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All enquiries and manuscripts should be directed to:

The Editor – *NUYTSIA*
Western Australian Herbarium
Dept of Environment and Conservation
Locked Bag 104 Bentley Delivery Centre
Western Australia 6983
AUSTRALIA

Telephone: +61 8 9334 0500
Facsimile: +61 8 9334 0515
Email: nuytsia@dec.wa.gov.au
Web: science.calm.wa.gov.au/nuytsia/

Department of Environment and Conservation
Western Australian Herbarium

New species of *Xanthoria* (Teloschistaceae) from Australia

S.Y. Kondratyuk[1], E.I. Kärnefelt[2] & A. Thell[2]

[1]M.H. Kholodny Institute of Botany, Tereshchenkivs'ka str. 2, 01601 Kiev-MSP-1, Ukraine
[2]Botanical Museum, Department of Systematic Botany, University of Lund, Ö.Vallgatan 18–20, S-223 61 Lund, Sweden

Abstract

Kondratyuk, S.Y., Kärnefelt, E.I., & Thell, A. New species of *Xanthoria* (Teloschistaceae) from Australia. *Nuytsia* 16(1) 63–76(2006). *Xanthoria elixii* S. Kondr. & Kärnefelt, *sp. nov.* and *X. streimannii* S. Kondr. & Kärnefelt, *sp. nov.* are described, illustrated and compared with allied taxa, and a detailed description of the common and widespread species *X. filsonii* Elix is also given. A key to Australian taxa of *Xanthoria* is provided.

Introduction

The genus *Xanthoria* was recently split into two almost equally sized genera when the *Xanthoria ulophyllodes*-group was transferred to *Xanthomendoza* based on morphological, anatomical and molecular data. The genus *Xanthomendoza* has its main distribution in the northern hemisphere, whereas, after the inclusion of the *X. ulophyllodes*-group in *Xanthomendoza*, *Xanthoria* is distributed primarily in Australia and southern Africa (Søchting *et al.* 2002).

Filson (1969) included only two species in *Xanthoria*, namely *X. parietina* and *X. ligulata* (treated as *X. ectanea*) in his paper on the fruticose and foliose members of the the Teloschistaceae in Australia. In an exsiccate Elix (1988) published a short description of *X. filsonii* characterised mainly on differences in the secondary chemistry. In revising *X. parietina* and *X. ligulata* from Australia, it became apparent that *X. filsonii* is rather widespread and can also be defined on morphological characters.

Even though many *Xanthoria* species have been described in recent years (e.g. Castello 1995, Giralt *et al.* 1993, Kärnefelt et al. 1995, Kondratyuk 1997, Kondratyuk & Kärnefelt 1997*a*, *b*, 2000, Kondratyuk & Poelt 1997, Kondratyuk et al. 2004, Lindblom 1997, Poelt & Petutschnig 1992*a, b*), several species have yet to be described from the southern hemisphere, two of which are described here as *X. elixii* and *X. streimannii*.

Materials and methods

The study presented here is based mainly on herbarium material kept in C, B, BCRU, BG, BM, CBG, GZU, H, HO, KW, LD, MEL, MIN, PERTH, S, SGO, TNS and UPS.

Fragments of lichens were sectioned with a Kryomat, Leitz freezing microtome and sections were mounted in water or in lactophenol cottonblue. Anatomical structure and hymenial characters were studied with a Zeiss Axioscope light microscope; photomicrographs were made with an Olympus DP 11 digital camera.

Extractions of secondary metabolites and HPLC analyses were made according to Søchting (1997, 2001). Quantification of the metabolites was based on absorption at 270 nm. The proportions of metabolites were calculated in relation to the total of all significant absorption peaks recorded. Thalli and apothecia were analysed separately.

Taxonomy

Xanthoria elixii S. Kondr. & Kärnefelt, *sp. nov.*

A *Xanthoria filsonii* differt lobis magis evolutis apotheciis carentibus, zonam marginalem distinctam formantibus, apotheciis majusculis in medio thalli sitis, necnon anatomia thalli et apotheciorum (vide descriptio anglica).

Typus: Western Australia: Shire of Mullewa: 62 km to Morawa, SE of Mullewa, between Tardun & Canna, 28°45'16.6" S, 115°40'20.8" E, chenopod heath (with *Atriplex nummularia* and *Casuarina obesa*). On *Atriplex nummularia*, 7 Jan. 2004, *Kondratyuk, S.* (20429), *Kärnefelt, I. & Cranfield, R.J.* (*holo*: PERTH 07194005; *iso*: CBG, KW, LD).

Thallus small, (8–)10–25(–40) mm diam., in aggregations to 4–5 cm across; plane, with distinct *c.* (1–)2–3 mm wide marginal zone without apothecia, central part with numerous apothecia; upper surface evenly yellow, orange-yellow to grey or whitish; lobes well developed at the margins as rounded terminal portions of dissected thallus margin (1–)1.5–2 mm deep and (0.7–)1–2(–3) mm wide, sometimes well developed, narrow and elongated 2–4(–5) mm long and (0.5–)1–2(–3) mm wide, total width of lobe with all secondary lobules (2–)3–4(–6) mm wide; slightly waved and with slightly developed marginal 'rim', loosely attached to the substrate at the marginal zone; thallus 80–110 mm thick in section; *upper cortex* thin, *c.* (5–)10–12(–17.5) mm, mesodermatous paraplectenchymatous; algal layer 16–20(–25) mm thick; *medulla c.* 40–50 mm thick, with single very long hyphae, *c.* 3 mm diam., lumina *c.* 1 mm diam.; *lower cortex* (7–)10–12 mm thick, mesodermatous paraplectenchymatous. *Hapters* along margins, *c.* 50 mm diam., *c.* 60 mm long. *Ascomata and ascospores: Apothecia* numerous, rather large, *c.* (1–)1.5–2.5(–3) mm diam., disk reddish or orange, mainly plane and constricted at the basis, with well developed margin; dark yellow-orange, orange to reddish orange; *thalline exciple*, 25–30 mm thick, palisade paraplectenchymatous; *true exciple* well developed in lateral part, to 30–40 mm thick in the uppermost portion, only (5–)7–15 mm thick in basal part, pseudoprosoplectenchymatous; algae in clusters below true exciple, algal cells spherical up to (8–)15–20(–27.5) mm diam.; *hymenium* (45–)50–62.5 mm high; subhymenium up to 25 mm thick; *paraphyses c.* 2.0 mm at the basis, uppermost cells widened, with oil droplets ('oil paraphyses' after J. Poelt), up to 5–6 mm diam.; asci (35–)48–50 × (10–)15–16 mm; *ascospores* small, ellipsoid to narrowly ellipsoid to sometimes slightly curved, (11–)12.5–15 × 5–7 mm [in water and 11–14(–16) × (4–)5–6.5 mm in K], septum *c.* (4–)5–6(–7) µm thick [in water and (4.5–)5–6(–7) mm in K]. (Figure 1)

Chemistry. Chemosyndrom A_3 (cf. Søchting 1997, 2001).

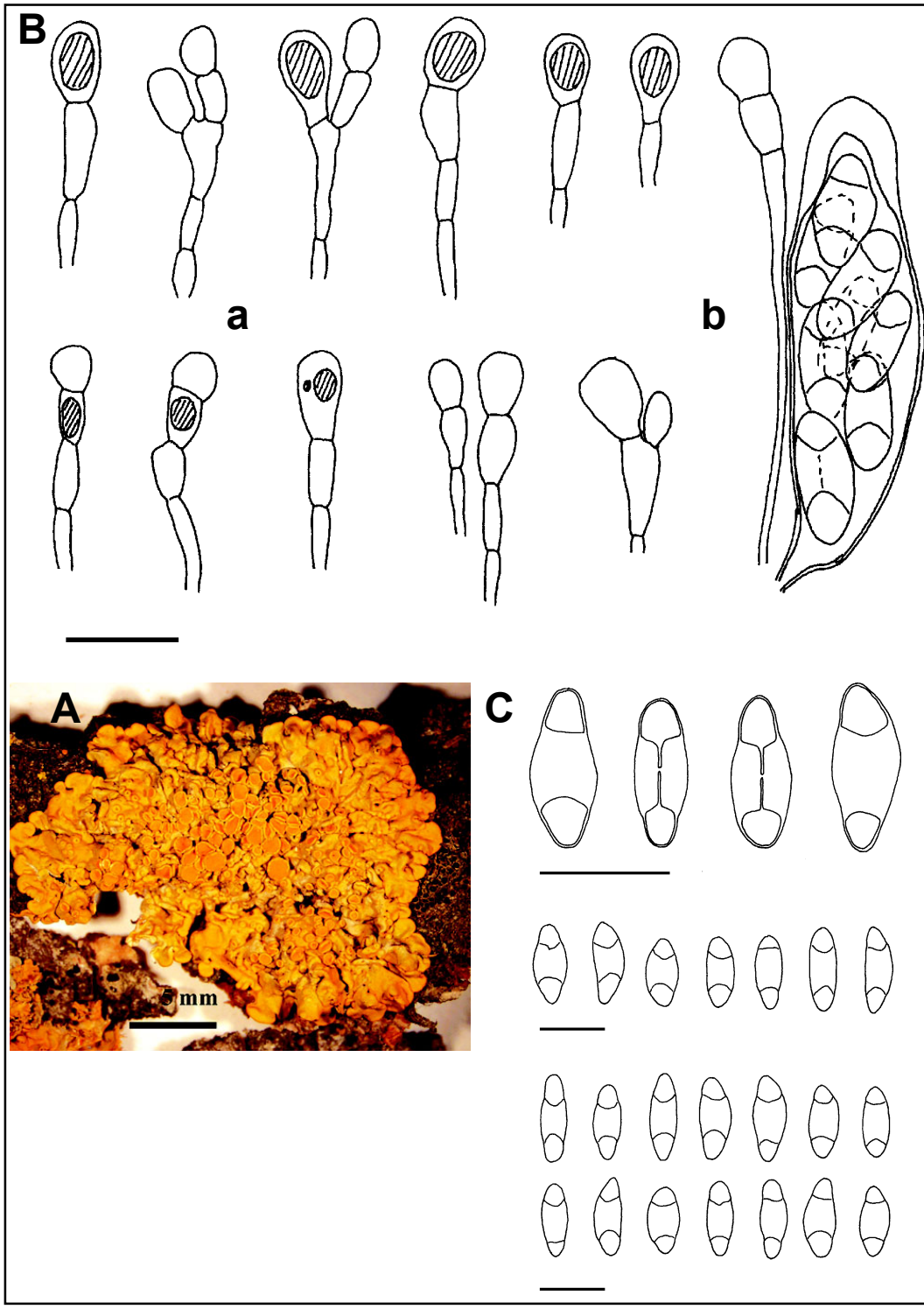

Figure 1. *Xanthoria elixii*. A – General habit (bar = 5 mm); B – (a) Paraphyses with oil droplets (= 'oil paraphyses', after J. Poelt), and (b) ascus with ascospores (bar = 10 µm); C – Ascospores [in K] (bar = 10 µm).
Taken from *Kondratyuk* 20429 (holotype, PERTH 07194005).

Table 1. A comparison of distinguishing characters between some *Xanthoria* species and Australian material of *Xanthoria parietina s. lat.*

Character	*Xanthoria parietina s.lat.*	*Xanthoria elixii*
Thallus		
size diam. (cm)	to 6(–10)	to 2.5
margin	bent upwards	bent upwards
marginal vs. central parts	±different	±different
attachment	loose	loose
type	sparse, laminal hapters	sparse, marginal hapters
upper cortex	leptod.-parapl.	mesod.-parapl.
lower cortex	leptod.-parapl.	mesod.-parapl.
Lobes		
structure	concave	±concave
size	large and wide	well developed
length (mm)	3–6	1.5–2
width (mm)	2–5	1–2
Apothecia		
frequency	sparse to numerous	numerous in central part
type	±lecanorine	permanently lecanorine
true exciple	scleropl.	pseudoprosopl.
cortex of thalline margin	leptod.- parapl.	palisade parapl.
Hymenium		
paraphyses with oil droplets	present	present
Ascospores		
size (µm)	14–17 × (7–)8–10	12.5–15.5 × 5–7
septum (µm)	(7–)8–10(–11)	5–6
Spermatia		
shape	broadly bacilliform	unknown
size (µm)	3–4 × 1.2–1.5	
Chemosyndrom	A	A_3
Ecology	on various substrates	on bark or wood
Distribution	widely distributed	Australia
References	Kondratyuk & Poelt 1997; Kondratyuk 1997	present paper

Abbreviations:
leptod.-parapl. = leptodermatous paraplectenchymatous; mesod.-parapl. = mesodermatous paraplectenchymatous; parapl. = paraplectenchymatous; prosopl. = prosoplectenchymatous; pseudoprosopl. = pseudoprosoplectenchymatous; scleropl. = scleroplectenchymatous

Xanthoria filsonii	***Xanthoria dissectula***	***Xanthoria microspora***
to 1.5	to 2.5	to 1.0
plane	plane	±plane
similar	different	similar
adnate	adnate	adnate
sparse, marginal hapters	short marginal rhizines	sparse, laminal hapters
parapl.	palisade, parapl, or algal plectenchyma	parapl.
parapl.	mesod.-parapl.	parapl.
plane	plane	plane
mostly undeveloped	small, distinctly widened towards tips	well developed
1–1.5	3–4(–5)	1.5–2.5
0.5–1.5	0.3–0.5 to 1–1.5	2–3(–5)
numerous, aggregated	sparse	sparse
lecanorine to biatorine	permanently lecanorine	±lecanorine
pseudoprosopl.	pseudoprosopl.	scleropl.
parapl.	palisade parapl.	parapl.
present	absent	absent
12–13 × 5–6	8–10 × 4.5–5.5	7–10 × 4–6
3–4.5(–6)	2.5–3(–5)	3.8–5.7
broadly ellipsoid	broadly bacilliform	unknown
2.2–2.7 × 1–1.2	3–3.5 × 1–1.5	
A_3	A_3	?
on bark	on bark	on bark or wood
Australia	South Africa	Asia, Mediterranean, Middle East
present paper	Kondratyuk et al. 2004	Bouly de Lesdain 1958; Kondratyuk 2004

Selected specimens examined. WESTERN AUSTRALIA: Along Hwy Moora–Coorow, 30°34'23.5" S, 116°01'05.6" E, Chenopodiaceae communities with *Atriplex* sp., *Scaevola spinescens*, 4 Jan. 2004, *Kondratyuk, S.* 20411, *Kärnefelt, I. & Cranfield, R.J.* (KW); Railway Reserve, along the road N 116, 2 km E of Three Springs, 29°32'46" S, 115°46'42" E, 4 Jan. 2004, *Kondratyuk, S.* 20415, *Kärnefelt, I. & Cranfield, R.J.* (KW, LD); SW end of Lake Barlee, *c.* 19 km by track E of Diemal–Barlee Stations road, 25 Aug. 1970, *Saffrey* 970 (PERTH 3884031); 8 km SSE of Kalbarri, 125 km NNW of Geraldton, 1968, *Wilson* 6595 (MEL 32528).
SOUTH AUSTRALIA: 14.6 km from Port Neill towards Tumby Bay, near "Brayfield", 34°11'S 136°15'E, *c.* 60 m, mallee along roadside, 1982, *Canning, E. M. & Corbett, S.* 5462 (CBG 8210165); 2 km E of Peake, along Highway 12, 35°22'S ,139°56'E, 1979, *Elix, J. A.* 5480 (CBG 9615593).
NEW SOUTH WALES: Willandra National Park, Halls Lake, 54 km NW of Hillston, 33°13'S, 145°03'E, 100 m alt., 30 Oct. 1987 *Curnow* 1566 (CBG 8705000).
AUSTRALIAN CAPITAL TERRITORY: Kambah Pool, 35°24'S, 149°00'E, *c.* 520 m alt., 1970, *Dahl, E. s.n.* (CBG 227590); Uriarra Crossing, Murrumbidgee River, 18 km W of Canberra, Wpt. 50, 35°15'03" S, 148°56'60" E, 1997, *Kärnefelt, I.* 9755501 (LD); Mt Ainslie, Canberra, 35°16'S, 149°07'E, 740 m alt., open *Eucalyptus* woodland on ridge. On *Bursaria spinosa*, common, 1983, *Streimann* 27832 (CBG 8309850).
VICTORIA: East Gippsland, Buchan Caves Reserve, 37°30'S, 148°09'E, 130 m alt., 1965, *Filson* 7995 (MEL 16568); NW Victoria, Sunset Country, head of McArthur's lease, 1951, *Goodall s.n.* (MEL 24803); NW of Swan Hill, 64 km W of Nyah West, *c.* 80 m alt., Wpt. 22, 35°11'69" S, 142°41'30" E, 1999, *Kärnefelt, I.* 992202 (LD); Buchan Caves area, on various trees in the park, 9 Feb. 2004, *Kondratyuk, S.* 204118 and *Kärnefelt, I.* (KW).
TASMANIA: Bass Strait, Furneaux Group, Cat Island, *c.* 20 yards E of eastern end of southern beach, 39°57'S 148°21'E, 3 m alt., 1967, *Whinray s.n.* (MEL 2045054); West (Inner) Sister Island, *c.* 20 yards in from high water level, *c.* 39°42'S 147°54'E, 1966, *Whinray s.n.* (MEL 1516799).

Distribution. Australia.

Ecology. *X. elixii* is a rather common corticolous species in Mangrove Swamps, coastal dunes and saltmarshes where it grows on mallee shrubs, usually on basal parts and dead sticks lying on the ground. It is has been collected from twigs of *Solanum orbiculatum*, *Diplolaena dampieri*, *Atriplex padulosa*, *A. cinerea*, *A. vesicaria*, on *Melaleuca* sp., *Casuarina stricta*, *Myoporum insulare*, *Acacia dealbata*, *Casuarina cunninghamii*, *Bursaria, Avicennia marina*, *Hymenophera gentala*, *Callitris*, *Eremophila* sp., *Lycium ferrocissimum*, *Exocarpus*, *Olearia muelleri*, *Nitraria*, *Arthrocnemum* bush, *Muehlenbeckia cunninghamii*, *Rhagodia baccata*, and on *Sclerostegia arbuscula*. *Xanthoria elixii* has been found associated with *X. filsonii* and *Caloplaca hanneshertelii* (Kärnefelt & Kondratyuk 2004), more seldom with *Teloschistes spinosus*, *Candelaria concolor*, *Caloplaca holocarpa* agg. *Xanthoria ligulata s.l.*; *Caloplaca cf. gyalectoides*, *Xanthoria streimannii* and *X. parietina s.l.* Several times it has been recorded with different lichenicolous fungi e.g. *Stigmidium* sp., *Lichenodiplis poeltii*.

Etymology. This species is named in honour of the well-known Australian lichenologist Jack Elix, who has contributed extensively to improve our knowledge of the taxonomy and secondary chemistry of Australian lichens.

Taxonomy. *X. elixii* superficially resembles juvenile individuals of *X. parietina*. However, these smaller individuals usually have well developed apothecia. In terms of thallus size, the presence of marginal hapters, the distinctly developed lobes, and the lecanorine apothecia with pseudoprosoplectenchymatous true exciple, *X. elixii* reminds one of *X. streimannii* (see below). However, *X. elixii* differs from this species

in the horizontally orientated terminal portions of the lobes, the loosely attached thalli, the much shorter and concave lobes and the presence of 'oil paraphyses'. *X. elixii* also differs from *X. streimannii* by the much thinner thallus with a lax medulla, the presence of palisade paraplectenchyma in the cortex of the thalline margin, the narrower septum of ascospores, and the different secondary chemistry (chemosyndrom A_3). The lobes of *X. streimannii* are often more greyish in the central part of thallus, while the lobes in *X. elixii* are usually more evenly yellow-orange. The morphologically slightly similar and also smaller species *X. filsonii* and the Mediterranean-Asian *X. microspora* both differ from *X. elixii* in the ascending marginal zone, the mesodermatous paraplectenchymatous upper cortex, the more or less concave lobes, the presence of palisade paraplectenchyma in the cortex of the thalline exciple of apothecia, and presence of 'oil paraphyses' (see Table 1).

Xanthoria filsonii Elix, Lich. Aust. Ex. No. 174 (1988) *Type*: Australia: Victoria, Hopetoun – Patchewolock Road, 5 km NE of Hopetoun, on *Rhagodia* along grazed roadside verge with *Rhagodia* and *Eucalyptus*, 80m alt., 1987, *Curnow* & *Lepp* 1422 (*holo*: CBG, *n.v.*; *iso*: LD!, MEL!).

Thallus very small, 6–15(–25) mm across, densely adpressed, more or less covered by apothecia, yellow-orange, reddish-orange sometimes to greyish-yellow, brownish-yellow or grey; lobes less developed or invisible beyond the apothecia, occasionally seen as single separate lobes of irregular shape up to 1–1.5(–2) mm long and *c.* (0.2–)0.5–1.5(–2.5) mm wide in young thalli, irregularly elongated, mainly separate, usually unbranched, plane or flat, often with primordia, unwarted zone of lobes not wider of 1(–2) mm; thallus in section 100–110(–150) mm thick; *upper cortex* 10–12.5(–17.5) mm thick, true paraplectenchymatous; algal layer 16–20(–50) mm thick; *medulla* rather lax composed of single or groups of long horizontally orientated hyphae, 4–5(–6) mm thick, sometimes with oil droplets; *lower cortex* thin, 10–15(–20) mm thick, true paraplectenchymatous. *Hapters* rare and mainly at the marginal zone of lobes. *Ascomata and ascospores: Apothecia* located in central part of the thallus, usually covering the lobes, *c.* (0.4–)1–1.2(–2) mm diam., regularly rounded to irregularly pressed, disc darker reddish-orange, becoming convex and biatorine when mature. In section zeorine, *thalline exciple* paraplectenchymatous; *true exciple* up to 50–60 mm thick at the uppermost part, well developed in the basal part, 10–15 mm thick scleroplectenchymatous to somewhat pseudoprosoplectenchymatous. *Hymenium* 45–50(–60) mm high; subhymenium up to 20 mm thick, asci (45–)48–50 × 10–12 mm; *paraphyses c.* 2.0 mm diam., the uppermost cells up to 7 mm diam., with oil droplets; *ascospores* (10–)12–13(–16) × 5–6 mm, septum 3–4.5(–6) mm thick. *Spermatia* oblong or narrowly to widely ellipsoid, 2.2–2.7 × 1–1.2(–1.5) mm.

Chemistry. Elix (1988) reported three compounds, of which teloschistin was the major component, with parietin and parietinic acid as minor components. From our data, *X. elixii* is characterised by chemosyndrom A_3 (cf. Søchting 1997, 2002).

Selected specimens examined: WESTERN AUSTRALIA: Southern end of Lake Lefroy, 18 km NE of Widgiemooltha, 95 km NW of Norseman, 31°16'S, 121°42'E, 1996, *Archer* 291 (MEL 241326); Roe Rd from Norseman to Esperance near Beete Railway Station, *c.* 64 km SSW of Norseman, 32°42'S, 121°31'E, 1965, *Donner s.n.* (MEL 16554); Coolgardie, Fraser Range, 32°01'S, 122°48'E, 1891, *Helms, R.* 40 (MEL 7438); Madura, 29 Aug. 1966, *Lowry s.n.* (PERTH 3883841); 8 miles S of Norseman, 1971, *Royce* 316 (PERTH 3883817); Eastern margin of Lake King, 1970, *Saffrey* 1210 (PERTH 3883809); Suomi Island, Pelsart Group, Abrolhos Islands, 1970, *Sammy s.n.* (PERTH 3884082); 11 km NE of Cocklebiddy, 1967, *Wilson s.n.* (PERTH 3884066).

SOUTH AUSTRALIA: Koonalda Cave, 31°24' S, 129°49' E, 1965, *Beauglehole* 14951 (MEL 22828); 8 km E of Geranium along Highway 12, 35°23' S, 140°14' E, 1977, *Elix* 4137 (CBG 9507691); York Peninsula, 10 km N of Stansbury on the road to Port Vincent, Wpt. 54, 34°49.82' S, 137°49.36' E, 1999, *Kärnefelt, I.* 995401 (LD); Nullarbor, Nullarbor HS, 31°25' S, 130°54' E, 1952, *Kemsley s.n.* (MEL 7469).
NEW SOUTH WALES: South Western Plains, 15 km from Hay towards Balranald, 34°32' S, 144°43' E, 85m alt., 1988, *Butler* 1469 & *Weston* (CBG 8801506); On the Sturt Hwy 20 miles W of Balranald, 34°36' S, 143°13' E, 1970, *E. Dahl s.n.* (CBG 227589).
VICTORIA: Wimmera, Western Victoria, Horsham – Murtoa road, *c.* 14.5 miles from Horsham, 36°37' S, 142°22' E, 1966, *Anish* 66/611 (MEL 18270); Dimboola National Park, 36°27' S, 142°01' E, 1949, *Beauglehole* 1914 (MEL 1020491); East Gippsland, Buchan Caves Reserve, 37°30' S, 148°09' E, 130m alt., growing together with *Xanthoria elixii*, 1965, *Filson, R.* 7995 (MEL 16568); NW Victoria, Sunset Country, head of McArthur's lease, 1951, *Goodall s.n.* (MEL 24803).
TASMANIA: Bass Strait, Furneaux Group, West Sister Island, 39°42' S, 147°54' E, 1966 *Whinray s.n.* (MEL 1516799).

Distribution. *X. filsonii* was until now known exclusively from type locality at Pink Lake in NW Victoria, however, is in fact rather widely distributed in Australia.

Ecology. *X. filsonii* is a corticolous species which has been found growing in open areas, grazing lands, in saltmarsh sites, and on shrubs near the sea. Furthermore it has been found on dead wood and bark of various trees and shrubs such as *Hymenanthera dentata*, *Atriplex cinerea*, *Eucalyptus largiflorens*, *Nitairia schoberi*, *Leucopogon parviflorus*, *Arthrocnemum* sp., *Ptilotus* sp., *Atriplex* sp., *Muehlenbeckia cunninghamii*, *Bursaria* sp., *Myoporum* sp., *Arthrocnemum* sp., *Lycium australe, Melaleuca* sp., *Enchylena tomentosa*, *Sclerostegia arbuscula*, *Scaevola crassifolia* and on *Acacia*. *Xanthoria filsonii* has been found growing together with *X. parietina*, *X. elixii*, *X. streimannii*, and with various species of *Caloplaca* (*C. citrina*, *C. cerina* agg., *C. holocarpa* agg., *Caloplaca* cf. *gyalectoides*), *Lecanora*, *Rinodina, Lecidella* spp., *Candelariella* spp., *Physcia* spp. etc.

Taxonomy. *X. filsonii* was hitherto distinguished from *X. parietina* merely by its chemosyndrom (Elix 1988). However, the material studied here revealed separating morphological characters between *X. filsonii* and *X. parietina* and other related species (Table 1). *X. filsonii* differs from *X. parietina* by its smaller size, small, flat and closely attached lobes, and presence of chemosyndrom A_3. The lobes in *X. parietina* are longer than 3 mm, with concave with undulate margins, slightly bent upwards. *X. filsonii* also reminds one of *X. polycarpa* from the boreal regions in the northern hemisphere, and of the Mediterranean species *Xanthomendoza concinna* and *X. aphrodites* in terms of the rather small size and the densely aggregated apothecia in the central parts of the thallus. *Xanthoria filsonii* differs from *X. polycarpa* in the flatter thallus in the central part, and the generally larger more closely attached lobes; furthermore, the lobes of *X. filsonii* are always flat, not dissected and usually straight and horizontally orientated.

Material of *X. filsonii* frequently included *X. ligulata s. l.* in earlier works, the latter a species of several maritime, epilithic taxa with uncertain taxonomical status, characterized by thick convex lobes forming a network-like thallus. The upper cortex of *X. ligulata* is palisade plectenchymatous, whereas it is mesodermatous paraplectenchymatous in *X. filsonii*. Furthermore, hapters in *X. filsonii* are rare and found exclusively at the lobe margins, a type of attachment characteristic of some additional *Xanthoria* species distributed in the Southern Hemisphere, such as *Xanthoria karroensis* (Kärnefelt *et al.* 2002), *X. dissectula* (Kondratyuk *et al.* 2004) and others.

Table 2. A comparison of distinguishing characters between some Australian *Xanthoria* species and Australian material of *Xanthoria parietina s. lat.*

Character	*X. parietina s.lat.*	*X. streimannii*	*X. ligulata*
Thallus			
size diam. (cm)	to 6(–10)	to 2.5	to 3–4
margin	bent upwards	horizontal	horizontal
marginal vs. central parts	±different	the same	sometimes different
attachment	loose	densely	densely
type	sparse laminal hapters	sparse marginal hapters	sparse marginal hapters
upper cortex	leptod.-parapl.	leptod.-parapl.	palisade parapl.
medulla	lax	dense	dense
lower cortex	leptod.-parapl.	leptod.-parapl.	parapl.
Lobes			
structure	concave	subconvex	convex
size	large and wide	well developed at the margins	well developed at the central part
length (mm)	3–6	3–4	10–14
width (mm)	2–5	1–1.5(–2.5)	0.7–1.5(–2)
Apothecia			
frequency	sparse to numerous	numerous in the central part	sparse to numerous
true exciple	scleropl.	pseudoprosopl.	pseudoprosopl.
cortex of thalline margin	leptod.-parapl.	parapl.	parapl.
Hymenium			
paraphyses with oil droplets	present, abundant	absent	present, abundant
Ascospores			
size (μm)	14–17 × (7–)8–10	13–15 × 6–8	11–13 × (6–)7–8
septum (μm)	(7–)8–10(–11)	6–7.5	(3–)5–6(–7)
Spermatia			
shape	broadly bacilliform	unknown	widely ellipsoid
size (μm)	3–4 × 1.2–1.5		?
Chemosyndrom	A	A	?
Ecology	on various substrates	on bark of trees or on wood	on rocks
Distribution	Widely distributed	Australia	Australia
References	Kondratyuk 1997; Kondratyuk & Poelt 1997	present paper	present paper

Abbreviations:
leptod.-parapl. = leptodermatous paraplectenchymatous; mesod.-parapl. = mesodermatous paraplectenchymatous; parapl. = paraplectenchymatous; prosopl. = prosoplectenchymatous; pseudoprosopl. = pseudoprosoplectenchymatous; scleropl. = scleroplectenchymatous

Xanthoria streimannii S. Kondr. & Kärnefelt, *sp. nov.*

A similibus *Xanthoria filsonii* et *X. elixii* differt thallo crasso parvo, zona marginali dissecta lobisque latioribus.

Typus: Arranda Oval, Belconnen, Canberra, ACT, 35°15'15" S, 149°04'43" E, 650m alt., on introduced roadside trees, 5 Feb.2004, *Kondratyuk, S.* 204103 (*holo*: CBG; *iso*: LD, KW, MEL, PERTH).

Thallus small, (10–)15–25(35) mm across, plane, closely adpressed to the substrate, rather thick, with marginally wrinkled lobes, upper surface yellowish-green, brownish-yellow to greyish-yellow, yellow-grey or almost whitish-grey, in the central part, to brightly yellow within the same thallus; underside white to yellowish at the margins which are slightly bent downwards, with short furcate hapters along the margins; lobes undeveloped in the central part, visible between dissections of thalline edge or between wrinkles of peripheral parts, (1–)3–4(–5) mm long and 1–1.5(–2.5) mm wide, irregularly branched; thallus in section 110–137.5 mm thick; *upper cortex* leptodermatous paraplectenchymatous; algal layer 37–47 mm thick; *medulla* rather dense; *lower cortex* leptodermatous paraplectenchymatous up to 15 (–20) mm thick. *Ascomata and ascospores*: *Apothecia* (0.4–)0.8–2.0 mm diam, abundant in central parts, thalline margin concolorous with thallus or slightly darker in the peripheral zone of thallus, disk yellow-orange, plane to undulating in dense aggregations, concave or plane; *hymenium* to 50–70 mm high, *true exciple* pseudoprosoplectenchymatous, up to 7.5–12 mm thick in basal part, and to 60 mm in the uppermost lateral portion; *thalline exciple* paraplectenchymatous with thickened cell walls, 20–28(30) mm thick; *paraphyses c.* 1.8–2 mm diam., the uppermost cells widened *c.* 5.5(–6) mm diam.; asci *c.* 48 × 14 µm; *ascospores* with wide lumina, (12.5–)13–15 × (5.5–)6–8 mm [in water and (11–)12–15(–17) × (5–)5.5–7 mm in K], septum (5–)6–7.5 mm [in water and (5–)6–9(–11) mm in K]. (Figure2)

Chemistry. *X. streimannii* is characterised by chemosyndrom A (cf. Søchting 1997, 2001).

Selected specimens examined: AUSTRALIAN CAPITAL TERRITORY: Griffith, 2 km S of Canberra 35º18'S, 149º09'E, 580 m alt., 1979, *Streimann, H.* 7552 (CBG 7907173); Mt Ainslie, Canberra, 35º16'S, 149º07'E, 740 m alt., 1983, *Streimann, H.* 27832 (CBG 8309850); Kingston, 4 km SE of Canberra, 35º20'S, 149º08'E, 560 m alt., on exotic trees, 14 Mar.1981 *Streimann, H.* 15274 (CBG 8101702); Casuarina Sands, 16 km W of Canberra, 35º20'S, 148º57'E, 500 m alt., 26 Nov.1980, *Verdon, D.* 4856 (CBG 8110518); Hawker, 10 km NW of Canberra, 35º14'S, 149º02'S, 600 m alt., on trunk of exotic tree at Belconnen High School, 22 Jun.1980, *Streimann, H.* 10356 (CBG 8004567).
NEW SOUTH WALES: Lake Mulwala, W of Corowa along Murray River, *c.* 130 m alt., Wpt. 19, 36º53'6"S, 147º18'17"E, 1999, *Kärnefelt, I.* 991901 (LD); 90 km S of Sydney, Kiama, center of town, Wpt 46, 1997, *Kärnefelt, I.* 9755101 (LD); Tea Tree Creek near Tinderry, 35º42'S, 149º15'E, 1970, *Dahl & McVean* (CBG 227486); Mountain Ck, "Brooklyn station". 35º04'S, 148º50'E. alt. 460 m, 16 Feb. 1975, *Burmeister, J.* 67 (CBG 58712); Bermagui Point, on bark of Araucarias not far from the oceanic coast, 29 Jan.2004, *Kondratyuk, S.* 20484 & *Kärnefelt, I.* (KW); Jindera, 15 km NNW of Albury, 35°57'33.1"S, 146°53'28.1"E, a. 235 m alt., on roadside trees (including *Fraxinus excelsior*) in settlement, 7 Feb.2004, *Kondratyuk, S.* 204109 & *Kärnefelt, I.* (KW).
TASMANIA: Campbell Town, The Willows Picnic Reserve, Wpt. 78, 41º55.68'S, 147º27.75'E, 1999, *Kärnefelt, I.* 997801 (LD); N of Hobart along A1, *c.* 1 km N of Oatlands, Wpt 71, 42º17.42'S, 147º23.05'E, 1999, *Kärnefelt, I.* 997101 (LD).
VICTORIA: South Yarra, S.E. 1, Rear of Williamstown Racecourse, Victoria, 1942, *Bibby s.n.* (CBG 132563); Melbourne, South Yarra, Botanical Garden, near 'Temple of the Winds' and 'Plant Craft Cottage', 15 Feb.2004, *Kondratyuk, S.* 204134a (KW).

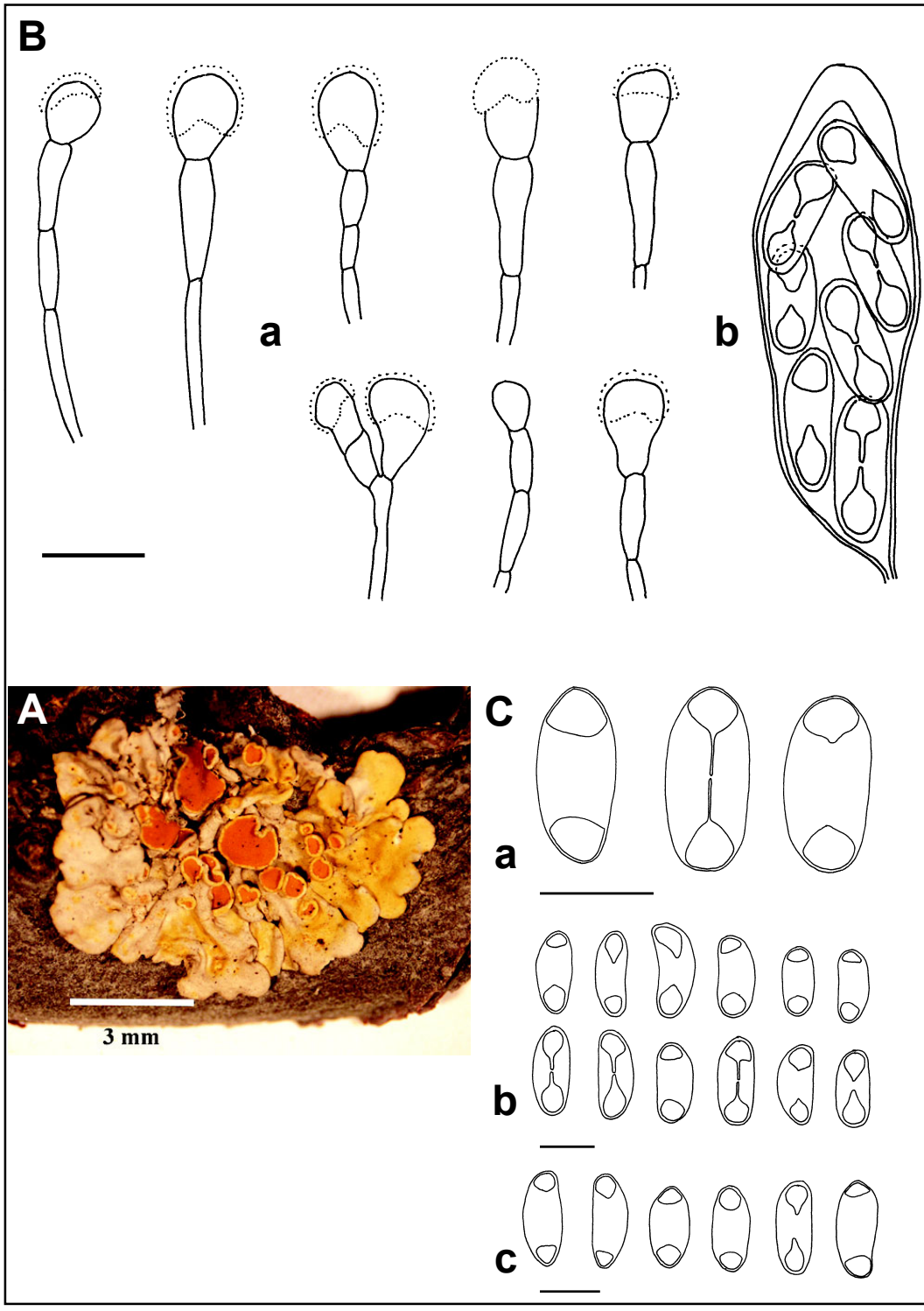

Figure 2. *Xanthoria streimannii*. A – General habit (bar = 3 mm); B – (a) Paraphyses, and (b) ascus with ascospores (bar = 10 µm); C – Ascospores [a and c – in K; b – in water] (bar = 10 µm).
Taken from *Kondratyuk* 204103 (holotype, CBG).

Ecology. *X. streimannii* is a corticolous species which has been found growing on bark of various trees, particularily introduced trees such as *Crategus*, *Ulmus*, *Salix* and *Araucaria araucariana*, and on *Arthrocnemum* in salt marsh, on trunks of exotic trees between dual carriage ways, in open *Eucalyptus* woodland on ridge, and on *Bursaria spinosa*. *X. streimannii* has been found in association with *Candelaria concolor* and *Candelariella* sp. It is often damaged by lichenicolous fungi.

Etymology. This species is named after the deceased Australian bryologist Heinar Streimann, whose contribution to lichenology was of great importance through his huge and well prepared collections of mainly Australian lichens.

Taxonomy. *X. streimannii* reminds one of *X. elixii* in thallus size, well developed lobes, lecanorine apothecia, a pseudoprosoplectenchymatous true exciple, its ecology and distribution restricted to the Southern Hemisphere. However, *X. streimannii* differs from *X. elixii* by a much thicker thallus including a well developed and rather dense medulla, the subconvex lobes, thicker septa in the ascospores, and presence of chemosyndrom A. Furthermore, *X. streimannii* differs from *X. elixii* in the densely attached thallus, longer lobes, lacking upwardly bending terminal portions, and absence of 'oil paraphyses'. *X. streimannii* differs from small sized species, such as *X. filsonii* and the Mediterranean-Asian *X. microspora*, by a thicker thallus with dense medulla, subconvex, much larger lobes, and larger ascospores with wider septa. *X. filsonii* is, in contrast to *X. streimannii*, characterized by numerous, biatorine apothecia, 'oil paraphyses' and chemosyndrom A_3 (Tables 1 and 2).

Key to Australian xanthorioid lichens

1. Thallus lobes thin, concave or plane, but never convex or subconvex **3**
1. Thallus lobes thick, smooth, terminal lobes slightly convex and deflexed **2**
2. Thallus lobes rather longer (5–10 mm long) and narrow; usually on coastal rocks ..... **X. ligulata**
2. Thallus lobes visible only at dissected margin, up to 2.5(–4) mm long, thallus *c.* 2–3(–5) cm diam., of very well developed circles, rosettes; widespread on bark of trees ..... **X. streimannii**
3. Thallus rather large, more than 2 cm diam. usually 4–6(–9) cm across, lobes concave with raised, flexuose margins, attached only by central part with hapters ..... **X. parietina**
3. Thallus rather small, less than 2 cm diam., in aggregations of several thalli more than 3 cm across, lobes horizontally orientated towards tips, attached mainly by marginal zones **4**
4. Thallus of irregular, mainly single lobes, which are mostly undeveloped or seen only in young thalli; thallus reddish-orange, mainly of densely aggregated apothecia; discs of apothecia non-concolorous with the thallus, usually becoming convex and biatorine when over-mature ..... **X. filsonii**
4. Thallus with well developed marginal zone, up to 1 cm wide always without apothecia, lobes well visible, never completely covered by apothecia; thallus yellow to yellow-orange with apothecia characteristically grouped at the central part, disc plane, lecanorine and stipitate in mature stage, concolorous with thallus or orange ..... **X. elixii**

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