

New species and new records of *Xanthoparmelia* (lichenized Ascomycota, *Parmeliaceae*) from eastern Australia

John A. ELIX

Abstract: Eight new species of *Xanthoparmelia* (*Parmeliaceae*) are described from eastern Australia: *X. biloelensis* Elix, *X. fracticollis* Elix, *X. kosciuszkoensis* Elix, *X. nerrigensis* Elix, *X. paratasmatica* Elix, *X. rankinensis* Elix, *X. remanella* Elix and *X. stuartioides* Elix. In addition, a further ten new state records of *Xanthoparmelia* are reported from eastern Australia.

Key words: Australia, lichenized Ascomycota, new species, *Parmeliaceae*, *Xanthoparmelia*

Introduction

Xanthoparmelia (Vain.) Hale is undoubtedly Australia's largest macrolichen genus (McCarthy 2003). In the southern half of the continent, species are prominent on all exposed, non-calcareous rock surfaces as well as on consolidated soils and, more rarely, on dead wood. *Xanthoparmelia* species are not only the most prominent macrolichens in terms of biomass but also in their diversity. The most recent catalogue of Australian lichens (McCarthy 2003) recorded 172 species and, subsequently, the synonymization of *Paraparmelia* Elix & J. Johnst. with *Xanthoparmelia* added a further 47 species (Elix 2003a), with a further eight new species reported since (Elix 2003b) giving a total of 227 species for Australia.

The diversity of this genus in southern Australia and southern Africa has probably arisen from its rapid morphological and chemical evolution in the many unique, semi-arid and arid habitats present with extensive exposures of granite, sandstone or similar siliceous rocks (Hale 1990). The paucity of collections from remote or little-studied habitats of this type in Australia has

meant that a number of species remain to be described. This report presents descriptions of eight new species and ten new records from eastern Australia.

Methods

The morphology of the lichen specimens was examined using a Zeiss Stemi 2000C stereo microscope, and conidia and ascospores were examined using a Zeiss Axiolab compound microscope. Chemical constituents were identified by thin layer chromatography (Culberson 1972; Culberson *et al.* 1981; Culberson & Johnson 1982; Elix & Ernst-Russell 1993), high performance liquid chromatography (Elix *et al.* 2003) and comparison with authentic samples.

The New Species

Xanthoparmelia biloelensis Elix sp. nov.

Thallus ut in *Xanthoparmelia ballingalliana* sed superficiei exisidiata differt.

Typus: Australia, Queensland, Bell Creek, Inverness Road, 27 km ENE of Biloela, 24°09'S, 150°33'E, 180 m, on volcanic rocks in pasture, 28 August 1993, J. A. Elix 34881 (BRI—holotypus).

(Fig. 1A)

Thallus small-foliose to subcrustose, tightly to very tightly adnate, 3–5 cm wide. *Lobes* contiguous, rarely weakly imbricate, ± flat, sublinear to subirregular, irregularly

J. A. Elix: Department of Chemistry, Faculty of Science, Australian National University, Canberra, ACT 0200, Australia.

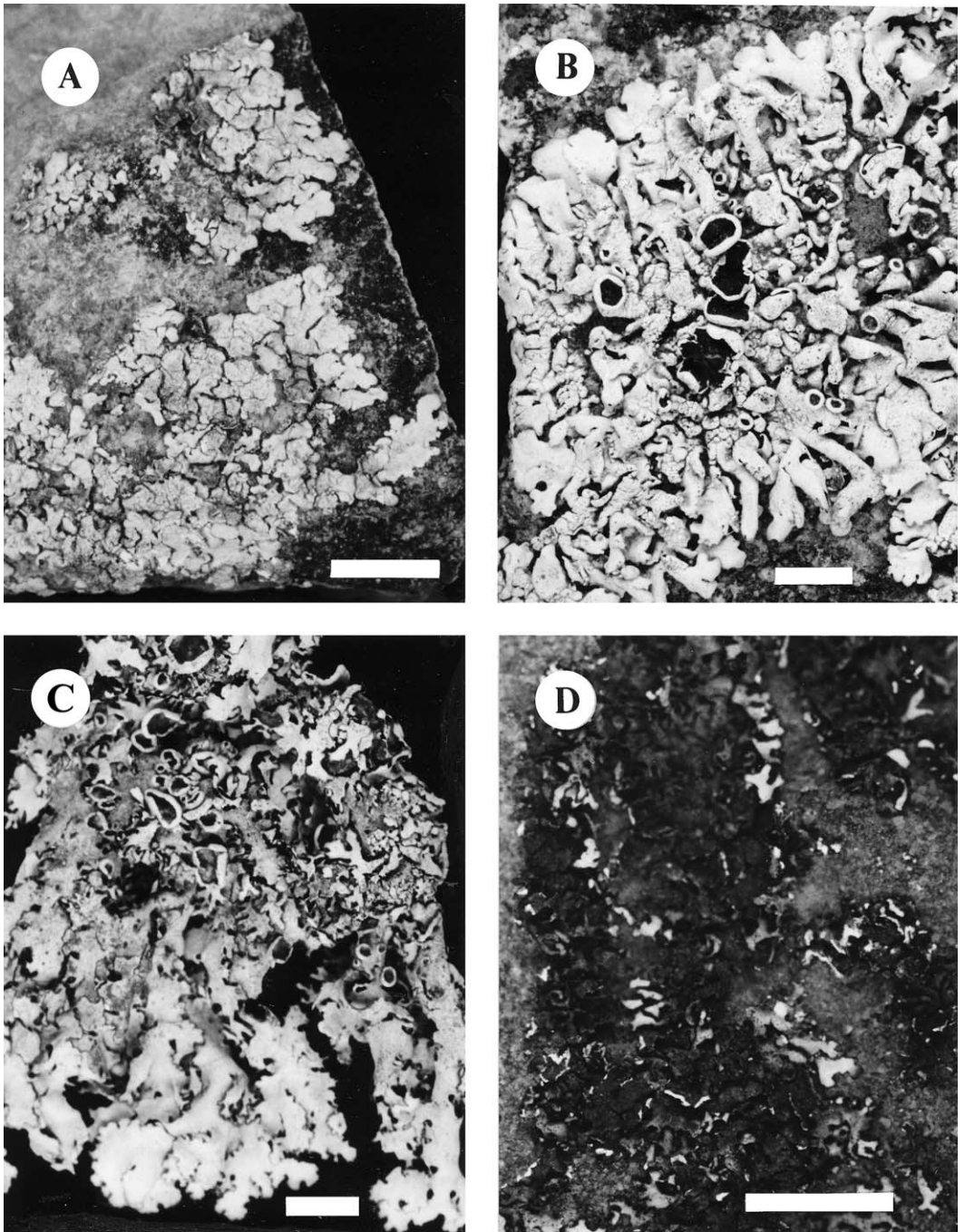


FIG. 1. New species of *Xanthoparmelia*. A, *X. biloelensis* (holotype); B, *X. fracticollis* (holotype); C, *X. kosciuszkoensis* (holotype); D, *X. nerrigensis* (holotype). Scales A–D=5 mm.

branched, 0.5–1.0 mm wide; laciniae absent; apices incised. *Upper surface* yellow-green but darkening with age, shiny at apices, emaculate, dull and rugulose within, developing transverse cracks, areolate in thallus centre, without isidia or soredia. *Medulla* white. *Lower surface* pale brown to brown, darker at the apices; rhizines sparse, simple, robust, 0.1–0.2 mm long. *Apothecia* and *pycnidia* not seen.

Chemistry. Cortex K –; medulla K –, KC –, C –, P –; containing usnic acid (minor), colensoic acid (major), norcolensoic acid (trace).

Etymology. The specific epithet derives from the Latin *ensis* (place of origin) and the township of Biloela.

Notes. This new species resembles *X. ballingalliana* Elix & J. Johnst., both having small-foliose thalli which become areolate and almost subcrustose in the centre, the narrow, sublinear to subirregular lobes, the brown lower surface and the medullary colensoic acid. Colensoic acid is very rare among the yellow-green species of *Xanthoparmelia*, being the major medullary substance in only two other species worldwide; *X. ballingalliana* mentioned above, and *X. colensoica* Nash, Elix & J. Johnst. *Xanthoparmelia ballingalliana* is distinguished by the presence of isidia on the upper surface (absent in *X. biloelensis*), while *X. colensoica* is readily separated by the jet-black lower surface (brown in *X. biloelensis*). At present this new species is known only from the type locality where it grows together with *Acarospora citrina* (Taylor) Zahlbr. ex Rech., *Buellia substellulans* Zahlbr., *Diploschistes euganeus* (A. Massal.) J. Steiner and other *Xanthoparmelia* species.

***Xanthoparmelia fracticollis* Elix sp. nov.**

Thallus ut in *Xanthoparmelia metaclystoides* sed lobis convexis, late revolutis et ad apices subascendentibus differt.

Typus: Australia, New South Wales, Barrier Highway, 15 km by road W of Broken Hill, 32°00'26"S,

141°16'57"E, 350 m, on low gneiss outcrops in open area with sparse *Acacia*, *Atriplex*, and *Prilotus*, 15 May 2003, J. A. Elix 30796 (CANB—holotypus).

(Fig. 1B)

Thallus foliose, adnate to tightly adnate, 4–6 cm wide. *Lobes* imbricate or contiguous, flat to markedly convex, subirregular to sublinear, subirregularly to irregularly branched, 1–3 mm wide; marginal and older lobes distinctly revolute and ± subascending; lobes rarely becoming lacinate, with laciniae sublinear-elongate, subdichotomously branched, 0.5–1.0 mm wide; apices subrotund or incised. *Upper surface* yellow-green, darkening with age, shiny at the lobe apices, emaculate, becoming rugose, cracked and areolate with age, lacking lobulae, soredia and isidia. *Medulla* white. *Lower surface* pale brown to brown; rhizines sparse, grouped subapically, simple, brown, very short (c. 0.1 mm long).

Apothecia common, sessile, 1–5 mm wide; disc concave at first, becoming flattened and undulate-distorted, dark brown, shiny; thalline exciple involute at first, smooth. *Ascospores* ellipsoid, 9–10 × 6–7 μm.

Pycnidia common, immersed. *Conidia* bifusiform, 6–8 × 1 μm.

Chemistry. Cortex K –; medulla K+ yellow then red, C –, P+ orange-red, containing usnic acid (minor), norstictic acid (major), connorstictic acid (minor) and salazinic acid (trace).

Etymology. The specific epithet refers to the place of origin of the type material, namely in the vicinity of Broken (Latin, *fractus*) Hill (Latin, *collis*).

Notes. An adnate to tightly adnate species, *X. fracticollis* is characterized by the development of convex, revolute, ± subascending lobes along the margins or in the centre of the thallus, the lack of vegetative propagules, the pale lower surface and the medullary chemistry. It could be confused with *X. metaclystoides* (Kurok. & Filson) Elix & J. Johnst., a species with similar-sized thalli

and medullary chemistry, but the latter has flat lobes that remain tightly adnate throughout and contains substantial amounts of salazinic acid in the medulla. Morphologically this new species resembles *X. exemplaris* Elix & J. Johnst., both having thalli with a pale lower surface which develop convex marginal lobes and/or laciniae with a canaliculate lower surface. However, *X. exemplaris* is distinguished by the smaller ascospores ($6-7 \times 4-5 \mu\text{m}$) and in the production of salazinic and consalazinic acids in the medulla. At present *X. fracticollis* is known from exposed, acidic rocks in semi-arid areas of western New South Wales and northern South Australia, often co-occurring with other *Xanthoparmelia* species, *Acarospora citrina*, *Caloplaca* sp. and *Lecanora farinacea* Fée.

Additional specimens examined. **Australia:** *New South Wales:* Silver City Highway, 8 km S of Broken Hill, on granitic rocks, $32^{\circ}02'56''\text{S}$, $141^{\circ}24'53''\text{E}$, 260 m, 2003, *J. A. Elix* 30781 (CANB); Mt Yavan, 30 km SW of Gundagai, $35^{\circ}12'\text{S}$, $147^{\circ}53'\text{E}$, 350 m, on schist rocks, 1999, *J. A. Elix* 30358 (CANB). *South Australia:* Mt Lofty Ranges, High Eden road, 6.5 km NW of Springton, $34^{\circ}42'\text{S}$, $139^{\circ}02'\text{E}$, 400 m, on quartz rocks, 1976, *J. A. Elix* 2252 (CANB); South Flinders Ranges, ridge adjacent to Drakes Nob, Simmonston, $32^{\circ}04'43''\text{S}$, $138^{\circ}09'13''\text{E}$, 220 m, on quartz rocks, 2003, *J. A. Elix* 31035 (CANB).

***Xanthoparmelia kosciuszkoensis* Elix sp. nov.**

Thallus ut in *Xanthoparmelia neotinctina* sed isidiis globosis vel subglobosis et ascosporis longioribus differt.

Typus: Australia, New South Wales, Kosciuszko National Park, 2 km N of Smiggin Holes along the Guthega road, $36^{\circ}21'\text{S}$, $148^{\circ}24'\text{E}$, 1700 m, on granite rocks in *Eucalyptus pauciflora* woodland, 21 January 1976, *J. A. Elix* 1685 (CANB—holotypus).

(Fig. 1C)

Thallus foliose, adnate to loosely adnate, 4–11 cm wide. *Lobes* contiguous to imbricate, subirregular, irregularly branched, 1–5 mm wide, developing marginal and laminal laciniae; laciniae sublinear, 0.5–1.0 mm wide, subdichotomously to subirregularly branched; lobe apices subrotund or incised. *Upper surface* yellow-green but soon blackening, \pm flat, dull in centre but shiny

at lobe apices, emaculate, with irregular cracks, ultimately areolate in thallus centre, lacking soredia and lobules, isidiate. *Isidia* sparse to dense, globose to subglobose, simple or rarely coralloid-branched, apices \pm blackened, syncorticate to weakly epicorticate, intact, not bursting open. *Medulla* white. *Lower surface* black, dark brown at apices; rhizines sparse to moderately dense, simple or tufted, black.

Apothecia sessile to substipitate, 1–6 mm wide; disc concave then flattened and ultimately undulate, mid-brown to dark brown; thalline exciple smooth but becoming isidiate; margin involute at first, then thin, persistent. *Ascospores* ellipsoid, $9-11 \times 4-6 \mu\text{m}$.

Pycnidia common, immersed. *Conidia* bacilliform to bifusiform, $5-7 \times 1 \mu\text{m}$.

Chemistry. Cortex K–; medulla K+ yellow then dark red, C–, P+ orange-red; containing usnic acid (minor), salazinic acid (major), norstictic acid (submajor or minor), consalazinic acid (trace), protocetraric acid (trace).

Etymology. The specific epithet derives from the Latin *ensis* (place of origin) and Kosciuszko National Park, the locality of the type material.

Notes. This species is characterized by the foliose thallus, the black lower surface, the globose to subglobose isidia which have more or less blackened, syncorticate to weakly epicorticate apices and the medullary salazinic and norstictic acids. *Xanthoparmelia neotinctina* (Elix) Elix & J. Johnst. is morphologically and chemically similar, but has slender, cylindrical isidia which become densely branched and coralloid (often forming a dense isidiose mat) and has shorter ascospores ($7-9 \mu\text{m}$). The Eurasian species *X. tinctina* (Maheu & Gillet) Hale has similar shaped isidia to *X. kosciuszkoensis*, but the isidia of *X. tinctina* often become erumpent and the medulla lacks substantial amounts of norstictic acid. This new species occurs in scattered colonies in alpine areas of south-eastern New South Wales and southern

Victoria, in cooler areas of south western Western Australia and in Tasmania. Common associated lichens include *Menegazzia platytrema* (Müll. Arg.) R. Sant., *Parmelia signifera* Nyl., *Parmelina labrosa* (Zahlbr.) Elix & J. Johnst., *Rhizocarpon geographicum* (L.) DC. s. lat., *Ramboldia petraeoides* (Nyl. ex C. Bab. & Mitt.) Kantvilas & Elix and various other species of *Xanthoparmelia*.

Additional specimens examined. **Australia:** New South Wales: Kosciuszko National Park, Farm Creek, 0.5 km S of Guthega Pondage, 36°23'S, 148°22'E, 1640 m, on granite rocks 2003, *J. A. Elix* 30652, 30655, 30658 (CANB). **Tasmania:** near Dora Point, 41°17'S, 148°19'E, 5 m, on granite rocks, 2001, *G. Kantvilas* 199/01 (HO). **Victoria:** Grampians, summit of Mt William, 37°18'S, 142°36'E, 1168 m, on sandstone rocks, 1984, *J. A. Elix* 11541 (CANB). **Western Australia:** halfway to summit of Mt Brown lookout, York, 97 km E of Perth, 31°53'S, 116°47'E, on acidic rocks, 1981, *N. Sammy* 810341 (PERTH).

***Xanthoparmelia nerrigensis* Elix sp. nov.**

Thallus ut in *Xanthoparmelia subcrustacea* sed lobis laxe adnatis, apicibus subascendentibus differt.

Typus: Australia, New South Wales, 8 km NE of Nerriga, just S of Morton National Park, 35°05'S, 150°09'E, 750 m, on sandstone rocks in *Eucalyptus* woodland, 29 March 2001, *J. A. Elix* 30455 (CANB—holotypus).

(Fig. 1D)

Thallus foliose, loosely adnate to adnate, 4–5 cm wide. Lobes separate to weakly imbricate, flat or concave, sublinear to subirregular, subirregularly branched, 0.5–1.0 mm wide; apices incised, ± subascending. *Upper surface* yellow-green at first but rapidly blackening, shiny at apices, emaculate, smooth then rugulose, developing cracks and becoming areolate in thallus centre, lacking soredia and isidia, lobulate; lobules marginal, sublinear, unbranched, 0.1–0.2 mm wide. *Medulla* white. *Lower surface* pale brown to brown, black-brown at the apices, rugulose; rhizines moderately dense, simple, concolorous, 0.1–0.3 mm long.

Apothecia sessile, 1–2 mm wide; disc concave then flattened and ultimately undulate, pale brown to mid-brown; thalline exciple

smooth, involute at first, then thin, persistent. *Ascospores* ellipsoid, 7–8 × 4–6 µm.

Pycnidia common, immersed to ± convex. *Conidia* bacilliform to bifusiform, 5–7 × 1 µm.

Chemistry. Cortex K –; medulla K+ yellow then pale red, C –, P –; containing usnic acid (minor), hypostictic acid (major), hyposalazinic acid (minor), hypoconstictic acid (minor).

Entymology. The specific epithet derives from the Latin *ensis* (place of origin) and Nerriga, the village in the vicinity of the type locality.

Notes. This species is characterized by the adnate to loosely adnate, foliose thallus, the narrow, sublinear to subirregular lobes with ± subascending apices, a brown lower surface, the lack of soredia and isidia, the hypostictic acid chemosyndrome in the medulla, and the minute marginal lobules. The lack of isidia, a pale lower surface and medullary hypostictic acid are also observed in *X. subcrustacea* Elix & J. Johnst., but the latter differs from *X. nerrigensis* in its tightly adnate thallus, and flat, more or less subrotund apices. This new species is known from two montane areas of eastern New South Wales where common associated lichens include *Hypogymnia subphysodes* (Kremp.) R. Filson, *Neofuscelia imitatricoides* Elix, *Parmelia signifera*, *Relicina sydneyensis* (Gyeln.) Hale, *Xanthoparmelia antleriformis* (Elix) Elix & J. Johnst. and *X. streimannii* (Elix & P.M. Armstr.) Elix & J. Johnst.

Additional specimen examined. **Australia:** New South Wales: ridge near Peelwood, 42 km NNW of Crookwell, 34°05'S, 149°23'E, 660 m, on acidic rocks, 1990, *J. A. Elix* 25717 (CANB).

***Xanthoparmelia paratasmanica* Elix sp. nov.**

Thallus ut in *Xanthoparmelia tasmanica* sed superficie maculata, rhizinis parce ramosis et sporis minoribus differt.

Typus: Australia, Queensland, Mt Marley, 1 km NE of Stanthorpe, 28°39'S, 151°57'E, 900 m, on granite rocks in *Eucalyptus*–*Callitris* dominated woodland, 5

September 1993, *J. A. Elix* 35631 (BRI—holotypus, CANB—isotypus).

(Fig. 2A)

Thallus foliose, loosely adnate, 5–10 cm wide. *Lobes* separate, contiguous or loosely imbricate, flat, sublinear to sublinear-elongate, dichotomously to subirregularly branched, 2–4 mm wide, \pm laciniate; lacinae sublinear, subdichotomously branched, 0.7–1.5 mm wide; apices incised. *Upper surface* yellow-green, smooth, shiny at apices, with scattered or effigurate maculae, lacking soredia and isidia. *Medulla* white. *Lower surface* rugulose, black, dark brown at apices; rhizines sparse, simple or tufted, rarely furcate, black.

Apothecia substipitate, 2–8 mm wide; disc concave, then flattened and ultimately undulate-distorted, pale brown to mid-brown; thalline exciple smooth, involute at first, then thin, \pm dentate, persistent. *Ascospores* ellipsoid, 8–10 \times 4–6 μ m.

Pycnidia common, immersed. *Conidia* bifusiform, 5–7 \times 1 μ m.

Chemistry. Cortex K –; medulla K+ yellow then dark red, C –, P+ orange-red; containing usnic acid (minor), salazinic acid (major), norstictic acid (trace), consalazinic acid (trace).

Etymology. The specific epithet refers to the similarity of this species to *X. tasmanica*, (Greek, *para*=near, compared with).

Notes. This species is characterized by the loosely adnate thallus, the sublinear to sublinear-elongate lobes, the scattered or effigurate maculae on the upper surface, the black lower surface, the lack of soredia and isidia and by the medullary salazinic acid. The morphology and medullary chemistry resemble that of *X. tasmanica* (Hook.f. & Taylor) Hale, a very common species in Australia, but the latter has an emaculate upper surface and a larger, more compact and tightly imbricate thallus. In addition, *X. paratasmanica* is distinguished by the smaller ascospores (8–10 \times 4–6 μ m cf. 10–11 \times 6–

7 μ m) and the often tufted and rarely furcated rhizines (rhizines are simple in *X. tasmanica*). *Xanthoparmelia paratasmanica* could be confused with the South African species, *X. neotasmanica* Hale as this also has a white-maculate upper surface. However, *X. neotasmanica* also has a larger (8–15 cm cf. 5–10 cm wide), more compact and tightly imbricate thallus, larger ascospores (10–12 \times 5–6 μ m) and a moderately to densely rhizinate lower surface (rhizines are sparse in *X. paratasmanica*). This new species is known from several montane areas of southern Queensland, eastern New South Wales and in South Australia. Common associated lichens include *Flavoparmelia haysonii* (C.W.Dodge) Hale, *Parmelia signifera*, *Punctelia pseudocoralloidea* (Gyeln.) Elix & Kantvilas, *Rimelia reticulata* (Taylor) Hale & A. Fletcher, *Xanthoparmelia flavescens* (Gyeln.) D.J. Galloway, *X. scabrosa* (Taylor) Hale and other *Xanthoparmelia* species.

Additional specimens examined. **Australia:** *Queensland:* 5 km N of Wallangarra along Highway 15, 28°53'S, 151°55'E, 910 m, on granite rocks, 1976, *J. A. Elix* 2665 (CANB); type locality, on granite rocks, 1993, *J. A. Elix* 35584, 35630 (CANB). *New South Wales:* Reids Flat road, 3 km W of Reids Flat, 42 km NE of Boorowa, 34°08'S, 148°59'E, 500 m, on granite rocks, 1992, *J. A. Elix* 26696 (CANB). *South Australia:* Flinders Ranges, ABC Range, Brachina Gorge, 14 km W of Blinman-Wilpena road, 31°20'S, 138°33'44"E, 400 m, on sandstone rocks, 2003, *J. A. Elix* 31181 (CANB).

***Xanthoparmelia rankinensis* Elix sp. nov.**

Thallus ut in *Xanthoparmelia bellanula* sed superficie maculata, pagina inferiori coffeata sed atrofusca et acidum norsticticum continente differt.

Typus: Australia, New South Wales, Lachlan Range State Forest, 15 km NW of Rankins Springs, 33°47'S, 146°07'E, 260 m, on soil in *Callitris*-dominated forest on moderate slope, 12 June 1990, *J. A. Elix* 25214 (CANB—holotypus).

(Fig. 2B)

Thallus foliose, loosely adnate, forming rosettes up to 5 cm wide. *Lobes* separate to loosely imbricate, linear-elongate, subdichotomously branched, divaricate, 0.8–

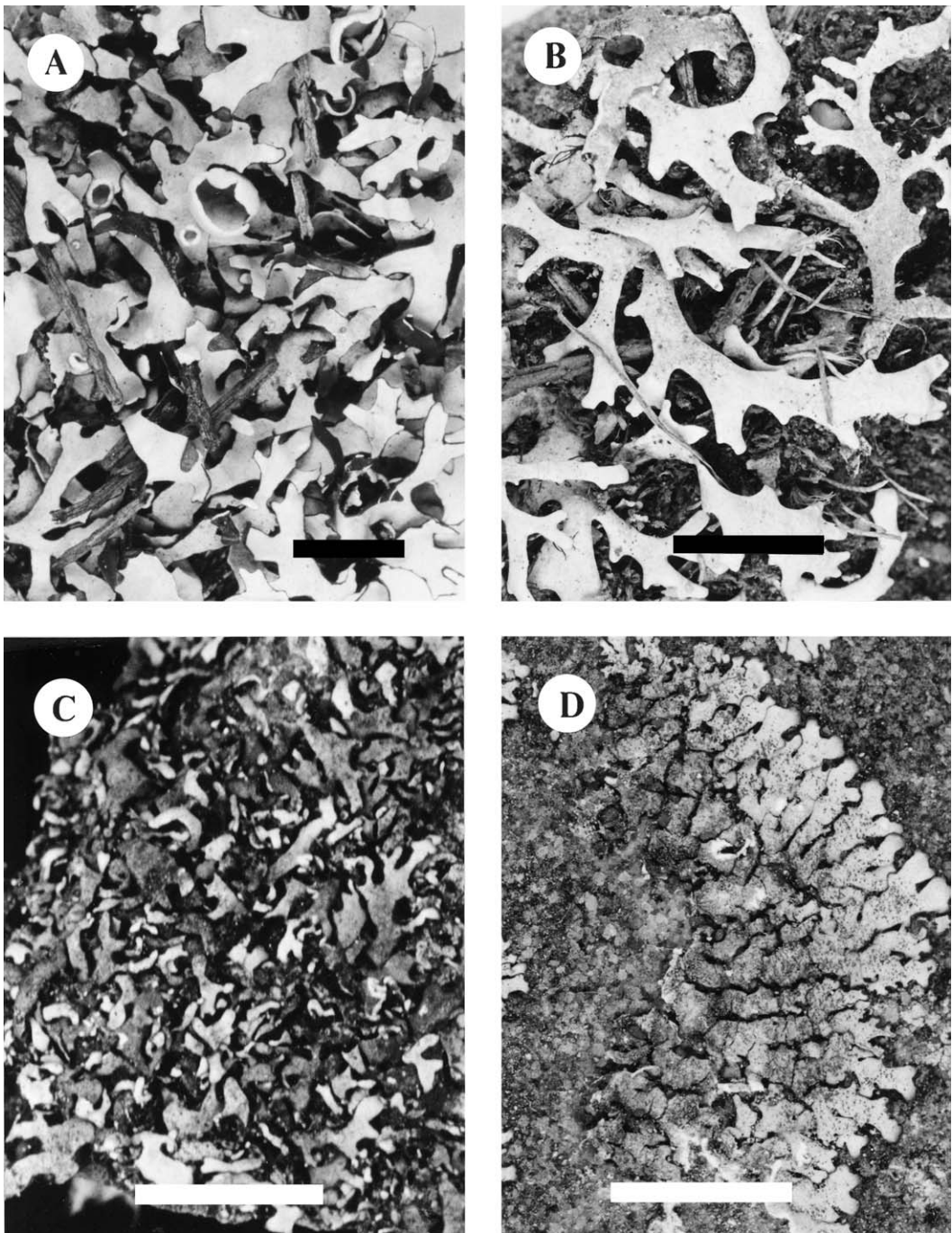


FIG. 2. New species of *Xanthoparmelia*. A, *X. paratasmanica* (holotype); B, *X. rankinensis* (holotype); C, *X. remanella* (holotype); D, *X. stuartioides* (holotype). Scales A–D=5 mm.

2.0 mm wide; apices incised. *Upper surface* yellow to yellow-green, flat to weakly convex, smooth, maculate, especially towards the lobe apices, without isidia or soredia, lobulate; lobules sublinear, unbranched or rarely dichotomously branched, 0.2–0.5 mm wide. *Medulla* white. *Lower surface* canaliculate in part, smooth, dark brown to brown-black; rhizines sparse to moderately dense, simple or very rarely furcate, black, 0.5–1.5 mm long, ± extending beyond the lobe margin.

Apothecia, with vestigial apothecia only.

Pycnidia common, immersed. *Conidia* bacilliform to weakly bifusiform, 3–5 × 0.7 µm.

Chemistry. Cortex K–; medulla K+ yellow then red, C–, P+ orange-red; containing usnic acid (major), salazinic acid (major), norstictic acid (submajor), protoce-traric acid (trace), consalazinic acid (trace).

Etymology. The specific epithet derives from the Latin *ensis* (place of origin) and Rankins Springs, the township in the vicinity of the type locality.

Notes. This species is characterized by the foliose thallus which forms rosettes on soil, the yellow to yellow-green, ± convex upper surface, subdichotomously branched lobes, a dark brown to brown-black lower surface which is in part canaliculate, the absence of isidia, and norstictic and salazinic acids in the medulla. *Xanthoparmelia rankinensis* belongs to the *X. amphixantha* (Müll. Arg.) Hale group of species and most closely resembles *X. bellatula* (Kurok. & Filson) Elix & J. Johnst., both having similar thalli and containing salazinic acid as the major medullary substance. However, these species are clearly distinguished by the maculation of the lobes, the colour of the lower surface and their medullary chemistry. In *X. bellatula* the upper surface is emaculate, the lower surface is yellow to pale brown and norstictic acid is absent or present only in minute traces, whereas in *X. rankinensis*, the upper surface is distinctly white-maculate, particularly towards the apices of the lobes, the lower

surface is dark brown to black-brown and norstictic acid is present in substantial quantities. At present this new species is known only from the type locality where it grows together with *Aspicilia contorta* (Hoffm.) Kremp., *Cladia corallaizon* F. Wilson ex Filson, *Diploschistes hensseniae* Lumbsch & Elix, *Heterodea muelleri* (Hampe) Nyl., *H. beaugleholei* Filson and *Psora decipiens* (Hedw.) Hoffm.

***Xanthoparmelia remanella* Elix sp. nov.**

Thallus ut in *Xanthoparmelia remanens* sed pagina inferiore nigricanti, isidiis cylindricis, apicibus syncorticatis differt.

Typus: Australia, Queensland, Mount Tinbeerwah, 37 km SE of Gympie, 26°24' S, 152°59' E, 250 m, on exposed volcanic rocks on slope with scattered heathy shrubs, 4 September 1993, J. A. Elix 35563 (BRI—holotypus).

(Fig. 2C)

Thallus foliose, loosely adnate to adnate, to 6 cm wide. *Lobes* contiguous to imbricate, sublinear to subirregular, subdichotomously to irregularly branched, 1–3 mm wide, laciniate; laciniae sublinear or sublinear-elongate, monophyllous or dichotomously branched, 0.2–0.8 mm wide; lobe apices incised. *Upper surface* yellow-green but soon darkening, ± flat to undulate, shiny but becoming dull, emaculate, rugulose, lacking soredia, isidiate. *Isidia* moderate to dense, cylindrical, rarely coralloid-branched; apices not inflated, syncorticate, darkening. *Medulla* white. *Lower surface* smooth, dark brown to black, brown at apices; rhizines moderately dense, simple, short, robust, to 0.5 mm long.

Apothecia and *pycnidia* not seen.

Chemistry: Cortex K+ yellow; medulla K–, C–, KC–, P–; containing usnic acid (major), scabrosin 4,4'-dibutanoate (minor), scabrosin 4-acetate 4'-butanoate (minor), scabrosin 4-acetate 4'-hexanoate (minor), scabrosin 4,4'-diacetate (trace).

Etymology. The specific epithet derives from the Latin *ellus* (resembling, but

smaller) and *X. remanens*, the species which it most closely resembles.

Notes. This species has the same medullary chemistry as the isidiate *X. remanens* (Elix) Elix & J. Johnst. However, *X. remanens* can be distinguished by the broader lobes (1.5–5 mm vs. 1–3 mm wide), the ivory to pale brown lower surface (dark brown to black in *X. remanella*) and by the nature of the isidia. The isidia of *X. remanens* are subglobose to warty or subcylindrical with \pm inflated, epicorticate, rarely erumpent apices; those of *X. remanella* are cylindrical with non-inflated, syncorticate, intact apices. At present *X. remanella* is known only from the type locality where it is quite common and grows together with *Buellia substellulans*, *Coccocarpia palmicola* (Spreng.) Arv. & D. J. Galloway, *Pertusaria subventosa* Malme, *P. xanthoplaca* Müll. Arg., *Pyrrhospora sanguinolenta* (Kremp.) Rambold & Hafellner, *Xanthoparmelia amplexula* (Stirt.) Elix & J. Johnst. and other *Xanthoparmelia* species.

Additional specimens examined. **Australia:** Queensland: type locality, on volcanic rocks, 1982, *J. A. Elix* 10421, 1993, *J. A. Elix* 35562 (CANB).

***Xanthoparmelia stuartioides* Elix sp. nov.**

Thallus ut in *Xanthoparmelia stuartensis* sed diminutus et lobis angustioribus differt.

Typus: Australia, Queensland, bluff along road to Blackdown Tableland, 30 km SE of Blackwater, 23°45'S, 149°07'E, 600 m, on sandstone rocks in dry sclerophyll forest above the escarpment, 22 August 1993, *J. A. Elix* 34342 (BRI—holotypus).

(Fig. 2D)

Thallus small-foliose to subcrustose, adnate to tightly adnate, to 4 cm wide. Lobes separate or rarely contiguous, sublinear to sublinear-elongate, subdichotomously branched, 0.3–1.0 mm wide; apices incised. *Upper surface* pale yellow-green, darkening with age, flat, shiny but becoming dull, emaculate, smooth or weakly rugulose, transversely cracked with age and becoming areolate in thallus centre, lacking soredia,

isidiate. *Isidia* globose to short cylindrical, simple, with apices syncorticate, blackened, intact. *Medulla* white. *Lower surface* flat, smooth, brown, dark brown at apices; rhizines moderately dense, robust, simple, concolorous, 0.1–0.4 mm long.

Apothecia and *pycnidia* not seen.

Chemistry: Cortex K –; medulla K+ pale yellow-brown, C –, KC –, P+ orange-red; containing usnic acid (minor), protocetraric acid (major), virensic acid (trace).

Etymology. The specific epithet derives from the Greek *oides* (resembling or having the form of) and *X. stuartensis*, the species which the new taxon most closely resembles.

Notes. This species is characterized by the adnate to tightly adnate, small-foliose to subcrustose thallus, the narrow, separate, sublinear-elongate lobes with incised apices, the brown lower surface, the simple subglobose to short-cylindrical isidia and the production of protocetraric acid in the medulla. *Xanthoparmelia stuartioides* resembles *X. stuartensis* Elix & J. Johnst. as both have thalli with a brown lower surface, an isidiate upper surface and identical medullary chemistry. However, *X. stuartensis* can be distinguished by its somewhat larger, foliose thalli (4–6 cm wide) and relatively broad, irregular lobes (1–3 mm wide) with subtund apices. *Xanthoparmelia stuartioides* on the other hand, has a small foliose to subcrustose thallus with narrow (0.3–1.0 mm wide), sublinear to sublinear-elongate, subdichotomously branched lobes with incised apices. At present this new species is known only from the type locality where it grows together with *Acarospora citrina*, *Dirinaria flava* (Müll. Arg.) C.W. Dodge, *Pyrrhospora sanguinolenta*, *Ramboldia petraeoides*, *Rimelia reticulata* and other *Xanthoparmelia* species.

The new records of *Xanthoparmelia* for eastern Australia

***Xanthoparmelia cravenii* Elix & J. Johnst.**

Bull. Brit. Mus. (Nat. Hist.), Bot. 15: 223 (1986).

Previously known from inland Australia including Western Australia, the Northern Territory, northern South Australia and western New South Wales (Elix 1994).

Specimen examined. Australia: Queensland: Cabbage-tree Creek, 42 km ENE of Taroom, 25°29'S, 150°12'E, 240 m, on sandstone rocks, 1993, *J. A. Elix* 35370 (CANB).

Xanthoparmelia dissitifolia Kurok. ex Elix & J. Johnst.

Bull. Brit. Mus. (Nat. Hist.), Bot. 15: 228 (1986).

Previously known from Western Australia, Tasmania, the Australian Capital Territory and South Africa (Elix 1994).

Specimen examined. Australia: New South Wales: Mt Alum, Buladelah, 32°25'S, 152°12'E, 100 m, on rhyolite rocks, 1990, *J. A. Elix* 24611 (CANB).

Xanthoparmelia examplaris Elix & J. Johnst.

Bull. Brit. Mus. (Nat. Hist.), Bot. 15: 243 (1986).

Previously known from inland South Australia (Elix 1994).

Specimens examined. Australia: New South Wales: Barrier Highway, 15 km by road W of Broken Hill, 32°00'26"S, 141°16'57"E, 350 m, on gneiss rocks, 2003, *J. A. Elix* 30813, 30815 (CANB).

Xanthoparmelia iniquita Elix & J. Johnst.

Bull. Brit. Mus. (Nat. Hist.), Bot. 15: 270 (1986).

Previously known from the Australian Capital Territory, New South Wales and Victoria (Elix 1994).

Specimens examined. Australia: Queensland: Cabbage-tree Creek, 42 km ENE of Taroom, 25°29'S, 150°12'E, 240 m, on sandstone rocks, 1993, *J. A. Elix* 35398 (CANB); Mt Marley, 1 km NE of Stanthorpe, 28°39'S, 151°57'E, 900 m, on granite rocks, 1993, *J. A. Elix* 35603, 35605, 35619 (CANB); Eukey-Wyberba road, 19 km ESE of Stanthorpe, 28°49'S, 151°59'E, 1000 m, on granite rocks, 1993, *J. A. Elix* 35709, 35729, 35619 (CANB).

Xanthoparmelia isidiotegeta Elix & Kantvilas

Mycotaxon 71: 89 (1999).

Previously known from Tasmania, Victoria and New Zealand (Elix & Kantvilas 1999).

Specimens examined. Australia: New South Wales: Kosciuszko National Park, Farm Creek, 0.5 km S of Guthega Pondage, 36°23'S, 148°22'E, 1640 m, on granite rocks, 2003, *J. A. Elix* 30667, 30672 (CANB). *Queensland:* Paling Yard Creek, 21 km ESE of Stanthorpe, 28°50'S, 151°59'E, 1000 m, on granite rocks, 1993, *J. A. Elix* 35805, 35812 (CANB).

Xanthoparmelia luminosa (Elix) Hale

Mycotaxon 20: 79 (1984).

Previously known from South Australia, the Australian Capital Territory, New South Wales (Elix 1994) and Western Australia (Elix 2003b).

Specimen examined. Australia: Victoria: Mt Arapiles, near camp-ground, 33 km W of Horsham, 36°45'S, 141°51'E, 300 m, on quartzite rocks, 1990, *J. A. Elix* 26071 (CANB).

Xanthoparmelia masonii Elix

Mycotaxon 47: 124 (1993).

Previously known from New South Wales (Elix 1994) and Tasmania (Kantvilas *et al.* 2002).

Specimen examined. Australia: Australian Capital Territory: Brindabella Range, N of summit of Mt Coree, 31 km W of Canberra, 35°18'S, 148°49'E, 1400 m, on rhyolite rocks, 1985, *J. A. Elix* 19806 & *H. Streimann* (CANB).

Xanthoparmelia mayrhoferi Elix

Mycotaxon 65: 489 (1997).

Previously known from Queensland (Elix 1997).

Specimen examined. Australia: New South Wales: Central-west slopes, Weddin Mountains National Park, 15 km SW of Grenfell, 31°54'S, 148°00'E, 340 m, on rocks, 1990, *J. A. Elix* 25105 (CANB).

Xanthoparmelia parvoclystoides Elix & J. Johnst.

Mycotaxon 33: 360 (1988).

Previously known from South Australia and Western Australia (Elix 1994).

Specimen examined. **Australia:** Queensland: Mt Marley, 1 km NE of Stanthorpe, 28°39'S, 151°57'E, 900 m, on granite rocks, 1993, *J. A. Elix* 35594 (CANB).

***Xanthoparmelia phillipsiana* (Filson)
Elix & J. Johnst.**

Bull. Brit. Mus. (Nat. Hist.), Bot. **15:** 307 (1986).

Previously known from Tasmania, Macquarie Island, New Zealand (Elix 1994) and Victoria (Elix 2002).

Specimen examined. **Australia:** New South Wales: Kosciuszko National Park, Farm Creek, 1 km W of Charlottes Pass, 36°26'S, 148°20'E, 1800 m, on granite rocks, 2003, *J. A. Elix* 30630 (CANB).

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