

***Elaphoglossum nimbaense* J.P.Roux, sp. nov. (Pteridophyta: Dryopteridaceae), a new fern species from Liberia, West Africa**

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ABSTRACT

Elaphoglossum nimbaense J.P.Roux, sp. nov., a new epiphytic fern species which appears to be endemic to the Nimba Mountains in Liberia, West Africa is described and illustrated. Features separating *E. nimbaense* J.P.Roux, sp. nov. from other species in section *Elaphoglossum* Schott ex J.Sm. are the crustaceous, centrally dark and glossy, pseudopeltate rhizome scales, the conspicuous short stipe of the sterile fronds – the fertile frond stipes are significantly longer, the somewhat carnosae, attenuate, long acuminate sterile laminae. The significantly larger adaxial epidermal cells of the fertile laminae in comparison with that of the sterile laminae and the reticulate (impresso-punctate) adaxial epidermis of the fertile laminae, perhaps caused by the collapse of bladder cells (enlarged moisture containing epidermal cells) with straight transverse walls is also characteristic of the species. The nomenclature of section *Elaphoglossum* and subsections therein are discussed.

RÉSUMÉ

Elaphoglossum nimbaense J.P.Roux, sp. nov., une nouvelle espèce de fougère épiphyte endémique du Libéria (Afrique de l'Ouest).

Elaphoglossum nimbaense J.P.Roux, sp. nov., une nouvelle espèce de fougère épiphyte semblant endémique des Monts Nimba au Libéria (Afrique de l'Ouest) est décrite et illustrée. Elle diffère des autres espèces de la section *Elaphoglossum* Schott ex J.Sm. par les écailles du rhizome, qui sont crustacées, pseudopeltées, à centre sombre et brillant, le stipe remarquablement court des frondes stériles – celui des fertiles étant significativement plus long –, ainsi que par ses limbes stériles un peu charnus, atténués et longuement acuminés. Les cellules épidermiques bien plus grandes à la face adaxiale des limbes fertiles – par comparaison aux stériles –, et à surface réticulée (imprimée-ponctuée), résultant peut-être de la plasmolyse de cellules aquifères à parois transversales rectilignes, sont également caractéristiques de cette espèce. La nomenclature de la section *Elaphoglossum* et de ses sous-sections est discutée ici.

KEY WORDS

Dryopteridaceae,
Elaphoglossum,
section *Elaphoglossum*,
Liberia,
Mt Nimba,
West Africa,
new species.

MOTS CLÉS

Dryopteridaceae,
Elaphoglossum,
section *Elaphoglossum*,
Liberia,
Mt Nimba,
West Africa,
espèce nouvelle.

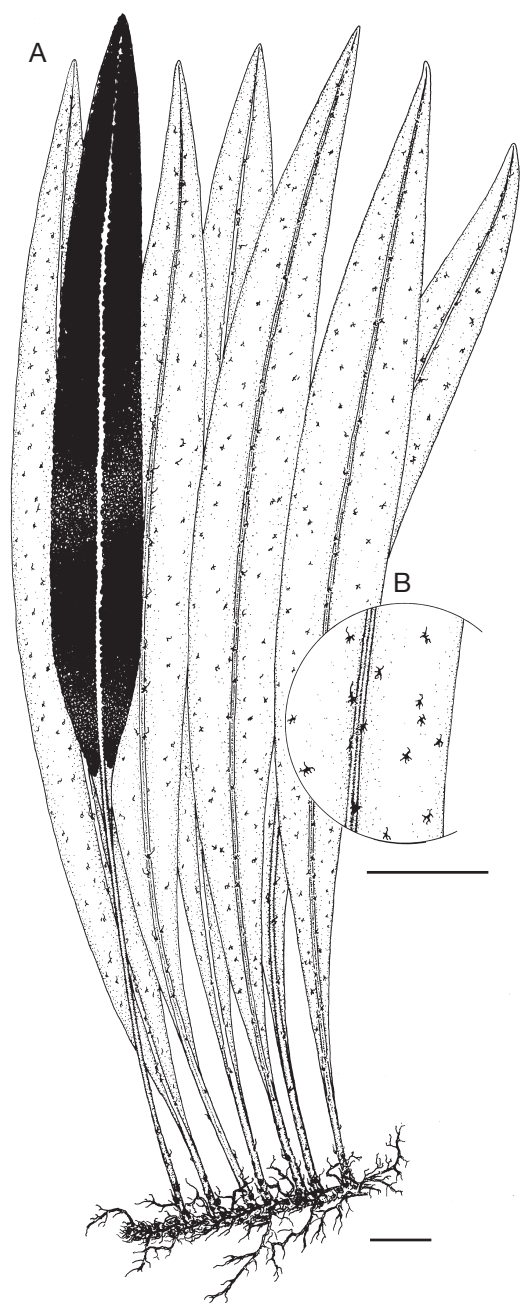


FIG 1. — **A**, *Elaphoglossum nimbaense* J.P.Roux, sp. nov. habit; **B**, adaxial surface detail. Prepared from *Johansson D. 825* (BOL). Illustrated by J. P. Roux. Scale bars: 1 mm.

INTRODUCTION

Elaphoglossum Schott ex J.Sm. is a genus with over 600 species occurring in the temperate and tropical parts of the world, but it is especially diverse in the Neotropics (Mickel & Atehortúa 1980; Kramer 1990; Mickel & Smith 2004; Rouhan *et al.* 2004) where *c.* 75% of the species occur. Nearly 75% of the species are epiphytes (Moran *et al.* 2007).

In assessing the identity of the new species the West African floristic studies of Tardieu-Blot (1953; 1964a, b), Harley (1955), Alston (1959) and Schelpe (1969) were considered. Collections belonging to *E. nimbaense* sp. nov. may have been assigned to *E. conforme* (Sw.) J.Sm. by some of these authors.

SYSTEMATICS

Family DRYOPTERIDACEAE Herter
Genus *Elaphoglossum* Schott ex J.Sm.
Section *Elaphoglossum* Schott ex J.Sm.

Elaphoglossum nimbaense J.P.Roux, sp. nov.
(Figs 1-4)

TYPUS. — **Liberia.** Sanniquelle Distr., Nimba Mountains, 900 m, epiphyte in the central part of the crown, 15.IX.1969, *Johansson D. 644* (holo-, BOL98466).

PARATYPES. — **Liberia.** Sanniquelle Distr., Nimba Mts, 1 200 m, epiphyte, on a *Parinari excelsa*, in the central part of the crown, 8.V. 1970, *Johansson D. 825* (BOL98467).

ETYMOLOGY. — From the Nimba Mountains where the species occur.

DESCRIPTION

Plants epiphytic. *Rhizome* creeping, irregularly branched, to 40 mm long, to 2.5 mm in diameter, set with roots, phyllopodia, and scales, the phyllopodia dark brown to black, 7-10 mm apart, terete, to 7 mm long, with pronounced lobed and fleshy aerophores at the base, the scales imbricate, crustaceous, atrocastaneous to black and nitid centrally, the margins paler, sessile, pseudopeltate, cordate-imbricate, broadly ovate, to 2.5 mm long,

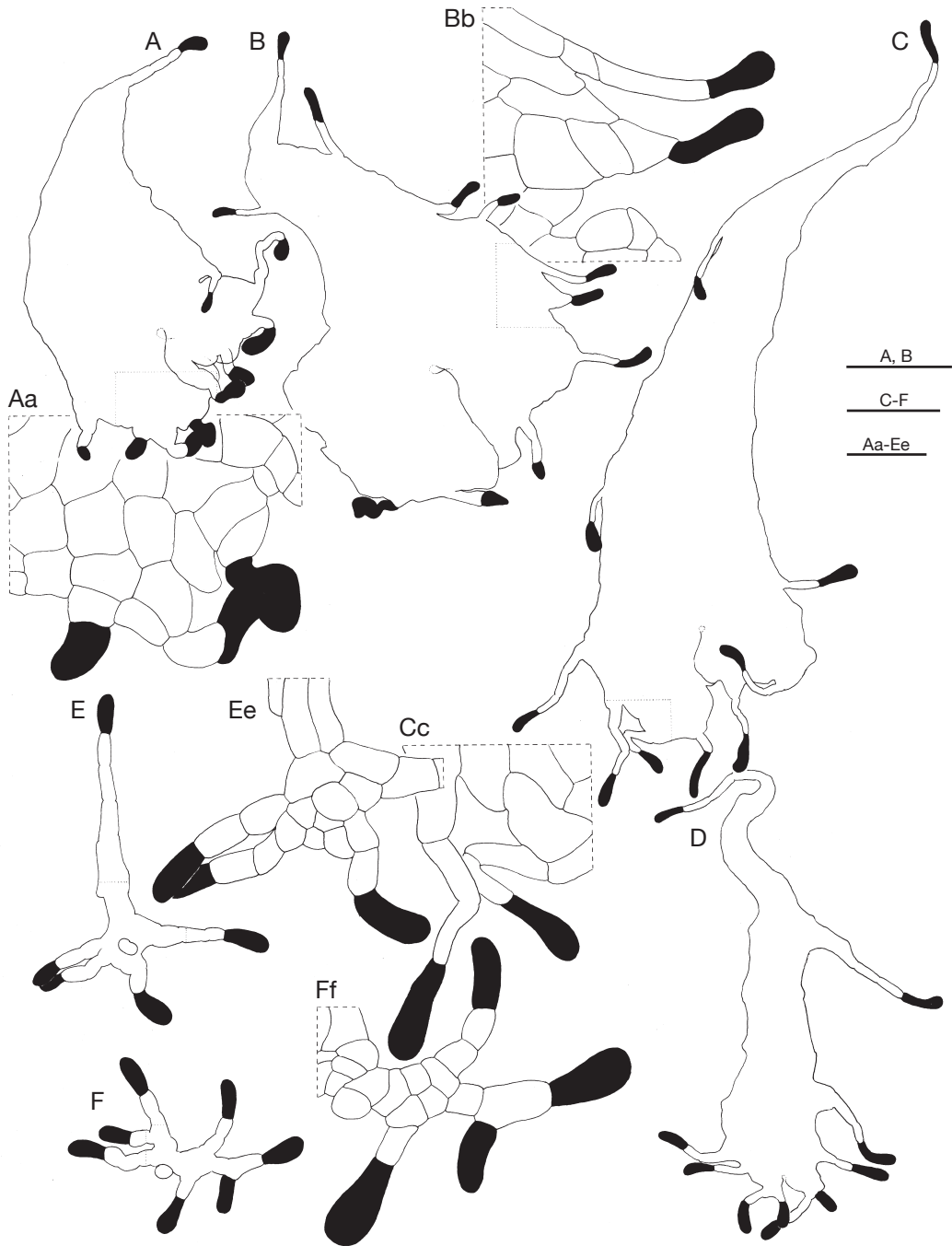


FIG. 2. — Rhizome, stipe and lamina scales of *Elaphoglossum nimbaense* J.P.Roux, sp. nov.: **A, B**, rhizome scales; **Aa, Bb**, details of A and B showing cellular structure; **C, D**, stipe base scales; **Cc**, detail of C showing cellular structure; **E, F**, scales from abaxial surface of laminae; **Ee, Ff**, details of E and F showing cellular structure. All prepared from *Johansson D. 825* (paratype BOL98467). Scale bars: A, B, C-F, 0.25 mm; Aa-Ee, 0.7 mm.

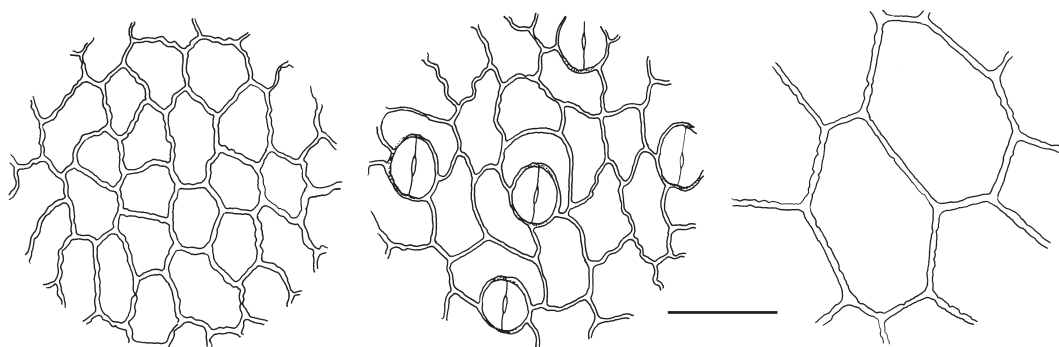


FIG. 3. — Epidermal cell outlines in *Elaphoglossum nimbaense* J.P.Roux, sp. nov.: **A**, adaxial surface of sterile lamina; **B**, abaxial surface of sterile lamina; **C**, adaxial surface of fertile lamina. All prepared from *Johansson D. 644* (holotype BOL98466). Scale bar: 100 μ m.

to 1 mm wide, the margins variously set with clavate gland-like cells, and short or long, filiform, pluricellular, uniseriate outgrowths terminating in a clavate gland-like cell, the apex short-filiform, terminating in a clavate gland-like cell; *fronds*: the sterile erect, up to 180 mm long, the fertile mostly overtop the sterile, up to 200 mm long; *stipes*: firm, brown, that of the sterile frond to 15 mm long, to 1.2 mm in diameter, adaxially shallowly sulcate, glabrous, that of the fertile frond to 80 mm long, to 1.2 mm in diameter, shallowly sulcate adaxially, initially sparsely set with scales similar to those on the phyllopodia, glabrous later; *laminae*: coriaceous, somewhat carnose, the sterile oblong-attenuate to narrowly elliptic, attenuate, to 170 mm long, to 17 mm wide, the apex acuminate, the margins strongly recurved in dried material, the epidermal cells isodiametric to slightly elongated, the transverse walls shallowly sinuate, the abaxial epidermal cells isodiametric, the transverse walls shallowly sinuate, stomata mostly of the copolocytic type, (50-)55.3(-60) μ m long, adaxially with spaced appressed scales, the scales ferrugineous, substellate, to 0.2 mm in diameter, the outgrowths pluricellular, uniseriate, terminating in a clavate gland-like cell, glabrous later, similar to but marginally larger scales occur on the adaxial surface of the laminae, the fertile narrowly elliptic, attenuate to narrowly cuneate, to 115 mm long, to 13 mm wide, the apex acuminate, adaxially with scales similar to those on the adaxial surface of the sterile laminae, the

adaxial epidermis reticulate (impresso-punctate), the cells isodiametric and significantly larger than the adaxial epidermal cells of the sterile laminae, the transverse walls straight; *costae* raised and narrowly sulcate adaxially, pronounced abaxially and somewhat angular in dried material; *venation* obscure in sterile and fertile laminae, vein branches forked, free. *Sori* acrostichoid, receptacular indumentum absent; *sporangium* stalk simple, 3-seriate below the capsule, the *capsule* circular to broadly elliptic in lateral view, with (10-)12(-13) indurated annulus cells, epistomium (3-)4-celled, hypostomium, (3-)4-celled. *Spores* brown, ellipsoidal, monolete, perispore with narrow reticulate cristae, perforations and spines absent, endospore (44-)45.6(-48) $\times$ (28-) 29.8(-32) μ m.

DISTRIBUTION AND HABITAT

Elaphoglossum nimbaense sp. nov. is known from the Nimba Mountains in Liberia, occurring at elevations ranging between 900 and 1 200 m (Fig. 3). The mountain range extends to Guinea and Côte d'Ivoire and the species may also occur in these countries. The vegetation at this altitude on Mt Nimba is of the Guineo-Congolian short forest and scrub forest type (White 1983) which is dominated by *Parinari excelsa* Sabine. The species is reported as being an epiphyte in the crowns of these trees. The Nimba Mountains form part of the Western African Forests hotspot (Myers *et al.* 2000), a region characterised by its unique fauna and flora, and high levels of species endemism.



FIG. 4. — Distribution of *Elaphoglossum nimbaense* J.P.Roux, sp. nov. in Liberia, West Africa.

DISCUSSION

Elaphoglossum nimbaense sp. nov. belongs to section *Elaphoglossum*. Morphological features defining section *Elaphoglossum* include erect or short- to long-creeping rhizomes mostly more than 2 mm in diameter, fronds articulated to distinct phyllopodia, fertile fronds that mostly overtop the sterile, coriaceous, rarely carnosae laminae, and free veins ending at or very close to the margin (not in hydathodes). Some species also bear distinct aerophores at the base of the phyllopodia. Many species also bear minute appressed substellate (not fimbriate) scales adaxially and abaxially on the laminae, the pluricellular scale rays mostly terminate in a gland-like cell and are often glutinous. Rhizome and stipe base scales are entire or near entire, or the margins may be variously set with short and/or long, pluricellular (often pluriseriate) outgrowths that terminate in a gland or gland-like cell. Perispore features include the presence of narrow or broad folds or cristae, and the presence or absence of spines and perforations (Moran *et al.* 2007). Fourteen of the 26 *Elaphoglossum* species occurring in Africa (Roux 2009, 2011), including *E. nimbaense* sp. nov., belong to section *Elaphoglossum*.

Features separating *E. nimbaense* sp. nov. from other species in section *Elaphoglossum* are the crustaceous, centrally dark and glossy, pseudopeltate rhizome scales, the conspicuous short stipe of the sterile fronds - the fertile frond stipes are significantly longer, the somewhat carnosae, attenuate, long acuminate sterile laminae. The significantly larger adaxial epidermal cells of the fertile laminae in comparison with that of the sterile laminae (Fig. 3A, C), and the reticulate (impresso-punctate) adaxial epidermis of the fertile laminae, perhaps caused by the collapse of bladder cells (enlarged moisture containing epidermal cells) with straight transverse walls is also characteristic of the species.

Subgeneric classifications of *Elaphoglossum* were presented by Fée (1845, under *Acrostichum*), Sodiro (1897, under *Acrostichum*), Christ (1899) and Mickel & Atehortúa (1980). Mickel & Atehortúa (1980) recognised ten sections in *Elaphoglossum*, but the results of molecular analyses suggest the recognition of five (Skog *et al.* 2004) or seven (Rouhan *et al.* 2004) sections. Both studies, however, supported the existence of a monophyletic section *Elaphoglossum*. Within this section two well-supported subclades resolved. Skog *et al.*

(2004) and Rouhan *et al.* (2004) referred to these as the *Platyglossa* and *Pachyglossa* subclades since they largely correspond to subsections described by Christ (1899). Mickel & Atehortúa (1980), however, placed subsection *Platyglossa* in synonymy under subsection *Pachyglossa*.

Mickel & Atehortúa (1980) and Rouhan *et al.* (2004) remarked on the taxonomic complexity of section *Elaphoglossum* due to the large number of species belonging to it and the relatively few morphological characters available for classification purposes. Skog *et al.* (2004) provides features distinguishing sections and subsections within the genus, but some of the features listed for section *Elaphoglossum* are weak. Frond length is not a reliable character due to phenotypic plasticity caused by environmental influences. Also the use of 'glabrous leaves' are incorrect as most, if not all, species in the section bear small (often minute) poorly developed/reduced scales on the adaxial and/or abaxial surfaces of the laminae. These structures often present as a small number of resinous glands and are frequently overlooked. Lamina and stipe scales too are often lost with age and the plants may appear glabrous.

Christ (1899) described subsection *Pachyglossa* (under section *Craspedoglossa* Christ), citing *E. conforme* (Sw.) J.Sm. as the type species (under Divisio *Conformia*). *Elaphoglossum conforme* is also the type species of the genus. The correct name of subsection *Pachyglossa* is therefore subsection *Elaphoglossum* (McNeill *et al.* 2006: art. 22.1).

Neither of the molecular studies (Skog *et al.* 2004; Rouhan *et al.* 2004) included confirmed material of *E. conforme* in their analyses and its position within section *Elaphoglossum* therefore remains untested. Moran *et al.* (2007) concluded that apart from DNA sequence evidence and three synapomorphic perispore characters there are no macromorphological or anatomical characters distinguishing the subsections within section *Elaphoglossum*. Based on perispore structure *E. conforme* was placed in subsection *Platyglossa* (Moran *et al.* 2007: 914) rather than subsection *Elaphoglossum* (= subsect. *Pachyglossa*). Perispore structure suggests that *E. nimbaense* sp. nov. belongs to subsection *Platyglossa*.

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*Our colleague sadly passed away on 12th May, 2013; the last
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