angled round sheath apex
Inflorescence	Much branched, with 100 – 200 spikelets	Sparsely branched, with up to 50 spikelets
Achene	Dark grey-green, spotted or blotched with black, rarely all black; surface irregular, somewhat shining, with scattered minute, distinctly raised blackish papillae	Mid grey-green to dark brown, without spotting or blotching; surface smooth, distinctly shining, without raised papillae
Anthers, at or after anthesis	less than or equalling 2 mm long, crest red brown, more than 0.5 mm long	less than or equalling 3 mm long, crest pale, less than 0.25 mm long

specimens of *B. nobilis* had inflorescences with 50 – 100 spikelets (very seldom less than 50). Numbers within *B. maritimus* did not exceed 50 spikelets per inflorescence, but extra-territorially, there were exceptions [for example, *Wingfield 1425* (NU), with 50 – 100 spikelets per inflorescence].

In general, the contralaminar part of the sheath apex is as was described for each species (Goetghebeur & Simpson 1991), but careful observation of several sheath mouths at about the middle of culm length is recommended. In *B. maritimus*, culms more or less 10 mm in width have less deeply cleft sheath mouths that approach the shallowly concave form characteristic of *B. nobilis*. (Other recorded differences are not always clearly defined, but if several sheath apices are observed, these distinctions become apparent.) Upper cauline sheaths in *B. maritimus* may produce a pale membranous 'tongue' above the red-dotted tissue of the contralaminar cleft. This tongue may be early deciduous leaving a truncate apex.

Fully mature, plant-ripened achenes of both species are alike, but there are differences, as expressed by Goetghebeur and Simpson (1991). To their descriptions we would add that fruits of *B. maritimus*, when fully developed and dry, may be black. They are wider and only bluntly 3-angled, the abaxial angle being poorly developed when contrasted with the narrower, more markedly trigonous mature fruits of *B. nobilis*. Surface markings on *B. nobilis* achenes are more irregular than those of *B. maritimus*. Under electron scanning, surface topography is similar, consisting of small, approximately iso-diametric cells, each, or the majority, with a central papilla arising from the presence of a 'hat-shaped' silica body deposited upon the inner periclinal wall of the cell. These papillate protrusions are less evident, smaller and more frequent than the 'distinctly raised blackish papillae' described for *B. nobilis* by Goetghebeur and Simpson (1991), which are larger, less numerous and, in the

achenes we have examined, placed nearer the achene apex rather than basally, and are not always present. Hypogynous bristles in *B. nobilis* are stronger and better developed than those of *B. maritimus*.

To already recorded differences, we would add glume awn length (1.0 – 2.2 mm long in *B. nobilis*; less than 1.0 mm in *B. maritimus*) and spikelet length (less than 10 mm long in *B. nobilis*; exceeding 10 mm in *B. maritimus*).

Conclusions

B. nobilis and *B. maritimus* are distinctive at species level in the area of the Flora of southern Africa. This distinction is probably applicable throughout sub-Saharan Africa, but a survey of tropical and North African specimens is desirable to confirm this and to assist in further assessment of the differences that most reliably distinguish these species.

Formal taxonomy

Key to identification

- 1a. Anthers at, or after, anthesis 3 – 4 mm long, excluding pale crest 0.2 – 0.3 mm long. Inflorescence with less than 50 spikelets. Spikelets (except when young) exceeding 10 mm in length. Glume awn length seldom exceeding 1.0 mm. Contralaminar portion of sheath mouth deeply cleft (except on culms exceeding 10 mm wide), cleft tissue membranous, red-dotted, truncate or with a pale projecting 'tongue' (early deciduous). Leaves and bracts not markedly scabrid *B. maritimus*
- 1b. Anthers at, or after, anthesis 2.5 – 2.9 mm long, excluding red-brown crest 0.7 – 0.9 mm long. Inflorescence with (50 –) 100 – 200 spikelets (occasional depauperate examples may carry 40 – 50). Spikelets usually not exceeding 10 mm in length (not seen in extreme age, but before then disintegration takes place). Glume awn length 1.0 – 2.2 mm. Contralaminar portion of sheath mouth shallowly concave, banded with narrow dark tissue surmounted by a pale membranous edge (early deciduous, never forming a projecting 'tongue', rather a frill). Leaves and bracts markedly scabrid, rough *B. nobilis*

Bolboschoenus maritimus (Linné) Palla in E. Hallier et A. Brand, W.D.J. Koch's Synopsis der deutschen und schweizer Flora 3: 2531 (1905). Type: Europe (LINN) (2 sheets). Lectotype (71.43) selected by Koyama, 1962.

Scirpus maritimus L.: 74 (1753); Thunb.: 17 (1794); Thunb.: 369 (1811); Nees: 509 (1832); Nees: 184 (1835); Kunth: 167 (1837); Boeck.: 722 (1869); Ridl.: 158 (1884); C.B.Cl.: 626 (1894); C.B.Cl.: 232 (1898); C.B.Cl.: 455 (1902); Forbes: 62 (1987). *Schoenoplectus maritimus* (L.) Lye: 145 (1971); Haines & Lye: 53 (1983).

Perennial. *Rhizome* horizontal, elongate, more or less 10 mm wide, fleshy, becoming woody, bearing widely-spaced, inconspicuous scale leaves and erect aerial culms either widely spaced, or grouped into sparse tufts; culm bases eventually hard, thickened. *Culm* up to 1.2 m high, trigonous at about middle (5 – 10 mm wide), becoming triquetrous above (more or less 2 mm wide), nodose, leafy, glabrous or minutely scabrous below inflorescence. *Leaf* sheath closed, contralaminar tissue at mouth deeply V-

shaped (shallower for culms, more or less 10 mm wide), membranous, dark, with pale red-spotted central zone breaking early (lower sheaths), or pale throughout, persisting, with, or lacking, a narrow convex projecting 'tongue' (upper sheaths); ligule absent; blade well developed, 5 – 8 mm wide, tapering apically, glabrous. *Inflorescence* variable, usually a simple anthela, rays 5 – 8, smooth, bearing clustered or solitary spikelets; occasionally compound with primary rays branched, or reduced to a head of 3 – 1 spikelets (Cape Peninsula particularly); total spikelet number never exceeding 50. *Bracts* 1 – 3, leaflike, base dilated, hardly sheathing, usually longest erect, overtopping inflorescence. *Spikelets* multi-flowered, cylindrical, tapering markedly or slightly distally, oblong to ovate in outline, 14 – 44 × 2 – 8 mm (more tropical specimens: oblong, long; southern Cape specimens: ovoid, shorter; compared at maturity), golden to dark brown (colour usually intensified with increased latitude). *Glumes* closely imbricate, 4 – 7 mm long (including awn), ovate or elliptic, 1 – 3-nerved, main nerve excurrent into recurved awn, flanks pubescent abaxially, apex emarginate, 2-lobed, becoming lacerate. *Hypogynous bristles* (0 –) 3 – 6, variable (usually shorter than achene), retrorsely scabrous, caducous. *Stamens* 3, *anthers* linear-oblong, 3.2 – 4.1 mm long excluding crest of 0.2 – 0.3 mm. *Style* linear, branches 3, long. *Achene* 2.7 – 3.0 × 1.6 – 2.3 mm, more or less biconvex to faintly trigonous (abaxial angle broad, hardly projecting), obovate in outline crowned by persistent triangular style-base 0.1 – 0.3 mm long, dark brown to black, smooth, shining, surface smooth but at high magnification clearly marked by isodiametric ripple-walled cells, each or the majority, with a central papilla.

Bolboschoenus nobilis (Ridley) Goetghebeur & D.A. Simpson, Kew Bulletin 46: 173 (1991). Type: Angola, Mossamedes, Maiombo River, *Welwitsch* 6975 (BM, lectotype designated by Goetghebeur & D.A. Simpson, 1991!).

Scirpus nobilis Ridley: 159 (1884).

S. maritimus L. var. *nobilis* (Ridley) C.B.Cl.: 627 (1894).

S. laetiflorens C.B.Cl.: 456 (1902); Gibbs Russell *et al.* 75 (1985). *S. maritimus* L. var. *laetiflorens* (C.B.Cl.) Kuekenh.: 392, 398 (1937), *quoad comb.* Types: South West Africa [Namibia] *Chapman & Baines s.n.* (K, syntype); Hereroland, *Fleck* 112A (syntype, not located).

S. maritimus auct., non L.: C.B.Cl.: 456 (1902) *quoad Welwitsch* 6975.

Perennial. *Rhizome* horizontal, elongate to more compact, more or less 20 mm wide, woody, bearing more or less triangular, veined, brown scale leaves overlapping on young parts, caducous leaving scars on mature portions. *Culms* robust, erect, up to 2 – 2.4 m, widely spaced or sparsely grouped, bases not markedly thickened, trigonous, smooth below (10 – 15 mm wide) to triquetrous, scabrid, (3 – 5 mm wide) below inflorescence, nodose, leafy. *Leaf* sheath closed (basal culm leaves reduced to sheaths only), contralaminar tissue at mouth shallowly concave (widely V-shaped), pallid, opaque, surmounted by a dark-brown band edged by

delicate narrow membranous tissue splitting and disappearing (not forming a projecting 'tongue'); ligule absent; blade well developed, 10 – 15 mm wide, tapering gradually, coarse, scabrid. *Inflorescence* a supra-decompound anthela; primary rays generally exceeding 12, 120 – 150 mm long, each sheathed basally by a closed prophyll up to 40 mm long, pallid, opaque, mouth oblique, a brown line edged by delicate membranous tissue soon disintegrating; ultimate rays carrying clusters of 5 or more crowded sessile spikelets; total spikelet number usually well exceeding 100. *Bracts* main 3 – 4, leaf-like, with sheathing base and expanded lamina, longer than inflorescence; those of ultimate rays much reduced, about 10 mm long, pallid, acuminate. *Spikelets* 12 – 15-flowered, ovate, elliptic or occasionally more or less globose, 8 – 9 × 3 – 4 mm (not seen in extreme age, disintegrating before this time), outline bristly (ragged) due to excurrent glume awns, golden brown. *Glumes* imbricate, 5 – 6 mm long including 1.0 – 2.2 mm long, excurrent, recurving awn, elliptic, keel prominent, flanks appearing nerveless, golden, pubescent abaxially, apex irregular, lacerate. *Hypogynous bristles* (0 –) 3 – 4 (6 not observed), variable, longest slightly shorter than achene, slender, broadening basally, finely retrorsely scabrous, caducous (easily left behind in glume when achene removed). *Stamens* 3, *anthers* linear-oblong, 2.5 – 2.9 mm long excluding 0.7 – 0.9 mm crest. *Style* linear, branches 3, long. *Achene* 2.3 – 2.6 × 1.4 – 1.6 mm trigonous, obovate in outline, crowned by persistent style-base 0.15 – 0.3 mm long, dark greenish-brown to black, shining or dull, with, or lacking, irregularly scattered, raised, papillate-like outgrowths; surface irregular to almost smooth, marked by outlines of iso-diametric cells that at high magnification are ripple-walled, each, or the majority, with a central papilla far smaller than the papillate-like outgrowths referred to earlier, the outer periclinal walls of epidermis readily breaking away. (Figure 2.)

Representative specimens examined

B. maritimus

- 1824 (Kachikau): Savuti River, just above Savuti Marsh (–CB), *Gibbs Russell* 2318 (PRE).
- 1918 (Grootfontein): Anenab (–AC), *Schoenfelder* 1096 (PRE).
- 1923 (Maun): Botswana, Nqamaqa Island (–BC), *Smith* 1737 (PRE).
- 1924 (Joverega): Botswana, 2 km N of Segxebe Pan (–AA), *Smith* 2452 (PRE).
- 2025 (Mompeswe): Botswana, 3 ml NE Makarikari Pan (–DA), *Drummond & Seagrief* 5145 (PRE).
- 2124 (Rakops): Botswana, channel of Botletle River, N of Lake Dow (–BC), *Wild & Drummond* 7227 (PRE).
- 2126 (Thada Mabeli): Botswana, flats N of Mopipi dam near Orapa (–AD), *Allen* X402 (J).
- 2229 (Waterpoort): Dongola Reserve, adjoining Limpopo River (–BC), *Codd & Dyer* 3867 (NU, PRE, PRU).
- 2330 (Tzaneen): Hans Merensky Nature Reserve (–DD), *Zambatis* 685 (PRE).
- 2417 (Mariental): Haribes, am Dammufer (–DA), *Volk* 12140 (B).
- 2517 (Gibeon): ohne Fundortsangabe, *Volk* 1096 (B).
- 2628 (Johannesburg): S of Alberton on Wadeville, Alrode roads (–AC), *Forbes* 739 (J).

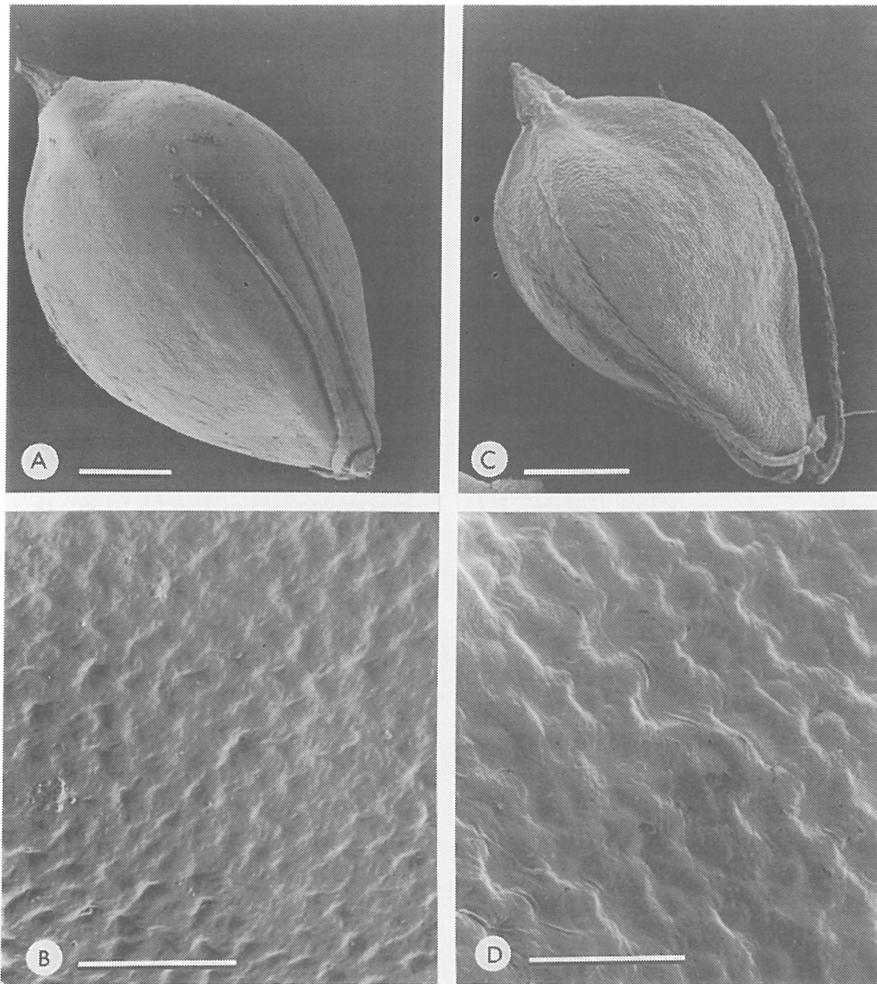


Figure 2 Achenes and pericarp detail. A, B. *Bolboschoenus maritimus*, C.J. Ward 1707 (NU); C, D. *B. nobilis*, Hilliard 4700 (NU). Scale bars: A & C, 0.5 mm; B & D, 50 μ m.

—2632 (Bela Vista): Swaziland, W entrance of Umbuluzi Poort (—AA), *Culverwell* 0220 (PRE); Tembe Elephant Park, Tembu Crossing, Mosi Swamp (—CD), *Ward & Farquaharson* 10037 (NU).
 —2732 (Ubombo): Lower Mkuze floodplain (—CB), *C.J. Ward* 8788 (NU, PRE).
 —2824 (Kimberley): Barkly West distr., Newlands (—AD), *Paton* 1323 (PRE).
 —2826 (Brandfort): Langs pad na Brandfort (—AC), *Muller* 1173 (PRE).
 —2832 (Mtubatuba): Nyalazi River towards entrance to False Bay (—AB), *C.J. Ward* 3485 (NU, PRE).
 —3020 (Brandvlei): Farm Lemoenkop, 2 miles S of farmhouse (—BA), *Roux & Lloyd* 93 (PRE).
 —3022 (Carnarvon): Boesakleegte (—AC), *Erasmus* 427 (PRE).
 —3118 (Vanhynsdorp): Lutzville, Olifantsrivier Bridge (—CB), *Arnold* 914 (PRE).
 —3119 (Calvinia): Lokenburg (—CA), *Acocks* 17572 (PRE).
 —3218 (Clanwilliam): Velddrif, Rocher Pan Nature Reserve (—CB), *van Rooyen & Ramsey* 543 (PRE, STE).
 —3219 (Wupperthal): Houdenbekrivier, Excelsior farm (—CD), *Hugo* 2288 (PRE, STE).
 —3226 (Fort Beaufort): Alexandria distr., farm Spadona (—DA), *Skead s.n.* 2 (PRE).
 —3228 (Butterworth): Transkei, Elliotdale distr., The Haven (—BB), *J.L. Gordon-Gray* 841, 1050 (NU).
 —3318 (Cape Town): Malmesbury, on road to Cape Town (—CD), *Clarkson* 380 (BOL, NU).

—3322 (Oudtshoorn): Wilderness (—DC), *Mogg* 11864 (PRE).
 —3324 (Steytlerville): Zwartkops Estuary (—DB), *Archibald* 5014, 5180 (GRA).
 —3325 (Port Elizabeth): Port Elizabeth, Creek (—DC), *Drege* 647 (GRA).
 —3326 (Grahamstown): Bathurst, Kowie River (—DB), *Burrows* 2787 (GRA).
 —3327 (Peddie): Hamburg (—AD), *Vorster* 2259 (PRE).
 —3418 (Simonstown): Muizenberg – Strandfontein Road (—AB), *Forbes* 609 (J).
 —3420 (Bredasdorp): near Stormsvlei (—AA), *Esterhuysen* 13563 (BOL, PRE).
 —3421 (Riversdale): coast near Still Bay (—AD), *Muir* 4180 (PRE).
 —3422 (Mossel Bay): Wilderness lagoon (—BA), *Jacot-Guillarmod* 8329 (PRE).

B. nobilis

—1712 (Posto Velho): Bainesberge bei Otjipemba (—BB), *Meyer* 1307 (WIND).
 —1713 (Swartbooisdrift): W of Epembe, Otjitariviers bei Oma (—CB), *Giess* 10502 (WIND).
 —1913 (Sesfontein): Hoanib River (—AC), *Craven* 1069 (WIND).
 —1914 (Kamanjab): Farm Palm, OU708, Quelle (—CC), *Giess* 3965, 8110 (WIND).
 —2114 (Vis): Brandenburg, Tsisab Valley (—AB/BA), *Hilliard* 4700 (NU).
 —2215 (Trekopje): Am Quellbach (—BA), *Giess* 14698 (WIND).

- 2216 (Otjimbingwe): Farm Otjozondi: KAR 36 (–AA), *Giess 3443* (WIND).
 —2317 (Rehoboth): Farm Buellsport (–AC), *Strey 2172, 2281* (PRE).
 —2416 (Maltahöhe): Naukluft, Bergzebrapark (–AA), *Merxmüller & Giess 28156* (PRE, WIND).

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