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Novitates Bruneienses, 10. Filmy ferns (Hymenophyllaceae) of Kuala Belalong, Brunei Darussalam

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ABSTRACT. The filmy ferns (Hymenophyllaceae) of Kuala Belalong in Brunei Darussalam are enumerated along with morphological descriptions and short notes on ecology and distribution. Determination keys to each group are included. In total, 22 species belonging to 6 genera (*Hymenophyllum* Sm., *Crepidomanes* C.Presl, *Didymoglossum* Desv., *Abrodictyum* C.Presl, *Cephalomanes* C.Presl and *Callistopteris* Copel.) were identified in the field and in herbaria, the majority of them being epiphytic. Two of the species, namely *Crepidomanes grande* (Copel.) Ebihara & K.Iwats. and *Didymoglossum motleyi* (Bosch) Ebihara & K.Iwats., have not previously been recorded from Brunei Darussalam.

Keywords. Borneo, distribution, herbaria, Malesia, pteridophytes, systematics

Introduction

Ferns are among the least known groups of vascular plants in terms of taxonomy, floristics and geography, not only in Borneo but in the whole Malesian region (Lindsay et al., 2009; Ebihara et al., 2012). This is probably due to their taxonomic complexity and nomenclatural instability (Christenhusz & Chase, 2014), although being perceived to be less attractive than flowering plants may also play a role. Furthermore, the immense diversity of ferns in Malesia (Moran, 2008) makes their study in this region rather demanding. Consequently, there are too few monographic studies as they are time consuming, sampling is often incomplete, material is not always available, and funding for such research is inadequate (Christenhusz & Chase, 2014). Brunei Darussalam is no exception to this lack of work on ferns as there are virtually no fern monographs for the country and only very few for neighbouring Sarawak and Sabah (Parris & Latiff, 1997). Fern records from Brunei Darussalam are scarce and existing records are from *Flora Malesiana* accounts, generic monographs and treatments, as well as other family or generic revisions. The *Flora of Peninsular Malaysia* Series I

(Parris et al., 2010, 2013) could potentially enhance pteridophyte research in Borneo as the two regions share much of their taxonomic diversity.

One of the most intriguing groups of ferns is the filmy ferns (Hymenophyllaceae). The number of species is currently estimated to be 434 (PPG I, 2016), even though much higher figures were previously suggested (e.g., about 650 species in Christenhusz & Chase, 2014). They are most abundant in humid tropical forests (Iwatsuki, 1990). These tiny, predominantly epiphytic plants are generally overlooked in the field as they are typically not recorded in standard surveys of tropical forests, despite their great diversity in this habitat (Zotz & Büche, 2000; Dubuisson et al., 2003). There have been floristic inventories and studies on the ecology of filmy ferns in the Neotropics (e.g. Zotz & Büche, 2000; Krömer & Kessler, 2006), however studies of this kind are lacking in the Paleotropics. Additionally, regional checklists are rare and only a Sabah pteridophyte checklist is available for Borneo (Said, 2005). For Brunei Darussalam, only random records of Hymenophyllaceae have been published, with the most extensive account probably by Iwatsuki (1965). Therefore, we decided to examine the filmy fern flora of Kuala Belalong in Temburong District of Brunei Darussalam, one of the most biologically surveyed localities in the country.

Materials and methods

The location

The survey took place at Kuala Belalong in the Temburong District of Brunei Darussalam. The site has lowland mixed dipterocarp forest, only slightly disturbed by human activities (Cranbrook & Edwards, 1994). The topography is very rugged, with narrow ridges and steep slopes as the prevailing landform and erosion gullies dissecting the slopes. The altitudinal range is from c. 70 m up to c. 350 m a.s.l. (though in the wider area not covered by the field survey, much higher altitudes occur up to c. 900 m a.s.l. on Bukit Belalong). The climate is equatorial with average temperatures around 30°C and little variation over the year. Precipitation reaches c. 4000 mm annually. The rainfall regime is driven by monsoon; rainless periods occur and can last several weeks. Relative air humidity exceeds 95% under the forest cover.

The survey

We used two basic methods for the filmy fern survey. The first method was a systematic inventory within three 1 ha permanent plots (divided into 10 × 10 m subplots for easier orientation) plus a cross-transect which did not overlap with any of the 1 ha plots (Fig. 1). The three permanent plots are situated in primary mixed lowland dipterocarp forest (see Hédl et al., 2009, for a description of the UBD plot 1 and Small et al., 2004, for a description of the Earthwatch plot) at altitudes from 80 m to 305 m a.s.l. The cross-transect was situated to transition from riverine to lowland mixed dipterocarp forest at an altitude of around 90 m a.s.l. Both terrestrial and epiphytic species were recorded. For the epiphytic species, the trunk of each woody plant was inspected for the occurrence of Hymenophyllaceae in all four sites. Only plants up to c. 2.5 m from

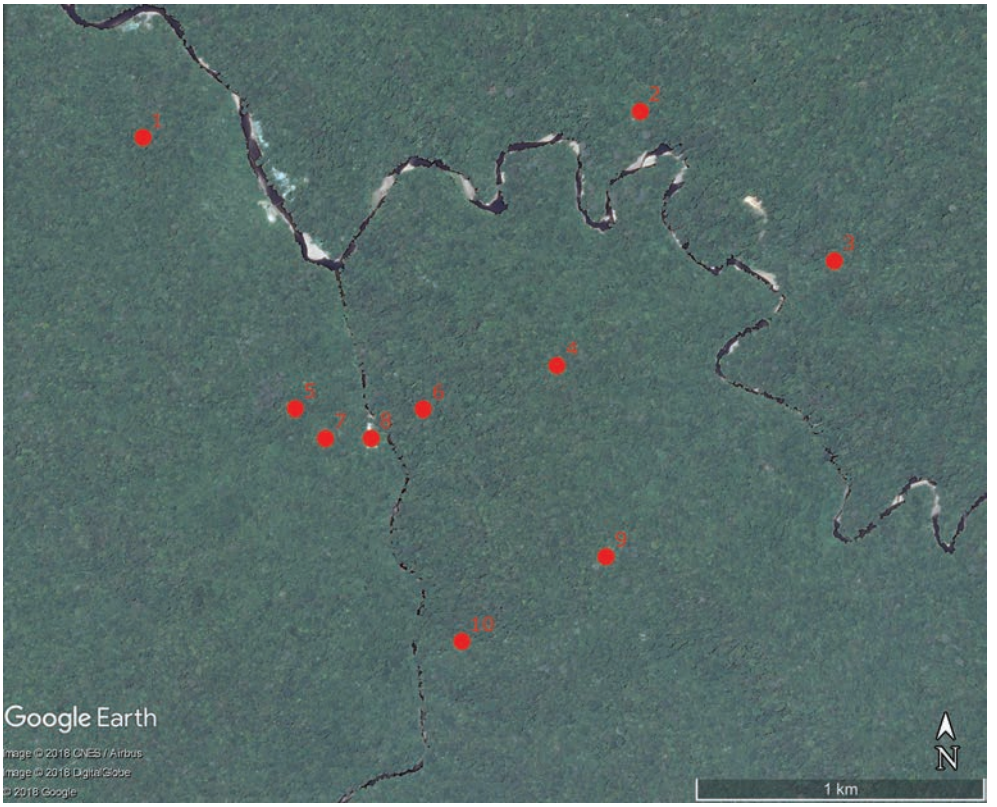

Fig. 1. Main collection localities. **1.** Sungai Apan. **2.** Sungai Baki. **3.** Sungai Tulan. **4.** Ecological plot 1. **5.** Sungai Mata Ikan. **6.** Cross-transect. **7.** Earthwatch plot. **8.** Kuala Belalong Field Studies Centre. **9.** Ecological plot 2. **10.** Sungai Esu.

the ground were recorded. The second method was to record any Hymenophyllaceae from a wide range of accessible locations around the Kuala Belalong Field Studies Centre, including the established forest trails (e.g. Ashton trail) and accessible river and stream valleys within a perimeter of c. 3 km from the Centre. We examined all types of suitable habitats including trees, rocks, stream banks, the forest floor and bare ground. The main collection localities are included in Fig. 1. Every species encountered was photographed and documented by a herbarium specimen. The field study was carried out from 2014 to 2017. Existing Hymenophyllaceae materials from the Kuala Belalong area in the Brunei National Herbarium (BRUN) were also studied.

Morphology

Morphological descriptions given for each species are based exclusively on plants from Kuala Belalong. The characteristics were measured on dried herbarium material. For each specimen, three to four fertile fronds were measured. If fewer than three fertile fronds were available, then fronds were measured which most resembled the fertile ones in size and shape. The following characters were measured for each frond:

length of blade (without the winged part of stipe if present), width of blade at its widest part, width of the ultimate segment of lamina (calculated as a mean of measurements of three randomly selected segments), length of stipe and the diameter of rhizome.

Only those species which were recorded in the field are provided with a morphological description. If similar species are discussed, then only those species which occur in West Malesia (Sumatra, Java, Borneo, Peninsular Malaysia and the Philippines) are considered.

For morphological terminology used in the text see Ebihara et al. (2006) and Iwatsuki (1977).

Notes on the systematics of Hymenophyllaceae and the system adopted in this study

Although Hymenophyllaceae is certainly a monophyletic group (Pryer et al., 2001), its infrafamilial classification is very complicated and inconsistent. The family was traditionally divided into two broadly defined genera, *Trichomanes* L. s.l. (trichomanoid) and *Hymenophyllum* Sm. s.l. (hymenophylloid). However, considerable morphological diversity within both groups led to them being further split into a number of narrowly defined genera (e.g. Copeland, 1938; Morton, 1968; Pichi Sermolli, 1977; Iwatsuki, 1984). With advances in molecular systematics, it has been demonstrated that some of these small genera are not monophyletic (Pryer et al., 2001; Hennequin et al., 2003, 2006a, 2006b; Ebihara et al., 2004), while the two traditionally recognised groups, *Hymenophyllum* s.l. and *Trichomanes* s.l., were revealed to be clearly monophyletic (Pryer et al., 2001; Ebihara et al., 2006). *Trichomanes* s.l. is characterized by involucres that are tubular throughout or at least in the proximal portion while *Hymenophyllum* s.l. has typically bivalved involucres. Christenhusz & Chase (2014) concluded that further splitting of these two genera is not justified. On the other hand, there are several monophyletic lineages within these two groups (Hennequin, 2003; Hennequin et al., 2003; Ebihara et al., 2006, 2007). In particular, *Trichomanes* s.l. is extremely morphologically and ecologically diverse and we find it is practical to distinguish the narrowly defined genera within it. Therefore, we have adopted the concept developed by Ebihara et al. (2006) and recognised by the Pteridophyte Phylogeny Group (PPG I, 2016), who divided the Hymenophyllaceae into a single widely defined genus *Hymenophyllum* s.l. and eight genera that previously belonged to *Trichomanes* s.l.

Key to the genera of Hymenophyllaceae of Kuala Belalong

The key is adapted and updated from Ebihara et al. (2006).

1a. Rhizomes long-creeping, fronds well-spaced along the rhizome; involucres tubular or bivalvate 2
1b. Rhizomes erect or very short-creeping, fronds clustered at the end of the rhizome; involucres tubular 4

2a. Rhizomes glabrous or sparsely covered with pale hairs; roots present, root-like shoots absent; involucres bivalvate ..... *Hymenophyllum*
2b. Rhizomes densely (exceptionally sparsely) covered with reddish to dark-coloured hairs; roots replaced by root-like shoots; involucres tubular 3

3a. Continuous false veinlets parallel to true veins present; blade venation catadromous; fronds simple, lobed or unipinnatifid ..... *Didymoglossum*
3b. Continuous false veinlets parallel to true veins absent; blade venation anadromous; fronds flabellate, unipinnatifid to tripinnatifid ..... *Crepidomanes*

4a. Fronds unipinnate to bipinnatifid ..... *Cephalomanes*
4b. Fronds bipinnate or more divided 5

5a. Long bristle-like brown hairs absent on stipes and rachises .... *Crepidomanes* subgen. *Nesopteris*
5b. Long bristle-like brown hairs present on stipes and rachises 6

6a. Lamina reduced (at most three rows of cells present between veins and margin of lamina), ultimate segments tooth-like to setiform ..... *Abrodictyum*
6b. Lamina not noticeably reduced, ultimate segments linear to cuneiform .... *Callistopteris*

Hymenophyllum Sm., Mém. Acad. Roy. Sci. (Turin) 5: 418, t. 9, fig. 8 (1793).
Hymenophyllum is the largest genus of Hymenophyllaceae and has a cosmopolitan distribution. It comprises about 250 species (Ebihara et al., 2006; Ebihara & Iwatsuki, 2007) and is also the most species-rich genus in Kuala Belong. We recorded nine species (in four subgenera), seven of them in the field. The remaining two species (*Hymenophyllum pallidum* (Blume) Ebihara & K.Iwats. and *H. lobbii* Moore) were identified from herbarium material.

Key to the Kuala Belalong species of *Hymenophyllum*

1a. Margins of segments serrate 2
1b. Margins of segments entire 6

2a. Stipe wingless or winged only in upper part 3
2b. Stipe winged throughout 4

3a. Blades of fertile fronds more than 4 cm long, bipinnatifid to tripinnatifid; rachis winged in upper half ..... 1. *H. bakeri*
3b. Blades of fertile fronds less than 4 cm long, bipinnatifid; rachis winged throughout ..... 2. *H. lobbii*

4a. Margins of segments serrate and flat; involucres on the surface without accessory projections ..... 3. *H. hosei*
4b. Margin of segments sharply serrate and crisped; involucres on the surface with accessory projections 5

5a. Blades of fertile fronds 2.9–5.5 cm long and 2.6–2.9 cm wide; stipe and rachis sparsely to densely covered with reddish hairs ..... 4. *H. cardunculus*
5b. Blades of fertile fronds 1.1–1.3 cm long and 0.8–1.2 cm wide; stipe and rachis subglabrous (sometimes with solitary reddish hairs) ..... 5. *H. acanthoides*

6a. Fronds dichotomously forked (the basal branching sometimes trichotomous), the branches sometimes unequal; margins of segments covered with unicellular, stiff, dark brown setae ..... 7. *H. digitatum*
6b. Fronds pinnatifid; margins of segments glabrous 7

7a. Rachis and costae on lower surface densely covered with long dark brown hairs; margins of lips indistinctly lobed ..... 6. *H. pachydermicum*
7b. Rachis and costae glabrous or blades covered with pale brown hairs; margins of lips entire 8

8a. Blades green and glabrous ..... 8. *H. polyanthos*
8b. Blades glaucous and at least sparsely hairy ..... 9. *H. pallidum*

Subgenus *Hymenophyllum*

1. *Hymenophyllum bakeri* Copel., Sarawak Mus. J. 2: 309 (1917). (Fig. 2 A–C)

Description of plants from Kuala Belalong. Rhizomes long-creeping, filiform, brown, branched, c. 0.34 mm in diameter, moderately to sparsely covered with pale brownish, multicellular hairs. Stipes of mature fronds 0.7–2.4 cm long, wingless, on lower surface covered with sparse multicellular red-brownish hairs. Lamina one cell thick, venation anadromous. Blades ovate to oblong in outline, bipinnatifid to tripinnatifid, in mature fronds 4.2–5.9 cm long and 1.6–2.6 cm wide, margins of segments finely serrate. Ultimate segments c. 1 mm wide, rounded at apex. Rachis winged in upper half, margins of wings entire. Rachis and sometimes also costae covered with sparse multicellular red-brownish hairs on lower surface. Sori in upper half of blades, solitary at the tips of basal acroscopic lobes of segments. Involucres bivalvate, divided ± 1/2 way down, obovate to oblong in outline, lips deltoid, rounded at apex, with toothed margins, receptacles long exserted.

Ecology and distribution in Kuala Belalong. This species grows on tree trunks and frequently forms large stands. It prefers the middle part of a trunk and it was frequently observed above 2.5 m high. It prefers lighter sites so its occurrence is concentrated

Fig. 2. *Hymenophyllum bakeri* Copel. **A.** Habit. **B.** Detail of blade with sori. **C.** Detail of sorus. *Hymenophyllum hosei* Copel. **D.** Habit. **E.** Detail of lamina. **F.** Detail of sorus. (Photos: O. Popelka)

mainly around gaps and other lighter places in the forest. It is common in Kuala Belalong including on ridges and in stream valleys.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, E ridge of Sungai Belalong, c. 1.5 km SE from its confluence with Sungai Temburong, ecological plot 2, 11 Jan 2014, *Popelka 2014/1* (OL); Kuala Belalong, E ridge of Sungai Belalong, c. 0.9 km ESE from its confluence with Sungai Temburong, ecological plot 1, 16 Jan 2014, *Popelka 2014/2* (OL); ibid., Feb 2015, *Popelka 2015/6* (OL); Kuala Belalong, Sungai Mata Ikan valley c. 0.4 km WNW from Kuala Belalong Field Studies Centre, 26 Jan 2015, *Popelka 2015/1* (OL); ibid., 30 Jan 2015 *Popelka 2015/3* (OL); Kuala Belalong, ridge c. 0.7 km W from Kuala Belalong Field Studies Centre, 25 Jan 2015, *Popelka 2015/2* (OL); Kuala Belalong, slopes above the E bank of Sungai Belalong, c. 0.2 km ENE from Kuala Belalong Field Studies Centre, 29 Jan 2015, *Popelka 2015/4* (OL); ibid., Feb 2015, *Popelka 2015/5* (OL).

Notes. Key characters of this species are serrate margins of segments, blades of fertile fronds more than 4 cm long, stipe wingless, rachis winged in upper half and involucre lips toothed at margins.

Hymenophyllum bakeri belongs to the taxonomically complicated *H. tunbrigense* (L.) Sm. group. It differs from *Hymenophyllum tunbrigense* s.s. by the following combination of characters: rachis winged only in the upper half, sori in upper half of blades, solitary at the tips of basal acroscopic lobes of segments, receptacles long exserted, and involucres obovate to oblong in outline.

2. *Hymenophyllum lobbii* Moore, Ned. Kruidk. Arch. 5(3): 176 (1863).

Ecology and distribution in Kuala Belalong. It was collected only once as a tree-trunk epiphyte on the main ridge south from Bukit Belalong in a submontane forest at an altitude of c. 820 m a.s.l. (*Edwards 2209*).

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** GR 159914, Main ridge south from Bukit Belalong, 2700 ft., 18 Jun 1992, *Edwards 2209* (BRUN).

Notes. Key characters of this species are serrate margins of segments, blades of fertile fronds less than 4 cm long, stipes wingless and rachis winged throughout.

It is very similar to *Hymenophyllum blandum* Racib., a species also known from Brunei Darussalam (Bukit Retak, *Edwards 826*). However, *Hymenophyllum lobbii* has a winged rachis.

3. *Hymenophyllum hosei* Copel., Philipp. J. Sci. 12: 46 (1917). (Fig. 2 D–F)

Description of plants from Kuala Belalong. Rhizomes long-creeping, brown, filiform, c. 0.27 mm in diameter, branched, sparsely covered with pale brownish hairs. Stipes of mature fronds 0.6–3.1 cm long, sparsely covered with multicellular light brownish hairs, winged throughout, wings gradually narrowing downwards. Lamina one cell thick, venation anadromous. Blades ovate to broadly-lanceolate in outline, bipinnatifid to tripinnatifid, in mature fronds 3.2–6.8 long and 1.8–2.8 cm wide, margins of segments serrate, ultimate segments c. 1.1 mm wide. Rachis sparsely covered with multicellular pale brownish hairs on lower surface, winged throughout, margins of wings serrate. Sori solitary on basal, short acroscopic lobes of segments. Involucres bivalvate, elliptic in outline, divided ± 1/2 way, narrowly winged in the lower part, lips rounded at apex, irregularly toothed at margins. Receptacles long exserted.

Ecology and distribution in Kuala Belalong. This species is confined to humid places along rivers and streams. It grows almost exclusively on the basal parts of tree trunks.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, Sungai Sitam valley c. 2.2 km S from the Kuala Belalong Field Studies Centre, 28 Nov 2017, *Dančák 2017/88A* (BRUN); ibid., 28 Nov 2017, *Dančák 2017/88B* (OL); Sg. Belalong, FSC site, 23 Aug 1990, *Edwards 963* (BRUN); Sg. Sitam camp site. FSC area, 24 Nov 1990, *Edwards 2042* (BRUN); Sg. Enkiang, above last falls, FSC area, 15 Feb 1991, *Edwards 2088* (BRUN); Sg. Enkiang, below lst falls, FSC area, 15 Feb 1991, *Edwards 2089* (BRUN); Temburong Dist. Subd. Amo, Upper Belalong River west of Bukit Belalong, 130 m, 04°30′N 115°08′E, 24 Mar 1991, *Johns 6996* (BRUN); Kuala Belalong, Sungai Mata Ikan valley c. 0.4 km WNW from Kuala Belalong Field Studies Centre, 26 Jan 2015, *Popelka 2015/14* (OL); Kuala Belalong, Sungai Baki valley c. 1.5 km NE from Kuala Belalong Field Studies Centre, 6 Feb 2015, *Popelka 2015/15* (OL); Kuala Belalong, Sungai Apan valley c. 0.9 km NWN from the confluence of Belalong and Temburong rivers, 15 Feb 2015, *Popelka 2015/16* (OL); Kuala Belalong, Sungai Tulan valley,

c. 2 km ENE from Kuala Belalong Field Studies Centre, 18 Jan 2014, *Popelka 2014/6* (OL); Beside the Belalong River, 7 Jul 1989, *Wong 1331* (BRUN), *Wong 1336* (BRUN).

Notes. Key characters of this species are blades bipinnatifid to tripinnatifid, rachis and stipes winged throughout and margins of segments serrate and flat.

Other species from the *Hymenophyllum holochilum* group, e.g. *H. holochilum* (Bosch) C.Chr. are similar. The main diagnostic character which differentiates *Hymenophyllum hosei* from *H. holochilum* is the broadly winged rachis (Copeland, 1917). There are several specimens in BRUN from Kuala Belalong, *Edwards 963* (BRUN), *Edwards 2042* (BRUN), *Edwards 2088* (BRUN), *Edwards 2089* (BRUN), *Johns 6996* (BRUN), which have previously been identified as *Hymenophyllum holochilum* but which have clearly winged rachis. Therefore we consider them to be *Hymenophyllum hosei* which consequently excludes *H. holochilum* from the filmy fern flora of the locality.

4. *Hymenophyllum cardunculus* C.Chr., Mitt. Inst. Allg. Bot. Hamburg 7: 144 (1928). (Fig. 3 A–C)

Description of plants from Kuala Belalong. Rhizome long-creeping, brown, filiform, c. 0.27 mm in diameter, branched, sparsely covered with pale brown multicellular hairs. Stipes of mature fronds 0.7–3.1 cm long, densely, sometimes sparsely, covered with multicellular reddish-brown hairs, narrowly winged throughout, margins of wings sharply, deeply serrate and distinctly crisped. Lamina one cell thick, venation anadromous. Blades variable in form and size, deltoid to ovate in outline, tripinnatifid, in mature fronds 2.4–5.5 cm long and 1.4–3.2 cm wide, margins of segments sharply, deeply serrate and extremely crisped, ultimate segments c. 1.3 mm wide, rounded at the apex. Rachis at the base glabrous to densely covered with multicellular reddish-brown hairs, winged throughout, margins of wings deeply, sharply serrate and extremely crisped. Rachis and main veins with accessory wings. Sori at the tips of short acroscopic segments in upper part of frond, obconic in outline, bivalvate, divided ± 1/2 way down, on the surface with long accessory projections, lips rounded, margins of lips deeply serrate, receptacles long exserted.

Ecology and distribution in Kuala Belalong. It is a rather rare epiphytic species which is probably confined to streams and riversides.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, Sungai Mada Roma, c. 2.8 km SSW from Kuala Belalong Field Studies Centre, 31 Jan 2015, *Popelka 2015/21* (OL), *Popelka 2015/22* (OL); Kuala Belalong, surroundings of Kuala Belalong Field Studies Centre, Feb 2015, *Popelka 2015/23* (OL); ibid., Feb 2015, *Popelka 2015/25* (OL); Kuala Belalong, Sungai Mata Ikan valley c. 0.4 km WNW from Kuala Belalong Field Studies Centre, Feb 2015, *Popelka 2015/24* (OL).

Notes. Key characters of this species are deeply, sharply serrate and extremely crisped margins of segments, blades of mature fronds 2.4–5.5 cm long and 1.4–3.2 cm wide, and stipes and rachis sparsely to densely covered with reddish hairs.

The similar species are *Hymenophyllum denticulatum* Sw., *H. acanthoides* (Bosch) Rosenst. and *H. sabinifolium* Baker.

Hymenophyllum cardunculus belongs to the *H. denticulatum* group of species. Species from this group are morphologically very similar and their determination is difficult. Three species from this group occur in Brunei Darussalam, two of them in Kuala Belalong (the other species being *Hymenophyllum acanthoides*). *Hymenophyllum denticulatum* is the rarest species in this group in Brunei Darussalam, having been collected only once in Gunung Retak (*Johns 6584*, BRUN). *Hymenophyllum cardunculus* is more common while the commonest species in this group is *H. acanthoides*. We have seen two herbarium sheets of *Hymenophyllum cardunculus* in BRUN (*Johns* 7409 and *Johns* 7512) that were originally identified as *H. acanthoides*.

5. *Hymenophyllum acanthoides* (Bosch) Rosenst., Bull. Jard. Bot. Buitenzorg, sér. 2, 2: 25 (1911). – *Didymoglossum acanthoides* Bosch in Miquel, Pl. Jungh. 5: 560 (1856). (Fig. 3 D–F)

Description of plants from Kuala Belalong. Rhizome long-creeping, brown, filiform, c. 0.2 mm in diameter, branched, sparsely covered with pale brown multicellular hairs. Stipes of mature fronds 0.2–0.7 cm long, glabrous or subglabrous (sometimes with sporadic multicellular brown hairs), winged throughout, margins of wings serrate, not crisped or slightly crisped. Lamina one cell thick, venation anadromous. Blades variable in form and size, deltoid to ovate in outline, bipinnatifid to tripinnatifid, in mature fronds 1–1.3 cm long and 0.8–1.2 cm wide, margins of segments sharply serrate and distinctly crisped, ultimate segments c. 0.83 mm wide, rounded at apex. Rachis glabrous, winged throughout, margins of wings sharply serrate and crisped. Rachis and costae with accessory wings. Sori at tips of short acroscopic segments in upper part of blades, involucres obconic in outline, bivalvate, divided ± 1/2 way down, with long accessory projections on the surface, lips rounded, margins of lips serrate, receptacles long exserted.

Ecology and distribution in Kuala Belalong. It is a typical epiphyte, which grows on the basal parts of tree trunks. *Hymenophyllum acanthoides* is the most frequent species of epiphytic filmy fern in the Kuala Belalong forests, despite forming only small stands.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, E ridge of Sungai Belalong, c. 1.5 km SE from its confluence with Sungai Temburong, ecological plot 2, 11 Jan 2014, *Popelka 2014/7* (OL); ibid., 12 Feb 2015, *Popelka 2015/18* (OL); Kuala Belalong, E ridge of Sungai Belalong, c. 0.9 km ESE from its confluence with Sungai Temburong, near ecological plot 1, 26 Jan 2015, *Popelka 2015/17* (OL); Kuala Belalong, surroundings of Kuala

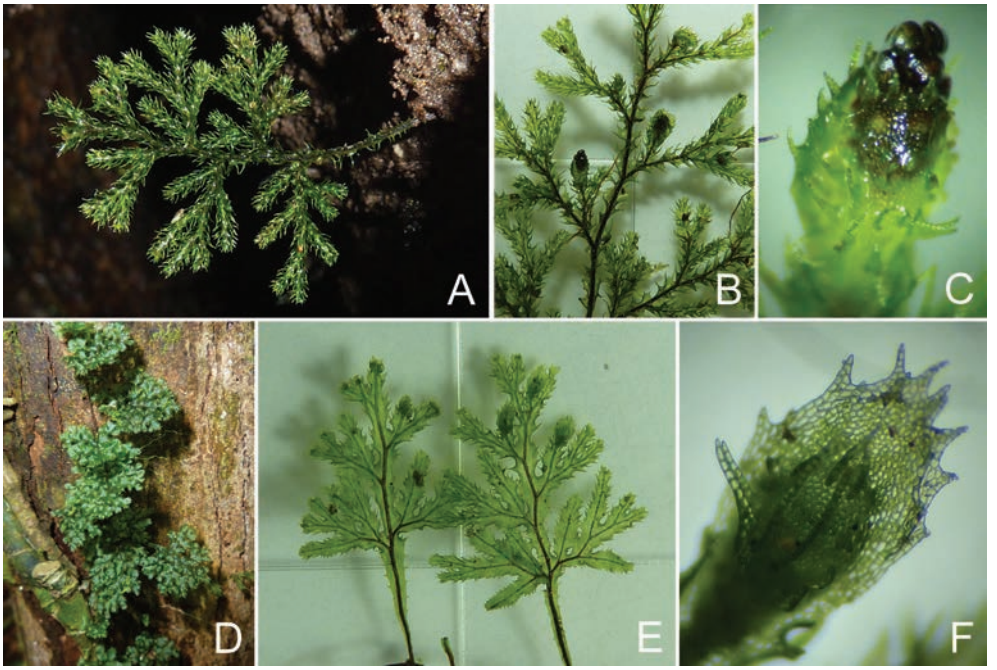

Fig. 3. *Hymenophyllum cardunculus* C.Chr. **A.** Habit. **B.** Detail of blade with sori. **C.** Detail of sorus. *Hymenophyllum acanthoides* (Bosch) Rosenst. **D.** Habit. **E.** Detail of fertile fronds. **F.** Detail of sorus. (Photos: O. Popelka)

Belalong Field Studies Centre, Feb 2015, *Popelka 2015/19* (OL); Kuala Belalong, Sungai Baki valley c. 1.5 km NE from Kuala Belalong Field Studies Centre, 6 Feb 2015, *Popelka 2015/20* (OL); Bukit Belalong, East ridge, 20 Jul 1989, *Vogel 8996* (BRUN).

Notes. Key characters of this species are sharply serrate and crisped margins of segments, involucres on the surface with accessory projections, blades of mature fronds 1.1–1.3 cm long and 0.8–1.2 cm wide, and stipes and rachis subglabrous.

Similar species are *Hymenophyllum cardunculus*, *H. denticulatum* (larger blades, less distinct crisped margin of segments) and *H. lobbii* (margins of segments not crisped, stipes wingless), see also Iwatsuki (1977).

6. *Hymenophyllum pachydermicum* Ces., Atti Accad. Sci. Fis. 7(8): 8 (1878). (Fig. 4 A–C)

Description of plants from Kuala Belalong. Rhizome long-creeping, brown, filiform, c. 0.26 mm in diameter, branched, densely covered with brown multicellular hairs. Stipes of mature fronds 0.3–0.6 cm long, on lower surface densely covered with long multicellular brown hairs, base of lamina long decurrent forming a wing, margins of wings entire. Lamina one cell thick, venation anadromous. Blades ovate to obovate in outline, unipinnatifid to bipinnatifid, in mature fronds 1.1–1.9 cm long and 0.9–1.5

cm wide, margins of segments entire, ultimate segments c. 1.2 mm wide, rounded or retuse at the apex. Rachis and costae on lower surface densely covered with long multicellular brown hairs. Rachis broadly winged throughout, margins of wings entire. Sori at the base of segments in upper part of blades, broadly-obovate in outline, bivalvate, divided ± 1/2 way down, lips rounded, margins of lips sharply lobed or entire, receptacles included in involucres.

Ecology and distribution in Kuala Belalong. It is a less common species growing in very humid environments, usually in deep gullies. Typically, it inhabits trunks of larger trees where it can form extensive stands.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Sg. Belalong. E ridge trail, between plots 1 & 2. FSC, 14 Feb 1991, *Edwards 2092* (BRUN); Amo. Bukit Belalong, 850 m, 24 Feb 1992, *Dransfield 1247* (BRUN); ibid., 24 Feb 1992, *Dransfield 1248* (BRUN); Bukit Belalong, North ridge, 800–900 m, 17 Jul 1989, *Vogel 9018* (BRUN); Kuala Belalong, E ridge of Sungai Belalong, c. 0.9 km ESE from its confluence with Sungai Temburong, ecological plot 1, 16 Jan 2014, *Popelka 2014/3* (OL); ibid., 17 Jan 2014, *Popelka 2014/4* (OL); ibid., Feb 2015, *Popelka 2015/58* (OL); Kuala Belalong, E ridge of Sungai Belalong, c. 0.9 km ESE from its confluence with Sungai Temburong, near ecological plot 1, 26 Jan 2015, *Popelka 2015/12* (OL).

Notes. Key characters of this species are entire margins of segments, rachis and costae on lower surface densely covered with long multicellular brown hairs and margins of lips sharply lobed or entire. There are no other similar species.

Subgenus *Sphaerocionium* (C.Presl) C.Chr., Index Filic., Suppl. Tertium pro Annis 1917-1933: 5 (1934).

7. *Hymenophyllum digitatum* (Sw.) Fosberg, Smithsonian Contr. Bot. 45: 1 (1980). – *Trichomanes digitatum* Sw., Syn. Fil. 370, 422 (1806). (Fig. 4 D–F)

Description of plants from Kuala Belalong. Rhizome long-creeping, filiform, c. 0.16 mm in diameter, branched, sparsely covered with brown hairs (especially at nodes). Stipes of mature fronds filiform 0.4–2.1 cm long, very sparsely covered with light brown hairs, wingless. Lamina one cell thick, venation anadromous. Blades variable in form and size, orbicular to broadly ovate in outline, usually unequally dichotomously forked (the basal branching sometimes trichotomous), the branches sometimes unequal, in mature fronds 0.8–1.8 cm long and 0.8–1.5 cm wide, margins of segments entire, covered with unicellular, stiff, dark brown setae. Ultimate segments c. 1.3 mm wide, rounded at the apex. Sori in upper half of fronds, at the tips of segments, immersed in lamina, obovate in outline, bivalvate, divided ± 1/3 way down, lips rounded, margins of lips entire, receptacles long exserted.

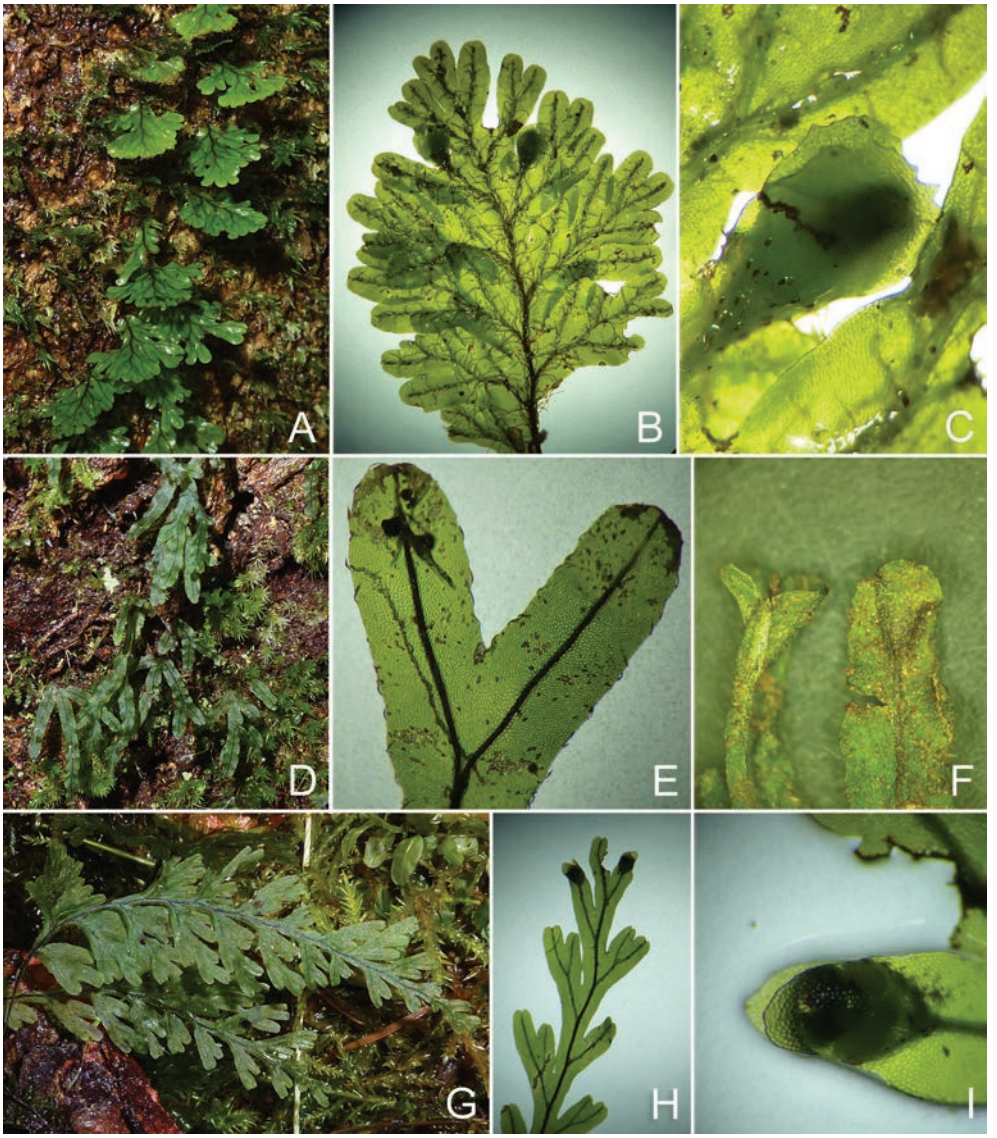

Fig. 4. *Hymenophyllum pachydermicum* Ces. **A.** Habit. **B.** Detail of blade with sori. **C.** Detail of sorus. *Hymenophyllum digitatum* (Sw.) Fosberg. **D.** Habit. **E.** Detail of lamina. **F.** Detail of sorus. *Hymenophyllum polyanthos* (Sw.) Sw. **G.** Habit. **H.** Detail of blade. **I.** Detail of sorus. (Photos: O. Popelka)

Ecology and distribution in Kuala Belalong. It is a rather rare species, occurring mostly in humid shaded places near running waters. It is a trunk-epiphyte which does not form extensive stands.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, E ridge of Sungai Belalong, c. 1.5 km SE from its confluence with Sungai Temburong, ecological plot

2, 12 Jan 2014, *Popelka 2014/5* (OL); Kuala Belalong, slopes above the E bank of Sungai Belalong, c. 0.2 km ENE from Kuala Belalong Field Studies Centre, 3 Feb 2015, *Popelka 2015/13* (OL); Kuala Belalong, along Ashton trail between Earthwatch ecological plot and Kuala Belalong Field Studies Centre, 27 Nov 2017, *Dančák 2017/120* (OL).

Notes. Key characters of this species are dichotomously forked blades, margins of lamina with stiff, simple and unicellular dark-brown setae.

Similar species include *Hymenophyllum palmatifidum* (Müll.Berol.) Ebihara & K.Iwats. (marginal hairs of lamina basally forked) which was collected in Bukit Gelagas (*Simpson 2314*, BRUN) and Gunung Retak (*Johns 6669*, BRUN) and *H. nitidulum* (Bosch) Ebihara & K.Iwats. (marginal hairs of lamina multicellular).

Subgenus *Mecodium* Copel., Philipp. J. Sci. 64: 93 (1937).

8. *Hymenophyllum polyanthos* (Sw.) Sw., J. Bot. (Schrader) 1800(2): 102 (1801). – *Trichomanes polyanthos* Sw., Prodr. 137 (1788). (Fig. 4 G–I)

Description of plants from Kuala Belalong. Rhizome long-creeping, filiform, brown, c. 0.24 mm in diameter, branched, glabrous or sparsely covered with short, unicellular, pale hairs. Stipes of mature fronds 1.1–2 cm long, glabrous or subglabrous, winged in upper half, wings gradually narrowing downwards, margins of wings entire. Lamina one cell thick, venation anadromous. Blades variable in form and size, ovate to broadly-lanceolate in outline, tripinnatifid, in mature fronds 3.3–7 cm long and 1.3–1.9 cm wide, margins of segments entire, ultimate segments c. 1.1 mm wide, retuse at apex. Rachis glabrous, winged throughout, margins of wings entire. Sori at the tips of ultimate segments, in upper part of fronds, obtuse in outline, bivalvate, divided ± 1/2 way down, lips acute at apex, entire, receptacles included in involucres.

Ecology and distribution in Kuala Belalong. It is a relatively rare trunk-epiphyte species which prefers rather light places.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Sg. Belalong, E ridge trail, near plot 1, FSC area, 14 Feb 1991, *Edwards 2090* (BRUN); Kuala Belalong, E ridge of Sungai Belalong, c. 0.9 km ESE from its confluence with Sungai Temburong, near ecological plot 1, 26 Jan 2015, *Popelka 2015/7* (OL); ibid., Feb 2015, *Popelka 2015/8* (OL); Kuala Belalong, Earthwatch ecological plot c. 0.2 km W from the Kuala Belalong Field Studies Centre, Feb 2015, *Popelka 2015/9* (OL); Kuala Belalong, surroundings of Kuala Belalong Field Studies Centre, Feb 2015, *Popelka 2015/10* (OL); ibid., Feb 2015, *Popelka 2015/11* (OL).

Notes. Key characters of this species are entire margins of segments, blades tripinnatifid, involucres bivalvate with lateral veinlets running up to the margin and margins of lips entire.

Hymenophyllum subgenus *Mecodium*, otherwise known as the *Hymenophyllum polyanthos* group, contains about 35 species (Ebihara et al., 2006; Hennequin et al.,

2006a, 2006b). It is a taxonomically complicated group and the delimitation of the species is sometimes rather weak. Although we believe that the plants from Kuala Belalong belong to *Hymenophyllum polyanthos* s.s. they require further study to confirm this determination.

Subgenus *Pleuromanes* (C.Presl) Ebihara & K.Iwats., Blumea 51(2): 232 (2006).

9. *Hymenophyllum pallidum* (Blume) Ebihara & K.Iwats., Blumea 51(2): 232 (2006). – *Trichomanes pallidum* Blume, Enum. Pl. Javae 2: 225–226 (1828).

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Beside Sg. Temburong, down from Kuala Sg. Babi FSC area, 4 Nov 1991, *Edwards 2195* (BRUN).

Notes. Key characters of this species are entire margins of segments, blades glaucous and hairy. The only similar species is *Hymenophyllum album* Blume.

Crepidomanes C.Presl, Epimel. Bot. 258 (1851).

We recorded four species of *Crepidomanes* subgenus *Crepidomanes* and one species of *Crepidomanes* subgenus *Nesopteris* (Copel.) Ebihara & K.Iwats. in Kuala Belalong. This genus contains more than 30 species distributed throughout the Paleotropics (Ebihara et al., 2006). Species of *Crepidomanes* subgenus *Crepidomanes* are typically epiphytes with long-creeping rhizomes densely covered with dark hairs without roots (replaced by root-like shoots). The main morphological feature useful for identification of species from this subgenus is the presence of submarginal false veinlets and marginal elongate cells. On the other hand, *Crepidomanes* subgenus *Nesopteris* species are mainly rather large terrestrial ferns with numerous roots and short erect rhizomes.

Key to the species of *Crepidomanes* of Kuala Belalong

1a. Rhizomes short and ± erect; fronds more than 12 cm long ..... 5. *C. grande*
1b. Rhizomes long-creeping; fronds less than 12 cm long 2

2a. Laminas without false veinlets or elongated marginal cells ..... 3. *C. minutum*
2b. Laminas with false veinlets or elongated marginal cells 3

3a. Laminas with marginal elongated cells but without submarginal false veinlets .... 4. *C. humile*
3b. Laminas without marginal elongated cells but with submarginal false veinlets 4

4a. Margin of segments undulate; mouth of involucres rather bilabiate, lips round .... 2. *C. christii*
4b. Margin of segments flat; mouth of involucres bilabiate, lips triangular .... 1. *C. bipunctatum*

Subgenus *Crepidomanes*

1. *Crepidomanes bipunctatum* (Poir.) Copel., Philipp. J. Sci. 67(1): 59 (1938). – *Trichomanes bipunctatum* Poir., Encycl. [Lamarck] 8(1): 69 (1808). (Fig. 5 A–C)

Description of plants from Kuala Belalong. Rhizome long-creeping, slender, c. 0.55 mm in diameter, branched, densely covered with blackish-brown hairs. Roots absent, root-like shoots present. Lamina one cell thick, venation anadromous, submarginal false veinlets present, two rows of cells present between false veinlets and margins of lamina. Stipes of mature fronds 0.4–3.2 cm long, sparsely to densely covered with dark brown hairs, hairs always in two opposite lines, narrowly winged in the upper part or wingless, wings gradually narrowing downwards. Blades variable in form and size, deltoid to ovate in outline, tripinnatifid, in mature fronds 1.8–6.6 cm long and 1.1–3.7 cm wide (fertile fronds often dwarfed), margins of segments entire and flat, ultimate segments c. 0.68 mm wide, rounded or retuse at the apex. Stipes, rachis and costae covered with minute scales. Rachis narrowly winged throughout, margins of wings entire. Sori in upper half of blades, at the tips of short acroscopic and basioscopic lobes, involucres tubular, obovate in outline, winged throughout, mouth bilabiate, lips triangular, receptacles long exserted.

Ecology and distribution in Kuala Belalong. It prefers light places near streams where it usually grows epiphytically, but also on wet rocks and stones. It typically grows on the basal parts of trunks. It is a relatively common species.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Sg. Belalong, above Kuala Sg. Nkabang, FSc area, 21 Mar 1991, *Edwards 2142* (BRUN); Kuala Belalong, Sungai Tulan valley, c. 2 km ENE from Kuala Belalong Field Studies Centre, 18 Jan 2014, *Popelka 2014/8* (OL); Kuala Belalong, E ridge of Sungai Belalong, c. 1.5 km SE from its confluence with Sungai Temburong, ecological plot 2, Jan 2014, *Popelka 2014/9* (OL); Kuala Belalong, surroundings of Kuala Belalong Field Studies Centre, Jan 2014, *Popelka 2014/10* (OL); ibid., Feb 2015, *Popelka 2015/32* (OL); Kuala Belalong, Earthwatch ecological plot c. 0.2 km W from the Kuala Belalong Field Studies Centre, 8 Feb 2015, *Popelka 2015/26* (OL); ibid., 8 Feb 2015, *Popelka 2015/27* (OL); ibid., Feb 2015, *Popelka 2015/29* (OL); Kuala Belalong, slopes above the E bank of Sungai Belalong, c. 0.2 km ENE from Kuala Belalong Field Studies Centre, Feb 2015, *Popelka 2015/28* (OL); ibid., Feb 2015, *Popelka 2015/30* (OL); Kuala Belalong, Sungai Apan valley c. 0.9 km NWN from the confluence of Belalong and Temburong rivers, 15 Feb 2015, *Popelka 2015/31* (OL).

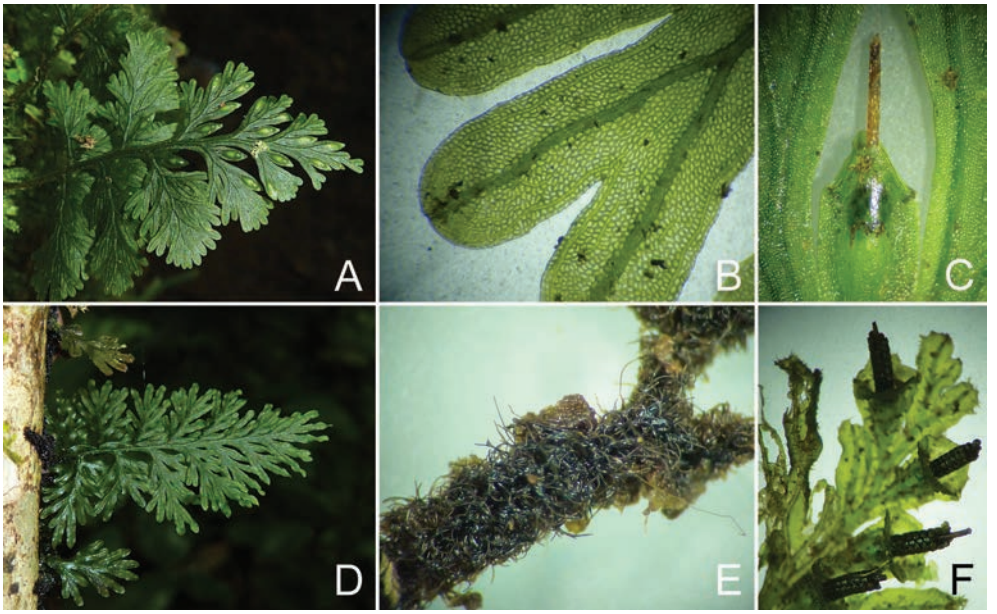

Fig. 5. *Crepidomanes bipunctatum* (Poir.) Copel. **A.** Habit. **B.** Detail of lamina with submarginal false veinlets. **C.** Detail of sorus. *Crepidomanes christii* (Copel.) Copel. **D.** Habit. **E.** Detail of rhizome. **F.** Detail of sorus. (Photos: O. Popelka)

Notes. Key characters of this species are submarginal false veinlets present, flat margins of segments and triangular lips. Similar species are *Crepidomanes christii* (Copel.) Copel. and *C. brevipes* (C.Presl) Copel.

2. *Crepidomanes christii* (Copel.) Copel. Philipp. J. Sci. 67(1): 60 (1938). – *Trichomanes christii* Copel., Philipp. J. Sci. 1(Suppl. 4): 251 (1906). (Fig. 5 D–F)

Description of plants from Kuala Belalong. Rhizome long-creeping, slender, c. 0.54 mm in diameter, branched, densely covered with blackish-brown hairs. Roots absent, root-like shoots present. Lamina one cell thick, venation anadromous, submarginal false veinlets present, two rows of cells present between false veinlets and margins of lamina. Stipes of mature fronds 0.2–1.2 cm long, wingless, covered with minute scales (exceptionally in the lower part with individual blackish-brown hairs). Blades variable in form and size, ovate in outline, tripinnatifid, in mature fronds 3.3–6.2 cm long and 2.2–4.1 cm wide, margins of segments entire and undulate, ultimate segments c. 0.69 mm wide, rounded or retuse at the apex. Rachis and costae covered with minute scales. Rachis winged in the upper part, margins of wings entire. Sori in upper half of blades, at the tips of short acroscopic and basioscopic lobes, involucres tubular, obovate in outline, winged throughout, mouth rather bilabiate, lips rounded, receptacles long exserted.

Ecology and distribution in Kuala Belalong. Like the previous species, it prefers light places near streams. It usually grows epiphytically, but also on wet rocks and stones. It prefers thin trunks and twigs. It is as common as *Crepidomanes bipunctatum*.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, Sungai Mata Ikan valley c. 0.4 km WNW from Kuala Belalong Field Studies Centre, 24 Jan 2016, *Dančák 2016/132* (OL); ibid., 27 Nov 2017, *Dančák 2017/75* (BRUN); ibid., 29 Jan 2015, *Popelka 2015/33* (OL); ibid., 26 Jan 2015, *Popelka 2015/36* (OL); ibid., 26 Jan 2015, *Popelka 2015/37* (OL); Kuala Belalong, Sungai Mada Roma c. 2.9 km SSW from Kuala Belalong Field Studies Centre, 28 Nov 2017, *Dančák 2017/83* (BRUN); Kuala Belalong, Sungai Baki valley c. 1.5 km NE from Kuala Belalong Field Studies Centre, 29 Nov 2017, *Dančák 2017/101* (BRUN); ibid., 29 Nov 2017, *Dančák 2017/103* (OL); ibid., 6 Feb 2015, *Popelka 2015/34* (OL); ibid., 6 Feb 2015, *Popelka 2015/35* (OL); Between Sg. Sitam Camp & FSC area, 24 Nov 1990, *Edwards 2034* (BRUN); Sg. Belalong, Bath stream by FSC, 20 Mar 1991, *Edwards 2139* (BRUN); Sg. Belalong, bath stream by FSC, 20 Mar 1991, *Edwards 2141* (BRUN); Sg. Baki, FSC area, 4 Nov 1991, *Edwards 2188* (BRUN); Kuala Belalong, surroundings of Kuala Belalong Field Studies Centre, Jan 2014, *Popelka 2014/11* (OL); ibid., Feb 2015, *Popelka 2015/38* (OL); Batu Apoi Forest Reserve, Sungai Belalong, Sungai Esu trail, 70 m, 04°33′N 115°09′E, 6 Feb 1992, *Poulsen 262* (BRUN).

Notes. Key characters of this species include presence of submarginal false veinlets, undulate margins of segments and rounded lips of involucres. Similar species are *Crepidomanes bipunctatum* and *C. brevipes*.

3. *Crepidomanes minutum* (Blume) K.Iwats., J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13(5): 524 (1985). – *Trichomanes minutum* Blume, Enum. Pl. Javae 2: 223 (1828). (Fig. 6 A–C)

Description of plants from Kuala Belalong. Rhizome long-creeping, branched, filiform, c. 0.25 mm in diameter, sparsely to densely covered with dark brown hairs. Roots absent, root-like shoots present. Lamina one cell thick, venation anadromous, submarginal false veinlets and marginal elongate cells absent. Stipes of mature fronds c. 0.1–1.8 cm long, subglabrous or sparsely covered with dark brown hairs, proliferations often observed. Blades very variable in form and size, unipinnatifid to bipinnatifid, flabellate or oblong to ovate in outline, in mature fronds 0.5–3 cm long and 0.5–2 cm wide, margins of segments entire and flat, ultimate segments c. 0.5 mm wide, retuse at the apex. Sori in upper half of fronds, at the tips of segments, involucres tubular, obovate in outline, with dilated mouth, truncate at mouth, completely immersed in lamina, receptacles long exserted.

Ecology and distribution in Kuala Belalong. Most frequently as an epiphyte on tree trunks. The first type is common in shaded places in the forest interior but usually in small stands. The second type grows in lighter places along forest streams and is noticeably rarer.

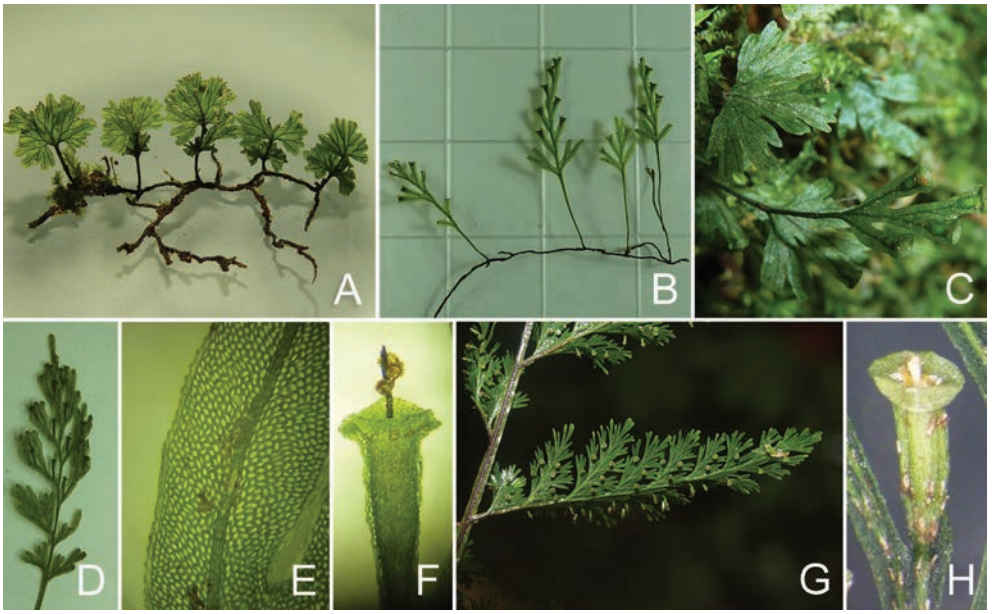

Fig. 6. *Crepidomanes minutum* (Blume) K.Iwats. **A.** Form with flabellate blades. **B.** Form with pinnatifid blades. **C.** Intermediate form. *Crepidomanes humile* (G.Forst.) Bosch. **D.** Habit. **E.** Detail of lamina with elongate marginal cells. **F.** Detail of sorus. *Crepidomanes grande* (Copel.) Ebihara & K.Iwats. **G.** Part of frond with sori. **H.** Detail of sorus. (Photos: A–F, H by O. Popelka; G by M. Hroneš)

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, Sungai Mata Ikan valley c. 0.4 km WNW from Kuala Belalong Field Studies Centre, 27 Nov 2017, *Dančák 2017/78* (OL); Kuala Belalong, along Ashton trail between Earthwatch ecological plot and Kuala Belalong Field Studies Centre, 1 Dec 2017, *Dančák 2017/122* (OL); Kuala Belalong, E ridge of Sungai Belalong, c. 1.5 km SE from its confluence with Sungai Temburong, ecological plot 2, 12 Jan 2014, *Popelka 2014/14* (OL); ibid., Feb 2015, *Popelka 2015/46* (OL); Kuala Belalong, E ridge of Sungai Belalong, c. 0.9 km ESE from its confluence with Sungai Temburong, ecological plot 1, 17 Jan 2014, *Popelka 2014/15* (OL); ibid., Feb 2015, *Popelka 2015/41* (OL); Kuala Belalong, ridge c. 0.7 km W from Kuala Belalong Field Studies Centre, 25 Jan 2015, *Popelka 2015/40* (OL); Kuala Belalong, Sungai Mada Roma, c. 2.8 km SSW from Kuala Belalong Field Studies Centre, 31 Jan 2015, *Popelka 2015/42* (OL); ibid., 31 Jan 2015, *Popelka 2015/43* (OL); Kuala Belalong, Sungai Baki valley c. 1.5 km NE from Kuala Belalong Field Studies Centre, 6 Feb 2015, *Popelka 2015/44* (OL); Kuala Belalong, Earthwatch ecological plot c. 0.2 km W from the Kuala Belalong Field Studies Centre, Feb 2015, *Popelka 2015/45* (OL).

Notes. Key characters of this species include absence of marginal elongate cells and submarginal false veinlets, and proliferation often observed.

The *Crepidomanes minutum* species complex is a taxonomically complicated group affected by nomenclatural confusion. It has high morphological variability, polyploidy, and frequent occurrence of hybrids which are stabilised by apogamy

and polyploidy (Nitta et al., 2011). As the group has not been critically revised yet, we recognise a single polymorphic species, *Crepidomanes minutum*. Plants from Kuala Belalong are highly variable in form and size and two morphologically and ecologically relatively distinct types occur here. The first type (*Popelka 2014/14*, *2014/15*, *2015/40* and *2015/41*) is distinguished by the following combination of characters: blades flabellate, in mature fronds 0.5–0.7 cm long and 0.5–0.9 cm wide, proliferation frequent, stipes of mature fronds 0.1–1 cm long, sparsely covered with dark brown hairs, rhizome densely covered with dark brown hairs. The second type (*Popelka 2015/42*, *2015/43* and *2015/44*) typically has blades oblong to ovate, once-pinnatifid to tripinnatifid, in mature fronds 1.1–3 cm long and 0.5–2 cm wide, stipes of mature fronds 0.2–1.8 cm long, subglabrous or sparsely covered with dark brown hairs, proliferation rare, rhizome sparsely to densely covered with dark brown hairs. However, we observed numerous intermediate forms and presume that the two extreme forms might only be a result of phenotypical response to different environments.

4. *Crepidomanes humile* (G.Forst.) Bosch, Versl. Meded. Kon. Akad. Wetensch. 9: 16 (1861). – *Trichomanes humile* G.Forst., Fl. Ins. Austr. 8: 84 (1786). (Fig. 6 D–F)

Description of plants from Kuala Belalong. Rhizome long-creeping, slender, c. 0.48 mm in diameter, brown, branched, densely covered with dark brown hairs. Roots absent, root-like shoots present. Lamina one cell thick, venation anadromous, elongate marginal cells present. Stipes of mature fronds 0.5–1 cm long, at the base covered with dark brown hairs, narrowly winged almost to the base. Blades variable in form and size, ovate to oblong in outline, tripinnatifid, in mature fronds 2–4.5 cm long and 1.1–1.8 cm wide, margins of segments entire and flat, ultimate segments c. 0.98 mm wide, rounded or retuse at the apex. Stipes, rachis and sometimes costae covered with minute scales. Rachis winged throughout, margins of wings entire. Sori solitary at the tips of basal acroscopic lobes of segments, involucres tubular, oblong in outline, narrowly winged throughout, with dilated mouth, receptacles long exserted.

Ecology and distribution in Kuala Belalong. It is the rarest species of epiphytic *Crepidomanes*. It seems that it is concentrated in places near streams similarly to *Crepidomanes bipunctatum* and *C. christii*.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, Sungai Tulan valley, c. 2.0 ENE from Kuala Belalong Field Studies Centre, 18 Jan 2014, *Popelka 2014/12* (OL); ibid., 29 Nov 2017, *Dančák 2017/98* (OL); Kuala Belalong, surroundings of Kuala Belalong Field Studies Centre, Feb 2015, *Popelka 2014/13* (OL); Kuala Belalong, Sungai Mada Roma, c. 2.8 km SSW from Kuala Belalong Field Studies Centre, 31 Jan 2015, *Popelka 2015/39* (OL).

Notes. Key characters of this species are presence of elongated marginal cells and dilated mouth.

As this is the only species of *Crepidomanes* with elongated marginal cells there are virtually no similar species with which it could be confused.

Subgenus *Nesopteris* (Copel.) Ebihara & K.Iwats., Blumea 51(2): 239 (2006)

5. *Crepidomanes grande* (Copel.) Ebihara & K.Iwats., Blumea 51(2): 239 (2006). – *Trichomanes grande* Copel, Philipp. J. Sci., C 6(2): 70–71 (1911). (Fig. 6 G, H)

Description of plants from Kuala Belalong. Rhizomes short, ± erect, thick, c. 1 mm in diameter, branched, densely covered with blackish brown hairs, roots numerous and robust. Lamina one cell thick, venation anadromous, false veinlets absent. Stipes of mature fronds 7.9–16.5 cm long, narrowly winged throughout, glabrous or subglabrous (sometimes with sporadic multicellular brown hairs). Blades variable in form and size, lanceolate to narrowly ovate in outline, tetrapinnatifid, in mature fronds 12.5–21.2 cm long and 3.5–9.7 cm wide, margins of segments entire and flat, ultimate segments c. 0.37 mm wide, rounded at the apex. Stipes, rachis and costae covered with minute scales. Rachis narrowly winged, margins of wings entire. Sori at the tips of short acroscopic and basioscopic lobes, pointing downwards nearly at a right angle to the lamina, involucre tubular, oblong in outline, very narrowly winged throughout, with dilated mouth, receptacles long exserted.

Ecology and distribution in Kuala Belalong. It was recorded from a single locality where it grows on wet rocks. This species is probably a new addition to Brunei's flora as it is not mentioned in Iwatsuki (1965) and was also absent from the Hymenophyllaceae collection in BRUN.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Temburong: Kuala Belalong, Sungai Esu waterfall, 21 Jan 2017, *Dančák 2017/49A* (BRUN); ibid., 21 Jan 2017, *Dančák 2017/49B* (OL).

Notes. Key characters of this species are rhizomes ± erect, roots numerous and blades more than 12 cm long. Similar species is *Crepidomanes maximum* (Blume) K.Iwats.

Didymoglossum Desv., Mém. Soc. Linn. Paris 6: 330 (1827).

Didymoglossum is perhaps the most easily recognised of the trichomanoid genera. This genus contains dwarf epiphytic ferns characterised by the presence of false veinlets. It contains more than 30 species, mainly distributed in tropical regions (Ebihara et al., 2006). Ebihara et al. (2006) divided the genus into two subgenera: *Didymoglossum* subgen. *Didymoglossum* is characterised by the absence of submarginal false veinlets (about 20 species) while *Didymoglossum* subgen. *Microgonium* (C.Presl) Ebihara & K.Iwats. is characterised by the presence of submarginal false veinlets. We recorded

two species belonging to *Didymoglossum* subgen. *Didymoglossum* and one species belonging to *Didymoglossum* subgen. *Microgonium*.

Key to the species of *Didymoglossum* of Kuala Belalong

1a. Submarginal false veinlets present; blades lobed to unipinnatifid ..... 3. *D. mindorense*
1b. Submarginal false veinlets absent; blades lobed or nearly circular 2

2a. Blades usually much longer than wide, lobed, to 1.5 cm long, fertile fronds usually with more than one sorus ..... 1. *D. sublimbatum*
2b. Blades nearly circular, not lobed, to 0.5 cm long, fertile fronds with a single sorus ..... 2. *D. motleyi*

Subgenus *Didymoglossum*

1. *Didymoglossum sublimbatum* (Müll.Berol.) Ebihara & K.Iwats., Blumea 51(2): 236 (2006). – *Trichomanes sublimbatum* Müll.Berol., Bot. Zeitung (Berlin) 12: 737 (1854). (Fig. 7 A–B)

Description of plants from Kuala Belalong. Rhizome long-creeping, slender, c. 0.66 mm in diameter, branched, densely covered with blackish-brown hairs. Roots absent, root-like shoots present. Stipes up to 0.2 cm long, or nearly sessile, densely covered with blackish-brown hairs. Blades very variable in form and size, oblong to elliptic in outline, lobed to deeply lobed at most to 1/4 way to rachis, the largest lobes in upper half of frond, cuneate at the base, in fertile fronds 1.5–3.1 cm long and 0.5–1.4 cm wide. Lamina one cell thick, venation catadromous, false veinlets present, parallel to true veins, numerous between each pair of true veins, submarginal false veinlets absent. Sori in upper half of fronds, at the tips of lobes, involucres tubular, lanceolate in outline, with dilated mouth, truncate at mouth, completely immersed in lamina, receptacles long exserted.

Ecology and distribution in Kuala Belalong. This species is more frequent along banks of streams. It typically grows in deep shade in humid sites. It is an epiphyte, usually growing on the lower parts of tree trunks.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Sg. Belalong, bath stream at FSC, 20 Mar 1991, *Edwards 2138* (BRUN); Beside Sg. Temburong, down from Kuala Sg. Babi. FSC area, 4 Nov 1991, *Edwards 2194* (BRUN); Beside Sg. Temburong, down from Kuala Sg. Babi. FSc area, 4 Nov 1991, *Edwards 2196* (BRUN); Kuala Belalong, Sungai Mata Ikan valley c. 0.4 km WNW from Kuala Belalong Field Studies Centre, 14 Jan 2014, *Popelka 2014/16* (OL); ibid., 6 Feb 2015, *Popelka 2015/47* (OL); Kuala Belalong, Sungai Baki valley

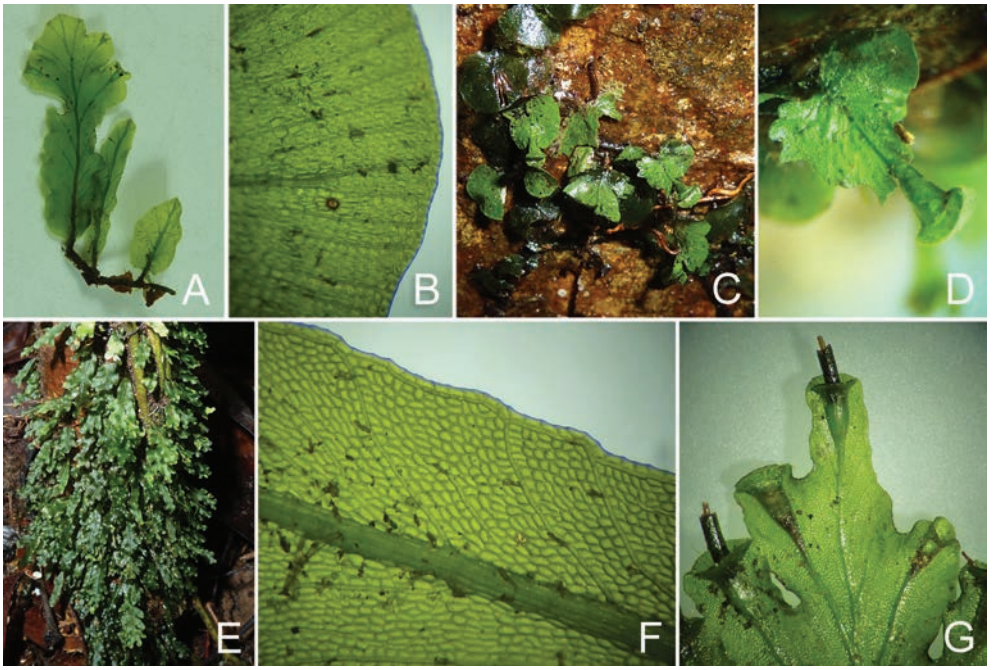

Fig. 7. *Didymoglossum sublimbatum* (Müll.Berol.) Ebihara & K.Iwats. **A.** Habit. **B.** Detail of lamina. *Didymoglossum motleyi* (Bosch) Ebihara & K.Iwats. **C.** Habit. **D.** Detail of blade with sorus. *Didymoglossum mindorense* (Christ) K.Iwats. **E.** Habit. **F.** Detail of lamina with submarginal false veinlets. **G.** Detail of sori. (Photos: O. Popelka)

c. 1.5 km NE from Kuala Belalong Field Studies Centre, 6 Feb 2015, *Popelka 2015/48* (OL); Kuala Belalong, Sungai Tulan valley, c. 2 km ENE from Kuala Belalong Field Studies Centre, 29 Nov 2017, *Dančák 2017/99* (OL).

Notes. Key characters of this species are blades lobed at most to 1/4 way to rachis, usually much longer than wide and absence of false veinlets.

Similar *Didymoglossum henzaianum* (Parish ex Hook.) Mazumdar has longer stipes in the fertile fronds, a more triangular frond shape, and nearly obconic involucres (Croxall, 1986).

2. *Didymoglossum motleyi* (Bosch) Ebihara & K.Iwats., Blumea 51(2): 236 (2006). – *Trichomanes motleyi* Bosch, Ned. Kruidk. Arch. 5(2): 145 (1861). (Fig. 7 C–D)

Description of plants from Kuala Belalong. Rhizome long-creeping, slender, c. 0.47 mm in diameter, brown, branched, densely covered with dark brown hairs. Roots absent, root-like shoots present. Stipes up to 0.8 mm long, or frond sessile, covered with dark brown hairs. Blades simple, sterile usually orbicular or suborbicular, cordate or cuneate at base, fertile usually broad-obovate, 0.2–0.4 cm long and 0.1–0.5 cm wide

(including sorus), cuneate or truncate at base and apical notch with single sorus, margin entire. Rachis glabrous, reaching only half way in sterile fronds. Lamina one cell thick, false veinlets present, radiating from rachis to just short of margin. Involucres tubular, oblanceolate in outline, mouth bilabiate, lips rounded, receptacles long exserted.

Ecology and distribution in Kuala Belalong. Like the previous species it occurs at the most humid sites in the forest, especially near streams in deep shade. It grows epiphytically on the lower parts of tree trunks. This species is probably a new addition to Brunei's flora as it is not mentioned in Iwatsuki (1965) and is also absent from the Hymenophyllaceae collection in BRUN.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, Earthwatch ecological plot c. 0.2 km W from the Kuala Belalong Field Studies Centre, Feb 2015, *Popelka 2015/53* (OL); ibid., Feb 2015, *Popelka 2015/54* (OL); ibid., Feb 2015, *Popelka 2015/55* (OL); ibid., 1 Dec 2017, *Dančák 2017/119* (BRUN).

Notes. Key characters of this species are simple blades, nearly circular, less than 0.5 cm long, with a single sorus.

Similar *Didymoglossum tahitense* (Nadeaud) Ebihara & K.Iwats. has a peltate frond.

Subgenus *Microgonium* (C.Presl) Ebihara & K.Iwats., Blumea 51(2): 236 (2006).

3. *Didymoglossum mindorense* (Christ) K.Iwats., Blumea 51(2): 236 (2006). – *Trichomanes mindorense* Christ, Philipp. J. Sci., C 3: 270 (1908). (Fig. 7 E–G)

Description of plants from Kuala Belalong. Rhizome long-creeping, slender, c. 0.64 mm in diameter, branched, densely covered with blackish-brown hairs. Roots absent, root-like shoots present. Stipes up to 0.2 cm long, or nearly sessile, densely covered with blackish-brown hairs. Blades very variable in form and size, lobed to unipinnatifid (sometimes entire), oblanceolate, spatulate, obovate, elliptic or oblong, base cuneate or gradually narrowed to the base of the frond, in fertile fronds 1.2–2.8 cm long and 0.5–0.9 cm wide. Lamina one cell thick, false veinlets present, parallel to true veins, numerous between each pair, submarginal false veinlets present. Sori in upper half of fronds, at the tips of lobes, involucres tubular, lanceolate in outline, with dilated mouth, truncate at mouth, completely immersed in lamina, receptacles long exserted.

Ecology and distribution in Kuala Belalong. Like the two previous species. It is an epiphyte usually growing on the lower parts of tree trunks in shade.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, Sungai Mata Ikan gorge near its confluence with Sungai Belalong, 27 Nov 2017, *Dančák 2017/77* (OL); Kuala Belalong, Sungai Baki valley c. 1.5 km NE from Kuala Belalong Field Studies Centre, 29 Nov 2017, *Dančák 2017/102* (OL); ibid., 29 Nov 2017, *Dančák 2017/118* (OL); FSC site,

near bungalows. Sg. Belalong, 21 Nov 1990, *Edwards 2041* (BRUN); Kuala Belalong, slopes above the E bank of Sungai Belalong, c. 0.2 km ENE from Kuala Belalong Field Studies Centre, 6 Feb 2015, *Popelka 2015/49* (OL); ibid., 28 Jan 2015, *Popelka 2015/50* (OL); ibid., Feb 2015, *Popelka 2015/51* (OL); Kuala Belalong, surroundings of Kuala Belalong Field Studies Centre. Feb 2015. *Popelka 2015/52* (OL); Kuala Belalong, along Ashton trail between Earthwatch ecological plot and Kuala Belalong Field Studies Centre, 1 Dec 2017, *Dančák 2017/121* (OL).

Notes. Key characters of this species are lobed to unipinnatifid blades, usually much longer than wide and presence of submarginal false veinlets.

Similar *Didymoglossum bimarginatum* (Bosch) Ebihara & K.Iwats. has blades simple and main false veins crowded (Croxall, 1986).

Abrodictyum C.Presl, Hymenophyllaceae 20 (1843).

The genus contains about 25 species distributed throughout the tropics (Ebihara et al., 2006). The members of the genus are terrestrial ferns, usually with a reduced lamina (at most three rows of cells present between veins and margins of lamina). We recorded one species in the field, the other species was identified from herbaria.

Key to the species of *Abrodictyum* of Kuala Belalong

1a. Ultimate segments tooth-like to setiform, much shorter than the undivided part of the pinnule ..... 1. *A. obscurum*

1b. Ultimate segments setiform, of the same length or longer than the undivided part of the pinnule ..... 2. *A. setaceum*

Subgenus *Pachychaetum* (C.Presl) Ebihara & K.Iwats., Blumea 51(2): 243 (2006).

1. *Abrodictyum obscurum* (Blume) Ebihara & K.Iwats., Blumea 51(2): 244 (2006). – *Trichomanes obscurum* Blume, Enum. Pl. Javae 2: 227 (1828). (Fig. 8 A–C)

Description of plants from Kuala Belalong. Rhizome very short, ± erect, thick, unbranched, with many wiry roots, covered with brown multicellular hairs. Stipes of fertile fronds 0.7–6 cm long, very narrowly winged in the upper part, densely covered with long bristle-like brown multicellular hairs. Lamina reduced, venation anadromous. Blades bipinnate to tripinnatifid, ovate in outline, in fertile fronds 2.6–7.5 cm long and 1.6–3.6 cm wide, stalks of pinnae very short, narrowly winged, ultimate segments tooth-like to setiform, much shorter than the undivided part of the pinnule. Rachis narrowly winged throughout, covered with long bristle-like brown multicellular hairs (more frequent in the lower part). Sori at the tips of short acroscopic and basioscopic lobes, involucre tubular, cuneate in outline, truncate at mouth, receptacles long exserted.

Ecology and distribution in Kuala Belalong. Scattered on the forest floor in deep shade, usually in ravines on bare soil close to streams.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, 200 ft, bank of the R. Belalong, 23 Mar 1957, *Ashton 55* (BRUN); Temburong River just upstream from Wong Nguan rapids, 120 m, 04°31′N 115°15′E, 5 Apr 1990, *Coode 6507* (BRUN); Kuala Belalong, E ridge of Sungai Belalong, c. 0.9 km ESE from its confluence with Sungai Temburong, ecological plot 1, 17 Jan 2014, *Dančák 2014/165* (OL); ibid., 16 Jan 2014, *Dančák 2014/362* (OL); ibid., 30 Nov 2017, *Dančák 2017/115* (OL); Kuala Belalong, slopes above the E bank of Sungai Belalong, c. 0.2 km ENE from Kuala Belalong Field Studies Centre, 29 Jan 2015, *Dančák 2015/466* (OL); Kuala Belalong, Kuala Belalong Field Studies Centre, loamy riverbank just opposite the centre, 28 Nov 2017, *Dančák 2017/90A* (BRUN); ibid., 28 Nov 2017, *Dančák 2017/90B* (OL); Sg. Belalong, near Kuala, 10 Feb 1990, *Edwards 942* (BRUN); Sg. Temburong, just above Kuala Sg. Babi. FSC area, 6 Apr 1991, *Edwards 2164* (BRUN); Subd. Amo. Upper Belalong River west of Bukit Belalong. 04°30′N 115°08′E, 24 Mar 1991, *Johns 7015* (BRUN); Batu Apoi Forest Reserve, on ridge between Kuala Belalong and Bukit Belalong, in permanent Plot 2 established by University Brunei Darussalam, 250 m, 04°33'N, 115°10'E, 1 Feb–1 Mar 1992, *Poulsen 340* (BRUN).

Notes. Key characters of this species are erect rhizome, bipinnate to tripinnatifid blades and tooth-like to setiform ultimate segments. Similar species is *Abrodictyum setaceum* (Bosch) Ebihara.

2. *Abrodictyum setaceum* (Bosch) Ebihara & K.Iwats., Blumea 51(2): 244 (2006). – *Trichomanes setaceum* Bosch, Ned. Kruidk. Arch. 5(2): 176–177 (1861).

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Amo, Bukit Belalong, 750 m, 20 Feb 1992, *Dransfield 1211* (BRUN).

Notes. Key characters of this species are erect rhizome and long setiform ultimate segments. Similar species is *Abrodictyum obscurum.*

Cephalomanes C.Presl, Hymenophyllaceae 17 (1843).

The genus contains four species distributed in Asia and the Pacific (Ebihara et al., 2006). Its members are terrestrial ferns with once-pinnate blades and asymmetric pinnae. We recorded two species in Kuala Belalong.

Key to the species of *Cephalomanes* of Kuala Belalong

1a. Pinnae inclined to the frond axis at an angle of 45°, sori in upper half of blades at the tips of short acroscopic lobes of pinnae, not immersed in notches .... 1. *C. javanicum*

1b. Pinnae almost perpendicular to the frond axis, somewhat inclined only in terminal part, sori throughout the blades in notches on acroscopic and basioscopic margin of pinnae ..... 2. *C. singaporianum*

1. *Cephalomanes javanicum* (Blume) C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 5: 334 (1848). – *Trichomanes javanicum* Blume, Enum. Pl. Javae 2: 224 (1828). (Fig. 8 D–F)

Description of plants from Kuala Belalong. Rhizomes short, erect, thick, unbranched, with many wiry roots, densely covered with dark brown hairs. Stipes of fertile fronds 3.1–4.6 cm long, wingless, densely covered with dark brown to dark reddish multicellular hairs. Venation anadromous. Blades unipinnate, lanceolate to long-lanceolate in outline, in fertile fronds 11.5–13.8 cm long and 1.7–2.9 cm wide, rachis very narrowly winged throughout, with scattered dark brown or dark reddish multicellular hairs (more frequent in the lower part). Stalks of pinnae winged. Pinnae asymmetric, oblanceolate to oblong-lanceolate in outline, cuneate at base, serrate or double serrate at margin. Sori in upper half of blades at the tips of short acroscopic lobes of pinnae, fertile pinnae deeply dissected on both sides of each sorus or lamina reduced. Involucre tubular, oblanceolate in outline, truncate at mouth, narrowly winged, receptacles very long exserted.

Ecology and distribution in Kuala Belalong. The species is locally common. It usually grows on bare soil in ravines in deep shade.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Kuala Belalong, 200 ft, 19 Mar 1957, *Ashton 12* (BRUN); Temburong River, at Wong Nguan rapids, 120 m, 04°31′N 115°15′E, 8 Apr 1990, *Coode 6655* (BRUN); Kuala Belalong, E ridge of Sungai Belalong, c. 0.9 km ESE from its confluence with Sungai Temburong, ecological plot 1, 16 Jan 2014, *Dančák 2014/181* (OL); Kuala Belalong, Sungai Mata Ikan gorge near its confluence with Sungai Belalong, 24 Jan 2016, *Dančák 2016/140* (BRUN); ibid., 21 Jan 2017, *Dančák 2017/44* (BRUN); Kuala Belalong, Sungai Esu, below the waterfall, 21 Jan 2017, *Dančák 2017/51* (BRUN); Kuala Belalong, Sungai Baki valley c. 1.5 km NE from Kuala Belalong Field Studies Centre, on bare ground, 29 Nov 2017, *Dančák 2017/100* (BRUN); Sg. Sitam. FSC area, 22 Nov 1990, *Edwards 2031* (BRUN); Sg. Enkiang, above lst falls, FSC area, 15 Feb 1991, *Edwards 2081* (BRUN); Sg. Belalong, bath stream, by FSC, 20 Mar 1991, *Edwards 2140* (BRUN); Sg. Temburong, just above Kuala Sg. Babi. FSc area, 6 Mar 1991, *Edwards 2163* (BRUN); Subd. Amo, Upper Belalong river west of Bukit Belalong, 04°30′N 115°08′E, 130 m, 24 Mar 1991, *Johns 6988* (BRUN); Bukit Belalong, south ridge, 750 m, 22 Jul 1989, *Wong 1519* (BRUN).

Notes. Key characters of this species are asymmetric pinnae and sori in upper half of blades in notches on acroscopic margins of pinnae.

A similar species is *Cephalomanes singaporianum* Bosch. All plants seen in Kuala Belalong can be assigned to *Cephalomanes javanicum* var. *sumatranum* (Alderw.) K.Iwats. This variety differs from the other varieties of *Cephalomanes*

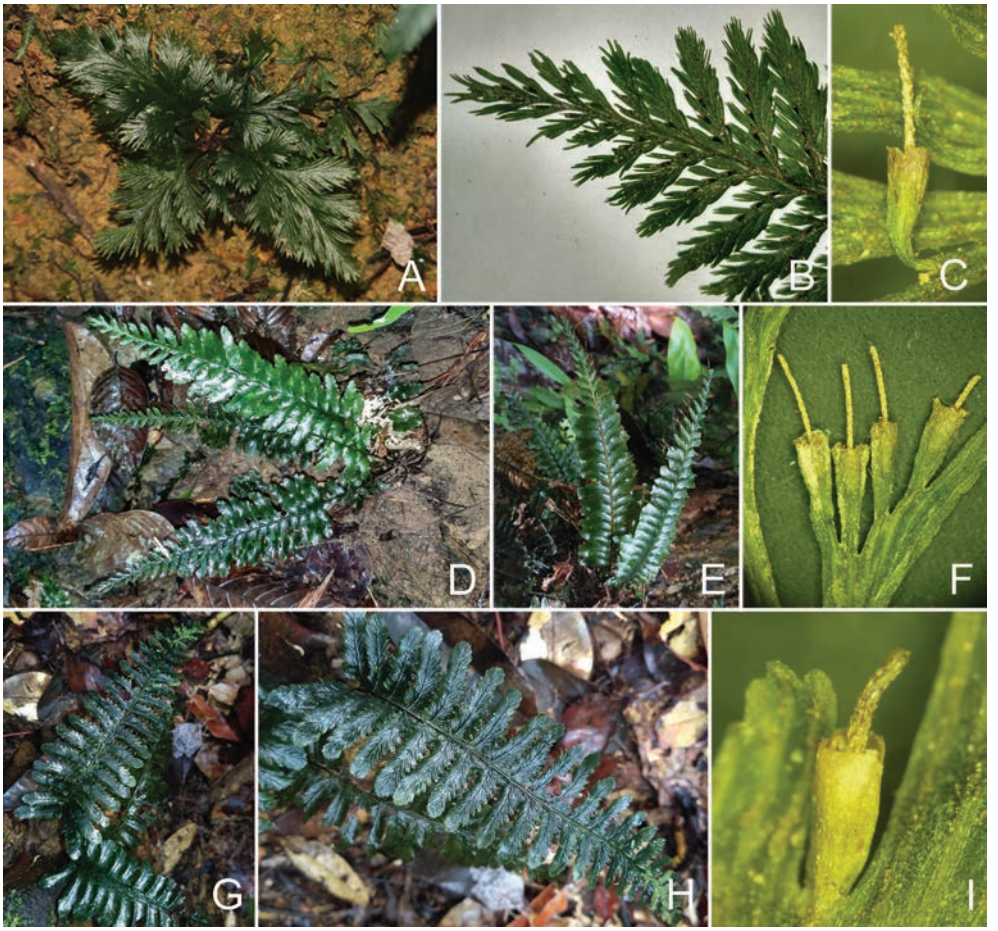

Fig. 8. *Abrodictyum obscurum* (Blume) Ebihara & K.Iwats. **A.** Habit. **B.** Detail of blade with sori. **C.** Detail of sorus. *Cephalomanes javanicum* (Blume) C.Presl. **D.** Habit. **E.** Detail of blade with sori. **F.** Detail of sorus. *Cephalomanes singaporianum* Bosch. **G.** Habit. **H.** Detail of blade with sori. **I.** Detail of sorus. (Photos: A, B, D, E, G, H by M. Dančák; C, F, I by O. Popelka)

javanicum by pinnae inclined to the frond axis at an angle of 45° and sori confined to the apical part of fronds.

2. *Cephalomanes singaporianum* Bosch, Ned. Kruidk. Arch. 4: 351 (1859). (Fig. 8 G–I)

Description of plants from Kuala Belalong. Rhizomes short, erect, thick, unbranched, with many wiry roots densely covered with dark brown hairs. Stipes of fertile fronds 6.8–17.4 cm long, wingless, densely covered with dark brown to dark reddish multicellular hairs. Venation anadromous. Blades once-pinnate, lanceolate in outline, in fertile fronds 11.2–21.5 cm long and 3.9–6.1 cm wide, rachis very narrowly

winged throughout, with scattered dark brown or dark reddish multicellular hairs (more frequent towards base). Stalks of pinnae winged. Pinnae asymmetric, oblong to oblong-lanceolate in outline, cuneate at base, usually double serrate at margins. Sori throughout the blades in notches on acroscopic and basioscopic margins of pinnae, fertile pinnae deeply dissected on both sides of each sorus. Involucre tubular, oblanceolate in outline, truncate at mouth, narrowly winged, receptacles very long exserted.

Ecology and distribution in Kuala Belalong. The species is quite common. It grows in both ravines and ridges on bare soil or in leaf litter. It tolerates drier places than *Cephalomanes javanicum*.

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Temburong River just upstream from Wong Nguan rapids, 120 m, 04°31′N 115°15′E, 5 Mar 1990, *Coode 6535* (BRUN); Kuala Belalong, E ridge of Sungai Belalong, c. 1.5 km SE from its confluence with Sungai Temburong, ecological plot 2, 7 Jan 2014, *Dančák 2014/8* (OL); Kuala Belalong, E ridge of Sungai Belalong, c. 0.9 km ESE from its confluence with Sungai Temburong, ecological plot 1, 13 Jan 2014, *Dančák 2014/124* (OL); Kuala Belalong, along Ashton trail between Earthwatch ecological plot and Kuala Belalong Field Studies Centre, 27 Nov 2017, *Dančák 2017/76A* (BRUN); ibid., 27 Nov 2017, *Dančák 2017/76B* (BRUN); ibid., 27 Nov 2017, *Dančák 2017/76C* (OL); Sg. Belalong, East ridge trail, half way up, FSC area, 14 Feb 1991, *Edwards 2087* (BRUN); Below junction of Temburong and Belalong rivers, 75 m, 23 Mar 1991, *Johns 6976* (BRUN); Subd. Amo, below junction of Temburong and Belalong rivers, 04°34′N 115°09′E, 23 Mar 1991, *Johns 6937* (BRUN); Subd. Amo, Upper Belalong river west of Bukit Belalong, 04°30′N 115°08′E, *Johns 6999* (BRUN); Subd. Amo. Upper Belalong river west of Bukit Belalong, 130 m, 04°30′N 115°08′E, 24 Mar 1991, *Johns 7017* (BRUN); Kuala Belalong, surroundings of Kuala Belalong Field Studies Centre, Feb 2015, *Popelka 2015/56* (OL); Batu Apoi Forest Reserve, Ridge W of Kuala Belalong Field Studies Centre, 250 m, 04°33′N 115°09′E, 1 Mar 1991, *Poulsen 204* (BRUN); LZ 298, beside the Temburong River. River bank, 19 Sep 1988, *Wong 465* (BRUN).

Notes. Key characters of this species are blades once-pinnate, pinnae asymmetric, serrate and sori throughout the frond. A similar species is *Cephalomanes javanicum*.

Callistopteris Copel., Occas. Pap. Bernice Pauahi Bishop Mus. 14(2): 49 (1938).
We recorded only two herbarium sheets of *Callistopteris superba* (Backh.) Ebihara & K.Iwats. in BRUN. The genus contains five relatively large species distributed from Asia to the Pacific (Ebihara et al., 2006).

1. *Callistopteris superba* (Backh.) Ebihara & K.Iwats., Blumea 51(2): 249 (2006). – *Trichomanes superbum* Backh., Cat. (Backhouse) 15 (1861).

Specimens examined. BRUNEI DARUSSALAM: **Temburong:** Between Sg. Sitam Camp & FSC area, 24 Nov 1990 *Edwards 2033* (BRUN); W. Ridge path, just above FSC, 7 Aug 1991, *Edwards 2167* (BRUN).

Notes. Key characters of this species are tripinnate to quadripinnate blades and entire margins of segments. A similar species is *Callistopteris apiifolia* (C.Presl) Copel.

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