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# *Teratophyllum hainanense* (Lomariopsidaceae), a New Species from Hainan Island, China

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**ABSTRACT.** A new species of Lomariopsidaceae, *Teratophyllum hainanense* S. Y. Dong & X. C. Zhang, from Hainan Island, China, is described and illustrated. It is related to *T. koordersii*, but differs in having 10 to 12 pairs of pinnae in mature bathyphylls and the scales of sterile pinnae on both midribs and veinlets as substellate, appressed, and small, with diameters only to ca. 0.2 mm. The genus *Teratophyllum* itself is reported from China for the first time.

**Key words:** China, Lomariopsidaceae, *Teratophyllum*.

*Teratophyllum* Kuhn is confined to the Paleotropics and comprises 12 species (Holttum, 1966, 1978). It extends from southern Burma to eastern Polynesia and Queensland, with most species in Malesia (Kramer, 1990). This genus has not been previously reported from China.

During an expedition of the fern flora of Hainan Island in May 2002, we collected a climbing fern without fertile fronds on Mt. Tiedingling and did not know its identity. We made another trip to Mt. Tiedingling in April 2003 and observed fronds of the unknown species at various stages and became convinced that it belongs to the genus *Teratophyllum*. Compared with *T. aculeatum* (Blume) Mettenius ex Kuhn and *T. ludens* (Fée) Holttum, two species from neighboring regions of the Indochina Peninsula, this species from Hainan is very different. It is distinguished from *T. aculeatum* by once-pinnate bathyphylls with crenate pinnae and from *T. ludens* by pinnae lanceolate and asymmetric at base in both bathyphylls and acrophylls. In addition to *T. ludens*, there are three other species in *Teratophyllum* with the pinnae of bathyphylls crenate, i.e., *T. arthropteroides* (H. Christ) Holttum, *T. clemensiae* Holttum, and *T. koordersii* Holttum, all

in section *Teratophyllum* (Holttum, 1978). The new species from Hainan is distinct from *T. arthropteroides* and *T. clemensiae* by its linear fertile pinnae. However, it is similar to *T. koordersii* from Luzon and the Celebes, differing in having 10 to 12 pairs of pinnae on mature bathyphylls (vs. 2 to 6 pairs) and the scales of sterile pinnae on both costae and veinlets as substellate, appressed, and small (ca. 0.2 mm diam.).

***Teratophyllum hainanense*** S. Y. Dong & X. C. Zhang, sp. nov. TYPE: China. Hainan Island: Qiongzong County, N slope of Mt. Tiedingling, 18°57'10"N, 109°42'19"E, 720 m, 11 Apr. 2003, S. Y. Dong 818 (holotype, PE [2 sheets]; isotypes, L, MO, P, PE). Figures 1, 2.

Affinis *T. koordersii* a quo differt bathyphyllorum maturorum pinnis lateralibus 10–12 jugatis, squamis pinnae acrophyllorum ad costam mediam et nervulos nascentibus appressis substellatis ca. 0.2 mm diametro, pinnis fertilibus linearibus, 13–18 cm longis et 0.8 mm latis.

**Mature plants.** Rhizome, 3–4 × 2 mm, green, dorsiventral, roots on the ventral surface and 2 rows of fronds on the dorsal surface, without obvious spines but with a few remaining spine bases; apex of rhizome and buds of fronds covered with brown lanceolate scales (ca. 8 mm long). **Sterile acrophylls**, usually 50–65 × 18–23 cm, stipe 8–13 cm long, swollen at base; rachis not winged, stramineous; pinnae 8 to 11 pairs, alternate, all articulate; petiolules 2–7 mm long, pinnae usually about 11 × 2.5 cm, largest to 16 × 3.4 cm, broadest near base, the proximal and basal portions nearly parallel-sided, tapering gradually from the middle to an acute apex, acroscopic base rounded or round-truncate, basisopic base cuneate; texture green, papyraceous; midribs prominent both above and below, usually pale; veins ca. 1.5–2 mm apart, slightly

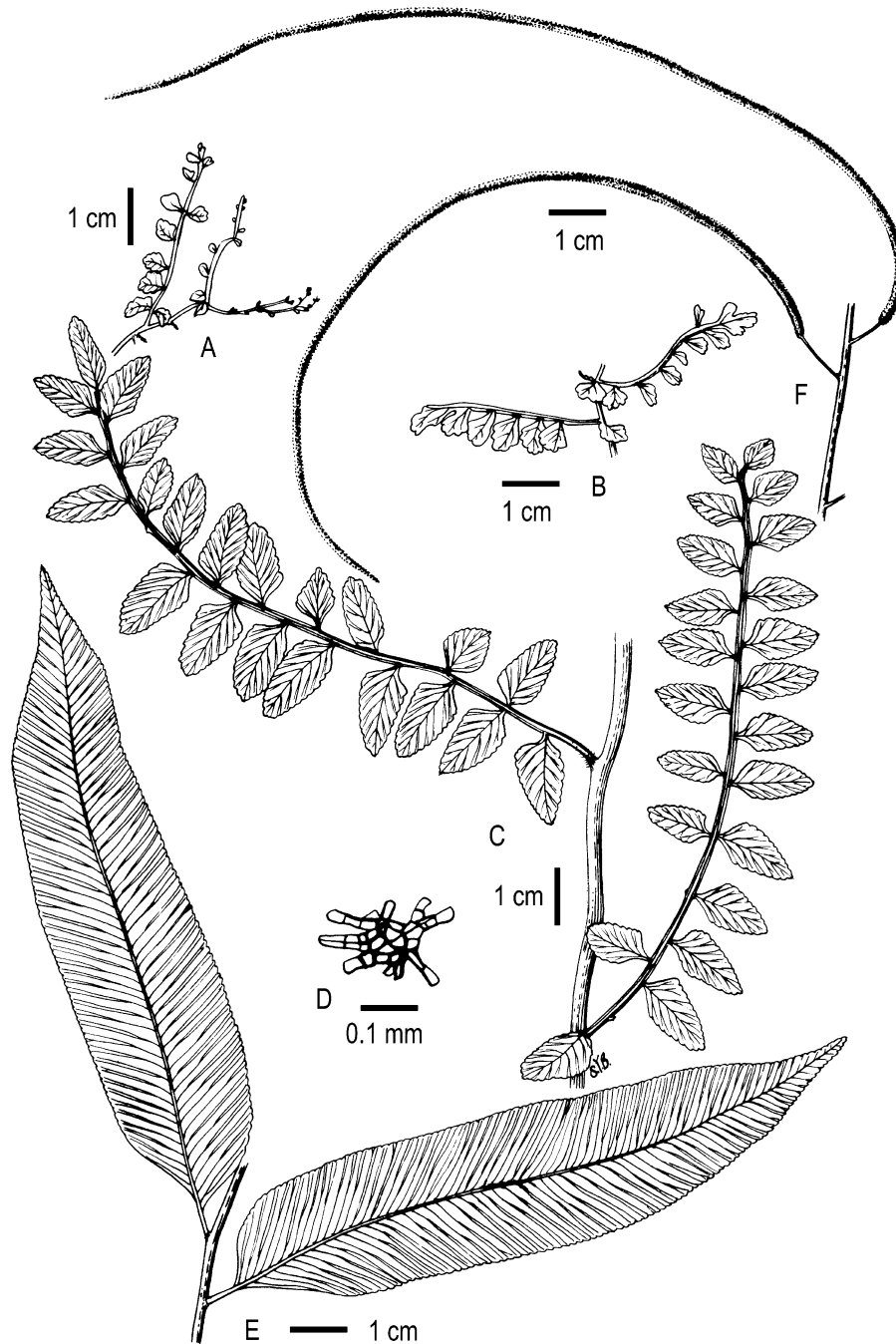


Figure 1. *Teratophyllum hainanense* S. Y. Dong & X. C. Zhang. Based on the holotype, S. Y. Dong 818 (PE). —A. Bathyphylls, early stage. —B. Dimidiate bathyphylls. —C. Mature bathyphylls. —D. Scale from lower surface of sterile acrophyll. —E. Pinnae of sterile acrophyll. —F. Pinnae of fertile acrophyll. Drawn by Sun Ying-Bao.

prominent on both surfaces, forked once or twice, ending ca. 0.2 mm from the margin or reaching the margin; margin nearly entire or slightly crenate (Fig. 1E); midribs and veinlets abaxially bearing

numerous minute substellate scales (ca. 0.2 mm diam.), the scales brown, appressed (Fig. 1D). *Fertile acrophylls*, 3 seen, ca. 30 × 15–20 cm, stipe 5–8 cm long, stipe and rachis pale; pinnae about

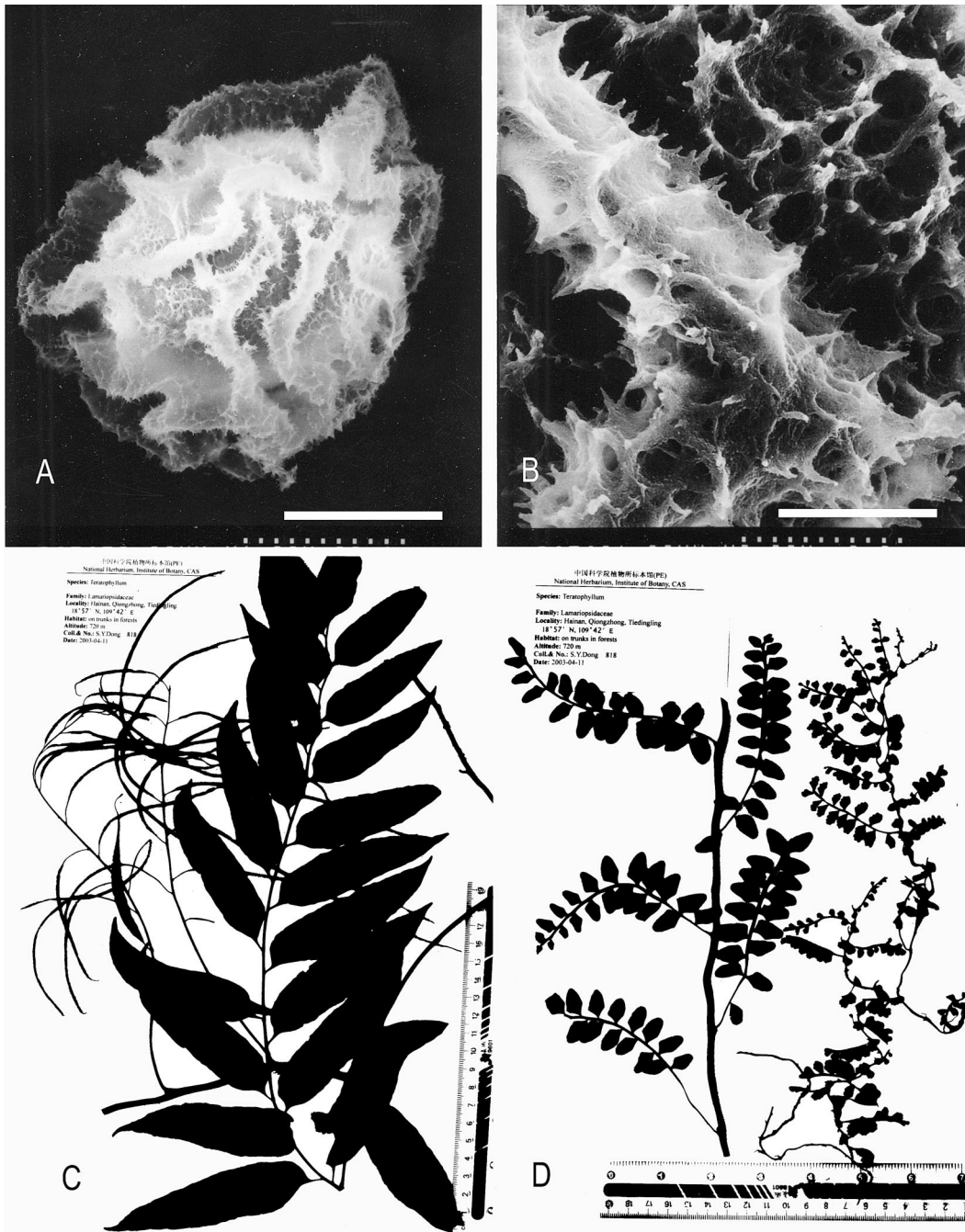


Figure 2. *Teratophyllum hainanense*. —A, B. SEM micrographs of spores. (A: scale bar 23.1  $\mu\text{m}$ ; B: scale bar 3.8  $\mu\text{m}$ ). —C. Adult sterile and fertile leaves. —D. Young and mature bathyphylls. All from S. Y. Dong 818 (PE).

10 pairs, petiolules 6 mm long, pinnae linear, usually 13–16  $\times$  0.8 mm, the longest to 18 cm long; sporangia covering the abaxial surface and appearing to cover both surfaces when mature, the width of the pinnae then expanding to ca. 1.5 mm (Fig.

1F). Sporangia containing 32 spores each, spores large, 50–72  $\mu\text{m}$  diam., with a folded echinulate perispore (Fig. 2A, B).

*Early stage.* Very young fronds ca. 2 cm long, with 6 small pinnae on the basiscopic side of the

Table 1. Features distinguishing *Teratophyllum ludens*, *T. koordersii*, and *T. hainanense*.

Characters	<i>T. ludens</i>	<i>T. koordersii</i>	<i>T. hainanense</i>
Pinnae of transition bathyphylls	elliptic or ovate, symmetric at base, 5 to 9 on basis-copic side of rachis and 0 to 2 on acroscopic side	lanceolate, asymmetric at base, 2 to 6 on basis-copic side of rachis and 2 to 5 on acroscopic side	lanceolate, asymmetric at base, 8 to 14 on basis-copic side of rachis and 4 to 12 on acroscopic side
Petiolules of pinnae of sterile acrophylls	0–5 mm long	0–5 mm long	2–7 mm long
Scales on pinnae of acrophylls	lanceolate, ciliate, ca. 0.6 mm long on midribs, and substellate, ca. 0.2 mm diam. on veinlets	lanceolate with branches at base, curled, ca. 1 mm long, only on midribs	substellate, appressed, ca. 0.2 mm diam., on midribs and veinlets (Fig. 1D)
Fertile pinnae	14–20 cm long, 2–3 mm wide	20–24 cm long, 2.5–3 mm wide	13–16(18) cm long, 0.8 mm wide (Fig. 1F)

rachis and 4 on the acroscopic side, the basal pinna like those in other stage bathyphylls, reflexed and overlapping the rhizome at a right angle, the 4 pinnae on the acroscopic side near the apex of fronds; fronds to develop next ca. 3.5 cm long, with 7 pinnae evenly distributed on the basis-copic side of rachis and 3 on the acroscopic side: 1 at the base, 1 on the distal portion, and 1 near the apex (Fig. 1A); rachis winged throughout, both surfaces of fronds scaly, the scales substellate with branches less than 0.2 mm long, like those on mature plants but smaller, with fewer branches and fewer cells in the center, the scales on the joint of rachis and rhizome lanceolate, ca. 1 mm long and 0.5 mm wide at base.

*Dimidiate bathyphylls.* Fronds 3–10 × 0.5–1.5 cm, the terminal part shallowly or deeply lobed, usually 7 to 9 pinnae presenting on the basis-copic side of rachis and no pinnae on the acroscopic side, rachis narrowly winged throughout; pinnae 0.5–1 × 0.5 cm, ± flabellate or ± rhomboid, crenate on the margin, rounded at apex, upper base subtruncate, lower base narrowly cuneate (Fig. 1B).

The form of the dimidiate fronds is not constant. The 2 to 6 pinnae near the apex of the fronds are inserted on the acroscopic side of the rachis in some cases. This stage bathyphylls in some plants and in branches above ground absent.

*Transition bathyphylls.* Fronds 10–15 × 2–4 cm, sessile, asymmetric at base, 2 to 3 acroscopic basal pinnae usually absent, the terminal pinna jointed to the rachis; rachis narrowly winged throughout, with 8 to 14 pinnae on the basis-copic side of rachis and 4 to 12 pinnae on the acroscopic side; pinnae 1–2.5 × 0.7–1 cm, crenate, round or blunt at apex, upper base truncate or broadly cuneate, lower base narrowly cuneate, veins usually forked, the end not reaching the margin (Fig. 1C);

laminar tissue papyraceous or subcoriaceous, the adaxial surface glabrous, the abaxial surface densely covered with minute substellate scales along midribs and veinlets.

A population of about 20 plants was observed in primary rain forest on the north slope in Mt. Tiedingling on Hainan Island, China. Early stage and dimidiate stage bathyphylls were presented only on stems creeping on the ground. Stems bearing next stage fronds were observed as climbing on tree trunks. When the rhizomes have ascended to 2–3 m, the fronds on the middle and lower parts of stems wither and are shed. Fertile fronds are produced near the apex of high-climbing stems. When fertile fronds are present, except for fertile pinnae and several sterile fronds, the other lower fronds are absent.

Of the known species of *Teratophyllum*, the normal bathyphyll stage is absent only in *T. ludens* and *T. koordersii* (Holttum, 1932). *Teratophyllum hainanense* is the third species without the normal bathyphyll stage (fronds having pinnae equally on both sides, and the pinnae being gradually smaller in size toward apex, the frond apex not being articulate). It is not close to *T. ludens*, but instead to *T. koordersii*. The distinguishing characters between *T. ludens*, *T. koordersii*, and *T. hainanense* are given in Table 1.

*Paratype.* CHINA. **Hainan Island:** Qiongzong County, N slope of Mt. Tiedingling, similar to holotype, 25 May 2002, S. Y. Dong & Z. C. Chen 639 (PE).

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