ISOËTACEAE

ISOËTES AEMULANS, A NEW SPECIES FROM SOUTH AFRICA

Isoëtes L. is a genus of ± 130 (Jermy 1990) to ± 150 (Taylor *et al.* 1993) species and is cosmopolitan in distribution. The species are generally associated with seasonal or permanent water bodies and may be amphibious, aquatic, or terrestrial. *Isoëtes* is represented in South Africa by 11 species from the summer and winter rainfall regions of the country. Most of the species are local endemics, (Roux 2009) often with restricted distributions.

Due to the cryptic stature of most *Isoëtes* species, they are mostly not well represented in herbaria and the species are poorly understood. During a review of *Isoëtes* in sub-Saharan Africa that was undertaken by the author, a new species was identified and is described here as *I. aemulans*.

Isoëtes aemulans *J.P.Roux*, sp. nov.

TYPE.—South Africa, 2828 (Bethlehem) Free State. Phuthaditjhaba, in shallow seasonal pan (–DD), 14 Jan. 1987, *J.P. Roux 1911* (NBG0143672-0, holo.).

Plants amphibious or aquatic. *Rhizomorphs* buried to 20 mm below substrate, dark brown, globose, to 5 mm tall, to 14 mm in diameter, 3-lobed, lobes weakly developed, with a large number of simple or dichotomously branched roots borne along rhizomorph fossae, roots pale to dark brown, with or without root hairs, root hairs borne on trichoblasts, if phyllopodia present then mostly less than 3 mm long, dark brown to black, glossy, centrally thinly crustaceous, marginally thinly chartaceous, arrested lycophyll primordia not observed. *Lycophylls* caespitose, herbaceous, erect, to 50 per plant, acicular, to 130 mm long, to 4.5 mm wide at spathulate base, with dorsilateral hyaline alae to 1 mm wide extending to 30 mm along the base of lycophyll, alae decrescent to obtuse; *subulae* pale to dark green, subulate, to 105 mm long, terete higher up, to 2.5 mm in diameter above the alae, convex abaxially, shallowly sulcate adaxially, gradually tapering to an acicular apex; *epidermal cells* at basal part of lycophylls oblong with near straight anticlinal walls, cells towards the lycophyll apices oblong to square, with near straight to slightly curved anticlinal walls, regularly with a single or more rows of narrower and longer epidermal cells above peripheral fibre strands; *stomata* absent or present, if present then in up to 4 rows along lacunae, often confined to the lycophyll apex, guard cells (40–)53(–70) µm long, mostly surrounded by small, irregularly shaped epidermal cells; *hypodermal collenchyma* absent; *peripheral fibre strands* present, mostly 3 in abaxial part of lamina, opposite lacuna walls, more numerous and smaller towards lycophyll apices; *cuticle* thin, faintly longitudinally striate; *translacunar septae* more than one cell layer thick, aerenchyma cells with short arms, pores triangular; *intrastelar canals* 1 to 3; *lacunae* without idioblasts; *ligules* membranous, hyaline, ovate-auriculate to deltoid, to 2.6 × 1.8 mm, central cushion papillate, margins fimbriate; *labia* acute; *velae* complete, or rarely with an opening < 0.5 mm in diameter at lycophyll base, cells polygonal in outline, with near straight to strongly curved anticlinal walls. *Sporangium sack cells* oblong to rectangular, near straight to gently curved, the anticlinal walls gently curved. *Sporangia* with brown walls, without strengthening cells, cells stacked, elongate, with near-straight to gently curved transverse walls; *megasporangia* elliptic in frontal view, to 4 × 2.5 mm, frontal face margins rounded; *microsporangia* unknown. *Megaspores* dimorphic, chalk-white to pale grey when dry, blackish when wet, tetrahederal-globose, with a broad equatorial ridge and laesura, the proximal and distal faces with low verrucae, the larger spores (472–)492(–536) µm in equatorial diameter, the smaller spores (296–)339(–424) µm in equatorial diameter; *microspores* unknown. *Chromosome number*: unknown. Figures 1–3.

Etymology: *aemulans*—more-or-less equal, or similar, with reference to the similar appearance of this species

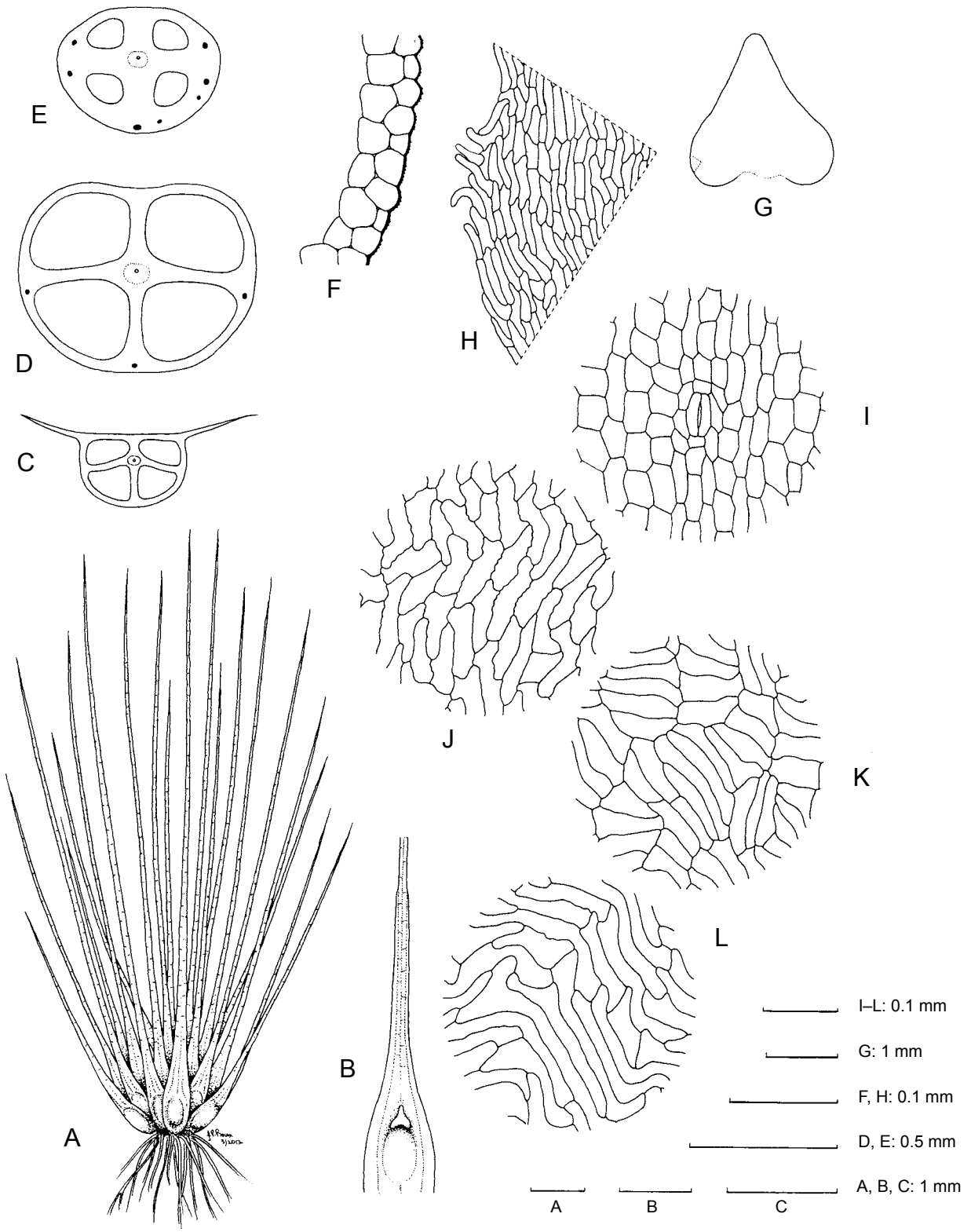

FIGURE 1.—*Isoëtes aemulans* J.P.Roux, sp. nov., *Roux 1191* (NBG). A, habit; B, adaxial view of fertile lycophyll base; C–E, sections through lycophyll; C, section above sporangium; D, section above alae; E, section near apex; F, section of lycophyll wall; G, ligule; H, section of lycophyll showing cellular structure; I, epidermis above lacuna showing stoma; J, cellular structure of velum; K, cellular structure of sporangium wall; L, cellular structure of sporangium sack. Artist: J.P. Roux.

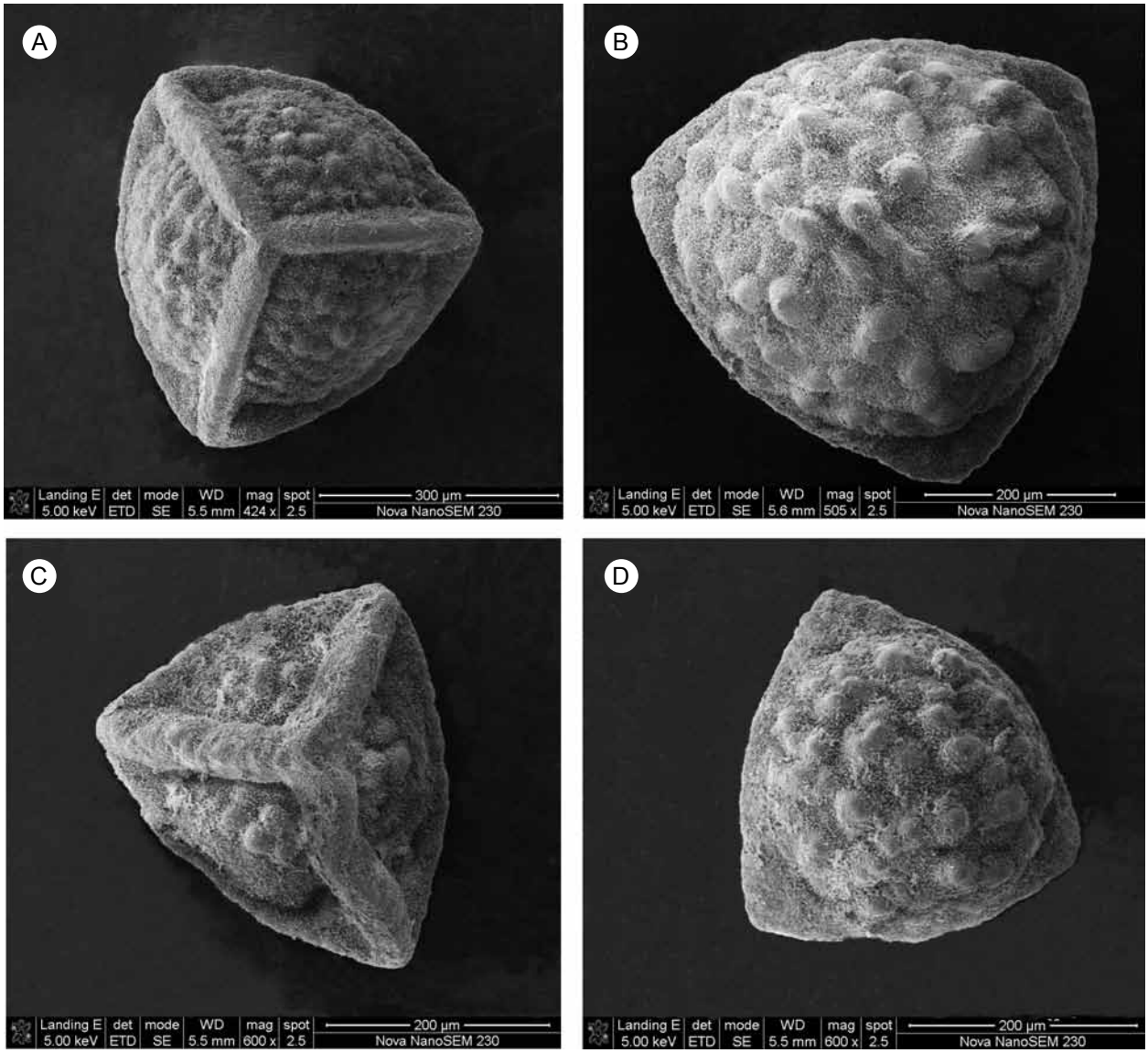

FIGURE 2.—Megaspores of *Isoëtes aemulans*, *Roux 5278* (NBG). A, proximal view of larger spore; B, distal view of larger spore; C, proximal view of smaller spore; D, distal view of smaller spore.

and *I. labri-draconis* N.R.Crouch, with which it is partly sympatric.

Distribution and ecology: *Isoëtes aemulans* occurs in the eastern summer rainfall region of South Africa. The species is known from Mpumalanga, Free State and KwaZulu-Natal from 1 300–2 420 m. Within this area the species occupies a range of habitats, including shallow seasonal pans, rock pools and seeps over sheetrock. In the southern Drakensberg region, it chiefly occurs on Clarens Sandstone and only rarely extends onto the overlying basalt formation.

Diagnostic features and relationships: *Isoëtes aemulans* differs from *I. labri-draconis* in it being a more robust species bearing more (up to 50 vs. 13 in *I. labri-draconis*) and longer (up to 130 mm long vs. 90 mm in *I. labri-draconis*) lycophylls with peripheral fibre strands in the lycophylls, and in the dimorphic megaspores. Dimorphic megaspores develop within the same sporangia.

Isoëtes aemulans was previously included in a broadly defined *I. transvaalensis* Jermy & Schelpe. *Isoëtes transvaalensis* is characterised by monomorphic megaspores with the proximal faces having a few low and inconspicuous verrucae, the distal face is near levigate with a few small and low verrucae, the lycophylls lack fibre bundles, and the epidermal cells towards the lycophyll apices are isodiametric to polygonal in outline, with near straight to gently curved and often much thickened anticlinal walls.

Additional specimens examined

MPUMALANGA.—**2430** (Pilgrim's Rest): Mariepskop (–DB), 18 Jan. 1969, *O. Hilliard & B.L. Burtt 5989* (NU, PRE); Mariepskop, *H.P. van der Schyff 6353* (BOL, PRU). **2528** (Pretoria): Quarry near Balmoral off-ramp in N4 (–DD), 7 Jan. 1984, *J.E. Burrows 5908* (PRE); **2530** (Lydenburg): On Kruisfontein road (–AC), *J.E. Burrows 3297* (BOL).

FREE STATE.—**2827** (Senekal): Excelsior, Korannaberg (–CC), 9 Mar. 1989, *J. du Preez 1942* (PRE); Korannaberg, Farm Wesselskloof (–CD), 20 Mar. 2011, *J.P. Roux 5278*, *5279*, *5281* (NBG). **2828** (Beth-

FIGURE 3.—Distribution of *Isoëtes aemulans*.

lehem): Qwa-Qwa, in seasonal pools (–DB), 16 Jan. 2007, *J.P. Roux 4219* (NBG); Witsieshoek, 16 Feb. 1981, *J.P. Roux 955* (NBG). **2829** (Harrismith): Harrismith, Bakerskop, (–AC), 23 Nov. 1982, *J.P. Roux 1277* (NBG); 4 Mar. 2002, *J.P. Roux 3348* (NBG); 21 Mar. 2011, *J.P. Roux 5286*, 5288, 5289 (NBG); Harrismith, Farm Windmill (–CA), 12 Jan. 1982, *J.P. Roux 1070* (NBG); Farm Klavervlei, 22 Mar. 2011, *J.P. Roux 5292, 5293, 5295, 5296* (NBG). **2927** (Maseru): Thaba Patswa (–AC), 12 Jan. 1989, *J. du Preez* 883 (BLFU).

KWAZULU-NATAL.—**2829** (Harrismith): Estcourt, Griffin's Hill (–DD), J.P. Roux 3334 (NBG); **2929** (Underberg): Mulangane Ridge, above Carter's Nek (–BC), *O.M. Hilliard & B.L. Burtt 17582* (NU); Cobham Forest Reserve, Sipongweni Caves (–CB), 14 Apr. 1974, *O.M. Hilliard 5531* (BOL, NU); Bushman's Nek, Thamathu Cave (–CC), 5 Feb. 1976, *O.M. Hilliard & B.L. Burtt 8961* (PRE); Sani Pass, 6 Feb. 2010, *J.P. Roux 4748* (NBG).

ACKNOWLEDGEMENTS

I wish to express my gratitude to Ezemvelo KZN Wildlife and the Free State Department of Economic Development, Tourism and Environmental Affairs for providing the necessary permits that allowed me to carry out the studies. Michelle Smith is thanked for graphical assistance. Curators of BLFU, BOL, NH, NU, PRE and PRU are thanked for making their *Isoëtes* collections available for study.

REFERENCES

JERMY, C. 1990. Isoetaceae, in K. Kubitzki (ed.), K.U. Kramer & P.S. Green (vol. eds.), *The families and genera of vascular plants. I. Pteridophytes and Gymnosperms*, pp. 26–30. Springer-Verlag, Berlin.

ROUX, J.P. 2009. Synopsis of the Lycopodiophyta and Pteridophyta of Africa, Madagascar, and neighbouring islands. *Strelitzia* 32, 1–296. South African National Biodiversity Institute, Pretoria.

TAYLOR, W.C., LUEBKE, T.T., BRITTON, D.M., HICKEY, R.J. and BRUTON, D.F. 1993. Isoëtaceae. In *Flora of North America, Vol. 2*. http://www.efloras.org, accessed 15 Apr. 2013.

J.P. ROUX

South African National Biodiversity Institute, Compton Herbarium, Private Bag X7, Claremont 7735, Cape Town, South Africa / H.G.W.J. Schweickerdt Herbarium, Department of Plant Science, University of Pretoria, Pretoria 0002, South Africa.

MS. received: 2013-03-07