

## HYPODEMATIACEAE

(H.P. Nooteboom, Leiden, The Netherlands)

*Hypodematiaceae* Ching, Acta Phytotax. Sin. 13 (1975) 96. — Type genus: *Hypodematium* Kunze.

Plants terrestrial or on rocks. *Rhizome* dorsiventral, vertical or horizontally creeping; scales basifixed, not cordate. *Fronde*s tri- to quadripinnate, glabrous or with hairs and/or scales. *Sori* indusiate, indusium rounded or elongate, sometimes reniform, attached at the base and sometimes also at the sides.

### DISTRIBUTION

Three genera and c. 15 species in East Asia, Malesia and Pacific Islands; one genus in all parts of the moist tropics.

### NOTE

According to Smith et al. (2006) Dryopteridaceae, is almost certainly monophyletic, if *Didymochlaena*, *Hypodematium*, and *Leucostegia* are excluded. Schuettpelz & Pryer (2008) included for the first time all three genera in one analysis. They confirmed the conclusion of Smith et al. (2006), and concluded that *Didymochlaena*, *Hypodematium*, and *Leucostegia* should indeed be segregated from Dryopteridaceae because including them would render that family paraphyletic.

*References:* E. Schuettpelz & K.M. Pryer, Fern phylogeny, in T.A. Ranker & C.H. Haufler, Biology and Evolution of Ferns and Lycophytes (2008) 395–416, Cambridge University Press. — Smith, A.R., K.M. Pryer, E. Schuettpelz, P. Korall, H. Schneider & P.G. Wolf, A classification for extant ferns. Taxon 55, 3 (2006) 705–731.

### KEY TO THE GENERA

- 1a. Rhizome vertical. Leaves bipinnate . . . . . **2. Didymochlaena**
- b. Rhizome horizontally creeping. Leaves 3–4 pinnate . . . . . 2
- 2a. Rhachises and veins bearing hairs . . . . . **1. Hypodematium**
- b. Leaves glabrous or with some minute hairs . . . . . **3. Leucostegia**

### 1. HYPODEMATIUM

*Hypodematium* Kunze, Flora 16 (1833) 690; Fée, Mém. Foug., 5. Gen. Fil. (1852) 297; Ching, Sunyatsenia 3 (1935) 3. — *Aspidium* Sw. sect. *Hypodematium* (Kunze) H.Christ, Farnkr. Erde (1897) 262. — *Dryopteris* Adans. sect. *Hypodematium* (Kunze) C.Chr., Index Filic. Suppl. 3 (1934) 7. — Type: *Hypodematium crenatum* Kuhn & Decken.

Plants on rocks. *Rhizome* short, densely covered with scales that are broadly basally attached, mixed with profuse, unicellular, papillate, glandular hairs with roots on the lower side, leaves close together, distichous, the base of the stipe swollen, arranged in

two close lateral rows on each side of rhizome and densely covered by a cushion like mass of clear red-brown, lanceolate imbricate thin scales. *Lamina* more or less 5-sided deltoid, acuminate, decompound, 3–4 pinnate, basal pinnae the largest, deltoid, much produced on the basiscopic side; basal segments of the upper pinnae (nearly) opposite; venation free, pinnate; rhachises and veins bearing numerous hairs. *Sori* dorsal on the veinlets, rounded, indusium membranaceous, rounded or reniform, attached to the receptacle by its base, pilose and ciliate; receptacle large, prominent; sporangia often with some hairs; spores bilateral, opaque, globular, coarsely verrucose.

Distribution — C. 12 species in East Asia, two in Malesia. *H. crenatum* widespread, also in tropical Africa.

#### ANATOMY

The vascular cylinder (after Nayar & Baipai 1970) is distinctive and has a broad, undivided ventral half and a dissected dorsal half, looking like that of Lomariopsidaceae; in adult rhizomes there are generally three irregular rows of leaf gaps dissecting the dorsal half of the stelar cylinder, the leaf gaps are clearly arranged in a spiral around the vascular cylinder, with a larger distance between successive gaps on the ventral side; the leaf gaps are large and spindle shaped and dissect the dorsal half of the stele into narrow, ribbon-like strands; leaf traces are paired, ribbon-like strands and the leaf gap extends conspicuously on the adaxial as well as on the abaxial side of them.

*Reference:* B.K. Nayar & N. Baipai, A reinvestigation of the morphology of *Hypodematium crenatum*. Amer. Fern J. 60 (1970) 107–118.

#### KEY TO THE SPECIES

- 1a. Stipe stramineous, 10–25 cm long. *Lamina* 8–15 by 6–15 cm, the whole surface, rhachises and veins bearing numerous acicular hairs . . . . . **1. *H. crenatum***
- b. Stipe red brown, 10–25 cm long. *Lamina* 15–20 by 10–20 cm; rhachises and veins bearing numerous acicular hairs . . . . . **2. *H. glabrius***

#### 1. *Hypodematium crenatum* Kuhn & Decken

*Hypodematium crenatum* Kuhn & Decken, Reisen Ost Afr. 3, 3 (1879) 37. — Type: Not located in herb. Decken.

*Rhizome* thick, short, horizontally creeping in dry rock crevices of limestone cliff, densely covered with crispy scales of c. 6–10 by 2–3 mm that are broadly basally attached, mixed with unicellular hairs, with roots on the lower side, leaves close together, distichous, the swollen base of the stipe, 5–6 mm high and 2–4 mm diam., arranged in two close lateral rows on each side of rhizome and densely covered by a cushion like mass of clear red-brown, lanceolate imbricate thin scales like those on the rhizome, their insertion not extending beyond the articulated top of the thickened base. *Stipe* stramineous, 10–25 cm long. *Lamina* 8–15 by 6–15 cm, thin, flat when dry, more or less 5-sided deltoid, acuminate, decompound, 3–4 pinnate, basal pinnae the largest, deltoid, anadromous, much produced on the basiscopic side; basal segments of the upper

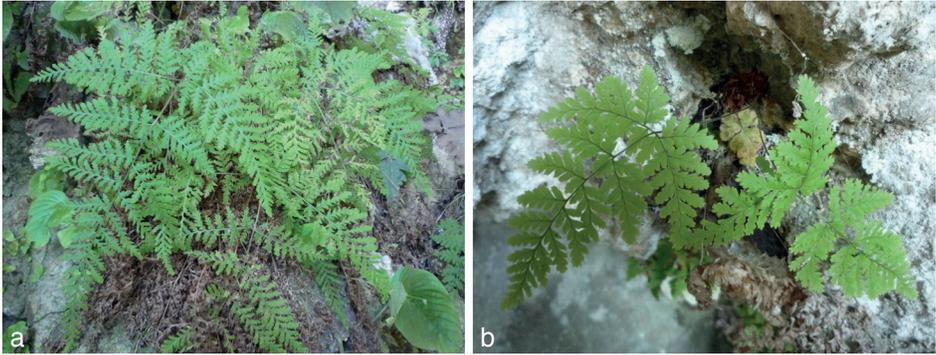


Fig. 1. a, b. Habit of *Hypodematium glabrius* (Copel.) Holttum. On limestone rocks of Gunung Teja and neighbouring hills, Peninsular Malaysia, Kelantan.

pinnae (nearly) opposite; venation free, pinnate; the whole surface, rhachises and veins bearing numerous acicular hairs. *Sori* dorsal on the veinlets, rounded, indusium membranaceous, rounded or reniform, attached to the receptacle by its base, pilose and ciliate; receptacle large, prominent; sporangia often with some hairs; spores bilateral, opaque, globular, coarsely verrucose.

Distribution — Widespread, also in tropical Africa; in *Malesia*: Sumatra, Atjeh, Papua New Guinea, Chimbu province. (Probably elsewhere on limestone cliffs, but vary rare and no collections seen.)

Ecology — In dry limestone crevices.

## 2. *Hypodematium glabrius* (Copel.) Holttum

*Hypodematium glabrius* (Copel.) Holttum, Gard. Bull. Singapore 38 (1985) 148. — *Dryopteris glabrius* Copel., Philipp. J. Sci., Bot. 5C (1910) 283.

*Hypodematium crenatum* auct. non (Forssk.) Kuhn & Decken, Reisen Ost Afr. 3, 3 (1879) 37; Holttum, Revis. Fl. Malaya 2 (1954) 501, f. 295. — Type: *Brooks* (1908) (?SING, ?P), Sarawak, Bidi.

*Rhizome* thick, short, horizontally creeping in dry rock crevices of limestone cliff, densely covered with crispy scales of c. 6–10 by 2–3 mm that are broadly basally attached, mixed with unicellular hairs, with roots on the lower side, leaves close together, distichous, the swollen base of the stipe, 5–6 mm high and 2–4 mm diam., arranged in two close lateral rows on each side of rhizome and densely covered by a cushion like mass of clear red-brown, lanceolate imbricate thin scales like those on the rhizome, their insertion not extending beyond the articulated top of the thickened base. *Stipe* red brown, 10–25 cm long. *Lamina* 15–20 by 10–20 cm, thin, flat when dry, more or less 5-sided deltoid, acuminate, decompound, 3–4 pinnate, basal pinnae the largest, deltoid, anadromous, much produced on the basiscopic side; basal segments of the upper pinnae (nearly) opposite; venation free, pinnate; rhachises and veins bearing numerous acicular hairs (according to Holttum 1985, capitate hairs are also present). *Sori* dorsal on the veinlets, rounded, indusium membranaceous, rounded or reniform, attached to the receptacle by its base, pilose and ciliate; receptacle large, prominent; sporangia often with some hairs; spores bilateral, opaque, globular, coarsely verrucose. — **Fig. 1.**

Distribution — *Malesia*: Peninsular Malaysia (Kelantan, Gua Teja), Borneo, Sarawak (Bidi).

Ecology — In dry limestone crevices.

Note — Very much like *H. crenatum*, but more glabrous, the fronds more open in branching, leaflets thin, quite flat when dried.

## 2. DIDYMOCHLAENA

*Didymochlaena* Desv., Ges. Naturf. Freunde Berlin Mag. Neuesten 5 (1811) 303, t. 7 (6, 6a). — Type: *Didymochlaena truncatula* (Sw.) J.Sm.

*Rhizome* massive, erect, bearing a group of fronds resembling a small tree fern; apex of rhizome and base of stipes densely covered with shining red-brown broadly basally attached scales and fine red brown hairs. *Leaves* bipinnate; pinnae jointed to the rhachis; pinnules very uniform, not further divided, joint to the rhachis, rectangularly elliptic resembling those of *Lindsaea*; a group of scales and/or hairs at the base of each pinnule; veins forked 1–3 times. *Sori* terminal on the acroscopic branch of a vein, receptacle and indusium elongate, like a long *Dryopteris* indusium; indusium attached longitudinally.

Distribution — One to three species in all parts of the moist tropics. In *Malesia* only one species.

Uses — Cultivated as an ornamental.

### 1. *Didymochlaena truncatula* (Sw.) J.Sm.

*Didymochlaena truncatula* (Sw.) J.Sm., J. Bot. 4 (1841) 196; Holttum, Revis. Fl. Malaya 2 (1954) 483; A.G. Piggott & C.J. Piggott, Ferns of Malaysia in colour (1988) 325, f. 1001–1005. — *Aspidium truncatulum* Sw., J. Bot. (Schrader) 1800, 2 (1801) 36. — *Adiantum lunulatum* Houtt., Nat. Hist. 2 (1774) 209, pl. C (100), f. 1. — Type: *Houttuyn Plate C f. 1*.

*Rhizome* often up to 10 cm above the ground, like a short tree fern. *Stipes* to 50 cm long or more. *Leaves* often more than 1 m long with numerous alternate pinnae, the longest 15–30(–40) cm long, the lowest pinnae shorter than the uppermost; pinnules parallelogram-shaped, contiguous, almost at right angles to rhachis, 8–20 by 5–10 mm; margins entire or very slightly toothed at the blunt apex; texture when dry chartaceous; the veins when dry not clearly raised on either side; colour when dry brown, when living dark green and often iridescent; the young leaves reddish. *Sori* about 4(–10) in a row near the acroscopic margin, often also one near the basiscopic side.

Distribution — Possible as large as the genus, but maybe many local species can be recognised, making the distribution much smaller.

Ecology — Moist shady valleys in primary forest at medium elevations.

## 3. LEUCOSTEGIA

*Leucostegia* C.Presl, Tent. Pterid. (1836) 94, pl. 4, f. 11; Holttum, Revis. Fl. Malaya 2 (1954) 351; Copel., Fern. Fl. Philipp. (1958) 167; Noot., Blumea 37 (1992) 184. — Type: *Leucostegia immersa* C.Presl.

*Rhizome* bearing scales and hairs or only scales. Roots borne on all sides of rhizome; the vascular structure is a dorsiventral dictyostele with a thick dorsal and a thick ventral strand, with alternating leaf gaps and bud traces branching from stelar strands at the base of each leaf gap with two simple leaf traces; scales glabrous or bearing multiseptate hairs, basifixed, base not cordate. *Stipes* articulated at the base to phyllopodia, grooved or not, glabrous. *Lamina* compound, tri- or quadripinnate (rarely in small plants bipinnate) towards base and in the middle part, deltoid and broadest towards base, glabrous (sometimes minute hairs present), entire to pinnatilobed (often fertile leaves more strongly dissected). Pinnæ deltoid or narrowly triangular. Pinnules of at least the larger pinnæ anadromous. Pinnules or pinna lobes narrowly ovate. Rhachis adaxially side grooved. Leaf axes glabrous (sometimes a few minute hairs present). Veins in ultimate lobes simple, not reaching the margin. False veins not present. *Sori* indusiate, frequently single on a segment, terminal on the veins. Indusium scaly, either attached at the narrow, cordate base only, or attached at the base and only part of the sides.

Distribution — China, India, Sikkim, Butan, Burma, Thailand, Cambodia, Vietnam; in *Malesia*: throughout; Pacific Islands.

KEY TO THE SPECIES

- 1a. Indusium scaly, attached at the narrow, cordate base only (sometimes the base rather broad), semicircular, 1–1.5 by 1–2 mm . . . . . **1. *L. immersa***
- b. Indusium attached at the base and part of the sides, oblong, 1.2–1.5 by 1 mm . . . . . **2. *L. pallida***

**1. *Leucostegia immersa* C.Presl**

*Leucostegia immersa* C.Presl, Tent. Pterid. (1836) 95, t. 4, f. 11; Copel., Fern. Fl. Philipp. (1958) 167; Holtum, Revis. Fl. Malaya 2 (1954) 352; Noot., Blumea 37 (1992) 185. — *Davallia immersa* [Wall., Cat. (1928) 256, nom. nud.] ex Hook., Sp. Fil. (1846) 156. — *Acrophorus immersus* Moore, Proc. Linn. Soc. London 2 (1854) 286. — *Humata immersa* Mett., Fil. Hort. Bot. Lips. (1856) 102; Copel., Public. Bur. Sci. Gov. Lab. 28 (1905) 51. — Type: *Wallich 256* (holo K; iso L, P), Nepal, 1821.

*Rhizome* 2–15 mm diam. without the scales; scales narrowed evenly towards the apex, bearing multiseptate hairs at least when young, basifixed along broad base. *Stipes* pale or dark brown, adaxially grooved or not grooved, 8–115 cm long, glabrous or with few scales. *Lamina* compound, tri- or quadripinnate, towards base and in the middle part, deltoid and broadest towards base, glabrous (sometimes minute hairs present), 6–120 cm long (or more), not or slightly dimorphous (often finer dissected fertile leaves). Longest petiolules 8–40 mm long. Pinnæ deltoid or linear-triangular. Pinnules or pinnalobes narrowly ovate, ultimate leaflets only shallowly lobed, rhomboid, ultimate segments 0.5–3 mm long. Veins in sterile ultimate lobes frequently simple, not reaching the margin, false veins not present. *Sori* frequently single on a segment, terminal at the vein endings. Indusium scale-like, attached at the narrow, cordate base only (sometimes the base rather broad), semicircular, 1–1.5 by 1–2 mm. — **Fig. 2.**



Fig. 2. *Leucostegia immersa* C.Presl. a. Rhizome with one leaf; b. detail with sori.

Distribution — China, India, Sikkim, Butan, Burma, Thailand, Cambodia, Vietnam; in *Malesia*: throughout.

Ecology — Epiphytic and terrestrial, altitude 1000–2300 m.

## 2. *Leucostegia pallida* (Mett.) Copel.

*Leucostegia pallida* (Mett.) Copel., Philipp. J. Sci. 34 (1927) 252; Fern. Fl. Philipp. (1958) 168; Holttum, Revis. Fl. Malaya 2 (1954) 353; Noot., Blumea 37 (1992) 186. — *Davallia pallida* Mett., Linnaea 36 (1869) 142. — Type: *Cuming 93* (not located), Aneityum, New Hebrides.

*Rhizome* 2–15 mm diam. without the scales; scales narrowed evenly towards the apex, bearing multiseptate hairs at least when young, basifixed along broad base. *Stipes* pale or dark brown, adaxially grooved or not grooved, 8–115 cm long, glabrous or with few scales. *Lamina* compound, tripinnate or quadripinnate, towards base and in the middle part, deltoid and broadest towards base, glabrous (sometimes minute hairs present), 6–120 cm long (ore more), not or slightly dimorphous (often finer dissected fertile leaves). Longest petiolules 8–40 mm long. Pinnae deltoid or linear-triangular. Pinnules or pinnalobes narrowly ovate, ultimate leaflets only shallowly lobed, rhomboid, ultimate segments 0.5–3 mm long. Veins in sterile ultimate lobes frequently simple, not reaching the margin, false veins not present. *Sori* frequently single on a segment, terminal at the vein endings. Indusium attached at the base and only part of the sides, oblong, 1.2–1.5 by 1 mm.

Distribution — Burma; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Philippines, New Guinea; Pacific Islands.

Ecology — Epiphytic, epilithic, or terrestrial, sometimes in riverbed. On various kinds of substrate, also on limestone.

