

## Two new species of ferns from Thailand

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ABSTRACT. Two new species of ferns from southern Thailand are described: *Cyclosorus thailandicus* S.Linds. (Thelypteridaceae) and *Tectaria phanomensis* S.Linds. (Tectariaceae).

### INTRODUCTION

During a botanical expedition to Southern Thailand in March/April 2003 a number of previously undescribed fern species were collected. One of these has been published already (Lindsay & Middleton, 2004). Two more are described here. Family and genus delimitation follows Smith et al. (2006).

The ferns were compiled for the *Flora of Thailand* in four parts (Tagawa & Iwatsuki, 1979, 1985, 1988, 1989). Subsequently a number of papers have been published in which new taxa have been described or new records have been added to the pteridophyte diversity of Thailand (Mitsuta, 1985; Parris, 1998; Hovenkamp et al., 1998; Boonkerd & Nooteboom, 2001; Boonkerd & Pollawatn 2002a, 2002b; Lindsay & Middleton, 2004; Lindsay et al., 2004; Suksathan, 2004; Boonkerd, 2006). Boonkerd & Pollawatn (2000) compiled a list with distribution maps and many photographs of all the pteridophytes of Thailand in which an additional 27 species were included. Boonkerd et al. (2005) added another 19 species. This rate of addition of new taxa and new records to a recently completed Flora account reflects the fact that pteridophytes are often neglected on traditional collecting expeditions and is testament to the relatively poor state of our taxonomic knowledge of them compared to many angiosperm plant groups.

Two of the most difficult groups in Thailand are *Tectaria* and its relatives and *Thelypteris* and its relatives. For *Tectaria* there is the Flora of Thailand account (Tagawa & Iwatsuki 1988 – under Dryopteridaceae) and Holttum (1991 – under *Tectaria* group) to account for all of the southern Thai and Malesian species. For *Thelypteridaceae* there are a number of publications by Holttum (1976, 1982) in addition to the Flora of Thailand account (Tagawa & Iwatsuki 1988). It is quite clear that these two new species are not accounted for in these works.

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## TAXONOMIC TREATMENT

**Cyclosorus thailandicus** S.Linds., **sp. nov.** Rhizoma suberectum; stipes 4.5–6 cm longi. Lamina 34.5–37 x 9.5–12 cm; pinnae 11–14-jugatae, infimae redactae. Sori binati. Typus: Thailand, Phetchaburi [Amphoe Kaeng Krachan, Kaeng Krachan National Park, trail from KU Camp along Phetchaburi River, 12°51'N, 99°18'E, 27 March 2003, *Middleton, Hemrat, Lindsay, Suddee & Suwanachat* 1748 (holotype BKF; isotype A)]. Fig. 1. Map 1.

Small terrestrial fern with delicate fronds. Rhizome suberect with closely spaced fronds; scales pale brown, narrowly triangular, 3–4.5 x 0.5–0.8 mm, uniformly coloured, minutely pubescent, margins entire. Stipe purplish, 1–6 cm long, scaly at base only. Lamina decrescent at base, widest slightly above the middle, 34.5–37 x 9.5–12 cm; 11–14 pairs of lateral pinnae; terminal pinna largest, apex acuminate, 11–12.5 x 1.4–2.5 cm, incise  $\frac{1}{4}$ – $\frac{1}{3}$  way towards costa; 4–5 pairs of basal pinnae, gradually reduced, butterfly-shaped, ca 1 x 1 cm; lateral pinnae sessile, ca 2 cm apart, oblong, base truncate, first acroscopic pinnule somewhat larger, apex acuminate, incised  $\frac{1}{4}$  way towards costule, 3.5–8.3 x 0.8–1.2 cm; rachis and costae pubescent above with acicular hairs, costae and lamina minutely pubescent all over beneath; veins 5–6 pairs, of which lowest pair anastomose, the second pair have the distal vein anastomosing with the intercostule vein, the proximal vein runs to sinus. Sori mostly very closely paired, confluent, in a single row in lower parts of pinnae, sometimes 2 or 3 in upper parts, situated where the first pair of veins anastomose below the sinus in lower parts, also on second or third veins in upper parts; indusium densely pubescent, reniform. Spores monoletate & ellipsoidal, with short low ridges.

Distribution.— Only known from the type from Kaeng Krachan National Park in Phetchaburi.

Ecology.— Collected in primary evergreen forest in sandy-stony soil beside river in deep shade at 330 m altitude.

IUCN Conservation Status Assessment.— Data Deficient (DD). The species is currently only known from the type specimen which was collected in a river bed, a habitat that could be subject to sudden and catastrophic change. However, it is unknown to what extent the species also occurs in the very extensive and protected surrounding forest.

Notes.— In the Flora of Thailand treatment Tagawa & Iwatsuki (1988) used broad delimitations for the genera in Thelypteridaceae rather than the very much narrower genus concept employed by Holttum (1982). We have chosen the intermediate position employed by Smith (1990) and Smith *et al.* (2006) and have thereby described this species in *Cyclosorus*. It is similar to *Christella zeylanica* (Fée) Holttum (which has no combination in *Cyclosorus*), from Sri Lanka and the Nicobar Islands (Panigrahi, 1975; Shaffer-Fehre, 2006), but differs in the position of the sori on the veins, the presence of paired sori, and the very much more densely pubescent indusia. It is also similar to the *Cyclosorus subpubescens* (Blume) Ching complex (the limits of the species in this complex are very fluid – see Holttum 1954, 1976, 1982; Tagawa & Iwatsuki 1988), and most similar to *Cyclosorus latipinna* (Benth.) Tardieu, but no species in the complex are known to have as many pairs of basal butterfly-shaped reduced pinnae or to have such pinnae almost to the base of the rachis.



Figure 1. Holotype of *Cyclosorus thailandicus* S.Linds.



Map 1. Distribution of *Cyclosorus thailandicus* S.Linds. (▲) and *Tectaria phanomensis* S.Linds. (●).

***Tectaria phanomensis* S.Linds., sp. nov.** Caudex ascendens. Stipes usque 48.5 cm longus. Lamina usque 63 x 65 cm, pinnae ca 8-jugatae. Typus: Thailand, Surat Thani [Amphoe Phanom, Khlong Phanom National Park, trail from headquarters around base of limestone mountain, 8°53'N, 98°41'E, 11 April 2003, *Middleton, Lindsay & Pooma* 2140 (holotype BKF; isotype A)]. Map 1.

Fern growing in limestone crevice with ascending rhizome; rhizome densely covered in scales. Scales yellow-brown, widest at base, to 15 x 1.25 mm, thin, brittle, crisped, composed of long cells, with long slender twisted tip, margins entire. Stipe 40–48.5 cm long, 4 mm diameter, brown beneath, green above, scales dense near base, scattered to half way up stipe. Lamina triangular, to 63 x 65 cm, with ca 8 pairs of free pinnae and terminal section with gradually reducing pinnae decurrent into neighbour; basal pinna largest, stalked, 34–36 x 20–21 cm, strongly asymmetrical, basiscopic pinnules enlarged, with first 4–5 basiscopic pinnules much longer than corresponding acroscopic pinnules, first acroscopic pinnule sessile, 1.5–2 cm from rachis, first basiscopic pinnule with short stalk, 2.1–3.3 cm from

rachis, remaining pinnules decurrent, eventually coadnate, pinna and pinnules acuminate; remaining pinnae to 10 cm apart, much narrower, pinnatifid, to 29 x 6 cm, lower pinnae on short stalks, gradually becoming sessile, eventually coadnate; veins forming costular areoles, otherwise free, running almost to margin, usually branched; costa and costules very densely covered in articulated orange hairs above, same but less dense beneath. Sori in 1–3 indistinct rows either side of costules, on veins, only occasionally terminal, exindusiate, 0.6–0.9 mm wide. Spores ellipsoidal, rugose.

Distribution.— Only known from the type from Khlong Phanom National Park in Surat Thani.

Ecology.— Collected from a pocket of thin soil on a limestone cliff; altitude ca 100 m

IUCN Conservation Status Assessment.— Least Concern (LC). Although the species is currently only known from the type specimen it was collected on karst limestone in Khlong Phanom National Park, a habitat that is extensive and well protected in this Park and in the contiguous and even larger Khao Sok National Park.

Notes.— Khlong Phanom National Park in Surat Thani province is proving to be one of the most interesting sites in Peninsular Thailand due to its high number of endemics. This new species of *Tectaria* grows close to the site of the recently described *Adiantum phanomensis* S.Linds. & D.J.Middleton (Lindsay & Middleton, 2004). It is characterised by the many long costular areoles and the lack of indusia.

Images of the isotype (at A) are available on the Harvard University Herbaria website ([www.huh.harvard.edu](http://www.huh.harvard.edu)).

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