The genus *Coniogramme* Fée in India

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Abstract. Thirteen Indian spp. of *Coniogramme* (including a new species *C. purpurea*, a new combination *C. denticulato-serrata* and a new record *C. serrulata*) are described and their distribution indicated.

Keywords. Pteridophyta; Filicales; revision of Indian species of *Coniogramme* Fée.

1. Introduction

The systematic position of the fern genus *Coniogramme* Fée has been variously interpreted by different workers. Copeland (1947) included this genus in the family Pteridaceae as the gymnogrammoid derivative of *Pteris*. Holttum (1954), Nayar (1970), Nayar and Kaur (1974) and Crabbe *et al.* (1975) included it in the family Gymnogrammaceae and Pichi-Sermolli (1970) considered it as a member of the family Hemionitidaceae.

It is a genus of about 20 species spread from Africa to Polynesia, north to Japan and one in Mexico (Copeland 1947). The shape, size, margins and position of hydathodes of pinnae or pinnules are the main distinguishing characters for recognition of species in this genus. Other features, such as 1-, 2- or 3-pinnate nature of the fronds, venation, pubescence and spores are not always useful characters of taxonomic value.

The synoptic treatment of the thirteen taxa of *Coniogramme* are indicated in table 1.

2. Materials

The present study is based on all the available vouchered herbarium specimens of the genus *Coniogramme* Fée deposited in various herbaria of the Botanical Survey of India together with the specimens housed in the Central National Herbarium, Howrah, and the Forest Research Institute, Dehra Dun. Icones of type and authentic specimens have also been examined wherever found necessary.
Table 1. Synoptic treatment of 13 taxa of the genus Coniogramme Fée in India.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Present work</th>
<th>Beddome 1883, 1892</th>
<th>Hieronymus 1916</th>
<th>Mehra and Bir 1964</th>
<th>Ito 1966</th>
<th>Ohashi 1975</th>
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<tr>
<td>1.</td>
<td>C. falcata (Don) Salom.</td>
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<td>2.</td>
<td>C. fraxinea (Don) Fée ex Diels</td>
<td>Syngramme fraxinea (Don) Bedd. sensu lato</td>
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<td>3.</td>
<td>C. piteolotii Tard.-Blot.</td>
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<td>4.</td>
<td>C. serrulata (Bl.) Fée</td>
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<td>5.</td>
<td>C. denticulato-serrata (Hieron,) Dixit and Das Comb. nov.</td>
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<td>C. fraxinea ex Diels var. denticulato-serrata Hieron.</td>
<td>C. fraxinea ex Diels var. denticulato-serrata Hieron.</td>
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<td>6.</td>
<td>C. affinis Wall. ex Hieron.</td>
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<td>C. affinis (Wall.) Hieron.</td>
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<td>7.</td>
<td>C. indica Fée</td>
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<td>8.</td>
<td>C. intermedia Hieron. var. intermedia</td>
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<td>C. intermedia var. villosa Ching</td>
<td>C. intermedia var. villosa Ching</td>
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<td>9.</td>
<td>C. intermedia Hieron. var. glabra Ching</td>
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<td>10.</td>
<td>C. purpurea Dixit and Das sp. nov.</td>
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<td>12.</td>
<td>C. procera Wall. ex Fée</td>
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<td>13.</td>
<td>C. subcordata Copel.</td>
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</tbody>
</table>

+ = taxa dealt with the same nomenclature.  
- = taxa not dealt with.
3. Systematic account


Type: Coniogramme javanica (Bl.) Fée, Gen. Fil. 167, t. 14B, f. 1, 1850–52.


Coniogramme fraxinea (Don) Fée ex Diels in Engler and Prantl, Naturl. Pflanzenf. 1 (4) : 262, 1899.

Diplazium fraxineum Don, Prod. Fl. Nepal, 12, 1825.

The correct name of the type species is Coniogramme fraxinea (Don) Fée ex Diels, since Coniogramme javanica (Bl.) Fée happens to be the taxonomical synonym.

Plants terrestrial, 50–250 cm tall, erect. Rhizome slender to usually thick, long creeping. Scales non-clathrate, thin, dull-brown, ovate-lanceolate, entire, deciduous and fragile at maturity. Fronds simple pinnate throughout or the basal pinnae bifid, or basal region tripinnate and pinnate upwards; terminal pinnae larger than the lateral ones. Stipes usually sulcate on the lower surface and terete on the upper surface. Margins of pinnae and pinnules entire to sharply serrate, and composed of many layered compact sclerosed cells exhibiting birefringence under polarised light. Midrib distinct and slightly raised on the lower surface and grooved on the upper surface. Veins free, ending in hydathodes within the margin (rarely anastomosing). Hairs present on the lower surface in some of the species. Sori non-indusiate, linear along the veins, leaving a short gap from the margins, sporangia mixed with paraphyses similar to foliar hairs. Spores trilette, verrucoid, without perispore.

4. Key to Indian species

1. Pinnae with entire or wavy margins, hydathodes away from the margins.

2. Pinnae ovate to oblong-lanceolate, round to cuneate at base, caudate at apex, thick to thin in texture, hydathodes medium in size.

3. Plants small, below 70 cm, fronds simple pinnate throughout, pinnae 15–20 × 3–5·5 cm ......................C. falcata

3. Plants large, normally above 70 cm, fronds bifid to bipinnate at basal region, pinnae 25–30 × 3·5–5·5 cm .........................C. fraxinea

1. Pinnae broadly elliptic-lanceolate, cordate to obliquely rotundotruncate at base, long acuminate at apex, papyraceous in texture, hydathodes large. .................................................................C. pitelotti

2. Pinnae with serrulate to sharply serrate margins, hydathodes close to margins.


5. Pinnae never linear-lanceolate.

6. Hydathodes at base or reaching deep into marginal serrations.
7. Hydathodes at base of marginal serrations.
8. Pinnae ovate to oblong-lanceolate, veins normally twice forked, margins serrulate-dentate.
9. Pinnae oblong-lanceolate, 15–25 × 3–4.3 cm, cuneate at base, thick in texture, margins serrulate......................C. serrulata
10. Pinnae ovate-lanceolate, 11–14 × 2–2.5 cm, auriculate at base, thin in texture, margins serrate-dentate...................C. denticulato-serrata
8. Pinnae lanceolate, 11–15 × 1.8–2 cm, veins normally once forked, rarely one of the branch again forked, margins irregularly serrulate........C. indica
5. Pinnae linear-lanceolate.
7. Hydathodes reaching deep into marginal serrations........C. affinis.
6. Hydathodes entering by tip into marginal serrations.
11. Stipe and rachis shining stramineous, sometimes with reddish tint or dark purple in colour, pinnae not gradually narrowed at both ends, margins serrate, hairs 3–5 celled.
12. Stipe and rachis shining stramineous in colour, sometimes with reddish tint, pinnae oblong-lanceolate, 15–20 × 2.5–3.5 cm, cuneate at base.......C. intermedia var. intermedia
12. Stipe and rachis shining dark purple in colour, pinnae ovate-lanceolate, 11–13 × 2.3–2.6 cm, rounded to truncate at base ................C. purpurea
11. Stipe and rachis dull brown in colour, pinnae gradually narrowed at both ends, margins sharply serrate to spinose, hairs 6–8 celled........C. caudata
10. Pinnae glabrous on the lower surface......................C. intermedia var. glabra

13. Pinnules small, 2–10 × 1–2 cm, adnate, cuneate to sometimes truncate at base, margins serrulate......................C. procer
13. Pinnules large, 9–14.5 × 2–2.5 cm, stalked, except towards the apical region, sub-cordate to roundly truncate at base, margins serrate to dentate......................C. subcordata


Hemionitis falcata Ham., mss. ap. in Don, Prodr. Fl. Nepal, 13, 1825 (nom. nud.).

Gymnogramme falcata (Don) J. Sm., J. Bot. 4: 51, 1842.

Plants 50–65 cm. Rhizome thick, creeping, clothed with many dull-brown, ovate-lanceolate scales. Fronds simple pinnate throughout. Stipes 25–28 cm, yellowish-brown. Pinnae 15–17 × 3–5.5 cm, stalked (stalk 3–5 mm long), ovate
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to oblong-lanceolate, obliquely rotundate to cuneate at base, caudate to sometimes falcate at apex, margins entire to repand with a narrow cartilaginous band of sclerotic cells, thin but firm in texture. Veins forked above the base, sometimes one of the forks again forked above the middle, ending in hydathodes, away from the margins. Spores 40-45 μm, yellow (figures 1, 16).


Icones examined: Received from the Herb. Brit. Mus. (N.H.), London (BM).

Figures 1-7. 1. C. falcata. 2-4. C. fraxinea. 2. Frond trifid at basal region. 3. Frond bipinnate at basal region. 4. Part of the frond with largest pinnae and short caudate apex. 5. C. pitelotii. 6. C. serrulata. 7. C. denticulato-serrata.
Type photograph: Nepal: Narainhetté, 1–3–1803, Buchanan s. n. (CAL). Originally identified as Hemionitis falcata Buch.-Ham. which is the manuscript name.

Other photographs: East Nepal: 1818, s. l. s. n., identified as Ceterach caudata Wall. but another label also pasted on the same sheet reads Nepalia, Wallich 1821 and above it identified as Gymnogramme caudata Wall. Nepal, Wallich 1821, identified as Gymnogramme caudata Wall. (CAL). The detailed study of populations in the field in future may suggest that C. falcata is merely an ecological form of C. fraxinea.


Diplazium fraxineum Don, Prod. Fl. Nepal, 12, 1825.

Gymnogramme fraxinea (Don) Bedd., Ferns British India Suppl. 24, 1876 (pro parte) sensu Clarke, Ferns Northern India, Trans. Linn. Soc. London II Bot. 1 : 569, 1880 (pro parte).

Syngramme fraxinea (Don) Bedd., Handb. Ferns. Brit. India 386, 1883 (pro parte) and Suppl. 100, 1892.


Plants 70–115 cm. Rhizome thick, long creeping, clothed with a few dull brown scales. Fronds many, 1·5–2·5 cm apart, bifid to bipinnate at basal region, pinnate upwards. Stipes 12–65 cm long, stout, sometimes bearing a few pale-brown scales at the base. Pinnae 25–30 × 3·5–5·5 cm, sub-opposite to alternate, basal ones stalked (stalk 1–3·5 cm long), upper ones sessile to decurrent, oblong-lanceolate, cuneate at base, caudate at apex, acumen repandulous (2–5·5 cm), margins entire to wavy with narrow cartilagenous band, thin to thick in texture, glabrous on both the surfaces. Veins close, forked above the base and usually again forked above the middle and ending in hydathodes away from the margins. Spores 32–35 μm, yellow (figures 2–4, 17).

Specimens examined: Uttar Pradesh–Mussoorie: Dourookhalla, ± 1400 m, 1878, Mackinnon s. n., (CAL–24213); Mussoorie, 1877, J. and D. s. n., (DD). Kumaon: Jesilote, ± 1400 m, Gill 344 (CAL). West Bengal–Jalpaiguri, ± 1000 m, 1949, Narayanswani et al 2657 (CAL); Karseong, ± 1700 m, 1909, Kari 815 (CAL); Munsong, ± 800 m, 1909, Kari 421 (CAL); Sikkim-s. l. s. n., (CAL–24191); Herb. Sikkimense T. Anderson s. n. (CAL–24184); 1911, Ramon s. n., (CAL); above Raisiong, ± 1700 m., 1850, J. D. Hook, s. n. (CAL);
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Tumlong, ± 700 m, 1908, Craib 394 (CAL); Kumai to Ronggu, ± 1000 m, 1849 Biswas 9262 (CAL); 1878. King, s. n. (MH–59923); 1857, R. lop s. n. (CAL–24187); 1857, T. T. s. n. (DD). Arunachal Pradesh—Abor expedition: Jurisdiction of Sireng with dihong, 1911, Burkill 37389 (CAL). Nagaland–Naga hills; Sarpong, ± 1000 m, 1907, Meebold 7203 (CAL); Zauria, 1882, Collect 4 (CAL). Manipur—Imphal, 1884, s. l. (CAL–23197). Meghalaya–Khasia, ± 1500 m, 1850, J. D. H. and T. Thomson s. n. (CAL); Khasia hills, ± 1000 m, 1888, Gustav Mann 34852 (DD). Orissa—Koraput: Deomalii, 500 m, Nair s. n. (CAL). Nepal—Dec. 1882, Maries s. n. (CAL–24199); Tarpu near Chyangthaphu, 1963, Hara et al 6305042 (CAL). Bhutan—Dorkha, 500 m, 1963, Thothathri 10524 (CAL). Malaya Peninsula—Larut: Perak, 800–1000 m, 1884, King’s collector 6493 (CAL). Malesian Islands—Java: Bhutium, 500 m, 1879, Forbes 496 (CAL); Pucmlr, 1500 m. 1880; Pasocroan, 1828, Baker and Posthumus 529 (CAL). Philippines—Luzon Central: Benguit, 1950 m, Lohar 1243 (CAL).

Icones examined: Received from Herb. Brit. Mus, (NH), London (BM).

Nepal–Wallich 198 (BM), originally identified as *Gymnogramme caudata* Wall. (CAL); *Wallich s. n.* collected in 1819 (CAL).

*Earlier records*: India, China–Yunnan, Malay Peninsula, Indo-China, Malesian Islands, Formosa, Philippines.

A plant from North-West Himalayas: Garhwal, *King s. n.* (CAL–24210) is distinctly bipinnate in the basal region, having three pairs of pinnules and a long caudate-falcate apex up to 6·5 cm long (figure 3). Plants from North-West Himalayas, 1823, *Simson* (CAL) and Sikkim, 1878, *Wray s. n.* (MH–59923) possess distantly placed sub-opposite pinnae, 25–27 × 3–3·5 cm. A plant from Manipur: Kala Nag Hills, 1300 m, 1882, *Watt 7490* (CAL) possesses the largest pinnac, 30 × 5·5 cm with coriaceous texture and broad band of sclerotic margins. A plant from
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Eastern India s. l. s. n. (CAL-24193) possesses very thin texture, short caudate apex and glaucous-green under surface (figure 4).

Syngamme fraxinea, sensu Bedd. (1883, 1892) represents a mixture of five species viz., C. serrulata (Bl.) Fée, C. denticulato-serrata (Hieron.) Dixit and Das, C. intermedia Hieron.; C. caudata (Wall. ex Ettingsch) Ching. and C. sera Fée.

Plate No. 232 of Beddome's (1864) Ferns of Southern India, as Gymnogramme javanica Bl. based on Thawaiates, No. 3264 from Sri Lanka represents C. sera Fée and not C. fraxinea (Don) Fée ex Diels. Thus, the report of distribution of C. fraxinea (Don) Fée ex Diels from South India by previous workers need confirmation. We have not come across even a single species of the genus from South India.


Rhizome not seen. Fronds with the lowermost pinnae bifid, rest simple pinnate. Stipes thick, pale-stramineous. Pinnae 28-32 × 5-6.5 cm, glaucous-green on the lower surface, stalked (stalk 6-10 mm), broadly elliptic-lanceolate, variable at base (such as lowermost pinnae cordate, the middle ones roundly truncate and the upper ones somewhat roundly cuneate), long acuminate at apex with the acumen 4-5.5 cm long, margins entire, papyraceous in texture. Veins close, fine, oblique, forked above the base and usually again forked, ending in large, clavate hydathodes away from the margins. Sori close, spores 40-50 μm, brown (figures 5, 18).

Specimens examined : Meghalaya—Khasya hills (lower ranges), 1850, s. l. s. n. (CAL-24174, 24175).

Earlier records : Eastern India; China—Yunnan; Tonkin (Dixit and Das, 1977).


Plants 70-90 cm. Rhizome thick, creeping, clothed with a few brown scales and thick dark-brown roots. Fronds bipinnate in the basal region and pinnate upwards. Stipes stout, 40-50 cm, stramineous. Basal pinnae pinnate with 2-3 pairs of lateral pinnules, lower pinnae stalked (stalk 1-1.5 cm). Pinnae 15-25 × 3-4.5 cm, oblong-lanceolate, thick in texture, glabrous, cuneate at base, caudate at apex, margins serrulate. Veins forked at the base and rarely again forked towards the apex and ending in hydathodes away from the marginal serrations. Spore 30-35 μm, yellowish-brown (figures 6, 19).

Specimens examined : Manipur, 1913, Watt 439, W. C. A, B, C (CAL); Agawar, 1913, Watt 3597 (CAL); 3597 A, B, C, (ISIM).

Earlier records : Java.

New record for India.

C. denticulato-serrata (Hieron.) Dixit and Das, Stat. Comb. nov,

Plants 90-110 cm. Rhizome creeping, not much thickened, clothed with many dark-brown scales and long thick roots. Fronds bipinnate in basal portion, pinnate upwards. Stipes 45-50 cm, stramineous, sometimes tinted with rust colour. Basal pinnae stalked (stalk 1.3-1.6 cm), pinnate with 1-4 pairs of decurrent, sub-opposite, small, lateral pinnules, 6-7 × 1.3-1.5 cm, ovate and auriculate at base. Anterior pinnae 15-20 × 2.3-2.6 cm, ovate-lanceolate, subsessile to decurrent, auriculate at base, shortly caudate at apex, with serrate margins (sparsely serrate apex and wavy base); lower surface glaucous-green, upper surface olive-green, membranous in texture. Veins forked above the base and usually again forked towards the apex, ending in hydathodes which do not extend into the marginal serrations. Spores 35-40 μm, yellow (figures 7, 20).

**Specimens examined**: Himachal Pradesh—Chamba, ± 2000 m, 1897, Morton 52 (CAL-29809). North-West Himalayas: *s. l.* 37, (CAL-24218). Uttar Pradesh—Deoband, ± 3000 m, 1903, Mackinnon *s. n.* (CAL-24205).

**Earlier records**: Eastern India.

New record for North-West Himalayas.

Distinguished from *C. fraxinea* by its smaller pinnae which are ovate-lanceolate, (15-20 × 2.3-2.6 cm), auriculate at base and with distinctly serrate margins, as against the larger pinnae (25-30 × 3.5-5.5 cm) with cuneate base and wavy to repand margins of *C. fraxinea* (Don) Fée ex Diels.


**Grammitis affinis** Wall. List. No. 11, 1828 (nom. nud.).

**Gymnogramma affinis** Presl, *Tent. Pterid.* 218, 1836 (nom. nud.).

*G. javanica sensu* Hook., *sp. Fil.* 5: 145, 1864 (*pro parte*) (non Bl. 1828); *sensu Bedd., Ferns Brit. India*, t. 57, 1866 (non Bl. 1828).

**Syngramme fraxinea** (Don) Bedd., *Handb. Ferns Brit. India*, 386, 1883 (*pro parte*), non. Suppl. 100, 1892.

Plants 90-120 cm. Rhizome slender, wide creeping. Fronds 1.0-1.5 cm apart, bipinnate except the anterior one-third portion which is pinnate. Stipes 35-65 cm, yellowish-brown. Basal pinnae stalked (stalk 1.5-2 cm), pinnate with 3-5 pairs of lateral pinnules which are 8-13 × 1.3-2.2 cm, linear-lanceolate, subcuneate to rotundate at base, caudate at apex, with sharply dentate to comb-like margins, and thin but firm in texture. Veins forked at the base and usually again forked towards the apex, ending in hydathodes which clearly extend deep into the marginal serrations. Lower surface of mature pinnae/pinnules yellowish-green to brownish-green, when dry, upper surface dark, olive-green. Spores 30-38 μm (figures 8, 21).

**Specimens examined**: Kashmir—Batkote—Furfazal, ± 2400 m, 1959, *T. A. Rao* 9774 (CAL). Himachal Pradesh—Simla, *G. Watt. s. n.* (CAL-24216); Dalhousie, *Clarke s. n.* (CAL-24219); Chamba: Kalaip forest, ± 3000 m, 1894, *J. H. Lace* 776 (CAL); Simla Hill, 1889, *s. l. s. n.*, (CAL-24215); Jako-Simla, ± 3000 m,
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1883, s. l. s. n. (CAL–24217). Punjab—Kothi-Rahla Rd., ± 2500 m, 1962, N. P. Singh 23063 (BSD, dupl. CAL). Uttar Pradesh—Tehri Garhwal: Nag Tiba Mt., ± 3000 m, 1878, Mackinnon s. n. (CAL–24203, 24214); Kumaon, s. l. s. n. (CAL–24207); ± 3000 m, 1848, s. l. s. n. (CAL–24204); Mussoorie, J. L. Stewart 1311 (CAL); Garhwal, ± 2700 m, 1962, Bhattacharyya 24510 (BSD, dupl. CAL); Mussoorie s. l. s. n., (CAL) Garhwal, 1868, G. King 381 (CAL); Chakrata Forest Div., 3–4000 m, 1958, K. C. Sahni 26835 (DD). Meghalaya—Khasia Hill, s. l. s. n. (CAL–41698).

Two specimens from North-West Himalayas, viz. Tehri–Garhwal: Nag Tiba Mountain, 3000 m, 1878, Mackinnon s. n. (CAL–24203) and Dalhousie, Clarke s. n. (CAL–24219) possess bipinnate lowermost pinnae.

Earlier records: India—Kumaon; Nepal (Alston and Bonner, 1956).

The present record of C. affinis Wall. ex Hieron., from Punjab, Himachal Pradesh, Jammu and Kashmir and Meghalaya shows extended distribution of the species further North and East of India.


Rhizome not seen. Fronds bipinnate at the basal region and simple pinnate upwards. Stipe 35–40 cm, brown. Basal pinnae pinnate with 1–2 pairs of lateral pinnules, stalked (stalk 2–3 cm), upper pinnae 11–15 × 2–2.5 cm, lanceolate, attenuately cuneate at base, caudate at apex (acumen 1.5–2 cm), with serrulate margins except at base, which is undulate, texture thin but firm, both surfaces glabrous. Veins forked at base, but rarely again forked, ending in hydathodes at the base of marginal serrations. Spores 40–43 μm (figures 9, 22).

Specimens examined: Meghalaya—Khasia, s. l. 50 (CAL); Manipur—Maothana, ± 2100 m, 1906, Meebold 5308 (CAL); Ukhrul: Hongva Hill, ± 2000 m, 1978, Dixit 59097 (CAL).

Icones examined: (Photo negatives obtained from Museum Botanicum Berolinense, Germany).

(1) Assam, Griffith s. n. (CAL) earlier determined by Kuhn as Gymnogramme serrulata Bl. (2) Griffith s. n., Herbarium G. mettenius determined by Mettenius as Gymnogramme serrulata Bl. These specimens have been cited by Hieronymus (1916) who is of the opinion that although the specimen in the herbarium of Museum Botanicum Berolinense does not carry any number, there can be no doubt that the name C. indica Fée pertains to the same as Griffith's No. 49 cited by Fée (1865). Therefore the photographs of the specimens may be considered as probable Isotypes.

Earlier records: India—Assam.

C. intermedia Hieron., Hedw. 57 : 310, 1916, var. intermedia.


Plants 80–130 cm. Rhizome wide creeping, clothed with dark-brown scales and long, thick roots. Fronds 5–10 mm apart, bipinnate at the basal region but pinnate upwards. Stipules 35–65 cm long, shining stramineous, but sometimes with a reddish tint. Basal pinnae pinnate, with 2–3 pairs of lateral pinnaules, and stalked (stalks 2–3.5 cm). Pinnales 15–20 × 2.5–3.5 cm, oblong-lanceolate, regularly cuneate at base, ciliate at apex (acumen 2.5–4 cm), pale green in colour, and with serrate margins, thin in texture and bearing 3–4 celled hairs on the lower surface. Midrib stramineous, raised but feeble towards the apex on the lower surface. Veins forked near the base and again forked towards apex, ending in hydathodes, the anterior ends of which usually extend into the marginal serrations. Spores 35–38 µm, yellow (figures 10, 23, 24).


Earlier records: India, China, Japan, Nepal, Bhutan.

Hieronymus (1916) cited Meebold 2584 as first specimen and it seems likely that he may have thought of designating it as the type. We have not seen the original specimen but its duplicate, bearing the same number housed in CAL, possesses villose under surface. In the absence of designation of the type, we suggest that the specimen Meebold 2584 should be designated as Lecto-type and duplicate of it in CAL shall be Iso-lectotype of Coriogramme intermedia Hieron. Hieronymus (1916) indicated villose and glabrous conditions of the plants. The glabrous ones shall be *C. intermedia* var. *glabra* Ching. The taxon *C. intermedia* var. *viliosa* Ching is accordingly treated as synonymous to *C. intermedia* var. *intermedia*.


Differs from *C. intermedia* Hieron. var. *intermedia* in having lower surface of the pinnae/pinnaules completely glabrous. Plate 143 of Ching (1935) belongs to *C. intermedia* var. *glabra*.


Earlier records: Eastern India, Nepal, Bhutan, Indo-China, China, Formosa and Japan.

*C. purpurea* R. D. Dixit and Anjali Das, sp. nov.
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*Coniogramme caudata* (Wall. ex Ettingsch) Ching affinis sed pinnis ovato-lanceo-latis, basi latissimis truncatisque, stipite, rachidique nitidis, atro-purpureo-coloratis, pilis brevibus, 4–5 cellucaribus differt.

Plants 30–50 cm tall. Rhizome wide creeping, not much thickened. Scales many, shining, dark-brown. Fronds distant, simple pinnate throughout or the lowermost pinnæ bifid. Stipes 13–25·5 cm long, and shining dark purple in colour as is the rachis. Pinnæ 11–13 × 2·3–2·6 cm, ovate-lanceolate, rounded to shallowly truncate at the base, shortly caudate at apex (acumen 1–1·3 cm) with closely dentate margins except the base which is wavy, and thin but firm in texture. Midrib raised on the lower surface, greenish-yellow in colour. Veins forked at the base, sometimes again forked towards the apex, ending in hydathodes, the anterior ends of which extend into the marginal serrations. Lower surface bearing 4–5 celled hairs. Spores 38–42 μm, deep yellow (figures 11, 25–27).

**Holotype:** West Bengal—Darjeeling: Little Ranjit Block, 2420 m, 22–9–1974, Dixit 52338, (CAL–4209), growing near a nala with a permanent source of trickling water.

**Isotype:** West Bengal—Darjeeling: Little Ranjit Block, 2420 m, 22–9–1974, Dixit 52338A (CAL–4151).


Granmites caudata Wall. (List No. 4, 1828 nom. nud.) ex Ettingsch, *Farnkr.*, 57, t. 37. f. 7, t. 38, 1865.

*Gymnogramma caudata* Presl., *Tent. Pterid.* 218, 1836 (nom. nud.).


Plants 80–150 cm. Rhizome thick, wide creeping clothed with many dark-brown scales and thick brown roots. Fronds 1·0–2·5 cm apart, simple pinnate throughout or bifid to bipinnate at basal region but pinnate upwards. Stipes 45–65 cm, dull-brown. Basal pinnæ stalked (stalk 1·0–2·5 cm), upper ones sub-sessile; pinnæ 15–22·5 × 2·5–4·5 cm, lanceolate to broadly lanceolate, caudate to attenuately cuneate at base, long caudate at apex (acumen 1·5–3 cm), with sharply serrate to spinulose margins made of sclerotic cells, and thin to thick in texture, lower surface pubescent (hairs 6–8 celled); upper surface glabrous. Veins fine, forked at base, rarely again forked near the middle, ending in hydathodes, the anterior ends of which extend into marginal serrations. Spores 33–38 μm, yellowish-brown (figures 12–13, 28–30).

Pithoragarh, ± 2800 m, 1965, N. C. Nair 35652 (CAL); Western Kathi, ± 2000 m, s. l. 3 (CAL); Tehri—Garhwal, 1895, s. l. 25431 (CAL); Northern India, s. l. 37 (CAL); Jaunsar Tons Valley, ± 2000 m, 1891, J. S. Gamble 34890 (DD). West Bengal—Daijeeling: Maneybhanjang—Little Ranjit Block, 1975, Dixit 52874 (CAL). Sikkim, ± 3000 m, 1972, s. l. s. n. (CAL); 1881 G. King s. n. (CAL); ± 1800 m, J. D. H. s. n. (CAL-243385), 1957, s. l. 35 (CAL). Arunachal Pradesh—Jabarang, 1955, Srinivasan s. n. (CAL-43133); Kameng: Bomdila, 1955, Srinivasan s. n. (CAL-42769), 1955, Srinivasan s. n. (CAL); ± 800 m, 1964, Joseph 39929 (ASSAM): Chakoo, ± 2100 m, 1957, Panigrahi 6313 (ASSAM). Assam Chorai Gopa hills, 1953, s. l. s. n. (CAL-24177); Manipur, ± 2000 m, 1954, D. B. Deb, 1672 (CAL). Meghalaya—Lushai Hills, 1859, s. l. s. n. (CAL-24170). Nepal—Thankor, 1950, Srinivasan s. n. (CAL-44393), Puri 610 (CAL); 2500 m, 1954, Puri 610 (CAL); E. Nepal—Gantewa, Arun Valley, 2100 m, 1959, Bachkheti 60 (DD).

Icones examined: Obtained from British Museum (N.H.), London (BM).

India Orientalis: Wallich List No. 4, originally identified as Grammitis caudata Wall. (CAL). A close examination of this photograph reveals that the pinnae are distinctly serrate at the margins. Therefore, the present photograph most probably represents Isotype as referred by Hieronymus (1916) and Ching (1937). Duplicates of Wallich List No. 4 with entire margins represent C. fraxinea (Don) Fée ex Diels., as cited by Hieronymus (1916).

Plants from Kumaon (Pithoragarh: Radgodí, ± 2800 m, 4-5-1965, N. C. Nair, 35652) (BSD, dupl. CAL) possess leathery texture, light olive-green on the upper surface and also hydathodes with elongated curved tips extending up to middle of the marginal serrations.

Earlier records: India—Eastern Himalayas, Nepal, China.


Grammitis procera Wall., List No. 3, 1828 (nom. nud.).

Gymnogramme javanica sensu Hook., Sp. Fil. 5 : 145, 1864 (pro parte, non Bl. 1828)

Synggramme fraxinea (Don) Bedd., Handb. Ferns Brit. India, 386, 1883 (pro parte).


Plants 100—140 cm. Rhizome wide creeping, clothed with many dark brown scales and long wiry roots. Fronds bipinnate (rarely tripinnatifid) except the apical portion which is pinnate. Stipe and rachis pale brownish in colour, and sparingly provided with caducous scales which leave prominent scars on shedding. Pinnae comprising of 7—15 pairs of lateral pinnules which are 4—10 × 1—2 cm, ovate-lanceolate, adnate, broadly cuneate to sometimes truncate at base, caudate at apex (acumen 1.5—2 cm) with closely serrulate margins except at the very base, thin in texture; the terminal pinnule is much larger than the lateral ones. Veins simple to once forked, ending in hydathodes at the base of marginal serrations. Spores 28—30 μm, deep yellow (figures 14, 31).

Specimen examined: West Bengal—Darjeeling: Tonglu, ± 3056 m, 1974, Dixit 52380; 52384 (CAL); Meghma, 1975, Dixit 52977 (CAL); Senchal, ± 2600 m,
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1871, Levinge s. n. (CAL–24192); 1976, R. K. Ghosh 53841 (CAL): Kurseong, ± 1400 m, 1939, K. Biswas 3701 (CAL). Sikkim–1–2000 m, J. D. H. s. n. (CAL); 2–3000 m, J. D. H. s. n. (CAL); Saddle, 1857, J. Thomson s. n. (CAL–24190); Kalipoku, ± 2000 m, 1887, King's Collector s. n. (CAL); Ratong, 1857, s. l. s. n. (CAL); Munsong, ± 1300 m, 1909, Kari 686 (CAL); Rungpo, 2100 m, 1877, G. King s. n. (CAL); 1857, T. T. s. n. (DD). Arunachal—Kameng: Seargaon, 1958, Panigrahi 15784 (CAL); Chakoc, 1957, Panigrahi 6322 (ASSAM); Rupa to Bomdila, 1957, Panigrahi 6776 (ASSAM); Triap: Waka, 1958, Panigrahi 14945 (ASSAM). Nagaland—Magoona: Naga Hill, 2000 m, 1889, G. Mann s. n. (CAL–24178); Naga Hills, 1886, D. Pain s. n. (CAL–24179); Naga Hills, 1886, D. Pain s. n. (DD). Manipur, ± 2000 m, 1881–82, G. Watt. s. n. (CAL). Nepal—Minchin: Dhap–Mul Pokhari, 1963 s. l. 586 (CAL).

Earlier records: India—Himalayas, N. Thailand, China (Yunnan) and Formosa.


Plants 100–175 cm. Fronds bipinnate (rarely tripinnatifid) except in the anterior region. Stipe and rachis stout, pale brown to stramineous, bearing a few small pale-brown caudicous scales which leave prominent scars on shedding. Pinnæ comprising of 10–20 pairs of pinnules which are 9–14·5 × 2–2·5 mm, distinctly stalked (stalk 4–5 mm) except a few pairs of adnate ones in the apical portion, subcordate to roundly truncate at base, acuminate at apex (acumen coarsely serrate, 2·5–3·2 cm), with sharply serrate margins except at the very base, thin but firm in texture; terminal pinnule not much larger in comparison of the lateral ones. Veins forked above the base and usually again forked above the middle, ending in hydathodes at the base of marginal serrations. Spores 32–35 μm, yellow (figures 15, 32).

Specimens examined: West Bengal—Darjeeling: Tonglu, ± 3056 m, 1974, Dixit 52384A, 52384B (CAL); Rambi, ± 1900 m, 1976, Dixit 50279 (CAL). Sikkim—1857, s. l. s. n. (CAL–24185); s. l. s. n., (CAL–24186). Nagaland—Kohima, 1914, s. l. s. n. (ISIM). Nepal—Baglung, ± 2300 m, 1963, Eleminge 1757, Specimen numbered 1 (DD).


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