

The lichen genus *Erioderma* (Pannariaceae) in China and Japan

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The lichen genus *Erioderma* is shown to have four species in China and Japan: *E. meiocarpum* Nyl. (W China), *E. rigidum* P. M. Jørg., *sp. nova* (NE China), *E. soreliatum* P. M. Jørg. & D. Galloway (S Japan) and *E. tomentosum* Hue (S China and Japan). *Erioderma asahinae* Zahlbr. is a synonym of the latter. *Erioderma meiocarpum* is reported as new to Mexico. All names are typified, and the phytogeography is discussed. A key to the species is presented.

Key words: China, *Erioderma*, Japan, lichens, taxonomy, typification

Although the lichen genus *Erioderma* is basically a genus of the Southern Hemisphere, a few species are present in the Northern Hemisphere, as far north as cold-temperate parts of Europe and North America (Jørgensen 2001). Studies in the Pannariaceae of SE Asia have revealed the presence of four species in its temperate region, a higher number than previously indicated (Zahlbruckner 1930, Sato 1963, Wei 1991), though Awasthi (2000) recorded the same number from India. The species are all rare and known from a few collections only, and are treated below.

The species

All species will be treated with a short description and notes on their taxonomy as well as habitat and distribution. They may be distinguished in the following way:

1. Thallus greenish with distinct, elevated veins on the lower surface, PD– (containing vicanicin), tropical ..
..... *E. tomentosum*
1. Thallus greyish or brownish, without distinct veins, PD+ orange (containing argopsin or eriodermin), temperate ..
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2. Thallus with limbiform soralia, containing erioder-

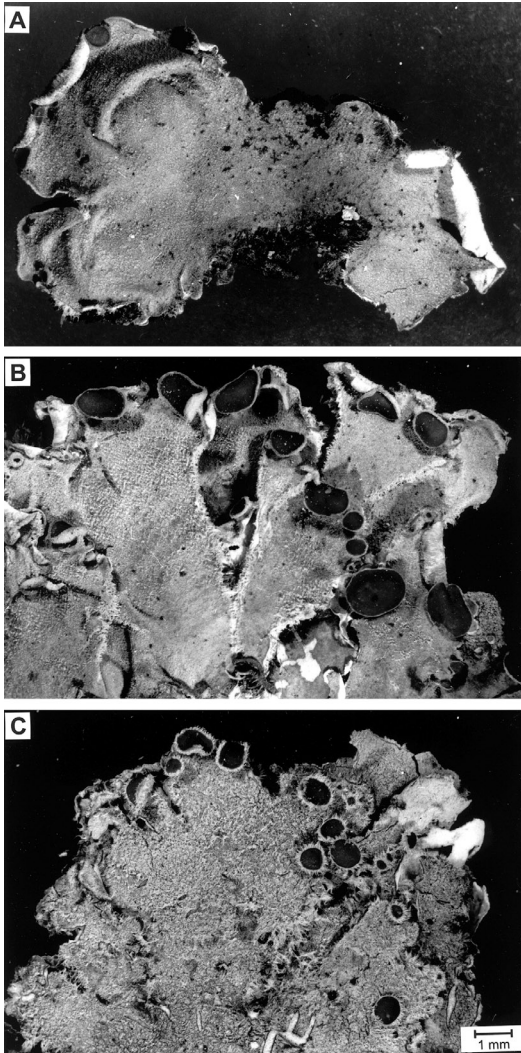


Fig. 1. *Erioderma meiocarpum* from different parts of its distribution area. — **A:** Asia (China). — **B:** Africa (Ethiopia). — **C:** America (Mexico).

- min, Japan *E. sorediatum*
- 2. Thallus without soralia, usually fertile, containing argopsin, China 3
- 3. Thallus brownish, glabrous, rigid; spores globose, NE China *E. rigidum*
- 3. Thallus greyish, distinctly tomentose, softer; spores ellipsoid, W China and Hubei *E. meiocarpum*

***Erioderma meiocarpum* Nyl. (Fig. 1)**

Syn. Lich. 2: 47. 1869. — Type: India. Tamil Nadu, Nilgiri Hills, Ootacamund, on way to Doddabetta peak,

in eucalypt plantation, below the peak, alt. ca. 2500 m, 3.I.1972 *D. D. Awasthi & K. P. Singh* 72.92 (LWU, neotype, here designated).

Thallus foliose, orbicular, to 4 cm diam., normally shallowly divided in lobes, PD+ orange-red (argopsin, norargopsin). Upper surface greyish with arachnoid tomentum, margins often ascending with bundles of bluish rhizohyphae. Lower surface white to pale yellowish, partly with white to bluish black rhizohyphae. Apothecia common, marginal, stipitate with dark brown disc and tomentose exciple. Ascospores simple, colourless, ellipsoid, 12–15 × 7–10 μm.

NOTES: A most characteristic species which is surprisingly uniform throughout its large distribution area, though the specimens from Mexico are more strongly hairy than the others. Since this is the only difference observed, I see no reason to recognize this as a separate taxon. This difference may be a result of the ecological conditions as well as the isolation of the population. Nor do I regard the slight chemical difference between the type (with argopsin and norargopsin) and some material from the Himalayas and East Africa (with traces of eriodermin in addition) as so important that it requires taxonomic recognition.

The original collection by Perrottet from “montibus nilgheriensibus” has not been traced, and is most possibly lost (O. Vitikainen pers. comm.). Therefore a neotype from the same region is designated.

HABITAT AND DISTRIBUTION: Corticolous or muscicolous in moist montane forests from East Africa through the Himalayas with disjunct localities in S India, Hubei (China) and Mexico (Fig. 2). The latter is a most remarkable extension of its distribution area, but in accordance with other Asian lichen taxa occurring in the mountains of Central America (Jørgensen 1983: 52).

SELECTED SPECIMENS EXAMINED: **China.** Hubei, Shennong jia distr., near Chang yai wu, in forest, on trunk of *Abies fargesii*, alt. 2300 m, without collector (HMAS). Sichuan, Mt. Gongga, Yanzigo, on *Acer* sp., alt. 2500 m, 1980 *Wang, Xiao & Li* 8659 (HMAS). Yunnan, Lijang distr., Haibaishui region, about 33 km from Baishui river, on *Quercus alpinus*, 1980 *Xiao Zerong* (HMAS). **India.** Sikkim, Darjeeling distr., near Tongloo Dak Bungalow, alt. ca. 3800 m, on bark of tree trunk, 1967 *D. D. Awasthi & M. R. Agarwal* (LWU). Tamil Nadu, Nilgiri Hills,

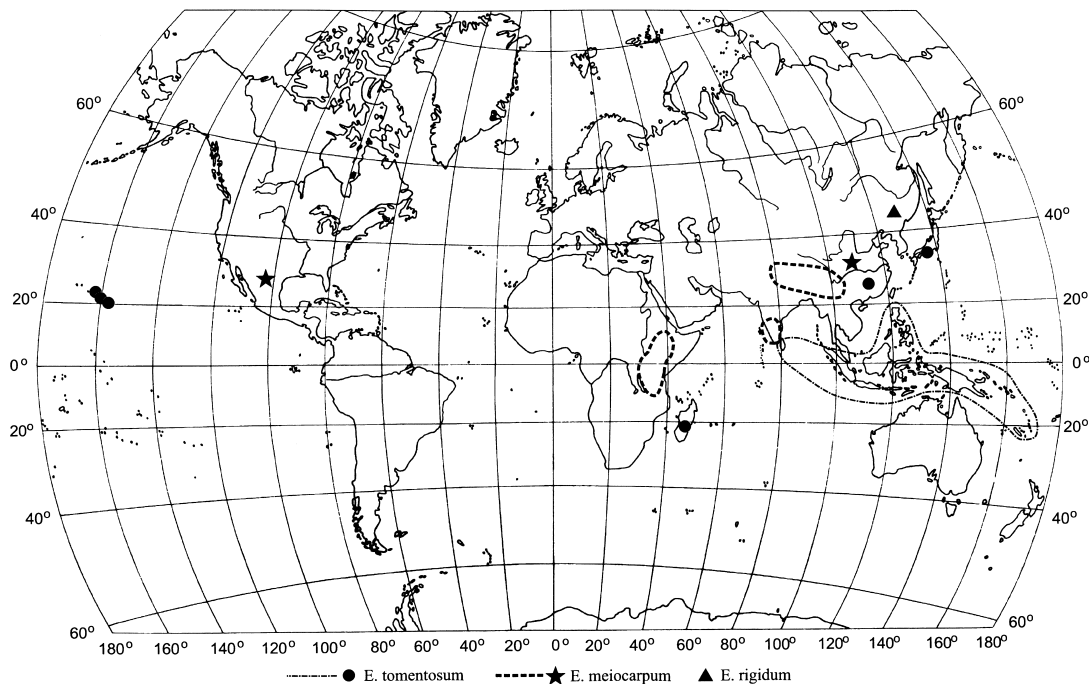


Fig. 2. Distribution of the fertile *Erioderma* species treated.

Ootacamund–Kotagiri road, on way to Mayani, 3 miles from Doddabetta, on tree trunk, 1971 *K. P. Singh* 71.111 (LWU); on the way to Doddabetta, alt. ca. 2000 m, on eucalypt, 1973 *K. P. Singh* 73.378 (LWU); Palni Hills, Kodaikanal, on Berijam road, near Paniyarapore, on bark of tree, alt. ca. 2 500 m, *D. D. Awasti & K. P. Singh* 70.319 (LWU). **Nepal.** Himalayan Foothills (“Vorhimalaya”), Okhaldunga, *Abies-Rhododendron* forest near Thodung, on *Berberis*, alt. 3000 m, 1962 *J. Poelt* (M). Eastern Prov., ascent to Sandakhpoo from Nepal, alt. ca. 3000 m, 1953 *D. D. Awasthi* 2464 (LWU). **Mexico** (first record). Coahuila, Top of Sierra de Madera, above Hacienda Canyon, north slope, on *Pinus cembroides*, alt. ca. 3000 m, 1976 *T. H. Nash* 14326 (ASU, BG).

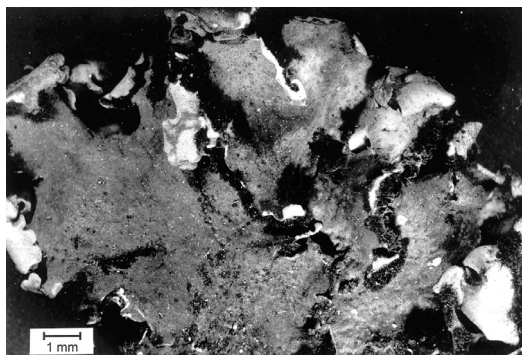


Fig. 3. *Erioderma rigidum* (holotype).

***Erioderma rigidum* P. M. Jørg., sp. nova**
(Fig. 3)

Eriodermati meiocarpi similis sed thallo rigido, fusco et glabro; sporis globosis.

TYPE: China. Heliongjiang Prov., Dailing, Liangshui-go forest, alt. 350 m, 10.XII.1975 *J. C. Wei* 2266 (HMAS, holotype and isotype).

Thallus foliose, forming radiating patches up to 5 cm diam. with elongated, shallowly incised, rigid, to 350 µm thick lobes with often upturned

margins, PD+ orange (argopsin). Upper surface brown, glabrous, only minutely tomentose at the margins. Lower surface whitish, centrally with well developed blackish rhizohyphae which may form a sponge-like cushion. Apothecia uncommon, marginal, pedicellate, with hairy exciple and dark brown disc. Ascospores simple, colourless, globular, 7–10 µm.

NOTES: A most characteristic species due to the rigid, glabrous, coppery brown thallus, but is certainly closely related to *Erioderma meiocar-*

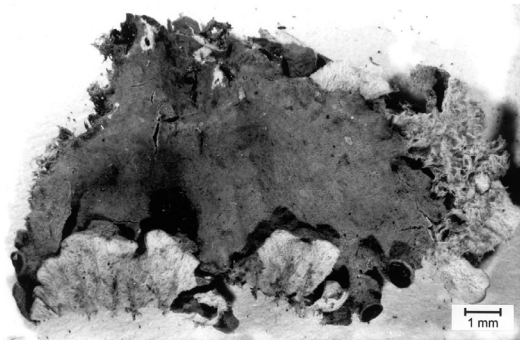


Fig. 4. *Erioderma tomentosum* (lectotype of *E. asahinae*).

pum from which it appears to have evolved. This is one of the northernmost species of the genus, the second one which is confined to the Northern Hemisphere. Only *E. pedicellatum* (Hue) P. M. Jørg. has a more northern distribution (Jørgensen 1972, 1992).

HABITAT AND DISTRIBUTION: Known only from an *Abies* forest in NE China, and possibly a rather local endemic.

ADDITIONAL SPECIMEN EXAMINED (PARATYPE): Type locality, 1975 *Wei* 2369 (HMAS).

Erioderma solediatum P. M. Jørg. & D. J. Galloway

Lichenologist 7: 139. 1975. — Type: New Zealand. Three Kings, Great Isl., Tasman Valley, 21.XI.1970 *D. J. Galloway* (CHR!, holotype).

Thallus foliose, broadly laciniately lobed, to 5 cm diam., with ascending margins, strongly involute when dry, with bluish limbiform soralia on the upturned lower surface, PD+ orange (eriodermin). Apothecia unknown. For further details see Galloway and Jørgensen (1985).

NOTES: This is a most characteristic, solediate species which is easily distinguished from the only other described, solediate *Erioderma*, the much larger, brown-hairy, PD–, *E. mollissimum* (Samp.) Du Rietz, which is not known from Australasia. It is more difficult to distinguish from *Leioderma solediatum* D. J. Galloway & P. M. Jørg. with which it sometimes occurs (also in Japan, see Jørgensen 1994). The latter is arachnoid hairy and PD–.

HABITAT AND DISTRIBUTION: Moist lowland forests (rarely above 1500 m alt.), mainly in the Pacific region (though there is one record from East Africa, Swinscow & Krog 1988). Only collected once in Japan, but likely to be more common.

SPECIMEN EXAMINED: Japan. Honshu, Prov. Tottori, Mt. Akiwa-san, *Y. Asahina* 26716 (TNS).

Erioderma tomentosum Hue (Fig. 4)

Bull. Soc. Bot. Fr. 48: 49. 1902. — Type: New Caledonia. Mt. Mou, towards 1200 m, 1892 *B. Balansa* 2932 (G, lectotype, here selected).

E. pulchrum Müll. Arg. var. *sandwicense* Zahlbr., Ann. Mycol. X: 377. 1912. — Type: USA. Hawaii, Kauai, Okolele, *R. Faurie* 282 (BM, lectotype, here selected).

E. asahinae Zahlbr., Bot. Mag. Tokyo 41: 322. 1927. — Type: Japan. Prov. Kii, Mt. Koya, 12.III.1926 *Y. Numajiri* 273 (TNS, lectotype, here selected).

Thallus foliose, irregularly lobate, lobes up to 2 cm broad, involute with partly crenate margins, PD– (vicanicin, norvicanicin and unidentified depsidone). Upper surface scrobiculate, greenish, densely arachnoid tomentose. Lower surface whitish with distinctly elevated, reticulate veins, often with fasciculate white rhizohyphae. Apothecia uncommon, submarginal to 1 mm broad with distinct hairy thalline margin and brown disc. Ascospores colourless, simple, subglobose, 6–8 × 9–13 μm. For further details see Vainio (1920: 5–6).

NOTES: A curiously misunderstood tropical species, though well described and understood by Vainio (1920). It has mostly been confused with *E. groendalianum* (Ach.) Vain. (see Keuck 1977: 143) with which it is not closely related, though both have distinct veins on the lower surface. *Erioderma tomentosum* is a much thinner, greenish, more *Peltigera*-like species with arachnoid hairs on the upper surface, containing vicanicin (and related substances). *Erioderma groendalianum* (Ach.) Vain., on the other hand, is a thickish, grey, Southern Hemisphere species (known from the Mascarenes, Tristan da Cunha, Tierra del Fuego, Juan Fernandez, and southern Brazil) with stiff hairs on the upper surface, and containing argopsin.

Part of this problem is due to the fact that the

type specimens have been difficult to locate. Recently a duplicate of the original collection was located among material from G, and it is here selected as lectotype. The types of the synonyms have not been traced in W where they ought to be, so lectotypes have been chosen on original material located elsewhere.

The specimens of *Erioderma tomentosum* from the northernmost localities tend to be smaller than those from its main populations, but they are otherwise quite typical (in anatomy and chemistry as well) and undoubtedly part of the variation of this species and not separate taxa.

This species has an isolated position in the genus, with no obvious close relatives.

HABITAT AND DISTRIBUTION: Mainly a corticolous species of damp, mossy forests in SE Asia, especially common on the large islands of SE Asia (particularly in New Guinea), reaching as far north as Japan and east as Hawaii (Fig. 2), where it is present on several of the islands. Surprisingly also known from one single, old collection from Madagascar, which even Vainio (1898: 35) mistook for *Erioderma groenlandianum*. One of the few really tropical species of the genus. Recorded (as *E. asahinae*) from Zhejiang by Wei (1991: 93).

SELECTED SPECIMENS EXAMINED: **China.** Jiangxi, Ping Shui Shan, Jing Gang Shan Nature Reserve, alt. 1530 m, 1995 *H. Kashiwadani* 39152, 39182, 39229 (TNS). **USA.** Hawaii, Maui (East), Haleakala, 1.25 mi. W of Puu Nianiau, at tree-line, alt. ca. 2000 m, 1981 *C. W. Smith* 5045 (CANL); Oahu, 1882–1883 *E. Bailey* (FH). **Indonesia.** Java, Preanger, Mt. Pangerango, Botanical Garden Tjibodas, alt. 1420 m, 1894 *V. Schiffner* 3285 (FH, UPS); Sumatra, in monte Singalang, alt. 1280 m, 1894 *V. Schiffner* 3402 (BM). **Malaysia.** Pahang, Cameron Highlands, alt. 2000 m, 1989 *M. Wahid Samsudin* (BG, CBN). **Papua New Guinea.** S. Highlands, Kengaput, 6 km SSE of Merdi, on sapling in *Dacrydium* swamp, alt. 1740 m, 1982 *J. A. Elix & H. Streimann* 12949 (CBG). **Philippines.** Luzon, Benguet Prov., Mt. Tonglon, 1908 *M. Ramos* (TUR). **Sri Lanka.** Nuwara Eliya, Hakgala Botanical Garden, 1972 *E. Dahl* (O). **Madagascar.** Ambohimitobo (Tanala), alt. 1350–1440 m, 1894 *C. Forsyth Major* (BM, TUR).

Conclusion

This revision has shown that *Erioderma* is a rare genus in SE Asia, only known from a few

scattered collections from China and Japan, though with four different species. China has three species of *Erioderma*: (1) *E. meiocarpum*, a continuation of the Himalayan distribution of this species (in Sichuan, Yunnan, to as far east as Hubei); (2) *E. rigidum*, a close relative of the former, surprisingly found in the NE China (former Manchuria), and possibly endemic to that region; (3) *E. tomentosum* in Jiangxi and Zhejiang, a northern outpost of this tropical Asian species, and part of the tropical flora element in this part of China.

Japan, however, has only two species, one in common with China, interestingly *Erioderma tomentosum* in its most northernmost known outpost (Fig. 2), as part of the tropical element of the Japanese flora. In addition the rather widespread, mainly Pacific warm-temperate species *E. sorediatum* has also been found in Honshu. All the Japanese collections are rather old (more than 50 years), and confirmation of the presence of these very sensitive species is urgently needed.

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