

A NEW FERN AND TWO FLORISTIC RECORDS FROM THE KARIUS LIMESTONE OF PAPUA NEW GUINEA

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Plesioneuron crassum subsp. *chromeum* Takeuchi (*Thelypteridaceae*) is described as a new subspecies from one of Papua's most isolated karst districts. The subspecies is distinguished by bifacially glabrous pinnae with revolute lobes, conspicuously raised aerophores, and glandular-setiferous sporangia. Distributional records for *Helicia acutifolia* (*Proteaceae*) and *Loranthus odoratus* (*Loranthaceae*) are also reported with the new fern.

Keywords. *Helicia*, limestone karst, *Loranthus*, *Plesioneuron*.

INTRODUCTION

The Karius Range is a botanically unknown kegelkarst accessible only by helicopter and currently under restricted-entry prohibitions. Its limestone environments are eerie landscapes, with mossy *Nothofagus* forests towering over a bleak terrain of sinkholes and hidden crevices (Fig. 1). Massive hydrocarbon reservoirs underlie the district, a principal target of the Highlands to Australia pipeline which is on track as the costliest development project in Papua New Guinea's history.

In April–May 2005, a botanical team was allowed to access the Karius wellheads as part of the front-end engineering for the Highlands Gas Project. Many range extensions and novelties have been preliminarily identified from the resulting collections (Takeuchi, 2005). *Plesioneuron crassum* subsp. *chromeum* is the first of the new plants to be formally presented from these investigations.

DESCRIPTIONS

Thelypteridaceae

***Plesioneuron crassum* (Copel.) Holttum subsp. *chromeum* Takeuchi, subsp. nov.**

Figs 2–4.

A subspecies typica sporangiis glandulis (nec glabris) setis 1–3 prope annulum praeditis differt. – Type: Papua New Guinea, Southern Highlands Province, Karius Range, 2300 m, 27 iv 2005, *Takeuchi, Towati & Jisaka* 19129 (holo LAE; iso A, L).



FIG. 1. Karius Range. *Nothofagus*-dominant forest on limestone karst. The emergent canopy is composed primarily of *N. pullei* Steenis and *N. rubra* Steenis.

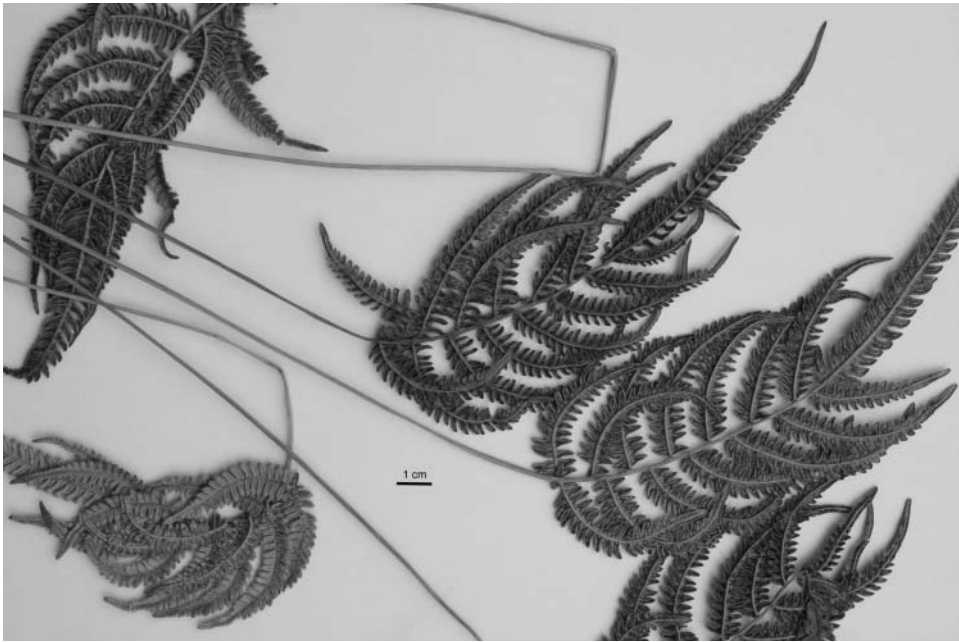


FIG. 2. *Plesioneuron crassum* subsp. *chromeinum*. Pinna detail, abaxial surfaces. Unmounted duplicate from the type gathering (Takeuchi, Towati & Jisaka 19129).



FIG. 3. *Plesioneuron crassum* subsp. *chromeinum*. Rachis with aerophores (arrow) in profile view (Takeuchi, Towati & Jisaka 19129).

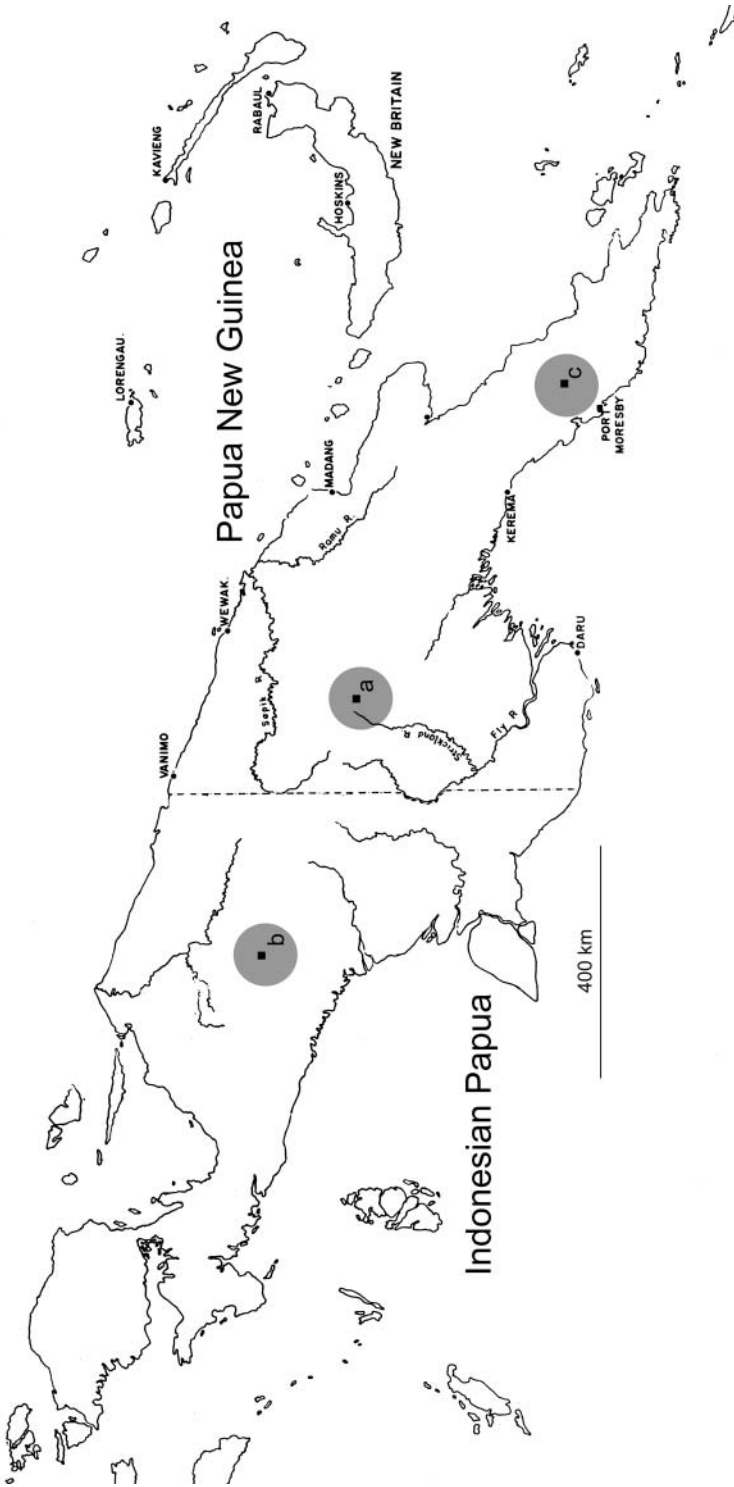


FIG. 4. Island of New Guinea. Localities from the text. a, Karius Range; b, Lake Habbema, type locality for *Plesioneuron crassum*; c, Mt Victoria, type locality for *Helicia acutifolia*.

Epilithic. *Caudex* prostrate, radial, 7–9 mm in diameter, striate, laxly furnished with acicular hairs, exterior surfaces dark brown, inside chalky white, roots wiry; scales linear-deltate, to c. 5.5 × 1.0 mm, suberect, firm, brittle, opaquely fuscous, bifacially setiform-hairy, scrobiculate, reticulate, cells elongate, thick-walled. *Stipe* (13.0–) 16.5–33.5(–37.5) cm × (1.0–)1.5–2.5 mm, deeply channelled on the dorsal side, rounded beneath, squarrose at the base; surface crustaceous, stramineous, discolorously marked by the callose-conoid residue of old scales, distally smooth; vasculature of two lateral strands upwardly uniting into a V- or U-configuration; scales as for the rhizome, fugacious; bristle-hairs restricted to the stipe base, unicellular, scattered, appressed or erect, nitid, dark brown; aerophores in two lateral lines on opposite sides of the dorsal channel, continuous, raised, stipes marginate or not along the aerophores. *Rachis* 5.5–10.5 cm long, on mature fronds 0.25–0.35 times the length of the stipe, on juvenile fronds 0.40–0.60 times the stipe, pallid, lacking scales, dorsal channel obscure, disappearing towards the apex; adaxial hair indument of erect bristles, black (or dark brown), dense, arranged in a continuous band along the upper side (or interrupted as separate tufts of varying length), abaxially glabrous; aerophores conspicuous, subulate to uncinata, 1–2 mm long, recurved (or obliquely ascending), black or concolorous with the rachis. *Lamina* isomorphic, bipinnatisect, widest near the middle (5.0–9.0 cm), truncate; pinnae bifacially glabrous, pustulate, alternate or subopposed, 6–11-jugate; terminal pinna (5.9–)6.9–10.0 × 0.9–1.4(–1.6) cm; basal pinna slightly reduced or not, rudimentary segments absent. *Largest lateral pinna* 5.2–6.6 × 0.9–1.3 cm, arcuate, at the frond centre separated (8–)12–17 mm from adjacent pinnae; base sessile or to 1 mm stipitate, symmetric; margin divided (0.2–)0.5–1.5 mm from costae, laxly furnished with appressed hairs, lobes obtuse, to 6–7 × 2–3 mm, straight-diverging from the midrib or weakly falcate, manifestly revolute; apex attenuate, (7–)11–19(–22) × 2–4 mm caudate. *Venation* pinnate, free to the margin, vein groups 14–22-nerval on the larger lobes, uni- or bi-nerval near pinna apices, not bifurcating, basal basicopic veins emerging directly from costae, 0.2–1.0 mm away from costules, ending at the sinus near the basal acroscopic vein from the adjacent group; costules 2–3 mm apart, diverging 65–85° from midribs; costae prominent on both sides, higher order nervation bifacially prominulous or planate. *Sori* superficial on veins, seated on prominent receptacles, contiguous with costules or to 0.3 mm distant, eparaphysate. *Indusia* glabrous, sparingly ciliolate or not, reticulate, firm, brunnescent, affixed on the proximal side of sori, persisting, erect and induplicate after spore discharge. *Sporangia* with 1–3 setae, minutely capitate-glandular; pedicels eglandular, with or without one acicular hair, similar hairs on receptacle; spores black, spinulose, unwinged.

Field notes. Stipes brownish-green; lamina fleshy, bifacially mid-green.

Distribution. Known only from the type locality.

Habitat. Epilithic on limestone, in *Nothofagus*-dominant mossy montane forest.

Etymology. The subspecies is named after ornithologist Francis Chrome, the senior scientist and co-leader of the Karius expeditionary survey.

Notes

1 The classification of the *Thelypteridaceae* is one of the most unsettled issues in pteridology. There is considerable disagreement over generic circumscriptions in this family, with various authors recognizing anywhere between one (Morton, 1963) and 32 genera (Pichi Sermolli, 1977). The 22 Malesian genera accepted by Holttum (1981) clearly places him with those favouring narrowly defined segregates. Other authorities have argued for elimination of the smaller satellites and their assimilation into a moderate number of larger groups. Smith (1990), for example, treats *Plesioneuron* Holttum as a synonym of *Cyclosorus* sensu Smith.

For reasons of convenience, Holttum's (1981) system is followed here. His taxonomy is the one adopted by *Flora Malesiana*, and is usually employed when naming thelypterid collections from this area.

2 The new fern is similar to *Plesioneuron crassum* (Copel.) Holttum, the conspicuously revolute pinnae with abaxially glabrous surfaces being the most notable points of resemblance. However, *Plesioneuron crassum* subsp. *chromeum* is a smaller plant than the typical *P. crassum*, the costae are bifacially glabrous (adaxially hairy in *P. crassum* subsp. *crassum*), and sporangia are setiferous and minutely glandular (not glabrous). The connection between the subspecies is obscured by an error in Holttum's key (1981: 399), wherein *Plesioneuron crassum* is placed under the first dichotomy for couplet 23, viz.:

23. Veins 20 pairs or more _____ to *P. crassum* at couplet 27

23. Veins 10–15 pairs _____ to the revised couplet 33 in Note 5 below

Since the vein groups in *Plesioneuron crassum* are usually composed of 12 pairs (Holttum, 1975: 243; also confirmed from Brass 10934!), the species should have appeared in the second lead, after which the sequence would then properly proceed to *P. croftii* Holttum. In its present form, Holttum's treatment cannot be used to identify *Plesioneuron crassum* except by comparison of specimens with the description.

3 Vein groups in *Plesioneuron crassum* subsp. *chromeum* are arranged in the mesophlebioid pattern, with basal basiscopic nerves inserted separately from costules. Although Holttum (1981: 397) comments that the costal nerves in *Plesioneuron* are never as far from costules as in *Mesophlebion* Holttum, the genera are inconsistent on this character. In *Plesioneuron crassum* subsp. *chromeum* the basal nerves are 0.2–1.0 mm from costules, within the range for many *Mesophlebion*.

4 The stipeliform aerophores in *Plesioneuron crassum* subsp. *chromeum* are very conspicuous and reminiscent of corresponding structures in *Plagiogyria egenolfioides*

(Baker) Copel. var. *decrescens* (C.Chr.) Zhang & Noot. *Plesioneuron* species are usually provided with aerophores at the pinna-nodes but none are as prominent (protruding to 2 mm above the rachis) as in *Plesioneuron crassum* subsp. *chromeinum*.

5 The novelty will key to couplet 33 in Holttum (1981: 399). In order to continue from that point, the decision train needs to be altered as follows:

- 33. Aerophores inconspicuously callose, or elongate in the plane of the rachis; sori medial or slightly inframedial _____ to the existing 34
- 33. Aerophores prominent, projecting 1–2 mm above the rachis as an ascending or hook-shaped process; sori contiguous with costules or nearly so _____ 35
- 35. Abaxial surfaces (including aerophores) acicular-hairy; sinus decurrent towards costae as a narrow ridge; sporangia minutely glandular, not setiferous _____
_____ *P. croftii*
- 35. Abaxial surfaces (including aerophores) glabrous; sinus ridge present or absent; sporangia minutely glandular and with 1–3 setae, or else glabrous _____ 36
- 36. Aerophores pulvinate; vein groups 21–25-nerval, basal nerve often furcate; sinus ridge usually present; sporangia glabrous ___ *P. crassum* subsp. *crassum*
- 36. Aerophores more prominent, subulate or uncinata; vein groups 14–22-nerval, nerves never furcate; sinus ridge absent; sporangia minutely glandular and with 1–3 setae _____ *P. crassum* subsp. *chromeinum*

6 *Plesioneuron crassum* subsp. *crassum* is known with certainty only from Lake Habbema in Irian Jaya (Holttum, 1981: 408). The new subspecies is a disjunct record from eastern New Guinea, but is found in similar habitats as the type subspecies.

7 Despite the fact that Papuaasia has nearly 90% of its Malesian representatives (32 out of 36), few *Plesioneuron* specimens have been added to the Papua New Guinea National Herbarium in the last 15 years. Less than a third of the Papuaian taxa are represented in the LAE holdings, which for the most part are composed only of four or five common species. This unfortunate collections lacuna is particularly ironic in view of New Guinea's status as the centre for diversification in the genus. The disproportionate number of single-locality species suggests that many *Plesioneuron* are range-restricted. More taxa probably await discovery (Holttum, 1981: 397).

DISTRIBUTIONAL RECORDS

Loranthaceae

Loranthus odoratus Wall. in Roxb., Fl. Ind. 2: 215 (1832). – Type: Nepal, Wallich s.n. (K).

Loranthus L. is represented in Malesia by a single species (*L. odoratus* Wall.). It is rare within the region, the only two collections originating from Sumatra and the Celebes (Barlow, 1997). The genus was not previously known from eastern Malesia,

although a wider distribution was predicted earlier by Barlow (1995). With the discovery of *Loranthus odoratus* (Takeuchi *et al.* 1936) in the Karius district, the generic range has been extended significantly eastwards into the Papuan area.

The flowers on the new locality record have a fully formed androecium and gynoecium. Although the anther cells are only 0.2–0.3 mm long (c.1 mm in *Loranthus odoratus* from other parts of its range), the Karius specimen otherwise agrees closely with the description in Barlow (1997: 356). The slightly reduced anthers suggest that the stamens may be incompletely functional.

Danser (1936) gives an informative account of floral variation in *Loranthus* (*Hyphear* Danser), showing that differences in the expression of sexual structures can be expected between populations. In view of the pattern of variation in this genus, the nonconforming features of the Karius gathering are probably not of taxonomic significance.

Proteaceae

Helicia acutifolia Sleumer, Bot. Jahrb. Syst. 70: 140 (1939). – Type: Papua New Guinea, Central District, Mt Victoria, 2045 m, 21 i 1936, Carr 15210 (holo B, probably destroyed; iso LAE!). **Figs 4, 5.**



FIG. 5. *Helicia acutifolia*. Fresh cuttings from the Karius karst (Takeuchi, Towati & Jisaka 19223).

Helicia acutifolia has not been seen since its initial discovery in 1936 at Mt Victoria. Recently acquired specimens (Takeuchi *et al.* 19046, 19210, 19218, 19223) key directly to this binomial in Foreman (1976, 1995) and conform in detail with the type collection. Despite its past absence from the botanical record, the species is one of the most common arborescent plants on the Karius limestone.

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