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Studies on the lichen genus *Sticta* (Schreber) Ach.: V*. Australian species

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Abstract: Twenty five species of *Sticta* occur in Australia. These are: *Sticta baileyi, S. brevipes, S. camarae, S. caperata, S. cyphellulata, S. diversa, S. duplolimbata, S. filix, S. flavocyphellata, S. fuliginosa, S. howei, S. hypopsiloides, S. latifrons, S. limbata, S. marginifera, S. myrioclada, S. pedunculata, S. rutilans, S. sayeri, S. stipitata, S. sublimbata, S. subtomentella, S. variabilis* and *S. weigelii*. A key and descriptions of each taxon are given together with details of biogeography, distribution, ecology and nomenclature. *Sticta baileyi, S. flavocyphellata* and *S. howei* are newly described, and *Sticta myrioloba* (Müll.Arg.) D.J.Galloway comb. & stat. nov., is proposed.

Species of *Sticta* are conspicuous, foliose lichens characterized by the presence of cyphellae on the lower surface (Yoshimura & Hurutani 1987) and a general absence of acetone-soluble metabolites (Galloway 1991b, 1994a, 1997). Detailed discussion of the characters used in the separation of taxa in the genus is given in the first paper in this series (Galloway 1994a) and will not be repeated here.

The first species of *Sticta* to be collected in Australia was Robert Brown's specimen of *S. stipitata* from Mt Wellington in Tasmania (Fig. 1). Brown's material (BM) labelled in his hand "Lichen filix Lin: fil: In lat umbros supra summitato Montis Tabularis insul. Diemen" was annotated and published as *S. subcaperata* by James Crombie (Crombie 1879; Groves & Moore 1989). Joseph Hooker's collections of Tasmanian lichens included *S. stipitata* recorded as *S. damaecornis* (Hooker & Taylor 1844), and *S. fuliginosa* and *S. stipitata*, recorded as *S. filicina* and *S. latifrons* (Babington & Mitten 1859). Ferdinand von Mueller's early collections of Australian lichens had a number of species of *Sticta* recorded as: *S. cinereoglauca, S. macrophylla, S. sylvatica* (Hampe 1852, 1856), none of which are known from Australia, and are obviously referable to other taxa, but I have not examined material seen by Hampe so cannot comment further.

The last two decades of the nineteenth century saw several new species of *Sticta* described from Australia (Krempelhuber 1881; Stirton 1881, 1900; Müller Argoviensis 1882, 1886, 1888, 1891a, 1893; Shirley 1889a; Wilson

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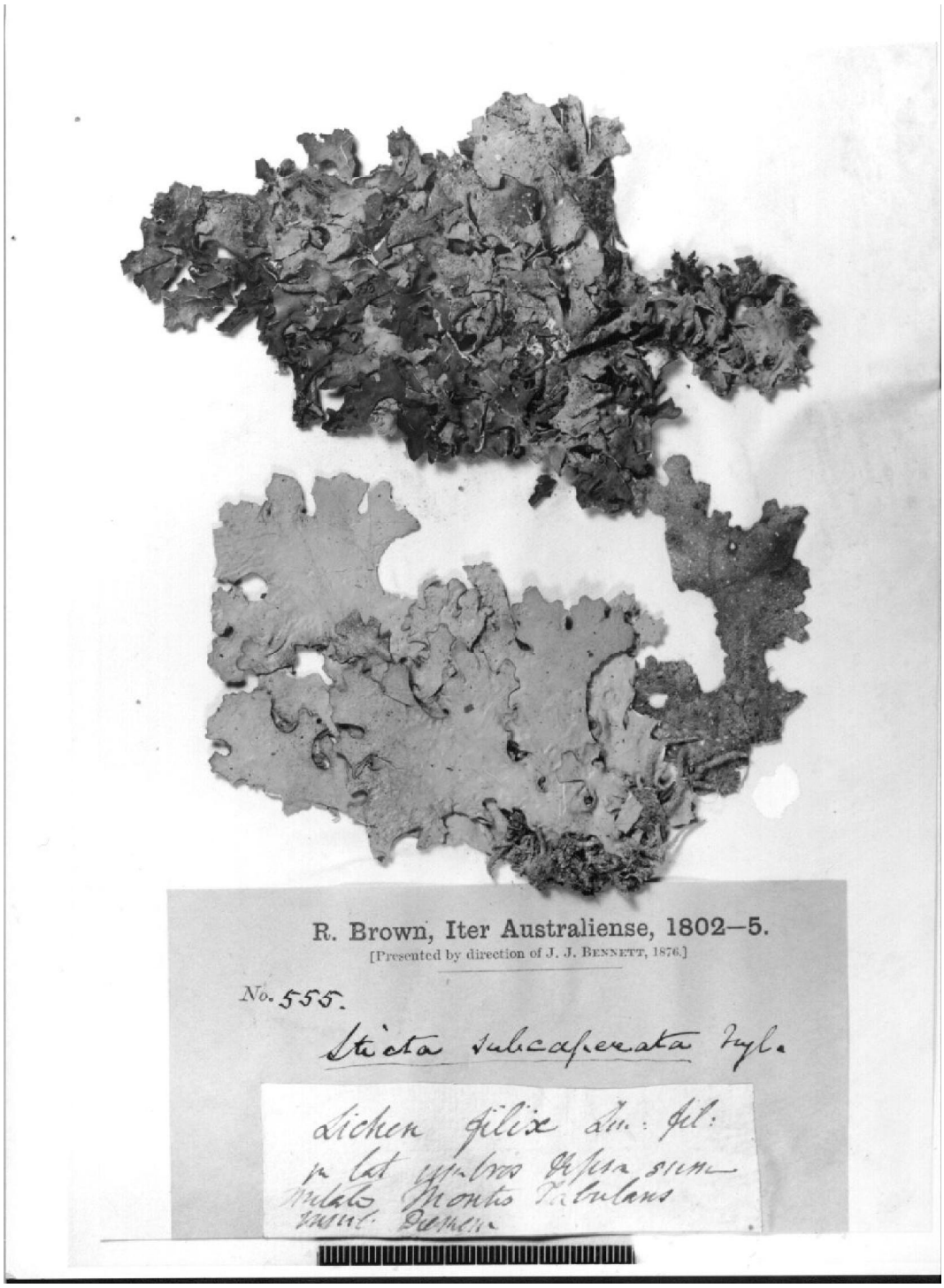

Fig. 1 *Sticta stipitata* collected by Robert Brown in Tasmania (BM). Scale in mm.

1891), and several discussions of *Sticta* (as *Sticta* and *Stictina*, following Nylander's (1860) classification then in vogue) or lists of species from various regions (Krempelhuber 1881; Stirton 1881; Müller Argoviensis 1887, 1891a, 1891b; Shirley 1889a, 1889b, 1893; Wilson 1893; Zahlbruckner 1896).

In the present century, Shirley (1913) lists taxa from Queensland, and in a series of papers Cheel (1910, 1912, 1916) gives us the most comprehensive account of the genus in Australia to date, discussing also New Zealand and palaeotropical species. Although the genus has been widely collected in eastern Australia for over 100 years, and large collections are held in both Australian and foreign herbaria, no modern assessment of the genus has thus far been attempted.

The most recent checklist of Australian lichens (Filson 1996) lists 45 taxa of *Sticta* of which only 18 are accepted in this account, the remainder being either species of *Pseudocyphellaria*, or tropical species of *Sticta* not known to be present in Australia (see notes on excluded taxa below). Kantvilas (1989, 1995) records four species from Tasmania (*S. fuliginosa, S. limbata, S. stipitata, S. sublimbata*). Typifications of many Australian taxa in *Sticta* are given in Filson (1986) and Rogers (1982). Species of *Sticta* are generally best developed in rainforest habitats in south-east Australia (Wilson 1891), Tasmania (Shirley 1893; Wilson 1893; Bratt 1972, 1976; Kantvilas 1985, 1988a, 1988b; Kantvilas & James 1987; Kantvilas et al. 1985; Jarman et al. 1991; Kantvilas 1995), and Queensland (Shirley 1889a, 1889b). In the latter region it is likely that further additions and new discoveries will be made. The present treatment is based solely on examination of a wide range of herbarium material from the early 19th century to the present and is offered as a working introduction to the genus in Australia.

Type and other material was obtained from the following herbaria: ANUC, B, BM, BRI, BRIU, CANB, CBG, CHR, COLO, DNA, E, G, GZU, H, HO, L, M, MEL, NSW, OXF, PC, UPS, US, W, WELT, and the private herbaria of Dr A. Aptroot (Baarn), Dr K. Kalb (Neumarkt) and Mr N. Sammy (Darwin).

For details of anatomical and morphological features in *Sticta* see Galloway (1994a, 1997).

Caulescent taxa: A striking feature of the genus *Sticta* in tropical biomes is the presence of species which are distinctly stalked, being attached to the substrate by a rooted holdfast, with the lobes proliferating from the top of the stalk. Thirteen species (52% of the total) in Australia are stalked [in comparison only 31% of the species of *Sticta* in New Zealand have stalks (Galloway 1997)] viz.; *S. brevipes, S. camarae, S. cyphellulata, S. duplolimbata, S. filix, S. hypopsiloides, S. latifrons, S. marginifera, S. myrioloba, S. pedunculata, S. sayeri, S. stipitata* and *S. subtomentella*. Of these, *S. brevipes, S. cyphellulata, S. duplolimbata, S. marginifera* and *S. subtomentella* have a cyanobacterial photobiont (38.5% of the stalked total), whereas 8 others have green photobionts (61.5% of the stalked total). In comparison, 40% of the southern South American species of *Sticta* are stalked, with 60% of these having cyanobacteria and 40% green algae as the major photobionts (Galloway 1994a).

The stalk and the holdfast are entirely fungal structures and can be viewed as modified rhizomorphs. Rhizomorphs are linear aggregates of hyphae which can extensively penetrate soil, rock or wood substrata (Sanders 1994) and which are involved in both substratum colonization and anchorage of thalli as well as in thallus growth and expansion after initial colonization of the substratum (Sanders & Rico 1992). Rhizomorphs are capable of lichenizing compatible free-living photobionts (green algae) or cyanobionts (cyanobacteria) and forming photosynthetically active lichenized fungal tissue recognized as a lichen thallus. They thus have an important role in lichen morphogenesis (Letrouit-Galinou & Asta 1994; Sanders 1994). Stalked species of *Sticta* are amongst the most rapidly growing and also the largest of foliose lichens making extensive use of rhizomorphs and consequently they have great potential in future studies on both lichen establishment and lichen morphogenesis. It is thought that the development of a stalk in species of *Sticta* confers a competitive advantage upon taxa colonizing mossy bark, where the thallus is anchored by the holdfast below a cover

of moss, and the lobes of the lichen are held clear of the moss cover by the stalk which grows up through the moss.

Photobiont versatility: Eleven species of *Sticta* (44%) in Australia have cyanobacterial photobionts as the major photosynthetic partner, while the remaining 56% of taxa having green photobionts also have cyanobacteria present as internal (or sometimes as external, *Dendriscocaulon*-like outgrowths) cephalodia.

The ability of cyanobacterial lichens to photosynthesize at low light intensities (Demmig-Adams et al. 1990a, 1990b; Green & Lange 1991), to be physiologically active when moistened with liquid water rather than with water vapour (Lange, Kilian & Ziegler 1986) and to show morphological and biochemical diversity in the formation of photomorphs (Renner & Galloway 1982; Lange, Green & Ziegler 1988; Demmig-Adams et al. 1990a; Galloway 1992, 1994a, 1995a, 1997), allows them to exploit a wide variety of habitat conditions, especially in temperate and in subtropical or tropical rainforest biomes and particularly to grow and compete at low light intensities. Thus green algal, and cyanobacterial species of *Sticta* have the potential to make important contributions to the nutrient status of the ecosystems in which they grow, through functioning of cyanobacterial heterocyst nitrogenase leading to enrichment of organic nitrogen (Rai 1990). The possible contribution of diazotrophic lichens (such as species of *Sticta*) to nitrogen enrichment in rainforest ecosystems is discussed in Galloway (1995a). Photomorphs are known in *Sticta* (Galloway 1994a, 1997) and proposals for their classification are discussed by Laundon (1995) and Heidmarsson et al. (1997).

Biogeographical notes: Lichens show distinctive patterns of distribution, and these were recently summarized by Galloway (1991a, 1996). In Australia, the presently known species of *Sticta* show six different biogeographical elements or affinities.

(1) *Endemic element:* this is the second largest element in the *Sticta*-mycobiota of Australia and comprises 33% of the species viz.; *S. baileyi, S. camarae, S. diversa, S. flavocyphellata, S. howei, S. rutilans, S. stipitata* and *S. subtomentella*. Of this number, 5 taxa (62.5%) have green photobionts and three taxa (37.5%) have cyanobacterial photobionts as major photosynthetic partners.

(2) *Palaeotropical element:* this constitutes the largest grouping in Australia's *Sticta*-mycobiota, comprising 10 species (40% of the total) including: *S. brevipes, S. caperata, S. cyphellulata, S. hypopsiloides, S. marginifera, S. myrioloba, S. pedunculata, S. sayeri, S. sublimbata* and *S. variabilis.* Of this number 6 taxa (60%) have green photobionts, and 4 taxa (40%) have cyanobacterial photobionts as major photosynthetic partners. This element is best developed in lowland rainforest (below 1000 m), confirming results of Aptroot et al. (1997) who record that the lichen mycobiota in New Guinea at low elevations (below 1000 m) is dominated by pantropical and palaeotropical taxa.

(3) *Cosmopolitan element:* two species, or 8% of Australia's *Sticta*-mycobiota are cosmopolitan, viz.; *S. fuliginosa, S. limbata* and both have cyanobacterial photobionts and produce copious quantities of asexual propagules.

(4) *Australasian element:* three species, or 12% of Australia's *Sticta*-mycobiota are shared between Australia and New Zealand, viz.; *S. filix, S. latifrons* and *S. martinii*. All three species have a green photobiont as the major photosynthetic partner, and all produce apothecia, though both *S. filix* and *S. martinii* produce phyllidia which may act as asexual propagules.

(5) *Pantropical element:* only one species, *S. weigelii*, or 4% of Australia's *Sticta*-mycobiota has a pantropical distribution. It is a cyanobacterial species producing copious quantities of asexual propagules.

(6) *Western Pacific element:* this element is represented by only one species or 4% of Australia's *Sticta*-mycobiota viz.; *S. duplolimbata* which ranges from Japan, China, Sri Lanka, the Philippines, New Guinea to northern Queensland. It is a cyanobacterial species producing asexual propagules (isidia).

KEY TO AUSTRALIAN SPECIES OF *STICTA*

1 Major photobiont green 2
Major photobiont cyanobacterial 15

2. Thallus attached by a basal holdfast from which lobes are attached by a short or long stalk.....3
Thallus without a basal holdfast, attached over whole of lower surface.....11

3 Thallus phyllidiate.....4
Thallus without phyllidia.....5

4 Stalk 0.5-2 cm long; cyphellae punctiform, 0.1 mm diam.; tomentum thin, velvety ....*Sticta filix*
Stalk 0.2-1 cm long; cyphellae thelotremoid, 0.1-1 mm diam.; tomentum thick ....*Sticta myrioloba*

5 Lobes arising from a well-defined, long stalk 6
Lobes arising from a short stalk or ± directly from holdfast.....8

6 Stalk narrow; lobes rather narrow, lanceolate or reniform 7
Stalk thick; lobes broadly rounded..... ..... *Sticta latifrons*

7 Stalk 3-10 mm tall; lobes lanceolate, 2-8 mm wide; cyphellae 0.1 mm diam. or less ....*Sticta sayeri*
Stalk less than 3 mm tall; lobes reniform, 5-10 mm wide; cyphellae to 2 mm diam. ....*Sticta pedunculata*

8 Lobes pendulous, ± dichotomously branching 9
Lobes ± erect, irregularly branching or polyphyllous.....10

9 Thallus lobes attached by rhizines, without a defined holdfast; spores 25-33 x 8.5-11 ìm [Lord Howe Island] .....*Sticta howei*
Thallus attached by holdfast; spores 30.5-44.5 x 7-8.5 ìm [south-east Australia and Tasmania] ..... *Sticta stipitata*

10 Lobe margins with projecting tomentum; lower surface plane .....*Sticta camarae*
Lobe margins without projecting tomentum; lower surface costate ...*Sticta hypopsiloides*

11 Cyphellae white 12 Cyphellae yellow-orange..... *Sticta flavocyphellata*

12 Thallus phyllidiate 13
Thallus without phyllidia ....*Sticta caperata*

13 Lobes tomentose below 14
Lobes glabrous below .....*Sticta variabilis*

14 Lobes convolute centrally .....*Sticta martinii*
Lobes flat centrally..... *Sticta baileyi*

15 Thallus attached by a basal holdfast.....16
Thallus without a basal holdfast, attached over whole or part of lower surface 20

16 Thallus isidiate; lobes rather narrow.....17
Thallus without isidia; lobes broadly rounded .....*Sticta subtomentella*

17 Lobe margins without projecting cilia 18
Lobe margins with projecting black cilia .... *Sticta duplolimbata*

18 Secondary marginal lobules or lobes absent 19
Secondary marginal lobules and lobes present.....*Sticta marginifera*

19 Lobes narrow, 1-2 (-6) mm wide, ± canaliculate; margins not thickened below .....*Sticta cyphellulata*
Lobes rounded-flabellate, 5-10 mm wide; margins thickened below, noticeably down-rolled.....*Sticta brevipes*

20 Thallus isidiate or phyllidiate.....21
Thallus sorediate, without isidia or phyllidia 24

21 Medulla K+ yellow or orange.....22
Medulla K- 23

22 Lobes large, 1-3 cm diam.; margins entire, without isidia .....*Sticta rutilans*

Lobes 0.5-1(-2) cm diam.; margins ragged, sparsely to densely isidiate ..... *Sticta diversa*

23 Lower surface pale; cyphellae large; lobes broadly rounded, ± monophyllous ....*Sticta fuliginosa*
Lower surface dark-brown to black; cyphellae small; lobes not monophyllous ..... *Sticta weigelii*

24 Lobes ± cochleate or monophyllous; soralia marginal and laminal in ± erose patches, soredia not derived from isidia ....*Sticta limbata*
Lobes irregularly spreading, not monophyllous; soralia linear, eroding lower surface of margins, rarely laminal; soredia derived from minute, granular to ± coralloid isidia .....*Sticta sublimbata*

1. *Sticta baileyi* D.J.Galloway *sp. nov.*
Type: Australia. Queensland, North Wallaman Logging Area, 18°36'S, 145°50'E, 600 m, 21. vi. 1984, H. Streimann 28791 (CBG 8406789! - holotype; BM! - isotype). Fig. 2.

Diagnosis: *Stictae martinii* similis sed lobis tenuibus, fragilibus, papyraceis, non pruinosis vel pubescentibus; apothecia rara; discus fuscus; hymenium testaceus, 120 ìm altus; ascosporae incolores, elongato-ellipsoideae, 3-septatae, (42-)44.5-50 x 8.5-11 ìm.

Etymology: The specific epithet commemorates the Colonial Botanist of Queensland, Frederick Manson Bailey (1827-1915) who contributed much to the understanding of Queensland lichenology in the late 19th century (see Bailey 1883, 1891a, 1891b, 1893, 1899).

Thallus foliose, (2-)3-8(-12) cm diam., rosette-forming to irregularly spreading, closely attached centrally and to margins, lobe apices and margins ± free. Lobes rounded to ± laciniate, 5-10 mm wide, flabellate, discrete or ± contiguous from margins to centre or subimbricate, sinuses rounded. Margins entire, wavy, delicately ridged below, to crenate or lacerate, sparsely to densely phyllidiate, here and there minutely white-tomentose. Upper surface fresh lettuce-green when moist, pale olive or grey-green when dry, plane to convex, mainly smooth to very shallowly pitted or obscurely wrinkled, flabby, pliable when moist, papery, brittle when dry; without isidia, maculae, pseudocyphellae or soredia. Phyllidia mainly marginal, occasionally to rarely laminal, 0.5-2(-4) mm tall, rounded or irregularly peltate to irregularly branched, subpectinate, attached by a short delicate stalk, margins with or without short, glistening hairs (x 10 lens), lower side white, glabrous, cyphellate, often closely packed in short to long rows to ± crowded, congested and spreading irregularly over thallus surface. Medulla white (K-). Photobiont green. Lower surface pale buff or whitish to brown or red-brown, uniformly velvety, short-tomentose from margins to centre, with longer, entangled, matted clusters of tomentum centrally. Cyphellae common, conspicuous, scattered, rounded, 0.2-1.5(-2) mm diam., often sunk in tomentum, margins narrow, conspicuous, sharply raised, clear of tomentum, white to brownish, pit membrane white. Pycnidia occasional to rare, towards lobe apices, punctate, 0.1 mm diam., ostiole red-brown.

Apothecia extremely rare (only seen once), laminal, rounded, 1-2 mm diam., sessile, constricted at base, plane or shallowly concave, disc dark brown, matt, epruinose, exciple whitish, translucent when moist, crenate, smooth or slightly roughened below. Hypothecium dark red-brown, opaque, unchanged in K, to 50 ìm thick. Thecium pale orange-yellow, to 120 ìm tall. Epithecium red-brown, unchanged in K, to 12 ìm thick. Asci cylindrical-clavate, 110-140 x 15-25 ìm. Ascospores colourless, fusiform-ellipsoid with pointed apices, 3-septate, (42-)44.5-50(-53) x 8.5-11 ìm.

Sticta baileyi has a white medulla (K-), a green photobiont, and rather broad, rounded lobes with phyllidiate margins. It is closely attached to the substratum and has rather papery, thin, brittle lobes. It differs from *S. martinii* in having mainly flat and not folded, canaliculate lobes which are not pruinose or pubescent; a taller hymenium which is pale orange-yellow and not colourless; and longer and larger spores. It also

Fig. 2 *Sticta baileyi*. Holotype (CBG 8406798). Scale in mm.

has a different ecology, being a rainforest epiphyte, whereas *S. martinii* occurs on alpine soils and amongst rocks in alpine-subalpine habitats.

Distribution and ecology: Apparently endemic to Australia where it is known from Queensland and New South Wales. An epiphyte of tree trunks, tree roots, and vines in humid rainforest, with an altitudinal range of 100 m - 1080 m. Still poorly collected and in need of study.

Additional specimens examined: QUEENSLAND: Crediton State Forest, 840 m, on upper tree trunk, 1 July 1986, H. Streimann 37636, 37655 (CBG); Cunninghams National Park, 700 m, 16 June 1983, M.E. Hale 66674 (US); 23.3 km E of junction of Kennedy Hwy and Palmerston Hwy, 800 m, 10 July 1983, M.E. Hale 64006 (US); Boar Pocket Road, 740 m, on fallen tree branch, 28 February 1983, H. Streimann 16919 (CBG 8302650); Windsor Tableland, 1080 m, on root of large strangling *Ficus* and on a boulder, 26 June 1984, H. Streimann 29664, 29668 (CBG 8407835, 8407839); Mulgrave River Road, SW of Gordonvale, 100 m, 22 July 1983, M.E. Hale 66676 (US); Hugh Nelson Range, Crater State Forest, 1000 m, on fallen branch, 2 March 1983, H. Streimann 27181 (CBG 8302935); Hugh Nelson Range, along road to Atherton, 1000 m, on vine stem, 7 February 1983, D. Verdon 5460 (CBG 8301805). NEW SOUTH WALES: Lions Tourist Road, N of Wiangaree, 800 m, 12 June 1983, M.E. Hale 65498 (US); Richmond River, L. Hodgkinson (MEL).

2. *Sticta brevipes* (Müll.Arg.) Zahlbr., in Rechinger, Denkschr. Akad. Wiss. Wien math.-naturwiss. Kl. 81: 268 (1907). *Stictina brevipes* Müll.Arg., Flora, Jena 65: 302 (1882).
Type: [Nov. Holl.] Australia, 1881, F. v. Mueller sub. n. 4 (G! - holotype - see Filson [1986: 282]). Fig. 3.

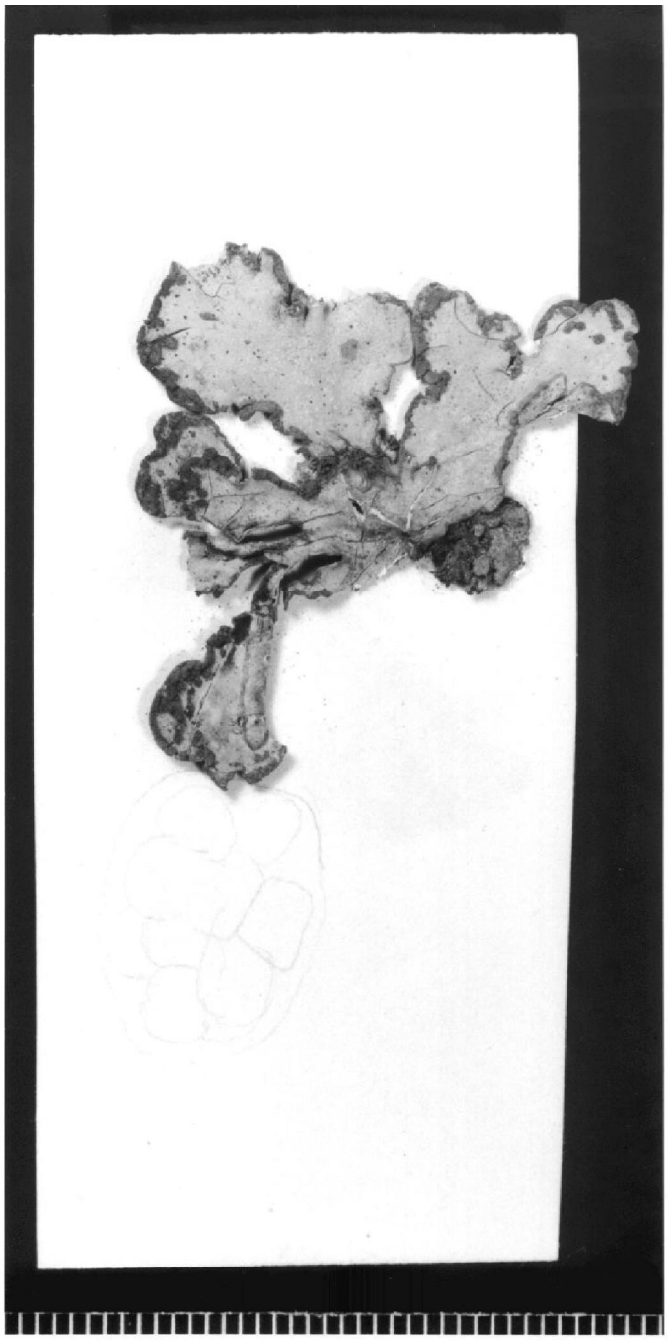

Fig. 3 *Sticta brevipes*. Holotype (G). Scale in mm.

Stictina suberecta Stirt., Trans. N.Z. Inst. 32: 73 (1900). *Sticta suberecta* (Stirt.) Zahlbr., Cat. Lich. Univ. 3: 399 (1925).
Type: Australia. Queensland: Brisbane, F.M. Bailey 125 (BM! - lectotype, *fide* Rogers [1982: 508]).

Thallus irregularly palmate from a basal holdfast, 1-2(-6) cm diam. at apices, firmly attached to a root-like holdfast 2-6 mm diam., from which several interpenetrating black rhizoids 0.2-0.4 mm diam. and to 8 mm long attach to the substratum, lobes connected to holdfast by a blackened, solitary terete stalk, 2-10 mm tall and 2-5 mm diam. Lobes irregularly polyphyllous, occasionally ± monophyllous, 5-10(-15) mm wide, ± rounded to subrotund at apices to somewhat lacerate-laciniate, canaliculate, inrolled; secondary, ± reniform, stalked, small lobules sometimes developing from margins. Margins rounded, entire to notched or incised, conspicuously thickened-ridged at broad apices, noticeably downrolled, commonly densely isidiate, isidia spreading onto both upper and lower surfaces in thick lines. Upper surface dark slate-blue to blue-black when moist, pale to dark grey-brown or olivaceous-glaucous, suffused red-brown at apices when dry, smooth, matt, undulate, wrinkled, ridged close to holdfast, slightly punctate-impressed or irregularly dimpled elsewhere, rigid, brittle when dry, pliable when moist; isidiate, maculate; without phyllidia, pseudocyphellae or soredia. Isidia dark blue-grey to blackened, minute, granular, styliform to coralloid, densely crowded in lines at lobe apices and margins, or in discrete patches on upper surface, occasionally covering lamina in a dark, diffract crust. Maculae minute, white (x 10 lens), giving a delicately marbled appearance to freshly collected specimens. Medulla white (K-). Photobiont cyanobacterial. Lower surface irregularly wrinkled-ridged, costate above holdfast, whitish, glabrous, glossy at margins, pale to dark-brown centrally, very thinly short, velvety tomentose centrally. Cyphellae prominent, scattered, minute, pin-prick-like, 0.1-0.3 mm diam., margins pale, swollen, much wider than small central pore, free of tomentum and appearing blister-like, cavity very narrow and deep, pit membrane white.

Apothecia not seen.

Sticta brevipes is a characteristic, stalked species having a cyanobacterial photobiont, a white medulla (K-), monophyllous to polyphyllous lobes (often reniform) that have thickened-ridged margins which are downrolled at lobe apices and conspicuously isidiate, the isidia crowded in lines at the margins or in discrete patches on the upper surface or occasionally thickly developed as a diffract crust over much of the upper surface. The lower surface is largely glabrous, irregularly wrinkled-ridged, glossy at the margins, and having projecting, minute, thelotremoid cyphellae with very small pores. It is not known fertile. It is distinct from *S. cyphellulata* which has rather narrow, canaliculate, dichotomously to irregularly branching lobes, the lower surface of which are evenly tomentose. This species is also occasionally fertile.

Distribution and ecology: Queensland, New South Wales and Norfolk Island, probably also more widely distributed in the Western Pacific. An epiphyte of humid lowland and montane rainforest where it grows on shaded rocks, in the crowns and at the bases of forest trees, and on rotting stumps, with an altitudinal range of 100 m - 1140 m.

Selected specimens examined: QUEENSLAND: Maalan, 980 m, on *Alphitonia* stem, 30 June 1984, H. Streimann 30617 (CBG 8409122); Wunburra Range, Best of All Lookout, 1005 m, on *Nothofagus moorei*, 20 August 1976, J.A. Elix 2510a (ANUC); Natural Arch National Park, on rocks, 22 August 1975, J.A. Elix 1116 (ANUC); Mt Bellenden Ker South Peak, 1550 m, on dead vine, 3 March 1983, H. Streimann 27492 (CBG 8305457); Toowoomba, Hartmann (MEL); Cardwell Range, Blencoe Creek, 740 m, on tree trunk, 17 June 1986, H. Streimann 36885 (CBG); Mt Glorious, 13 December 1979, R.W. Rogers 2171 (MEL 1036455); Mt Baldy, 1080 m, on *Araucaria* trunk, 25 June 1984, H. Streimann 29262 (CBG 8407390). NEW SOUTH WALES: Cambewarra Mountain, on boulders, January 1964, D. McVean 6450 (CBG 8410545, COLO); North Tamborine National Park, on rocks, 29

August 1975, J.A. Elix 1261 (ANUC); Cardwell Range, 750 m, on a boulder, 20 June 1984, H. Streimann 28599 (CBG 8406606); Clyde Mountain, 730 m, on rocks, 29 January 1976, J.A. Elix 1772 (ANUC); Upper Kangaroo River Road, 120 m, on *Syzygium* stem, 1 November 1985, H. Streimann & J. Curnow 35797 (CBG). NORFOLK ISLAND: Track at end of Sellwyn Pine Road, 210 m, on *Freycinetia*, 8 December 1984, H. Streimann 34658-9 (CBG); Filmy Fern Trail, 130 m, on a rotting log, 3 December 1984, H. Streimann 32112 (CBG).

3. Sticta camarae Müll.Arg., Flora, Jena 65: 303 (1882). Type: Australia: New South Wales, Camara, F. v. Mueller 1881 (G! - holotype - see Filson [1986: 274]). Fig. 4.

Thallus irregularly spreading from one or several holdfasts, 6-10(-20) cm diam., attached to substratum by a gnarled, thickened, root-like holdfast 3-5 mm diam., or rarely loosely attached centrally, margins and apices free, ascending. Lobes linear-laciniate, 3-6(-10) mm wide, 1-3(-6) cm long, dichotomously to irregularly branched, apices divergent, furcate to irregularly divided or ± rounded, blunt or acute. Margins entire, slightly thickened below, at apices of lobes appearing furry through development of tomentum. Upper surface bright lettuce-green when moist, pale grey-green to olivaceous when dry, undulate, plane to subcanaliculate to irregularly punctate-impressed or shallowly wrinkled, brittle and rather papery, coriaceous when dry, flabby when moist; without isidia, maculae, phyllidia, pseudocyphellae or soredia. Medulla white (K-). Photobiont green. Lower surface pale tan or whitish at margins, brown, red-brown to blackened centrally close to holdfast, irregularly wrinkled-striate at margins, ± costate centrally at holdfast, glabrous or patchily tomentose, tomentum thin, even, velvety, pale buff to red-brown, usually slightly projecting at lobe margins. Cyphellae numerous, scattered, small, pin-prick-like or shallowly crateriform, 0.1-0.2(rarely-0.3) mm diam., margins thin, raised, projecting only slightly above tomentum, pit membrane white. Pycnidia occasional to numerous, punctate, 0.1-0.2 mm diam., ostiole pale to dark red-brown or black.

Apothecia occasional or absent, marginal, sessile, constricted at base, rounded, 0.5-2(-3) mm diam., shallowly concave at first, plane to convex at maturity, disc matt, pale to dark red-brown, exciple pale, whitish, tomentose-hairy when young, excluded at maturity. Hypothecium opaque yellow-brown to red-brown. Thecium colourless to pale straw, 70-85 ìm tall. Epithecium yellow to red-brown, 8-14 ìm thick. Ascospores colourless, fusiform-ellipsoid with pointed apices, 1-3-septate, (22.5-)25-30.5(-33.5) x 6.5-8.5 ìm.

Sticta camarae is a stalked, green-photobiont species forming large, often pendulous clones when the point of attachment may become rather unclear; it has a white medulla (K-), long, pendulous, linear-laciniate, dichotomously branching, rather broad and flat lobes with entire margins without isidia or phyllidia. The lower surface is plane, and only costate near the holdfast; it is whitish to pale tan, mainly glabrous to thinly tomentose in patches, the tomentum projecting slightly at lobe margins which in places appear slightly furry. The cyphellae are small, pin-prick-like. It is distinguished from *S. hypopsiloides* by its much larger, pendulous, more robust thallus, broader and flatter and more regularly branching lobes which can be slightly furry-tomentose at their margins and apices, and a plane lower surface which lacks conspicuous raised ridges (costae) except near the anchoring holdfast. *Sticta recedens* Vain. from New Caledonia and the Philippines (Vainio 1913: 122-123) is similar to *S. camarae*, but has markedly thickened margins below, a more consistently dimpled, punctate-impressed upper surface, laminal and marginal apothecia and longer spores, 36-52 x 8-10 ìm (Vainio 1913).

Distribution and ecology: Queensland and New South Wales. Apparently endemic to Australia. An epiphyte of rainforest trees but still very poorly collected and its ecological requirements largely still unknown.

Specimens examined: QUEENSLAND: Sine loco, F.M. Bailey (WELT [Knight Vol. 26A:

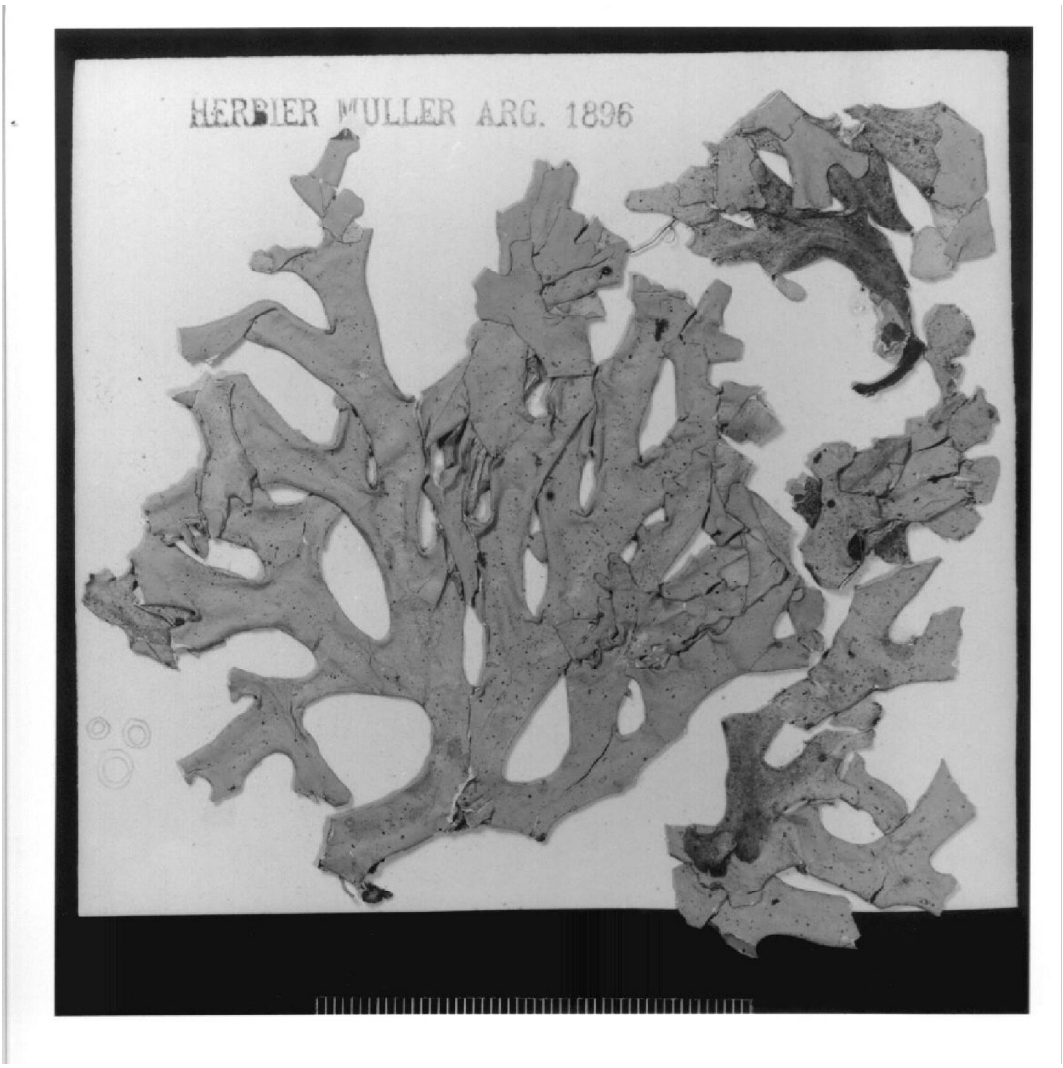

Fig. 4 *Sticta camarae*. Holotype (G). Scale in mm.

23]); Toowoomba, Hartmann (MEL); Roberts Plateau, Shirley (MEL); Mt Lindsay, Hill (MEL). NEW SOUTH WALES: [Holotype and Isotype] Richmond River, Camara (MEL); Rocky Crossing, Williams River, Barrington area, R. Filson 11178 (MEL 1030389); Clarence River, 1875, Wilcox (BM); 14 miles W of Dorrigo, H. & E. Walter L81 (M).

4. *Sticta caperata* (Nyl.) Nyl., Acta Soc. Sci. Fenn. 7: 437 (1863). *Sticta damaecornis* var. *caperata* Nyl., Syn. Meth. Lich 1(2): 357 (1860). *Sticta sinuosa* var. *caperata* (Nyl.) Müll.Arg., Bot. J. Linn. Soc. 32: 202 (1896). Type: "Ile Bourbon" [Réunion], sine loco, sine collectoribus (H-NYL 33639! - lectotype selected here).

Thallus rosette-forming to irregularly spreading, 5-10(-18) cm diam., loosely attached centrally, apices ± free. Lobes broadly rounded, 1-2.5(-3) cm diam., irregularly and rather sparingly branched, discrete, contiguous to overlapping at margins, complex-imbricate to ± continuous centrally, sinuses rounded. Margins entire, sinuous, slightly thickened below, with or

without short, dark, tomental hairs giving a furry appearance. Upper surface olive green when moist, pale grey-green, olivaceous, suffused red-brown when dry, plane to convex, shallowly undulate, here and there minutely pitted, wrinkled or dimpled, matt or glossy, thick, coriaceous, without isidia, maculae, phyllidia or soredia. Medulla white (K-). Photobiont green. Lower surface pale tan at margins, darkening centrally, or ± dark-brown or black from margins to centre, tomentose from margins to centre, tomentum even, rather woolly centrally, dark brown. Cyphellae common, crowded, rather small, 0.1-0.8 (rarely to 1.0) mm diam., margins conspicuous, swollen, clear of tomentum, pit membrane white.

Apothecia occasional to rare or absent, marginal and submarginal, sessile, constricted at base, 1-2(-2.5) mm diam., disc concave to plane, pale to dark red-brown, matt to shining, exciple persistent, coarsely scabrid-areolate, pale buff, translucent when wet. Hypothecium orange-brown, unchanged in K. Thecium colourless, 80-95 ìm tall. Epithecium red-brown, unchanged in K, 11-14 ìm thick. Ascospores colourless, fusiform-ellipsoid with pointed apices, 1-3-septate, contents vacuolate and apparently spuriously 5-7-septate, 36-44.5(-47) x 8-9 ìm.

Sticta caperata is characterized by a white medulla (K-), a green photobiont, broadly rounded lobes with entire margins and lacking isidia, phyllidia or soredia. The margins commonly have short, dark, projecting tomental hairs which give them a somewhat fuzzy or furry appearance (cf. *S. diversa*) and tropical collections sometimes have characteristic clusters of *Dendriscocaulon* projecting here and there from lobe margins, from the upper surface and also from the lower surface, a fact noted by Nylander (1860: 357) when he commented "...facie haud *Ricasoliae glomuliferae*, obiter viso, sed saepius magis flavicante; interdum quoque cephalodiis glomerulosis leptogiodeis". The New Zealand endemic *S. subcaperata* differs from *S. caperata* in not having projecting tomental hairs at the lobe margins, in not having *Dendriscocaulon*-like outgrowths developing from either upper or lower surfaces; in having a taller hymenium; a dense, orange-yellow epithecium; a bright orange-yellow disc; and slightly shorter spores (Galloway 1997).

Distribution and ecology: In Australia known only from Mt Warning in New South Wales. A palaeotropical species known from Réunion, Madagascar, Comoro Is. Tahiti (Hue 1901a), the New Hebrides, and Fiji. It is undoubtedly more widely distributed in the Western Pacific. A species of montane rainforest between 700 m - 900 m.

Specimens examined: NEW SOUTH WALES: Mt Warning, 3 October 1920, Rodway s.n. (BM). Mt Warning, along summit trail, 19 August 1976, J.A. Elix 2500 (CBG).

5. *Sticta cyphellulata* (Müll.Arg.) Hue, Nouv. Archs Mus. Hist. nat. Paris sér. 4, 3: 99 (1901). *Stictina cyphellulata* Müll.Arg., Flora, Jena 65: 301 (1882). Type: Australia. Queensland: Bellenden Ker Range, Karsten L. 48 pr.p. (G! - holotype; BM! MEL! - isotypes - see Filson [1986: 282]). Fig. 5.

Stictina neocaledonica Müll.Arg., Flora, Jena 65: 303 (1882). *Sticta neocaledonica* (Müll.Arg.) Hue, Nouv. Archs Mus. Hist. nat. Paris sér. 4, 3: 101 (1901). Type: [New Caledonia] "bois des montagnes, sud de la Nouvelle Calédonie, 1866", Vieillard (G! 001992 - holotype).

Sticta poechii Zahlbr., Ann. Mycol. 10: 377 (1912). Type: [Irian Jaya] Deutsch New Guinea, Sattelberg, 900 m, 21.12.1904, Dr R. Pöch (M! - holotype).

Thallus ± palmate, 2-5 cm tall, from a central rooted holdfast 2-8 mm diam., lobes proliferating from a short, terete stalk 1-3 mm tall and 2-3 mm diam. Lobes linear-laciniate, rather narrow, (1-)2-4(-6) mm wide, 1-4(-6) cm long, irregularly to dichotomously branching, often having a ± conspicuous, subcanaliculate main branch from which lateral branches develop, commonly canaliculate. Margins entire, ± thickened above, sinuous to irregularly and shallowly notched, occasionally with black, projecting cilia, commonly crowded-isidiate,

Fig. 5 *Sticta cyphellulata*. Holotype (G). Scale in mm.

often somewhat raised. Upper surface dark, glaucous blue-black when moist, greyish-glaucous or grey-brown when dry, smooth, undulate, matt or shining, not wrinkled or dimpled, here and there minutely papillate (x 10 lens), rather fragile, coriaceous, brittle when dry, pliable when moist; without phyllidia, pseudocyphellae or soredia. Isidia mainly marginal, granular, 0.1-1 mm tall, styliform, densely clustered to coralloid-branched, occasionally developing into small lobules or leaflets at lobe margins, not on lower or upper surface. Maculae minute, white, giving a marbled appearance to thallus when moist. Medulla white (K-). Photobiont cyanobacterial. Lower surface pale or whitish at margins, darkening to buff-brown or dark-brown or black centrally, irregularly wrinkled-striate or ± smooth at margins, ± costate centrally and close to stalk, glabrous in a narrow zone at margins or tomentose from margins to centre, tomentum short, close, velvety, pale buff to dark-brown or red-brown. Cyphellae minute, scattered, often crowded, pin-prick-like, 0.1-0.2 mm diam., margins prominent, white, swollen, shining, projecting from tomentum, pit membrane white.

Apothecia rare, submarginal to laminal, developed towards lobe apices, sessile, constricted at base, rounded, 0.5-2(-3) mm diam., subconcave to plane, disc waxy, glossy, pale red-brown to orange, exciple pale whitish to buff-pink, scabrid. Hypothecium orange-brown, unchanged in K, 45-70 ìm thick. Thecium pale orange-brown to green-brown, 85-110 ìm tall. Epithecium olive green turning orange-yellow in K, 8-13 ìm thick. Asci cylindrical, 85-110 x 15-20 ìm. Ascospores colourless, fusiform-ellipsoid with pointed apices, 1-3-septate, (25-)28-36(-39) x (7-)8-11 ìm.

Sticta cyphellulata is a stalked species having a cyanobacterial photobiont, a white medulla (K-), rather narrow, canaliculate, dichotomously to irregularly branched lobes with conspicuously isidiate margins. It is discussed at length in Hue (1901a: 99-100). It differs from *S. brevipes* which has more rounded, flabellate lobes that are markedly thickened, downrolled at their apices; from *S. marginifera* which has prominent, stalked, marginal lobules; and from *S. duplolimbata* which has prominent, long, black, marginal cilia. The New Zealand species *S. caliginosa* D.J.Galloway, has larger, wider lobes with lacerate, phyllidiate margins, a thicker, more robust holdfast and stalk, and much larger cyphellae on the lower surface (Galloway 1997).

Distribution and ecology: Queensland, New South Wales and Victoria (Cheel 1912: 268). Known also from Papua New Guinea (Jatta 1903; Szatala 1956; Hawksworth & Shaw 1984; Streimann 1986), New Caledonia, Fiji, Malaysia and Tanzania [Vezda, *Lich. Sel. Exs.* 2398 (BM)]. In humid, shaded habitats, on mossy rocks, tree buttresses, vines, dead stumps and on shrubs in montane rainforest between 600 m - 1200 m.

Selected specimens examined: QUEENSLAND: Upper Baron River, June 1899, F.M. Bailey (BM); Cardwell range, Culpha Creek catchment, 780 m, on treelet stem and dead tree buttress, 23 June 1984, H. Streimann 28990, 28998 (CBG 8407118, 8407126); Blencoe Creek, 740 m, on a rock, 17 June 1986, H. Streimann 36849 (CBG); Mt Baldy, 1080 m, on *Araucaria* roots and trunk, 25 June 1984, H. Streimann 29272, 29286 (CBG 8407400, 8407414): Mt Bellenden Ker South Peak, 1550 m, on dead stump and treelet stem, 3 March 1983, H. Streimann 27324, 27475 (CBG 8395289, 8305440); Windsor Tableland, 1200 m, on a vine, 26 June 1984, H. Streimann 29558 (CBG 8407725); Crystal Creek National Park, 900 m, on bark, 25 February 1986, G. Rambold 4784 (M); Atherton Tablelands, Short Creek Falls, 720 m, 2 March 1986, G. Rambold 4852, 4854 (M); Mt Lewis summit ridge, 120 m, frequent on trees and rocks, 1 February 1983, D. Verdon 5333 (CBG 8301437); Eungella National Park, 680 m, 18 February 1986, G. Rambold 4545 (M). NEW SOUTH WALES: Royal National Park near Sydney, 19 December 1958, H. & E. Walter L 70 (M); Toonumber Forest Way, 450 m, on trunk, 18 October 1978, D. Verdon 3976 (CBG 7809462); Mt Wilson, 720 m, on a rock, 1 November 1984, H. Streimann 31575 (CBG); Tianjara Falls, 350 m, on shaded boulder, rare, 21 June 1979, H. Streimann 7855 (CBG 7909258); Dorrigo National Park, eastern side of Dorrigo Mountain, 29 October 1965, R. Filson 7644 (MEL 1021766).

6. Sticta diversa (Stirt.) Zahlbr., Cat. Lich. Univ. 3: 379 (1925). *Stictina diversa* Stirt., Trans. Proc. N. Z. Inst. 32: 75 (1900). Type: Australia. Queensland: Mr Bailey (BM! - lectotype *fide* Rogers [1982: 508]). Fig. 6.

Sticta quercizans var. *microphylla* Kremp., Verhandl. zool.-bot. Ges Wien 30: 335 (1881)["1880"]. *Stictina quercizans* var. *microphylla* (Kremp.) Müll.Arg., Flora, Jena 70: 116 (1887). *Stictina weigelii* var. *microphylla* (Kremp.) Stizenb., Flora, Jena 81: 133 (1895). *Sticta weigelii* var. *microphylla* (Kremp.) Zahlbr., Cat. Lich. Univ. 3: 406 (1925). Type: Australia. Rockhampton, on rocks, Thozet (MEL! - lectotype selected here).

Thallus rosette-forming to irregularly spreading, 3-5(-10) cm diam., closely attached centrally, margins ± free, occasionally ± subascendent. Lobes 5-10(-20) mm diam., 1-4 cm long, rounded, ± discrete at margins, closely contiguous to complex-imbricate centrally. Margins very irregular, occasionally entire, ± ragged, incised, slightly thickened below, sparsely to densely isidiate. Upper surface dark slatey blue-black to olivaceous-brown in parts, suffused red-brown at apices when moist, grey-blue, olivaceous greyish to dingy brown when dry, uneven, shallowly undulate to ± punctate-impressed to subfaveolate, fragile and rather papery to coriaceous; without maculae, pseudocyphellae or soredia. Isidia minute, clustered, granular-coralloid, delicate, styliform, becoming clustered and ± squamiform and dorsiventral, marginal, often spreading onto upper surface towards apices. Phyllidia minute, squamiform, 0.1-0.8 mm diam., developing from laminal isidia, best seen towards lobe margins and apices. Medulla white (K+ yellow-orange). Photobiont cyanobacterial. Lower surface pale tan to whitish at margins, brown to red-brown or ± blackened centrally, occasionally glabrous and ± wrinkled-uneven at margins, to tomentose centrally or tomentose from margins to centre, tomentum shaggy, densely entangled, pale tan to brown, occasionally with anchoring bundles or tufts of rhizines. Cyphellae common, round to irregular, 0.2-2(-3) mm diam., sunk in tomentum, deeply urceolate, margins narrow, raised, sharply defined, slightly swollen, concolorous with lower surface, free of tomentum, pit membrane white, granular-scabrid.

Apothecia not seen.

Sticta diversa has a cyanobacterial photobiont, a white medulla which is characteristically K+ yellow, rather thin, somewhat papery, broadly rounded lobes with isidiate margins, the isidia densely developed in patches, or ± continuous, rarely spreading onto the upper surface and becoming phyllidiate. It has a greyish to dark grey-brown upper surface which is not maculate, and a brown to red-brown or blackened lower surface with large, deeply urceolate cyphellae. It is similar to *S. weigelii* but distinguished by the K+ yellow medullary reaction, and the lack of marginal branches or knobbles on the tomental hairs of the lower surface. It is distinguished from *S. sublimbata* by the presence of marginal isidia, the absence of soredia, and the K+ yellow medullary reaction.

Distribution and ecology: From Lat. 17°S in Queensland to New South Wales. Apparently endemic to Australia. In humid, shaded habitats in lowland to montane rainforest where it colonises tree trunks, fallen branches, roots, boulders, mossy rocks in streams, and shaded rock faces. It has also been collected from tree crowns, and from the stems of vines and palms. It has an altitudinal range from 130 m - 1080 m.

Selected specimens examined: QUEENSLAND: Blue Water Creek, 600 m, on palm stem, 19 June 1984, H. Streimann 28409, 24810 (CBG 8406219, 8406220); Cardwell Range, 750 m, on tree trunk, 20 June 1984, H. Streimann 28568 (CBG 8406575); State Forest Reserve 605, Dawson Logging Area, 800 m, 21 July 1983, M.E. Hale 64010 (US); Crediton State Forest, 840 m, on tree trunk, 1 July 1986, H. Streimann 37653, 37656 (CBG); Mt Tamborine, 500 m, on rock, 4 February 1953, R.D. Hoogland 3154 (BM, L, US); Eugella Range, Callistemon Cascades, 300 m, on granite rock, 28 January 1983, D. Verdon 5271 (CBG 8301375); Brisbane, F.M. Bailey (BM); Atherton Tablelands, Lamins Hill, 840 m, on trees, 28 February 1986, G. Rambold 4828 (M); Natural Arch National Park,

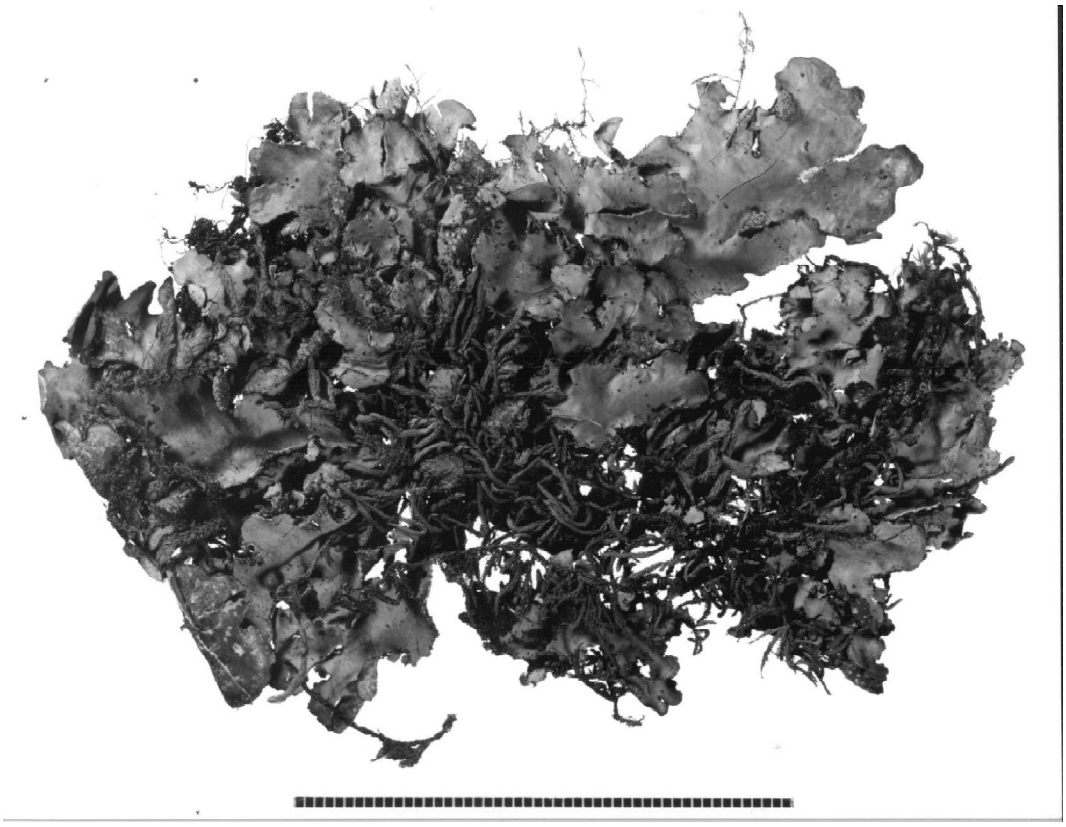

Fig. 6 *Sticta diversa*. Atherton Tableland, G. Rambold 4828 (M). Scale in mm.

on rocks, 22 August 1975, J.A. Elix 1116 (ANUC). NEW SOUTH WALES: Lions Tourist Road, 800 m., 12 June 1983, M.E. Hale 65890 (US); Coffs Harbour below Waihou Trig Station, 340 m, on small sandstone outcrop, 12 October 1978, D. Verdon 3795 (CBG 7809276); Illawarra, Kirton (WEL); Buladelah to Taree Road, 9 May 1965, R. Filson 7191 (MEL 27212).

7. *Sticta duplolimbata* (Hue) Vain., Philipp. J. Sci. Sect. C. Bot. 8: 125 (1913). *Sticta ciliaris* f. *duplolimbata* Hue, Nouv. Archs Mus. Hist. nat. Paris sér. 4, 3: 102 (1901). Type: Japan. Insula Oshima in Riukiu, July 1900, R.P. Faurie 2756 (BM! - lectotype selected here).

Thallus palmate to irregular, 2-4(-8) cm diam., attached to substrate by a rooted holdfast to 1.5 cm diam., lobes arising from a short stalk 5-8 mm long. Lobes subrotund to irregularly laciniate, irregularly branching, 5-10 mm diam. Margins entire to notched or irregularly incised, isidiate, ciliate, sometimes with small secondary lobules with ciliate margins. Isidia styliform, minute, granular, dark-grey, often crowded at margins. Cilia prominent, black, to 2 mm long, marginal, fringing lobes. Upper surface dark blue-black when moist, pale grey or glaucous red-brown when dry, undulate to ± plane, smooth or occasionally shallowly wrinkled or pitted, thin, papery to somewhat coriaceous, rarely scattered-isidiate, maculate, without phyllidia. Maculae minute, white, reticulate (x 10 lens). Medulla white (K-). Photobiont cyanobacterial. Lower surface pale buff at margins, dark-brown to black centrally, tomentose from margins to centre or occasionally glabrous at margins, tomentum even, brownish to black, velvety to ± felted,

occasionally small, stalked thalline lobules project from the lower surface. Cyphellae round to irregular, 0.1-1 mm diam., margins slightly swollen, thelotremoid, pale, conspicuous, projecting from tomentum, pit membrane white.

Apothecia not seen.

Sticta duplolimbata is a stalked species characterized by a white medulla (K-), a cyanobacterial photobiont, minute, styliform isidia at lobe margins, and long, black cilia fringing the lobes. The cilia serve to distinguish it from similar small, stalked cyanobacterial species such as *S. brevipes*, *S. cyphellulata* and *S. marginifera*. The presence of isidia intermixed with the marginal cilia distinguish it from *S. leamii* Zahlbr. (Zahlbruckner 1931), a New Guinea taxon which has marginal cilia but not isidia. *S. duplomarginata* is illustrated in Yoshimura (1974: pl. 37, fig. 373).

Distribution and ecology: Known in Australia only from northern Queensland. Also in Japan (Hue 1901a; Yoshimura 1974); China (Wei 1991); Sri Lanka (Leighton 1870, as *Stictina ciliaris*); the Philippines (Vainio 1913); New Guinea (Zahlbruckner 1931; Szatala 1956; Hawksworth & Shaw 1984; Streimann 1986) and probably more widely distributed in the Western Pacific. On mossy tree trunks and shrubs and on rotting logs in humid, shaded, montane rainforest. It has an altitudinal range of 600 m - 1600 m. Still very poorly known and collected in Australia.

Specimens examined: QUEENSLAND: Zarda-Root's Creek Track, 6 January 1936, H. Flecker 1432 (BM); Mt Baldy, 1080 m, on *Araucaria* trunk, 25 June 1984, H. Streimann 29267 (CBG 8407395); North Wallaman logging area, 600 m, on tree trunk, 21 June 1984, H. Streimann 28788 (CBG 8406795); Mt Bellenden Ker South Peak, 1550 m, on treelet stem and rotting log, 3 March 1983, H. Streimann 27384 (CBG 8305349, 8305355); Centre Peak Bellenden Ker, along trail from Telecom cable car station to North Peak, 15 January 1993, N. Sammy 931174, 931177, 931187 (herb. Sammy).

8. *Sticta filix* (Sw.) Nyl., J. Linn. Soc. Bot. 9: 246 (1866). *Lichen filix* Sw., Meth. musc.: 36 (1781). *Lobaria filix* (Sw.) Räuschel, Nomenclat. bot.: 329 (1797). *Platisma filix* (Sw.) Hoffm., Descript. pl. cl. crypt. 3: 1 (1801). *Sticta filicina* Ach., Meth. Lich.: 275 (1803) nom. superfl. *Stictina filicina* (Ach.) Nyl., Syn. Meth. Lich. 1(2): 349 (1860). Type: New Zealand, sine loco [Probably Dusky Sound], G. Forster (UPS-THUNBERG 29191! - lectotype *fide* Galloway [1985a: 555]). Fig. 7.

Thallus palmate, irregular, 2-10(-20) cm wide and to 8 cm tall, arising from a central, rooted holdfast 1-1.5 mm diam., from which a terete to ± canaliculate to flattened stalk develops and from which lobes proliferate, stalk red-brown to black, woody, 0.5-1(-2) cm tall and to 4 mm wide. Lobes very variable, 1-15 mm wide, usually very narrow (1-3 mm), either forming a single main stem from which lateral and secondary branches arise, or forming several primary branches which in turn proliferate into finer lobes at apices, branching polytomous. Margins highly dissected-incised, rather ragged or proliferating into phyllidia. Upper surface bright green to olive-green when moist, pale grey-green to olivaceous when dry, uneven, undulate to minutely pitted or dimpled, ± canaliculate centrally, fragile, brittle when dry; without isidia, maculae, pseudocyphellae or soredia. Phyllidia common at margins and apices, simple to 2-3-branched, constricted at base, 2-3 mm tall. Medulla white (K-). Photobiont green. Lower surface pale cream or whitish at margins to pale tan, brown or ± blackened centrally and near stalk, distinctly costate-ridged centrally, glabrous or uniformly short, velvety tomentose from margins to centre, tomentum pale tan to brown. Cyphellae minute, pin-prick-like with slightly swollen margins, central pore very narrow, 0.1 mm diam. or less, pit membrane white.

Apothecia rather rare in Australian material, scattered, submarginal and laminal, towards apices, sessile, constricted at base, 0.5-2.5 mm diam., concave to plane or convex at maturity, disc matt, red-brown to dark-brown, exciple pale buff-brown, minutely scabrid, persisting as a simple to minutely crenulate margin to disc. Hypothecium opaque, yellow-

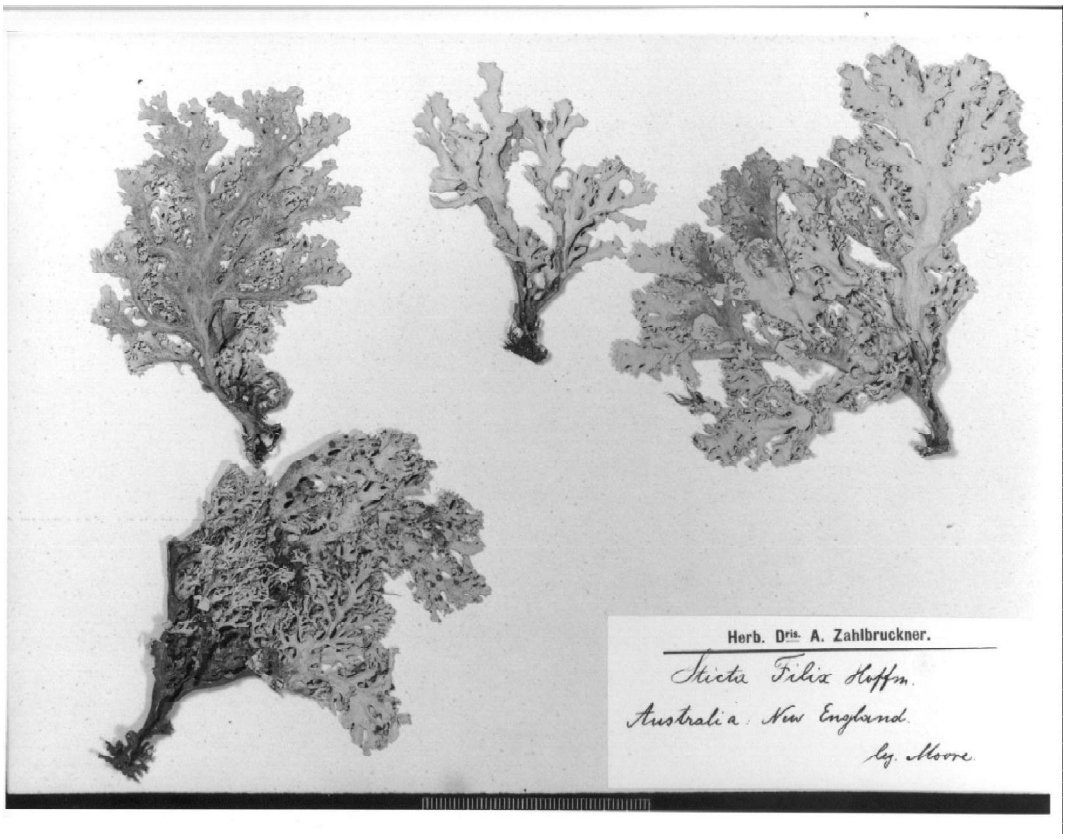

Fig. 7 *Sticta filix*. Australia, New England, Moore (W 866). Scale in mm.

brown. Thecium colourless to pale straw, 85-95 ìm tall, paraphyses strongly conglutinate and septate. Epithecium mustard-yellow to yellow-brown, 8.5-11 ìm thick. Ascospores colourless, fusiform-ellipsoid with pointed apices, 1-septate, 28-33.5 x 6-8 ìm.

Sticta filix is a characteristic stalked species having a green photobiont, a white medulla (K-), rather narrow, branched lobes which are characteristically dissected-incised or fenestrate and with marginal and laminal phyllidia, and a distinctive, costate lower surface. It is distinguished from *S. myrioloba* by the longer and more prominent stalk, the thinner tomentum and smaller cyphellae on the lower surface and the smaller numbers of phyllidia developed at the margins and on breaks and cracks on the upper surface. *Dendriscocaulon dendroides* (Nyl.) R.Sant. ex H.Magn. forms distinctive phytosymbiodemes with *S. filix* in particularly humid habitats in New Zealand, but these have not so far been recorded in Australia. First correctly recorded from Australia by Zahlbruckner (1896: 193). Earlier records of *S. filix* from Australia and also some later ones (e.g. Bratt 1972, 1975, 1976; Rundel et al. 1979; Weber 1981) are referable to *S. stipitata*.

Distribution and ecology: Queensland to Victoria. Also widely occurring in New Zealand (Galloway 1997). On mossy rocks in shaded, humid habitats in rainforest, 1000 m - 1400 m, rarely at sea level. Still rather poorly known and collected in Australia.

Specimens examined: QUEENSLAND: Toowoomba, Hartmann (MEL). NEW SOUTH

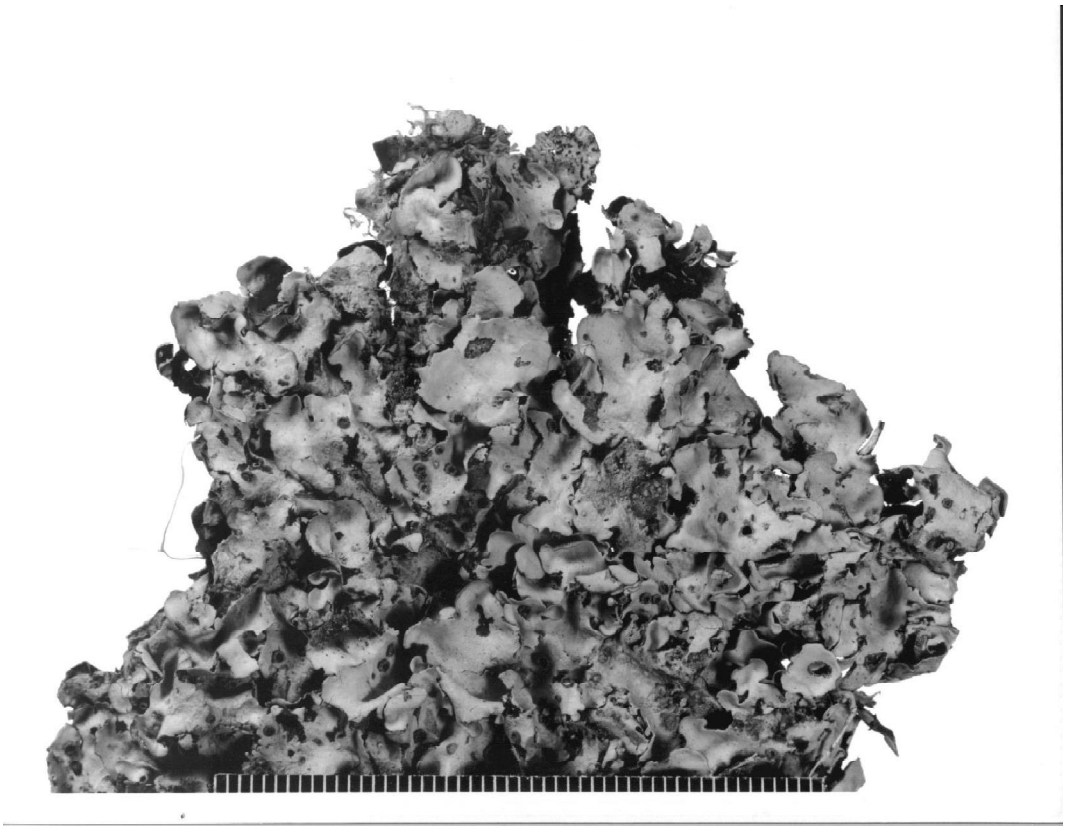

Fig. 8 *Sticta flavocyphellata*. Holotype (BM). Scale in mm.

WALES: Mt Warning, 1090 m, on mossy rocks, 19 August 1976, J.A. Elix 2491 (ANUC); Point Lookout, on rocks, October 1976, D. McVean 67191 (CBG 8410562, MEL 32456, BM); Minnamurra Falls, on rock face, January 1964, D. McVean 6458 (CBG 8410579); New England National Park, Lyrebird Track, 1300-1400 m, 6 Febuary 1986, G. Rambold 4339, 4358, 4361 (M); New England, Moore (W 2755). VICTORIA: Sealer's Cove, F. v. Mueller (BM).

9. *Sticta flavocyphellata* D.J.Galloway *sp. nov.* Type: Lord Howe Island: "on the NE ridge of Mount Gower, at a height of about 1400 feet", August 1965, J.C. Garne 3/36 (BM! - holotype). Fig. 8.

Diagnosis: *Stictae cinereoglaucae* similis sed lobis parvis, crassis; medulla nivea vel ochracea, K+ sanguinea; subtus fuscus vel bubalinus; cyphellis minimis, testaceis; ascosporae 5-7-septatae, 39-42(-44.5) x 7-8.5 ìm.

Thallus rosette-forming to irregularly spreading, (3-)5-10 cm diam., of densely overlapping lobes. Lobes very variable, ± rounded, ± shell-like, overlapping, 5-15 mm diam. Margins crisped, ± raised at apices, noticeably thickened above and below, entire to irregularly incised, crenate or folded, often small, shell-like lobes proliferate from breaks in margin. Upper surface olive-green when moist, pale yellowish-greyish suffused rust or ochre at margins and cracks in thallus when dry, matt or shining in parts, undulate, irregularly pitted, wrinkled or ± papillate (x 10 lens), rather coriaceous, flabby when moist, brittle when dry;

without isidia, maculae, phyllidia, pseudocyphellae or soredia. Medulla white to yellow-white, turning ochre-yellow to rust-red in breaks and cracks, K+ rust red. Photobiont green. Lower surface pale tan or brown at apices, or dark-brown to black from margins to centre, tomentose from margins to centre, tomentum silky white at margins, dark brown centrally, even, velvety to felted, here and there anchored by tufts of black rhizines. Cyphellae conspicuous, rounded, 0.5-3(-4) mm diam., margins very thin, abrupt, often inapparent, sunk in tomentum, pit membrane granular, mustard-yellow.

Apothecia scattered or in clumps, submarginal and laminal, 0.5-1.5(-2) mm diam., sessile, disc subconvex, matt to shining, yellow-brown to red-brown, exciple pale tan to ochre, massive, coarsely scabrid-areolate, persisting at maturity as a thick, corrugate-scabrid margin to disc. Hypothecium dingy yellow-brown. Thecium colourless to pale straw, 95-114 ìm tall. Epithecium yellow-brown, 8-11 ìm thick. Asci clavate, 80-104 x 22-25 ìm. Ascospores colourless, fusiform-ellipsoid, with pointed apices, 5-7-septate, 39-42(-44.5) x 7-8.5 ìm.

Sticta flavocyphellata has a green photobiont; a white medulla which becomes yellowish to rust-red on exposure to air (then K+ red); imbricate, rounded lobes without isidia or soredia; a thick, dark brown to black tomentum on the lower surface in which are sunk round cyphellae with a characteristic mustard-yellow pit membrane. Apothecia have a persistent, corrugate-scabrid margin and characteristic long, fusiform, colourless, 5-7-septate spores. It is the only species in the Australian lichen mycobiota having yellow cyphellae and 5-7-septate spores. The New Zealand endemic species *S. cinereoglauca* Hook.f. & Taylor has 7-septate spores, but has much larger, more papery lobes with a pale lower surface and large white cyphellae. It has a white medulla which is K- (Galloway 1997).

Distribution and ecology: Known only from Lord Howe Island and apparently endemic to it. Growing over rocks and litter on damp rock faces in montane forest. Further collections and observations are needed to assess its detailed ecological requirements.

Additional specimen examined: LORD HOWE ISLAND: On a damp vertical rock face on the E side of Mt Lidgbird, near the “goathouse”, c. 480 m, August 1965, J.C. Garne 3/14 (BM).

10. *Sticta fuliginosa* (Hoffm.) Ach., Meth. Lich.: 280 (1803). *Lobaria fuliginosa* Hoffm., Deutsch. Fl. 2: 109 (1796). *Parmelia sylvatica* var. *fuliginosa* (Hoffm.) Hepp, Lich. Fl. Würzburg: 26 (1824). *Parmelia fuliginosa* (Hoffm.) Schaer., Lich. Helv. Spic. sect. 10: 438 (1840). *Stictina fuliginosa* (Hoffm.) Nyl., Syn. Meth. Lich. 1(2): 347 (1860). *Sticta sylvatica* var. *fuliginosa* (Hoffm.) Hepp, Abbild. Beschr. Spor.: 371 (1875). Type: Wales, Cader Idris, August 1726 (Dillenius 1742 Tab. XXVI, Fig. 100A - lectotype: OXF 100A - epitype, selected in accordance with Laundon 1984: 218-219).

Exsiccati: Weber *Lichenes Exsiccati* No 240 (Boulder, Colorado), see also Weber (1981); Elix *Lichenes Australasici Exsiccati* No. 223 (Canberra).

This characteristic, isidiate species is widespread, though never particularly common, in temperate regions of the world. Australian material examined approximates in both anatomy and morphology to the description of the species given in Galloway (1994a).

Sticta fuliginosa has a cyanobacterial photobiont, broadly rounded, rather papery, ± monophyllous lobes (thalli generally 1-5 cm diam., rarely 6-15 cm diam. in some NSW populations), delicate, granular-coralloid, dark brown-black isidia on margins and upper surface of lobes, and a pale creamish white lower surface with pale tomentum and large (0.1-3.0 mm diam.), conspicuous cyphellae with a white pit membrane. It is readily distinguished from *S. diversa* which has a different lobe morphology, a dark brown lower surface and a K+ yellow medullary reaction; from *S. marginifera*, *S. brevipes* and *S. cyphellulata* which are distinctly stalked taxa; and from *S. limbata* and *S. sublimbata* which are sorediate taxa lacking isidia.

S. fuliginosa varies in thallus size according to habitat conditions, with most specimens examined being rather small (1-5 cm diam.) and typical of the species in other parts of the world e.g., New Zealand (Galloway 1985a, 1997), Great Britain (Purvis et al. (1992), Chile (Galloway 1994a), but with large specimens from NSW reaching 15 cm diam.. In very humid sites, small thalline lobules readily develop from both laminal and marginal isidia and quickly form new secondary thalli, but the formation of *Dendriscocaulon*-like structures which occurs in some Valdivian populations in Chile (Galloway 1994a) was not seen in Australian material examined. All Australian material examined was sterile.

Distribution and Ecology: Queensland to Tasmania; mainly montane, from 200 m - 1100 m. A cosmopolitan species widely distributed in temperate areas. Rare in Tasmania and there confined mainly to wet sclerophyll forests or to scrubby margins of rainforest. Associating with *Collema laeve, C. leucocarpum, Leptogium azureum* and species of Pannariaceae (Kantvilas 1985; Kantvilas & James 1987; Jarman *et al*. 1991; Kantvilas 1995). In New South Wales and Victoria on understorey shrubs (*Acacia mearnsii, Acmena smithii, Bedfordia salacina, Bursaria spinosa, Casuarina* spp., *Drimys lanceolata, Leptospermum phylicoides, Pomaderris aspera*) in moist *Eucalyptus* forest associating with *Normandina pulchella* and with species of *Coccocarpia, Heterodermia, Leptogium, Nephroma, Pannaria, Parmelia, Pseudocyphellaria, Psoroma, Usnea* and mosses. Occasionally also on rocks on roadside banks. In Queensland on tree trunks in open rainforest and on roadside trees.

Selected specimens examined: QUEENSLAND: Between Milaa Milaa and Ravenshoe, on tree trunks, November 1963, D. McVean 63113 (CBG 8410563); Winburra Range, 805 m, on roadside trees, 20 August 1976, J.A. Elix 2540 (ANUC); Mt Baldy, 1060 m, on treelet stem, 2 July 1984, H. Streimann 30635 (CBG 8409140). NEW SOUTH WALES: Barrington Tops, Polblue Swamp, 1000 m, on gum tree, 8 September 1982, N. Stevens 4032 (BRIU); Mt Wilsin - Mt Irvine Road NNE of Katoomba, 780 m, in crown of *Ceratopetalum* and on *Eucalyptus* trunk, 1 November 1984, H. Streimann 31548, 31658, 31674 (CBG); Between Captain's Flat and Parkers Gap, 1100 m, epiphytic on *Acacia* branches, 31 October 1978, D. Verdon 4129 (CBG 7810986); Clyde Mountain, 730 m, on rocks of road bank, 20 January 1976, J.A. Elix 1779 (ANUC); Brown Mountain Lookout, 944 m, on *Eucalyptus*, 20 January 1976, J.A. Elix 1590 (ANUC). VICTORIA: Waygara State Forest, 200 m, on *Leptospermum* shrubs, 22 November 1978, J.A. Elix 5313 (ANUC); Healesville, on trunk of tree, 27 July 1974, S. & R. Filson 15007 (MEL 1013098); Bairnsdale, on wet bark, 21 June 1964, R. Filson 6442 (MEL 1021821); Mt Stradbroke, very rare, 6 March 1978, R. Filson 8289 (MEL 1022813). TASMANIA: Near Dundas, 220 m, on *Nothofagus*, sheltered, rare, 5 January 1974, G.C. Bratt 74/24 (HO 32978); Montezuma Falls Track, Williamsford end, 320 m, on *Cassinia*, sheltered, rare, 4 January 1974, G.C. Bratt 74/70 (HO 32979); Nelson River, Western crossing, Lyell Hwy, 320 m, on dolly bush, sheltered, common, 3 April 1972, G.C. Bratt & M.H. Bratt 72/170 (HO 32973, MEL 1527064).

11. *Sticta howei* D.J.Galloway, *sp. nov.*
Type: Lord Howe Island: on top of Mount Gower, on trunks of trees, 9.ix.1963, A.C. Beauglehole 73071 (MEL 1045751! - holotype). Fig. 9.

Diagnosis: *Stictae latifrons* similis sed lobis tenuibus, non caulescentibus; ascosporae incolores, 1-septatae, 25-30.5(-33.5) x 8.5-11 ìm.

Thallus irregularly spreading, 8-15(-22) cm diam., closely attached centrally, occasionally by irregular holdfasts or rhizines or ± loosely attached, margins and apices free. Lobes broadly rounded to irregularly laciniate, 1-4 cm wide, 3-9 cm long, discrete to contiguous towards margins, complex-imbricate centrally. Margins entire, sinuous, shallowly notched or folded, slightly thickened below, without isidia or soredia, occasionally secondarily lobulate and with occasional tufts of whitish to blackened rhizines attaching to other lobes. Upper surface

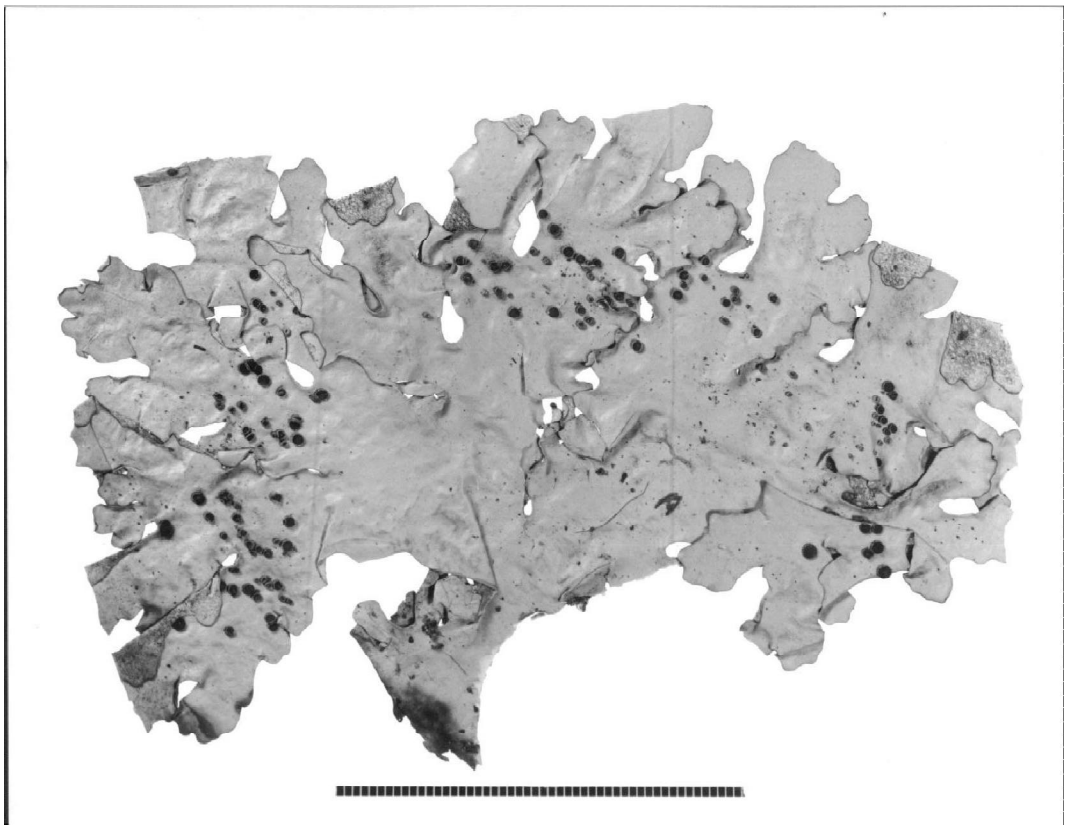

Fig. 9 *Sticta howei*. Holotype (MEL 1045751). Scale in mm.

bright lettuce-green to olive-green when moist, pale olivaceous buff when dry, irregularly wrinkled, undulate or smooth, thin, papery, rather fragile and brittle when dry, flabby when moist; without isidia, maculae, phyllidia, pseudocyphellae or soredia. Medulla white (K-). Photobiont green. Lower surface pale buff or whitish at margins, pale brown darkening centrally, rarely blackened centrally, irregularly wrinkled-ridged, glabrous at margins or uniformly short, velvety tomentose from margins to centre, tomentum mid-brown to dark-brown. Cyphellae scattered, sunk in tomentum, rather flat, round to irregular, 0.3-1.5 mm diam., margins thin, pale, slightly raised, often lost in tomentum, pit membrane white.

Apothecia scattered, laminal towards centre or apices of lobes, often immature, very small and crowded, 0.5-2 mm diam., rounded or deformed through mutual pressure, sessile, constricted at base, disc matt, subconcave at first, plane to subconvex at maturity, pale to dark red-brown, exciple brownish, prominent, obscuring disc at first, minutely scabrid-roughened, persisting at maturity as a minutely roughened-stellate margin to disc. Hypothecium opaque, yellow-brown, unchanged in K. Thecium colourless, 80-100 ìm tall. Epithecium pale yellow-brown, unchanged in K, 8-14 ìm thick. Asci clavate, 72-80 x 16-20 ìm. Ascospores colourless, fusiform-ellipsoid with pointed apices, 1-septate, 25-30.5(-33.5) x 8.5-11 ìm.

Sticta howei has a white medulla (K-), a green photobiont, broadly rounded lobes arising from irregular holdfasts, but without distinct

stalks, entire margins without isidia or phyllidia, and scattered, small, laminal apothecia. It is distinguished from *S. macrophylla* Delise (Galloway 1995b: 176) which has a cyanobacterial photobiont and larger, more robust lobes, and from *S. latifrons* (see below) which has a distinct anchoring holdfast and a single stalk from which the lobes arise, and thicker, more coriaceous lobes.

Distribution and ecology: Endemic to Lord Howe Island. Discussed in earlier literature as *S. latifrons* (Krempelhuber 1881; Zahlbruckner 1896) and *S. sinuosa* var. *macrophylla* (Delise) Müll.Arg. (Cheel 1912: 266). An epiphyte of tree trunks in humid montane rainforest. One of the largest lichens on Lord Howe Island.

Additional specimens examined: LORD HOWE ISLAND. ESE side of Mt Lidgbird, on trunk of tree, 26 November 1962, A.C. Beauglehole 73268, 73516 (MEL 10455736, 1045718); Mt Gower, August 1911, W.W. Watts (NSW L 532); Fall of Lidgbird, 29 July 1911, W.W. Watts (NSW 4560); Sine loco, Mr King (NSW L 533); Summit plateau of Mt Gower, 870 m, 23 May 1971, J. Pickard (NSW L 2383, MEL 1527313); Mt Gower summit, on tree trunk, August 1965, J.C. Garne 3/51 (BM); Sine loco, Moore (W); Sine loco, Fullagar (MEL) [Note by E. Cheel "...This is *Sticta damaecornis* var. *macrophylla* Bab., non Nyl. Müll. Arg. in Flora 1887 p. 4 says this is *Sticta sinuosa* var. *macrophylla* p. 8"]; Summit Mt Gower, March 1950, I. McComish (MEL).

12. *Sticta hypopsiloides* Nyl. Annls Sci. nat. Bot. sér. 4, 15: 42 (1861). *Lobaria hypopsiloides* (Nyl.) Trevis., Lichenotheca Veneta exs. no. 75 (1869). Type: New Caledonia, sine loco, "ad cortices in montibus", Vieillard 1796 (PC - not seen).

Thallus irregularly spreading, 4-10(-15) cm diam., from a rooted basal holdfast 4-8(-15) mm diam. and a short supporting stalk 5-10 mm tall. Lobes subdichotomously to irregularly branched, elongate-laciniate, rather narrow and delicate, 1-5(-8) mm wide, 2-5(-7) cm long, apices distinct and ± divergent, contiguous to ± imbricate centrally, sinuses rounded, plane to ± canaliculate. Margins entire, thickened below with a ± continuous, pale ridge. Upper surface bright lettuce-green to olive-green when moist, pale grey-green to pale olivaceous or suffused red-brown when dry, irregularly wrinkled-ridged to punctate-impressed or ± faveolate in parts, matt or shining, thin and fragile to tough, coriaceous; without isidia, maculae, phyllidia or soredia. Medulla white (K-). Photobiont green. Lower surface whitish at or near apices to dark-brown or red-brown near stalk, wrinkled or ridged-striate, conspicuously costate centrally, ± glabrous at margins, with a thin, pale to dark-brown tomentum at or near central rib. Cyphellae scattered, minute, pin-prick-like, with noticeably swollen, smooth margins, pore to 0.2 mm diam., usually less, pit membrane white.

Apothecia occasional to rare, marginal or submarginal or laminal, towards lobe apices, sessile, 0.5-1.5 mm diam., disc matt to rather waxy, yellow-orange to red-brown, exciple pale whitish, persisting as a thin, entire margin to disc. Hypothecium opaque, brownish or orange-brown. Thecium colourless, 90-100 ìm tall. Epithecium clear yellow, 8-11 ìm thick. Ascospores colourless, ellipsoid-fusiform, apices rounded or pointed, contents granular or vacuolate, mainly 1-septate, rarely 3-septate, 28-30.5(-33.5) x 8.5-11 ìm.

Sticta hypopsiloides is a characteristically short-stalked species having a green photobiont, a white medulla (K-), rather delicate, narrow, elongate-laciniate, dichotomously to irregularly branched lobes with entire margins without isidia or phyllidia, an upper surface which is punctate-impressed to subfaveolate, and a lower surface which is wrinkled or ridged-striate at margins and distinctly costate centrally on all lobes. It is distinct from *S. camarae* which has much larger and longer, pendulous lobes which are often tomentose-furry at margins and apices, a lower surface which is not noticeably costate, except near the holdfast, and longer and narrower spores.

Distribution and ecology: Known only from Queensland in Australia, also in New Caledonia

(Nylander 1861, 1868; Hue 1901a; Smith 1922), New Guinea and Java. An epiphyte of montane rainforest. Still very poorly known in Australia.

Additional specimens examined: QUEENSLAND: Bellenden Ker, Sayer (MEL); Zarda Root's Track, 6 January 1936, H. Flecker 1423-6 (BM); Platypus Creek Jungle, on bark of tree, 3 January 1936, H. Flecker 1230 (BM); E of Junction Kennedy Hwy and Palmerston Hwy, 10 July 1983, M.E. Hale 64004 (US).

13. *Sticta latifrons* A. Rich., Voy Astrolabe 1: 27, Tab. 8, fig. 2 (1832). *Sticta filicina* var *latifrons* (A. Rich.) Mont., Annls Sci. nat. Bot. sér. 3, 18: 309 (1852). *Lobaria latifrons* (A. Rich.) Hellb., Bih. K. Svenska Vetensk.-Akad. Handl. 21(3/13): 34 (1896). Type: New Zealand, South Island, Astrolabe Harbour [near Adele Island, Nelson], R.P. Lesson (PC-THURET! - lectotype, *fide* Galloway 1985a: 558).

Thallus lobate, expanded, frond-like, 5-25 cm tall, attached to substratum by a rooted holdfast 1-1.5 cm wide, lobes developing from a stalk 1-2 cm tall. Lobes broadly rounded, 2-4 cm wide, sinuses prominent, ± imbricate at apices, rarely discrete, often fenestrate or torn, ± continuous centrally. Margins entire, sinuous, occasionally notched or slightly ragged, rarely secondarily lobulate, conspicuously thickened below. Upper surface bright green to olive-green when moist, pale grey-green to pale fawn when dry, undulate to unevenly pitted, punctate-impressed to subfaveolate in parts, thick, tough, rather brittle when dry, coriaceous, pliable when wet, without isidia, maculae, phyllidia or soredia. Medulla white. Photobiont green. Lower surface pale tan to dark-brown or in parts blackened, especially near stalk, costate above stalk and often ridged, bullate or subfaveolate, thinly and evenly tomentose from margins to centre. Cyphellae rounded, minute to large and prominent, 0.2-2(-4) mm diam., rather shallow, margins thin, slightly raised, pit membrane white.

Apothecia scattered, occasional to rare or absent, most prominent towards lobe apices, sessile, constricted at base, 0.5-2 mm diam., shallowly concave to plane, disc red-brown to reddish orange, matt, exciple concolorous with or paler than disc, persisting at maturity as a slightly raised, crenulate margin to disc. Hypothecium yellow-brown. Thecium colourless to pale straw, 75-90 ìm tall. Ascospores colourless, fusiform-ellipsoid with rounded or pointed apices, 1-3-septate, 22-28(-33) x 8.5-10 ìm.

Sticta latifrons is characterized by its robust holdfast, thick, terete, supporting stalk and large, thick, coriaceous lobes with entire margins and with scattered, red-brown apothecia; the lower surface is evenly short-tomentose and the cyphellae are large and rather flat. The record of this species from Lord Howe Island (Zahlbruckner 1896) refers to *S. howei*.

Distribution and ecology: New South Wales; still very poorly collected and incompletely known from Australia, with no modern collections available. No information is available on the ecological requirements of this species in Australia. The few nineteenth century specimens seen agree in all respects with material from New Zealand.

Specimens examined: NEW SOUTH WALES: Sine loco, sine collectoribus (MEL); Sine loco, C. Leichardt (MEL); "Australia felix", Dr F. v. Mueller (MEL).

14. *Sticta limbata* (Sm.) Ach., Meth. Lich.: 280 (1803). *Lichen limbatus* Sm., in Sm. & Sowerby, Engl. Bot. 16: 1104 (1803). *Stictina limbata* (Sm.) Nyl., Syn. Meth. Lich. 1(2): 346 (1860). Type: Wales, Hafod, Cardiganshire, J.E. Smith (BM! - lectotype, *fide* Galloway 1994a: 259).

Sticta limbata is characterized by broadly rounded, ± monophyllous, rather papery lobes 1-3(-7) cm diam., that are conspicuously erose-grey-sorediate along the margins (which are often also conspicuously inrolled) and often also with scattered, pustular laminal soralia near the lobe apices. It has a white medulla, a cyanobacterial photobiont, and a pale buff to mid-brown lower surface with felted woolly white or pale tomentum in which are sunk rather sparse,

conspicuous cyphellae (0.2-2 mm diam.) which occasionally may become grey-blue-sorediate. It is distinguished from *S. sublimbata* by its broader, more rounded and thinner lobes which are ± monophyllous, and by the presence of linear marginal soralia (which are not sorediate isidia), scattered laminal soralia, a pale lower surface with pale or whitish tomentum, and cyphellae which occasionally become sorediate.

A widespread cosmopolitan sorediate species of characteristic morphology. Australian material examined approximates closely to the description in Galloway (1994a).

Distribution and ecology: New South Wales, Victoria and Tasmania. Sea level to 1030 m. Also widely distributed in the Northern Hemisphere in Great Britain and Europe (Purvis et al. 1992), East Africa (Swinscow & Krog 1988), New Zealand (Galloway 1985a, 1997) and southern South America (Galloway 1994a). On understorey twigs and tree buttresses in very wet, humid, open forests in New South Wales (Kantvilas 1990); common at scrubby margins of rainforest and in some wet heaths and sclerophyll forests in Tasmania (Kantvilas & James 1987; Jarman et al. 1991; Kantvilas 1995), associating with *Collema subconveniens, Nephroma cellulosum, Pseudocyphellaria crocata, Sticta sublimbata*, and other lichens with cyanobacterial photobionts in families Collemataceae and Pannariaceae (Kantvilas 1985, 1990).

Seelected specimens examined: VICTORIA: Mt Macedon township, 1030 m, on poplar trees, 9 May 1976, J.A. Elix 2119 (ANUC); Mt Macedon, 26 January 1900, R.A. Bastow (MEL); Strezlecki Ranges, 5 August 1979, R. Filson 16721 (MEL 1026220); Apollo Bay, 10 July 1986, W.H. Ewers (MEL 1051222). TASMANIA: Montezuma Falls Track, 320 m on *Leptospermum*, sheltered, rare, 4 January 1974, G.C. Bratt 74/99 (HO 32877); Near Parrawe, 420 m, on *Cassinia*, sheltered, rare, 25 April 1973, G.C. Bratt 73/394 (HO 32874); Moulting Lagoon on the East Coast, on teatree, sheltered, 31 January 1965, G.C. Bratt & M.H. Bratt 1913 (HO 32994); Craccroft Range, Blakes Opening, Teatree Spur, on teatree, sheltered, common, 17 September 1965, G.C. Bratt & J.A. Cashin 2658 (HO 32993).

15. *Sticta marginifera* Mont., Annls. Sci. nat. Bot. sér. 2, 18: 265 (1842). *Sticta filicina* var. *marginifera* (Mont.) Mont., Annls Sci. nat. Bot. sér. 3, 18: 308 (1852). *Stictina filicina* var. *marginifera* (Mont.) Nyl., Syn. Meth. Lich. 1(2): 349 (1860). *Stictina marginifera* (Mont.) Nyl., Bull. Soc. Linn. Normandie sér. 2, 2: 53 (1868). *Lobaria marginifera* (Mont.) Trevisan, Lichenotheca Veneta exs. 75 (1869). Type: [Philippines] Manille, Gaudichaud (BM! - lectotype selected here).

Stictina marginifera var. *coralloides* Müll.Arg., Flora, Jena 65: 302 (1882). *Sticta marginifera* var. *coralloides* (Müll.Arg.) Zahlbr., Cat. Lich. Univ. 3: 395 (1925). Type: [New Caledonia] Novae Caledoniae, Monte Mu, Vieillard (G 002117! - holotype).

Thallus palmate to irregularly branched in clumps or spreading, 1-4 cm diam., developing from a thin to thick (1-4 mm), short to long stalk (2-10 mm long) arising from a rooted holdfast. Lobes flabellate to reniform to irregularly dichotomously branching, proliferating, rounded to oblong lobules attached to primary lobes by a thin, terete stalk. Margins entire or irregularly notched, thickened below, occasionally ± inrolled, with or without isidia and lobules these when present often densely developed, sometimes also with irregularly developed black cilia. Upper surface dark blue-black when moist, greyish glaucous to dark red-brown when dry, undulate to irregularly pitted to subreticulate-ridged near apices, thin, papery, rather fragile, isidiate, maculate, phyllidiate. Isidia marginal, spreading onto upper surface, terete, styliform at first becoming coralloid, often densely so, to 1.5 mm tall. Maculae minute, white, often in a well-developed reticulum, best seen when moist (x 10 lens), giving a distinctive marbled appearance to the upper surface. Phyllidia marginal, developing from isidia, to 2 mm tall, irregularly lobed. Medulla white (K-). Photobiont cyanobacterial. Lower surface white or pale buff at margins, ochraceous to red-brown centrally, commonly

ridged-striate to reticulate, bullate or puckered, glabrous and shining to minutely pubescent. Cyphellae scattered, small, pin-prick-like, margins flat or only slightly raised, to 0.05 mm diam., pit membrane white.

Apothecia not seen.

Sticta marginifera is a stalked species having a cyanobacterial photobiont, a white medulla (K-), isidiate lobe margins which become secondarily lobulate, and a glabrous to minutely pubescent lower surface with minute, scattered cyphellae. It is discussed and illustrated in Montagne (1846: 144-145; plate 146, fig. 2). It is distinct from *S. brevipes* which has flabellate lobes, thickened and down-rolled at the apices, which never become secondarily lobulate; from *S. cyphellulata* which has rather narrow, canaliculate lobes with isidiate margins which never become secondarily lobulate; and from *S. duplolimbata* which has distinctive long, black, marginal cilia and does not develop secondary lobules from the isidia.

Distribution and ecology: In Australia known from Queensland and New South Wales. Also in New Caledonia (Montagne 1846; Nylander 1861, 1868), the Philippines (Vainio 1913) and probably more widespread in the Western Pacific. In humid, deeply shaded habitats in montane rainforest in mossy rocks, rotting logs, and at the base of tree trunks. It has an altitudinal range from 700 m - 1600 m.

Selected specimens examined: QUEENSLAND: Mobo Creek, 750 m, on moist, semi-exposed rocks, 28 February 1983, H. Streimann 16937 (CBG 8302668); Mt Bellenden Ker South Peak, 1550 m, on a moist, shaded rock, a rotting log, a tree trunk, and a shrub stem, 3 March 1983, H. Streimann 27356, 27364, 27385, 17442, 27465 (CBG 8305321, 8305329, 8305338, 8305350, 8305407, 8305430); Wunburra Range, Best of All Lookout, 1005 m, on *Nothofagus moorei*, 20 August 1976, J.A. Elix 2510b (ANUC); Cardwell Range, Blencoe Creek, 740 m, on a rock, 17 June 1986, H. Streimann 36843 (CBG); Atherton Tablelands, Short Creek Falls, 720 m, 2 March 1986, G. Rambold 4853 (M); Springbrook National Park, on trunk of *Nothofagus moorei*, 22 August 1975, J.A. Elix 1125 (ANUC). NEW SOUTH WALES: Minamurra Falls, on rocks, 13 March 1975, J.A. Elix 717 (ANUC); Olney State Forest, on mossy rocks, 10 August 1981, D.L.Hawksworth 5163 (BM); Wingaree State Forest, Brindle Creek, 750 m, on exposed mossy rock, 3 September 1978, H. Streimann 6026 (CBG 7900273).

16. *Sticta martinii* D.J.Galloway, N. Z. J. Bot. 21: 198 (1983). Type: New Zealand. South Island, Canterbury, Moa Basin, Moa Creek a tributary of the Wilberforce River, on mossy rocks, 17 February 1979, I. Brown (CHR 381002 - holotype; BM - isotype).

Thallus irregularly spreading, often in ± caespitose clumps on rock or litter, 2-6(-10) cm diam., loosely attached centrally, margins and apices ascending. Lobes very variable, 2-4(-10) mm wide, broad, subrotund at margins, to canaliculate, narrow, convolute-complex-imbricate and crowded centrally. Margins rarely entire, slightly thickened below, sinuous, crisped, ± ascending, ± lacerate-incised to phyllidiate, sometimes pubescent or white-pruinose. Upper surface bright lettuce-green to olive-green suffused brown or red-brown in parts when moist, pale olive when dry, often uniformly greenish brown or red-brown in exposed habitats, undulate, wrinkled or punctate-impressed in parts, minutely white or brownish papillate (x 10 lens), internal cephalodia visible as prominent swellings, crisp, fragile, papery when dry, pliable when moist; without isidia, maculae or soredia. Phyllidia marginal, 0.1-0.5 mm wide and tall, irregular, pectinate, ± ascending. Medulla white (K-). Photobiont green. Lower surface pale tan at margins to dark-brown or blackened centrally, tomentose from margins to centre or glabrous in patches, tomentum short, even, velvety. Cyphellae conspicuous, round to irregular, 0.1-1 mm diam., margins rather flat, not often projecting from tomentum, pit membrane white.

Apothecia (not seen in Australian material) sessile to subpedicellate, sparse to numerous, solitary or 2-3 together, round to contorted through mutual pressure, 0.1-4 mm

diam., disc concave at first, soon becoming plane and then convex-undulate, pale red-brown to dark-brown or brown-black, exciple pale flesh-coloured or whitish (translucent when moist), inflexed at first, thin at maturity and then crenate-striate, often ± denticulate or corrugate-scabrid or pubescent. Thecium colourless, 50-70 ìm tall. Epithecium red-brown, granular, 8-12 ìm thick. Ascospores colourless, elongate-ellipsoid with pointed apices, 20-30 x 5-8.5 ìm.

Sticta martinii is characterized by its ascending, lacerate-phyllidiate lobe margins which may occasionally be white-pruinose or pubescent, and the fragile, somewhat papery lobes. It has a white medulla (K-), a green photobiont, and forms rather pulvinate thalli. It is distinguished from *S. baileyi*, which has larger and flatter lobes and a different ecology.

Distribution and ecology: In Australia from Queensland to Tasmania. Also in New Zealand (Galloway 1985a, 1997). Throughout most of its known range *S. martinii* is a subalpine to alpine grassland species growing on soil, litter underneath shrubs, on exposed rocks and in moist crevices between rocks and boulders, with an altitudinal range of 120 m - 1760 m.

Selected specimens examined: QUEENSLAND: McPherson Range, Coomera River, 21 May 1951, P.F. Morris (MEL 1021793). NEW SOUTH WALES: Blue Lake. 7 km NE of Mt Kusciusko, 1900 m, grassland with scattered shrubs on dry rock face, S aspect, between boulders in moist, shaded situations, 5 December 1979, H. Streimann 9641 (BM, CBG 800495); Kosciusko National Park, Charlotte's Pass Chalet, 1760 m, on granitic boulders, 16 January 1986, G. Rambold 3552 (M). VICTORIA: The Niggerheads, Bogong High Plains, on exposed rock, 25 January 1967, R. Filson 9573 (MEL 1036065). TASMANIA: Track to Lakes Belton and Belcher, 1200 m, on soil, sheltered, rare, 12 November 1974, G.C. Bratt & J.A. Cashin 74.1200 (HO 32876); Ben Lomond National Park, on litter under shrubs, 1967, D. McVean 6767 (CNG 8410550).

17. *Sticta myrioloba* (Müll.Arg.) D.J.Galloway, *comb. & stat. nov.*
Sticta filix var. *myrioloba* Müll.Arg., Flora, Jena 65: 254 (1886). Type: Australia.[New South Wales] McLeay River, Aug. Rudder ex Baron Ferd. v. Mueller 1882 (G 002074! - lectotype selected here). See also Filson (1986: 275). Fig. 10.

Thallus irregularly palmate, 2-8(-12) cm diam., attached to substratum by a rooted holdfast from which arises a dark brown-tomentose, terete to ± flattened stalk, 2-10(-12) mm long and 1-3 mm diam. Lobes proliferating from basal stalk, linear-laciniate to irregularly branched, 2-8(-12) mm wide, 5-15(-30) mm long, discrete, contiguous or complex-imbricate. Margins conspicuously and often densely phyllidiate, larger lobes distinctly thickened-ridged. Upper surface bright-green when moist, pale grey-green to olivaceous or greenish buff when dry, undulate to here and there shallowly pitted, smooth, occasionally shining in parts, to subcanaliculate in mid line, coriaceous, brittle when dry, pliable when moist; without isidia, maculae or soredia. Phyllidia mainly marginal, often densely congested, developing along tears or holes in upper surface, very variable, ± rounded to irregularly squamiform, to complex-branched or coralloid, lower surface pale, shining, glabrous, with small cyphellae. Medulla white (K-). Photobiont green. Lower surface pale, whitish to buff, shining and glabrous at margins, pale to dark-brown centrally, conspicuously ribbed centrally, tomentose centrally, glabrous at margins, tomentum short, rather sparse, to thick and felted, pale brownish to ± blackened. Cyphellae numerous, thelotremoid, round to irregular, 0.1-0.5(-1) mm diam., margins swollen, glabrous, concolorous with lower surface, deeply urceolate, pit membrane white.

Apothecia rare (only seen twice), sessile, constricted at base, round to irregular, 0.5-3(-4) mm diam., disc subconvex to plane, orange-yellow, matt, exciple pale pinkish white, roughened-scabrid, obscuring disc at first, excluded at maturity. Hypothecium orange-brown, unchanged in K, to 55 ìm thick. Thecium pale straw-yellow, 70-110 ìm tall. Epithecium orange-brown, orange in K, to 15 ìm thick. Asci

Fig. 10 *Sticta myrioloba*. Lectotype *S. filix* var. *myrioloba* (G). Scale in mm.

cylindrical, 110-120 x 15-20 ìm. Ascospores colourless, fusiform-ellipsoid with pointed ends, 1-septate, (22-)25-36.5(-41.5) x 7-8.5(-11) ìm.

Sticta myrioloba is a stalked species with a white medulla (K-), a green photobiont, linear-laciniate, irregularly branched lobes with densely phyllidiate margins, and minute, thelotremoid cyphellae on the lower surface. It is distinguished from *S. filix* by the densely phyllidiate lobe margins and the dense development of phyllidia on the upper surface around tears and cracks, the shorter supporting stalk, the thicker, darker and more felted tomentum, the sparsely developed apothecia and the larger spores.

Distribution and ecology: In Australia known from Queensland and New South Wales. Also in Papua New Guinea and possibly more widely distributed in the Western Pacific. An epiphyte of lowland to montane rainforest growing on trunks and branches of trees and shrubs, palms and vines, with an altitudinal range of 600 m - 1100 m.

Seelected specimens examined: QUEENSLAND: Toowoomba, Hartmann (G); Great Dividing Range, Mt Baldy 1080 m, on treelet stem and base of *Araucaria*, 24 June 1984, H. Streimann 29246, 29296, 20396 (CBG 8407374, 8407424, 8407434); Natural Arch National Park, on trunk of large *Ficus macrophylla*, 22 August 1975, J.A. Elix 1118 (ANUC); Eungella National Park, trail to Mt Dalrymple summit, 100-1100 m, on bark, 19 February 1986, G. Rambold 4605 (M); Lake Barrine, 20 July 1946, H. Flecker 1031 (MEL); Windsor Tableland, 1080 m , on a vine and shrub branches, 26 June 1984, H. Streimann 29671 (CBG 8407842). NEW SOUTH WALES: Richmond River, Camara, sine collectoribus (MEL); Tweed Range, Wianaree State Forest, Brindle Creek, 3 August 1988, G. Kantvilas 532/88 (BM).

18. *Sticta pedunculata* Kremp., J. Mus. Godeffroy 1: 97 (1873). Type: Samoa. Sawai, “in Gebirgs-Waldungen”, Dr Graeffe (M! - holotype).

Thallus irregularly monophyllous, 2-5 cm tall, attached by a rooted holdfast, the lobes proliferating directly from the holdfast or from a short stalk. Lobes broadly rounded, 5-15 mm wide, reniform to sublinear. Margins entire, thickened below, often inrolled at apices, not secondarily lobulate. Upper surface bright lettuce-green to deep olive-green when moist, pale green-grey or olivaceous-buff when dry, irregularly punctate-impressed or dimpled, ± subfaveolate at apices, shining or matt, thin, papery when dry, flabby when moist, with here and there irregularly coralloid to complexly branched, projecting tufts of *Dendriscocaulon*-like outgrowths; without isidia, maculae, phyllidia or soredia. Medulla white (K-). Photobiont green, Lower surface whitish to very pale tan, ± glabrous, shining or occasionally thinly and minutely tomentose in central parts, here and there irregular tufts of *Dendriscocaulon* project. Cyphellae occasional, large, widely scattered centrally, to 2 mm diam., flat, margins narrow, not much raised, minute, pin-prick-like at margins, pit membrane white.

Apothecia not seen in Australian material.

Sticta pedunculata is a stalked species having a green photobiont, a white medulla (K-), rounded to tapering, lanceolate to reniform lobes which are rather thin and papery in texture, with a dimpled upper surface and outgrowths of *Dendriscocaulon* occasionally developing from both upper and lower surfaces. The margins are entire and without development of secondary stalked lobules. The lower surface is mainly glabrous with here and there pubescent patches of thin tomentum; and the cyphellae are widely scatterd, large (to 2 mm diam.). It is distinguished from *S. sayeri* by the shorter stalk, the shorter, broader, more papery lobes and the larger cyphellae. An illustration is given in Krempelhuber (1873).

Distribution and ecology: Queensland at Lat. 17 °S. Also known from Samoa (Krempelhuber 1873), Fiji, New Guinea and the Solomon Islands. An epiphyte of rainforest trees. Still very poorly collected and incompletely known in Australia.

Specimen examined: QUEENSLAND: Bellenden Ker National Park, Boulders area, 6 km W of Babinda, 70 km S of Cairns, 50 m, March 1988, A. & M. Aptroot 22416 (Herb. Aptroot).

19. *Sticta rutilans* (Stirt.) Zahlbr., Cat. Lich. Univ. 3: 398 (1925). *Stictina rutilans* Stirt., Trans. Proc. R. Soc. Vict. 17: 68 (1881). Type: Australia. Queensland: Brisbane, F.M. Bailey (BM! - lectotype, *fide* Rogers [1982: 508]). Fig. 11.

?*Stictina macrocarpa* var. *speirocarpa* Nyl, Flora, Jena 52: 118 (1869). *Sticta macrophylla* f. *speirocarpa* (Nyl.) Hue, Nouv. Archs Mus. Hist. nat. Paris sér. 4, 3: 98 (1901). Type: "Nova Hollandia" [Australia], sine loco, sine collectoribus (H-NYL - not seen).

Thallus irregularly spreading, 5-10(-15) cm diam., loosely attached centrally or more generally over the lower surface by anchoring tufts of felted, black rhizines. Lobes broadly rounded, 1-3 cm diam., usually imbricate-folded, ± contiguous, rarely discrete from apices to centre. Margins entire, sinuous, noticeably thickened below, occasionally also with an inrolled rim in parts, frequently with projecting black tomental hairs and appearing furry, here and there phyllidiate, and appearing subpectinate in parts. Upper surface dark olivaceous blue-black suffused red-brown when moist, greyish, glaucous to dark red-brown when dry, undulate, shallowly and irregularly wrinkled or pitted, matt or shining, tough, coriaceous, maculate, phyllidiate; without isidia or soredia. Maculae minute, white (x 10 lens), giving a marbled appearance to the upper surface when moist. Phyllidia occasional at margins or regenerating from laminal cracks and tears, 1-2 mm tall and wide, constricted at base, margins often conspicuously hairy. Medulla white to somewhat yellowish, K+ yellow or orange. Photobiont cyanobacterial. Lower surface dark brown to black, ± thickly and evenly tomentose from margins to centre, tomentum dark brown or black, in discrete tufts at or near margins, entangled-felted centrally. Cyphellae conspicuous, 0.1-2(-3) mm diam., deeply sunk in tomentum, margins swollen, often inapparent, pit membrane white.

Apothecia occasional, rare or absent, very widely scattered when present, laminal towards apices, sessile, constricted at base, 1-3 mm diam., disc matt, red-brown to dark-brown, exciple pale whitish or buff, prominent in young fruits and then obscuring disc, persisting at maturity as a thin, scabrid, irregular margin to disc. Hypothecium orange-brown to red-brown, intensifying to yellow-orange in K, 60-70 ìm thick. Thecium orange-yellow to yellow-red, intensifying in K, 80-100 ìm tall. Epithecium red-brown to orange-brown, strongly orange-yellow in K, 15-20 ìm thick. Asci cylindrical, 80-110 x 15-20 ìm. Ascospores colourless, fusiform, 1-3-septate, (25-)28-36(-42) x 7-8.5(-10) ìm.

Sticta rutilans has a cyanobacterial photobiont, a white to yellow medulla which is K+ yellow or orange, broadly rounded lobes with entire, sinuous margins with projecting black tomentum giving a furry appearance, occasional phyllidia developing from laminal cracks and tears and lacking isidia. It has a thickly tomentose, brown to black lower surface in which are sunk large, urceolate cyphellae. It is distinguished from *S. macrophylla* Delise, which has a K- medulla and larger lobes which are never phyllidiate or with projecting black tomentum, but occasionally have *Dendriscocaulon*-like outgrowths; and from *S. subtomentella* which is a similar broad-lobed species, with lobes developing from a rooted holdfast and with a K- medulla, the lobes never having tomentose or phyllidiate margins. The K+ yellow-medulla species *S. diversa*, has smaller and more irregular lobes than *S. rutilans*, and also has marginal isidia.

Distribution and ecology: Apparently endemic to Australia where it is known from Queensland and New South Wales. On mossy rocks and tree trunks in humid, shaded habitats in montane rainforest, between 900 m - 1400 m. Still poorly collected and imperfectly known.

Specimens examined: QUEENSLAND: Toowoomba, Hartmann (BM). NEW SOUTH WALES: S of Corker Mountain, 1200 m, on moist rocks, 30 June 1988, G. Kantvilas 259/88 (BM); New England National Forest, 2

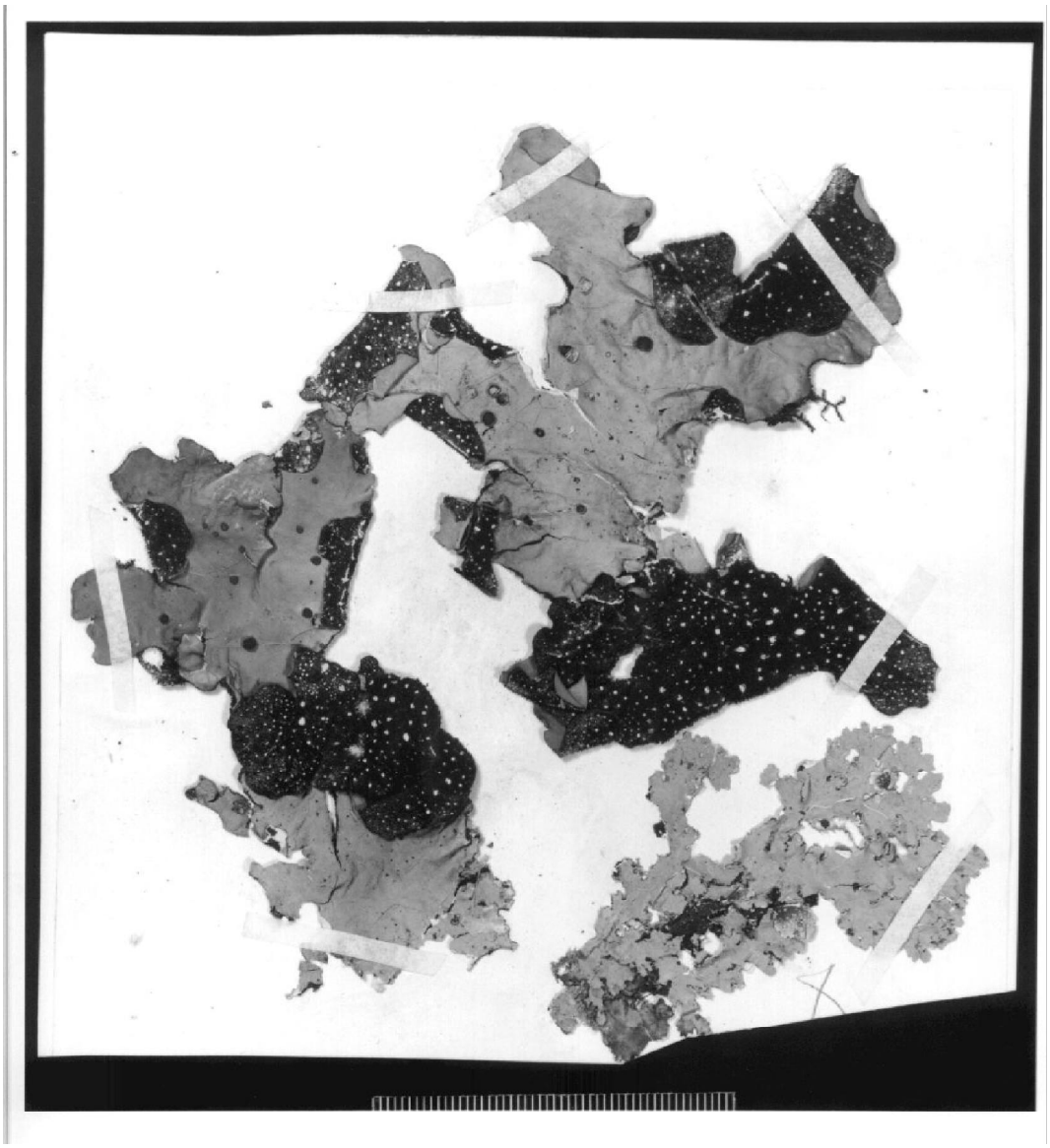

Fig. 11 *Sticta rutilans*. Victoria: Hastings River, D. Beckler (BM). Scale in mm.

September 1981, M.E. Hale 58806 (US); Gloucester Tops, Darby Munro Hut, on rock, 26 October 1963, R. Filson (MEL 1021826); New England National Park near Point Lookout, 1350 m, 12 October 1981, H. Mayrhofer & J. Williams 3114-5 (GZU); Hastings River, D. Beckler (BM); New England National Park, Lyrebird Track, 6 February 1986, G. Rambold 4341 (M).

20. *Sticta sayeri* Müll.Arg., Flora, Jena 71: 28 (1888). Type: Australia. Queensland, Bellenden Ker, Sayer (G 002159! - holotype; MEL! - isotype). See also Filson (1986: 281). Fig. 12.

Thallus of ± rounded to reniform, irregularly lanceolate to subdichotomously branching upright lobes 1.5-5(-8) cm tall, connected to a rooted holdfast by smooth, terete stalks 0.5-2 mm diam. and 3-10 mm tall, black at

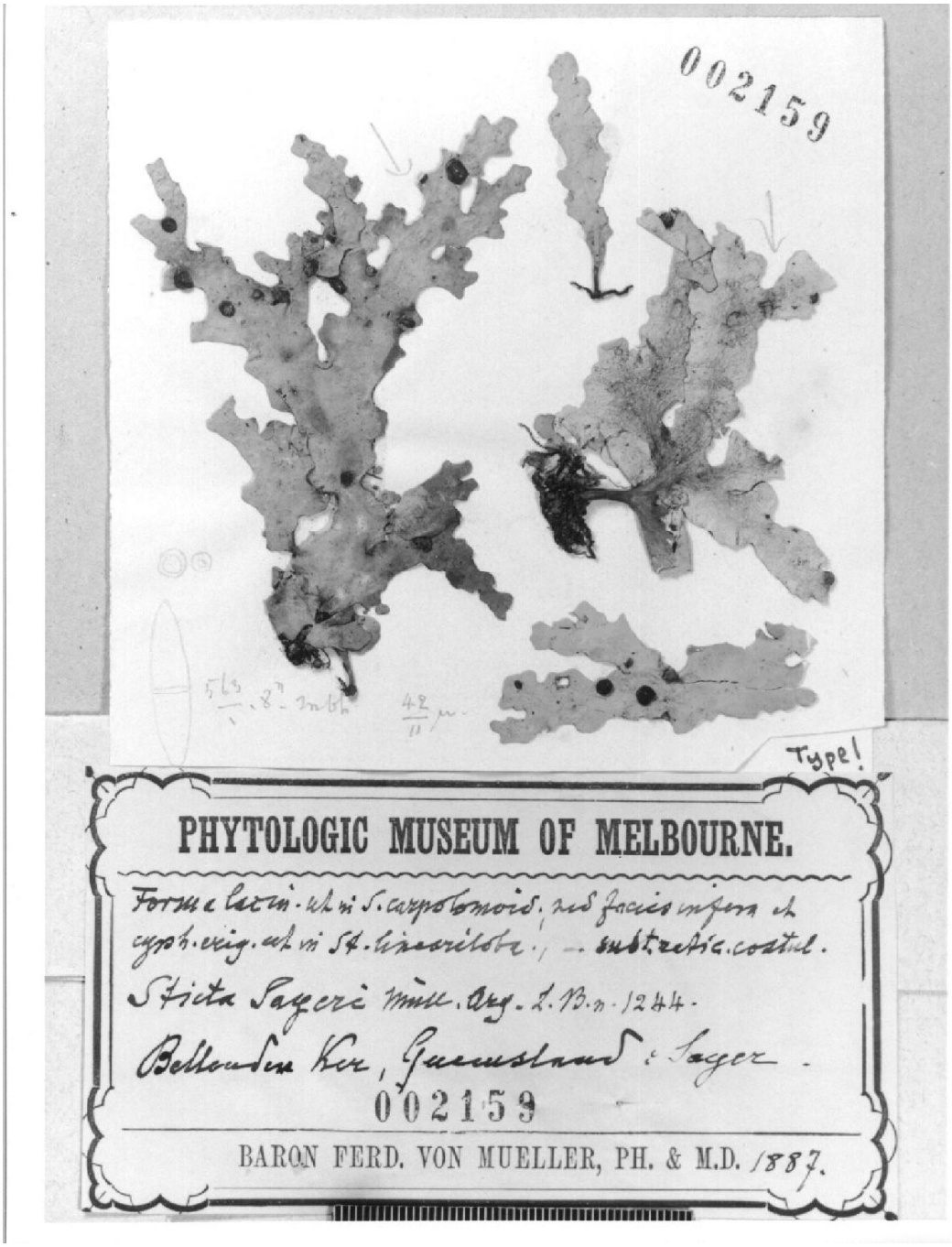

Fig. 12 *Sticta sayeri*. Holotype (G 002159). Scale in mm.

base, pale buff to ivory above, the black holdfast interconnecting with other thalli by thick, black rhizoids. Lobes linear-laciniate to irregularly lanceolate, simple or dichotomously branched, 2-8(-15) mm wide, apices rounded, truncate or shallowly furcate, conspicuously grooved at insertion of stalk, sinuses rounded and distinctly thickened. Margins entire, shallowly sinuous to irregularly notched, slightly thickened below, occasionally with small to large stalked secondary lobules attached; without isidia, phyllidia or soredia. Upper surface bright lettuce-green to olive-green when moist, pale grey-green when dry, smooth to irregularly wrinkled or pitted, matt or shining in parts, ± canaliculate centrally, firm, coriaceous when dry, pliable when moist; without isidia, maculae, phyllidia or soredia. Medulla white (K-). Photobiont green. Lower surface glabrous, shining, smooth, ivory or white at margins to pale buff, irregularly wrinkled, ridged or puckered and ± costate centrally near stalk, without tomentum. Cyphellae minute, 0.1 mm diam. or less, shallow, scattered, pin-prick-like, margins pale, slightly swollen.

Apothecia occasional to rare, marginal and laminal, sessile, constricted at base, insertion of pedicell leaving a pronounced depression on the lower surface, 1-3(-5) mm diam., plane to convex, disc shining at first becoming matt, pale to dark red-brown, exciple corrugate-scabrid, dark brown or black, conspicuous at first, ± excluded at maturity. Hypothecium red-brown, unchanged in K, 40-55(-80) ìm thick. Thecium pale straw-yellow, 100-110(-170) ìm tall. Epithecium orange-red to orange-brown, unchanged in K, 10-25 ìm thick. Asci cylindrical, 100-140 x 15-25 ìm. Ascospores colourless to pale greenish, ellipsoid, 1-3-septate, (24-)33.5-44.5(-50) x 8-11(-14) ìm.

Sticta sayeri is a stalked species (stalk long, terete, prominent), with a green photobiont, a white medulla (K-), irregularly lanceolate to subdichotomously branching upright lobes, with entire margins. Occasionally small tufts of *S. marginifera* may develop from basal rhizoids or rarely from lobe margins or from the upper upper surface. The lower surface is glabrous, shining, ivory or whitish, and the cyphellae are minute, thelotremoid. For differences with *S. pedunculata* see above.

Distribution and ecology: Queensland and New South Wales. Also known from New Guinea and possibly more widely distributed in the Western Pacific. Amongst mosses, its long stalks anchoring it to tree trunks, rotting logs or mossy rocks in stream beds in montane rainforest between 750 m - 1592 m.

Specimens examined: QUEENSLAND: Mt Lewis, 1000 m, on granite boulders and creek edge, 2 February 1983, D. Verdon 5369, 5398 (CBG 8301473, 8301502); Upper Mossman River, on bark of tree, 20 September 1936, H. Flecker (MEL); Mt Bellenden Ker, 1550 m, on tree trunk and rotting log, 3 March 1983, H. Streimann 27385, 37427, 27442 (CBG 8305350, 8305392, 8305407); Mr Bartle Frere, 28 October 1939, H. Flecker (MEL); Wunburra Range, Best of All Lookout, 1005 m, on sunny rocks, 28 March 1948, A Vievens (MEL); Centre Peak, Bellenden Ker, along trail from telecom Cable Car Station to North Peak, 15 January 1993, N. Sammy (Herb. Sammy). NEW SOUTH WALES: Brindle Creek, 750 m, on exposed mossy rock in creek, 3 September 1978, H. Streimann 6205 (CBG 7900272).

21. *Sticta stipitata* C.Knight ex F.Wilson, Proc. Roy. Soc. Queensland 7: 10 (1891). Type: Australia. Victoria. Mt Macedon, on tree, Rev. F.R.M. Wilson (G 002326! - lectotype selected here). See also Filson (1986: 281). Fig. 1.

Sticta shirleyana Müll.Arg., Hedwigia 32: 122 (1893). Type: Australia. Queensland, 1891, Shirley (G 002063! - holotype). See also Filson (1986: 281).

Thallus irregularly spreading, ± palmate, 2-6(12) cm diam., often confluent, from a rooted holdfast 5-12 mm diam. Lobes proliferating directly from holdfast or from a short, thick stalk to 5 mm wide and tall, very irregular, laciniate, strongly dissected, 5-10(-15) mm wide, 1-6 cm long, sinuses prominent, rounded or acute. Margins entire, sinuous, ± ascending and inrolled near apices, variously

notched, incised or lobulate, occasionally with small projecting tomental hairs, slightly thickened-ridged below. Upper surface bright lettuce-green to deep olive-green when moist, pale grey-green or olivaceous to pale buff when dry, undulate, occasionally shallowly wrinkled, pitted or dimpled, rather brittle when dry, pliable when moist; without isidia, maculae, phyllidia or soredia. Medulla white (K-). Photobiont green. Lower surface pale whitish to tan or brownish at margins, darkening centrally, tomentose from margins to centre, tomentum short, even, velvety, occasionally shaggy in parts, whitish or pale tan to brownish. Cyphellae scattered, prominent, round to irregular, 0.2-2 mm diam., deeply urceolate, margins thin, sharply defined, slightly raised, pit membrane white.

Apothecia frequent, marginal and laminal, most common towards lobe apices, sessile, constricted at base, 0.5-3(-4) mm diam., plane to convex, disc matt, pale orange-brown to dark red-brown, exciple pale whitish or buff, minutely scabrid, persisting as a narrow, entire to subcrenulate margin to disc. Hypothecium red-brown, unchanged in K, 30-50 ìm thick. Thecium colourless to pale straw, 90-100 ìm tall. Epithecium red-brown, 8-11 ìm thick. Ascospores colourless, with rounded or pointed apices, 1-3-septate, (25-)30.5-36(-44.5) x 7-8.5(-11) ìm.

Sticta stipitata is a short-stalked species with a green photobiont, a white medulla (K-), rather variable, dissected, fragile lobes with entire margins without isidia or phyllidia. The absence of isidia and phyllidia and the shorter stalk distinguish it from *S. filix* and *S. myrioloba*, and the shorter stalk and the smaller, more dissected, fragile lobes separate it from *S. latifrons* and *S. camarae*. It forms photosymbiodemes with *Dendriscocaulon dendriothamnoides* Dughi ex D.J.Galloway, a phenomenon first recorded by Wilson (1891, 1893) and subsequently discussed by Cheel (1910, 1912: 266-267); James & Henssen (1976) and Kantvilas (1985, 1995). The species is extremely variable, Kantvilas (1985) noting "...In such habitats [in the upper parts of trees, at forest margins or in alpine situations beneath shrubs or in rock crevices] the lobes are usually more divided, narrow, suffused brownish and the underside is darker brown and markedly wrinkled. When growing in a thick mat of bryophytes, the basal stalk may be almost absent and the thallus is secondarily attached by parts of the underside". It is illustrated in Kantvilas (1995: 94).

Distribution and ecology: New South Wales to Tasmania. Common and widespread in many rainforest and wet sclerophyll communities in Tasmania, especially occurring in moist, shaded, habitats, typically among bryophytes at the base of trees or on logs and rocks (Bratt 1972, 1975, 1976; Kantvilas 1985, 1988; Kantvilas et al. 1985; Kantvilas & James 1987; Jarman et al. 1991). Rundel et al (1979) discuss physiological responses of Tasmanian populations of *S. stipitata* (as *S. filix*) and show that it is absent from areas where precipitation is less than 1200 mm p.a., and that its low light compensation point accounts for its relative dominance in shady forest habitats. It has an altitudinal range from 170 m - 1606 m.

Selected specimens examined: NEW SOUTH WALES: Williams River, 0.5 km NE of Barrington Guest House, epiphytic in subtropical rainforest, 2 July 1988, G. Kantvilas 358/88 (HO); Kosciusko National Park, Pipers Creek, 1400 m, on moist, shaded rock face, 6 April 1981, H. Streimann 145349 (CBG 8102007); Kangaroo Valley, 22 May 1940, Rodway (BM). VICTORIA: Apollo Bay, F. v. Mueller (BM); Cape Otway, Railway Reservation between Lavers Hill and beech forest, 21 September 1963, R. Filson 5344 (MEL 27202); Turtons Pass, 430 m, on tree trunk, 24 August 1975, H. Streimann 2418 (CBG 061725); Bogong High Plains, on trunks of *Podocarpus lawrencei*, February 1948, P.N.S. Bibby (MEL). TASMANIA: Western side Maydena Range, Styx Road, 600 m, on dead wood, sheltered, not common, 6 October 1969, G.C. Bratt, M.H. Bratt & W.S.T. 689/69 (HO 32922); Hellyer Gorge, 23 February 1968, W.A. Weber & D. McVean (COLO 232591, 233193, 234601); 12 km NE of Zeehan, on dead wood, 20 January 1979, J.A. Elix 5666 (ANUC): Mt Wellington, 500 m., on dead wood, 16 January 1979, J.A. Elix 5580 (ANUC); Florentine Valley, 450 m, occasional on *Nothofagus cunninghamii*,

27 July 1980 & 10 April 1981, G. Kantvilas 236/81, 157/80 (BM); Little Fisher River, 800 m, 19 August 1982, G. Kantvilas 218/82 (BM); Federation Peak, 1100 m, under boulders, 29 December 1964, R. Filson 6702 (BM, MEL 27211); Crater Peak, 1200 m, on shrubs, stems and soil, 16 February 1984, P. James & G. Kantvilas 418/84 (BM).

22. *Sticta sublimbata* (Steiner) Swinscow & Krog in D.J.Galloway, N. Z. J. Bot. 21: 198 (1983). *Stictina weigelii* var. *sublimbata* Steiner, Bull. Herb. Boissier sér. 2, 7: 642 (1907). *Sticta weigelii* var. *sublimbata* (Steiner) Zahlbr., Cat. Lich. Univ. 3: 406 (1925). Type: South Africa. Cape Province, Sanatorium 'Mamotsuiri', 1000 m, Henri A. Junod 983 (W - holotype - not seen).

Sticta sublimbata is a characteristic tropical species having wavy or irregular, sorediate margins. It is known from the Caribbean, East Africa (Swinscow & Krog 1988), southern South America (Galloway 1994a) and New Zealand (Galloway 1985a, 1997). Tasmanian material examined closely approximates the description given in Galloway (1994a, 1997).

Sticta sublimbata is characterized by a white medulla; a cyanobacterial photobiont; rather thick, coriaceous lobes (3-9 cm diam.) which are wrinkled-undulate, dark red-brown to grey-brown and slightly shining in parts, reminiscent of species of *Peltigera*. It has characteristic linear, marginal soralia and occasional laminal soralia, with grey-brown granular soredia derived from minute, granular-coralloid isidia, and a dark brown to black lower surface, with prominent, scattered white cyphellae (0.2-3 mm diam.) deeply sunk in the tomentum and with prominent margins. Tasmanian material is not known fertile. The species is distinguished from *S. limbata* by its thicker, more coriaceous, rather variable lobes, which are never broadly monophyllous, and in its having sorediate isidia instead of primary soralia.

Distribution and ecology: Tasmania, where it is rare, in montane sites from 300 m - 1120 m (Kantvilas 1988; Kantvilas et al. 1985; Kantvilas & James 1987; Jarman et al. 1991; Kantvilas 1995). Also known from New Zealand (Galloway 1985a, 1997), East Africa (Swinscow & Krog 1988) and southern South America (Galloway 1994a). In sheltered, humid habitats on understorey shrubs and trees (*Acacia, Bedfordia, Cassinia aculeata, Cyathodes, Eucalyptus, Phyllocladus, Telopea*) in open rainforest amongst mosses and other lichens.

Selected specimens examined: TASMANIA: 1.6 km S of Tarraleah Turnoff, on *Acacia* & *Cassinia*, sheltered, rare, 19 December 1976, G.C. Bratt & J. Engel 76/1199 (HO 33002); Lake Track, 0.8 km from Cynthia Bay, 4.6 km NW of Derwent Bridge, 740 m, on *Phyllocladus* & *Telopea*, shelterd and open, rare, 7 October 1972, G.C. Bratt & J.A. Cashin 72/1076 (HO 32867); Nelson River, Bradshaw's Road, 300 m, on *Cassinia aculeata*, medium shade, common, 2 January 1966, G.C. Bratt 3028 (HO 32976); Montezuma Falls Track, Williamsford end, 320 m, on *Cassinia*, sheltered, common, 4 January 1974, G.C. Bratt 74/98 (HO 32981); Maestri Mine, Dundas, 260 m, on dolly bush, sheltered, uncommon, 2 April 1972, G.C. Bratt & M.H. Bratt 72/150 (HO 32861).

23. *Sticta subtomentella* (C.Knight) Zahlbr., Cat. Lich. Univ. 3: 399 (1925). *Stictina subtomentella* C.Knight ex Shirley, Proc Roy.Soc. Queensland 6**:** 24 (1889). Type: Australia. Queensland, Mt Mistake, Sept. 1885. Mr F.M. Bailey communicated by Miss F.M. Campbell (NSW! - holotype; G! , WELT [Knight Herb. Vol. 12: 16]! - isotypes). See also Filson (1986: 285). [Note 1]. Fig. 13.

Stictina suborbicularis Müll.Arg., Nuovo Giorn. bot. Ital. 23: 387 (1891). *Sticta suborbicularis* (Müll.Arg.) Zahlbr., Cat. Lich. Univ. 3: 399 (1925). Type: Australia. Queensland, Brisbane, 1887, Bailey (G 002058! - holotype; G 002050!, G 002046!, G 002049! - isotypes). See also Filson (1986: 285). [Note 2].

Note 1: Isotype material in Charles Knight's

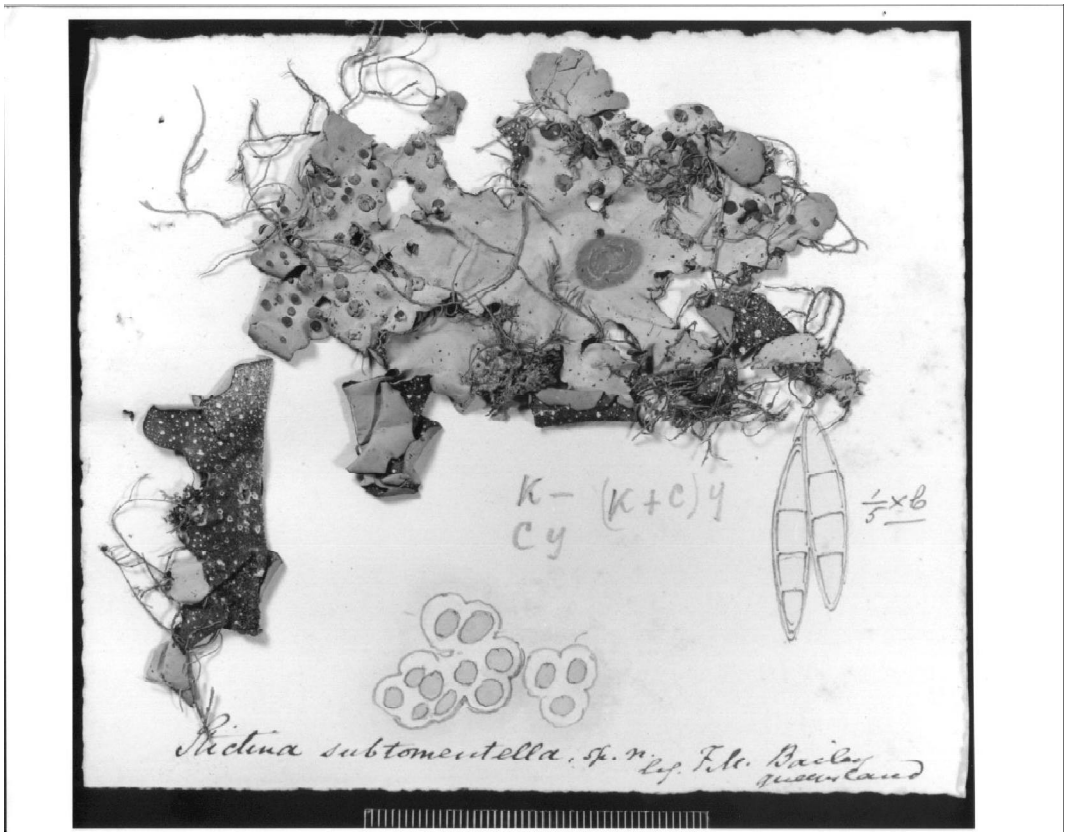

Fig. 13 *Sticta subtomentella*. Isotype, Herb. C. Knight Vol. 12:16 (WELT). Scale in mm.

herbarium (WELT) has a Latin description of the new species and the following comments in Knight's hand which were printed with a few minor alterations in the protologue, "Differs v. *St. tomentosa* in the ap being scattered never marginal & the lobes - thallus non laciniate - from *St. tomentella* in the surface - the thallus being eminently smooth & free from inaequalities, the cyphellae eminently white & the spores elongato fusiform".

Note 2: A specimen of *S. subtomentella* in Charles Knight's herbarium (WELT Vol. 12: 16) is annotated by Knight "*Sticta subtomentella* sp.n. leg F.M.Bailey, sent to Dr Muller Geneva" and is obviously part of the material on which Müller Argoviensis described *Stictina suborbicularis*.

Thallus broadly rosette-forming to irregularly spreading, 5-10(-15) cm diam., monophyllous to subpolyphyllous, arising directly from a broad basal holdfast 5-10 mm diam., or very shortly stalked. Lobes broadly rounded, 1-3(-6) cm wide, without isidia, phyllidia or soredia. Margins entire, sinuous, very shallowly scalloped, conspicuously ridged below, commonly minutely tomentose or with dark brown tomentum projecting from lower surface. Upper surface dark slatey blue-grey when wet, pale greyish, olivaceous, suffused red-brown at margins when dry, smooth, plane to subundulate, occasionally slightly wrinkled or pitted, flabby, pliable when wet, tough, rigid, coriaceous when dry, maculate, without isidia, phyllidia or soredia. Maculae minute, white, scattered, effigurate.

Medulla white (K-). Photobiont cyanobacterial. Lower surface whitish or pale buff, often obscured by thick, dark tomentum, tomentose from margins to centre, tomentum brown-black, thin and fine to thick and shaggy. Cyphellae large, prominent, round to ± angular (0.1-)0.5-2(-3) mm diam., flat, sunk in tomentum or obscured by tomentum, margins thin, only slightly raised, pit membrane vivid white, minutely granular.

Apothecia occasional to common and sometimes crowded, mainly laminal, occasionally marginal, sessile, constricted at base, 1-2(-3) mm diam., plane to subconvex, disc matt, pale to dark red-brown, exciple whitish buff, smooth to minutely granular, conspicuous in young fruits, ± excluded at maturity. Hypothecium pale orange-yellow, opaque. Thecium pale straw yellow, to 70 ìm tall. Epithecium red-brown, 10-12 ìm thick. Ascospores colourless, fusiform, 1-septate, 28-36(-42) x 7-8.5 ìm.

Sticta subtomentella is a short-stalked species having a cyanobacterial photobiont, a white medulla (K-), and broadly rounded lobes with entire margins without isidia or phyllidia. For differences between *S. subtomentella* and other broad-lobed cyanobacterial taxa, *S. diversa*, *S. macrophylla* Delise, *S. rutilans*, see above under *S. rutilans*. The widely distributed neotropical and palaeotropical species *S. tomentosa* (Sw.) Ach. (Galloway 1994b) is distinct from *S. subtomentella*, having orbicular, rosette-forming, rather papery lobes which are not attached by a holdfast, and it has marginal apothecia with silky-tomentose margins, and a pale lower surface, as correctly pointed out by Charles Knight (Shirley 1889a: 24) in his comment qualifying the original description of *S. subtomentella*.

Distribution and ecology: Aparently restricted to Queensland and New South Wales. *S. subtomentella* is epiphytic on mossy tree trunks on shrubs in deeply shaded montane rainforest where it has been collected from 690 m - 1400 m. It is still relatively poorly collected and incompletely known.

Specimens examined: QUEENSLAND: Binna Burra National Park, Mt Merino, 8 December 1958, H. & E. Walter (M); "Moss Garden" along Qld-NSW border, 800 m, 4 September, M.E. Hale 58844 (US); Darling Downs, H. Lau (MEL); McPherson Range, Coomera River, 21 May 1951, P.F. Morris (MEL 1025995); Toowoomba, Hartmann (MEL); Binna Burra National Park, near summit of Tullawal on Border Track, 10 April 1993, N. Sammy (Herb. Sammy). NEW SOUTH WALES: Clyde Mountain, 690 m, on bark near the base of large eucalypt, 19 June 1975, J.A. Elix 971 (ANUC); 17 km W of Dorrigo along the Armidale Road, 1080 m, on *Leptospermum*, 17 August 1976, J.A. Elix 2360 (ANUC); below Point Lookout, S. Brownlie A 70a (MEL 1023411); Blue Mountains, A.B. Oldfield (US).

24. *Sticta variabilis* Ach., Lichenogr. Universalis: 455 (1810). *Lobaria variabilis* (Ach.) Trevis., Lichenotheca Veneta Ser.I. Fasc. II: 75 (1869). Type: Réunion, ad truncos vetustos sylvarum, Bory de St-Vincent (PC-THURET! - lectotype, *fide* Galloway 1995b: 150).

Thallus irregularly spreading, 2-5(-10) cm diam., loosely attached centrally, margins free and ascending. Lobes irregularly laciniate, ± dichotomously to complexly branching, often with a central primary lobe which is also ± grooved-canaliculate, from which lateral lobes repeatedly branch, often with proliferating marginal phyllidia, discrete or imbricate at apices, complex-entangled centrally, occasionally lacerate or fenestrate in older parts. Margins entire to irregularly divided or ragged, often becoming secondarily lobulate or phyllidiate, apices acute, rounded or furcate. Upper surface pale to dark olive-green when wet, pale grey-green or olivaceous when dry, irregularly shallowly wrinkled to ± plane or undulate, matt or shining, very crisp and fragile, easily damaged when dry; without isidia, maculae or soredia. Phyllidia marginal, simple to 1-3-branched, 1-3 mm tall, constricted at base. Medulla white (K-). Photobiont green. Lower surface white to pale tan, glabrous from margins to centre, glossy or matt, noticeably costate centrally. Cyphellae frequent, minute, pin-prick-like, 0.1 mm diam.,

rarely to 1 mm diam., round to irregular, rather flat, margins not raised, pit membrane white.

Apothecia not seen.

Sticta variabilis is characterized by a white medulla (K-), a green photobiont, and highly dissected lobes with characteristic, fragile phyllidia; the lower surface is glabrous and costate centrally, the cyphellae are minute, thelotremoid. The narrow, dissected lobes distinguish it from *S. baileyi* and *S. martinii*. It is illustrated in Galloway (1995b: 151).

Distribution and ecology: Queensland and New South Wales. Also in East Africa (Swinscow & Krog 1988 [as *S. papyracea*]), Réunion, Mauritius, Comoro Islands (Hue 1901a; Galloway 1995b) and Papua New Guinea (Lauterbach 1929: 566). On mossy rocks in montane rainforest, but still very poorly known and collected.

Specimens examined: QUEENSLAND: McPherson Range, near Binna-Burra Lodge, 800 m, on rock, 1 February 1953, R.D. Hoogland 3144 (L); On the way to Coomera River, 21 May 1951, P.F. Morris (MEL 1021799); Springbrook Plateau, Best of All Lookout, on moss covered rock, 8 October 1983, G.N. Stevens 4295 (BRIU); Lamington National Park, Tullawallah, on rocks, 28 April 1981, L. Tibell 12719 (UPS); Lamington National Park, 1946, Lyndon (MEL). NEW SOUTH WALES: Richmond River, July 1894, F.R.M. Wilson (MEL).

25. *Sticta weigelii* (Ach.) Vain., Acta Soc. Fauna Fl. Fennica 7: 189 (1890). *Sticta damaecornis* â *weigelii* Ach. Lichenogr. Universalis: 446 (1810). *Parmelia damaecornis* var. *weigelii* (Ach.) Eschw. in Martius, Fl. bras. 1: 214 (1833). *Stictina weigelii* (Ach.) Stizenb., Flora, Jena 81: 133 (1895). Type: Martinique, sine collectoribus (H-ACH - not seen).

Sticta quercizans var. *appendiculata* Müll.Arg., Flora, Jena 65: 302 (1882). Type: Norfolk Island, F. v. Mueller 1879 (G 001988! - holotype).

Sticta weigelii is a characteristic isidiate species, widespread in the tropics and in southern South America but absent from New Zealand. Australian material examined is similar in both morphology and anatomy to the description of the species given in Galloway (1994a: 274).

Sticta weigelii is distinguished by a cyanobacterial photobiont, irregular, clustered, rosette-forming lobes with densely isidiate margins, the isidia often densely developed in patches or ± continuously on the upper surface. It has a dark red-brown or grey-brown upper surface and a dark-brown to black, thickly tomentose lower surface (tomental hairs have characteristic lateral branches (Harris 1987) or are knobbly at or near their tips), with scattered, round to irregular cyphellae 0.5-1.5 mm diam., deeply immersed in the tomentum, margins sharply defined, slightly raised, pit membrane white. It is closely similar to *S. sublimbata*, but is distinguished by the presence of isidia and the absence of soredia.

Distribution and ecology: Apparently rather rare in northern Queensland and still very poorly known in Australia. Widespread in tropical and temperate regions (Imshaug 1956; Harris 1987; Swinscow & Krog 1988; Galloway 1994a). An epiphyte of montane rainforest.

Specimens examined: QUEENSLAND: Barron State Forest, Herberton Range, 1050 m, on tree trunk, 2 March 1983, H. Streimann 27282 (CBG 8304183); SE of Millaa Millaa, 530 m, 10 July 1983, M.E. Hale 64005 (US).

Excluded taxa:

In the most recent checklist of Australian lichens (Filson 1996) there are a number of taxa listed under *Sticta* which must be excluded from it, either because they do not occur in Australia or else they are referable to other genera, or to other taxa in *Sticta*. These are noted briefly below:

Sticta damaecornis (Sw.) Ach. A characteristic, green photobiont-containing species which is restricted to Jamaica and Cuba (Galloway 1994b: 36-41). The name has

been widely misapplied to both tropical and temperate taxa over many years.

Sticta demutabilis Kremp. = *Pseudocyphellaria sulphurea (*Schaer.) D.J.Galloway (Galloway 1994b:154).

Sticta dichotomoides Nyl. A stalked, green photobiont-containing species, apparently endemic to Tahiti (Nylander 1860: 355).

Sticta filicina Ach. = *Sticta filix* (see Galloway 1985a: 555; 1997: 133)

Sticta glaucescens Kremp. = *Pseudocyphellaria glaucescens* (Kremp.) Imshaug

Sticta insculpta (Stizenb.) Zahlbr. = *Pseudocyphellaria insculpta* (Stizenb) D.J.Galloway (Galloway 1994b: 129).

Sticta insculpta f. ***sublaevis*** (Müll.Arg.) Zahlbr. = *Pseudocyphellaria insculpta* (Stizenb.) D.J.Galloway

Sticta lacera (Hook.f. & Taylor) Müll.Arg. A New Zealand endemic not present in Australia (Galloway 1997: 140-142).

Sticta luridoviolacea (Stirt.) Zahlbr. = *Pseudocyphellaria neglecta* (Müll.Arg.) H.Magn.

Sticta macrophylla Delise. A palaeotropical species not known from Australia (Galloway 1995b: 176-178).

Sticta mooreana Zahlbr. = *Pseudocyphellaria mooreana* (Zahlbr.) Imshaug (Galloway 1992: 180). Disjunct between Lord Howe Island and Juan Fernandez.

Sticta orbicularis (A.Br. ex Meyen & Flot.) Hue. A stalked, cyanobacterial species with marginal isidia known from the Philippines but not known to occur in Australia.

Sticta parvula Stirt. = *Chondropsis semiviridis* (Nyl.) Nyl. [Type: Australia, Lachlan River, Baron F. v. Mueller (BM! - lectotype, selected here)]. A pencil note on the BM specimen records "...Sticta parvula (Strn) to exiguella - name must be changed as sp. has been given to a var. of Sticta filix by Nyl. "

Sticta pulvinata (Meyen & Flot.) Vain. A taxon described from the Philippines but the exact status of which is still doubtful.

Sticta purpurascens Stirt. = *Pseudocyphellaria rubella* (J.D.Hook. & Taylor) D.J.Galloway & P.W.James (Galloway 1988: 231).

Sticta quercizans var. ***appendiculata*** Müll.Arg. A synonym of *Sticta weigelii* (see above).

Sticta seemanii C.Bab. in Seeman. A West Indian taxon, not known from Australia.

Sticta sinuosa Pers. in C.Gaudichaud. A green-photobiont species described from Brazil and not known to occur in Australia.

Sticta sinuosa var. ***macrophylla*** Müll.Arg. Material referred to under this name from Lord Howe Island is referable to *Sticta howei*.

Sticta subcaperata (Nyl.) Nyl. A green photobiont-containing species not known from Australia. It is endemic to New Zealand (Galloway 1997). Early Australian records of *S. stipitata* were recorded under this name.

Sticta suberecta (Stirt.) Zahlbr. = *Sticta brevipes*

Sticta suborbicularis (Müll.Arg.) Zahlbr. = *Sticta subtomentella*

Sticta sylvatica (Huds.) Ach. A Northern Hemisphere species (the type species of *Sticta*) not known from Australia.

Sticta tomentella Nyl. A Peruvian taxon not known from Australia. Most probably a synonym of *Sticta humboldtii* Hook. in Kunth.

Sticta weigelii var ***beauvoisii*** (Delise) Hue = *Sticta beauvoisii* Delise. A cyanobacterial species endemic to eastern North America (Galloway 1995b: 171), incorrectly recorded from Australia.

Sticta weigelii var. ***microphylla*** = *Sticta diversa*

"Stictina cinereoglauca Hook.f. & Taylor". An invalid name for *Sticta cinereoglauca* Hook.f. & Taylor, which is a green photobiont-containing species with characteristic 5-7-septate spores, and which is endemic to New Zealand (Galloway 1985a, 1997).

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